ANNUAL REHABILITATION PLAN ENVIRONMENTAL AUTHORISATION FOR THE CONSTRUCTION OF LIME KILNS, HAUL ROAD AND UPGRADE OF ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT WITH RESPECT TO MINING ACTIVITIES ON FARM VADELANDSHCE RIETKUIL NEAR VREDENDAL, WESTERN CAPE PROVINCE

DMR Reference Number: WC 30/5/1/2/3/2/1 294MR

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CONTENTS

LIST OF ABBREVIATIONS

DMR	Department of Mineral Resources
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
IAPs	Interested and Affected Parties
LoM	Life of the Mine
MHSA	Mine Health and Safety Act (Act 29 of 1996) 1996
MPRDA	Minerals and Petroleum Resources Development Act of 2002 (Act No. 28 of 2002)
NEMA	National Environmental Management Act of 1998 (Act No. 107 of 1998)
NWA	National Water Act of 1998 (Act No. 36 of 1998)

1 INTRODUCTION

Cape Lime (Pty) Ltd, a subsidiary of Afrimat (Pty) Ltd proposes to upgrade its current Environmental Management Programme report in order to be compliant with the NEMA EIA Regulations 2014 as amended. Cape Lime's existing Environmental Management Programme was approved (28 October 2002) in terms of the Minerals Act, 1991 (Act 50 of 1991) and updated in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No 28 of 2002) approved on 17 May 2013.

As from the 8th December 2014 the Department of Mineral Resources became a competent authority in all activities related to mining identified in terms of National Environmental Management, 1998 (Act 107of 1998) and NEMA also set a minimum standard to which all the reports relating to mining activities must conform to.

Cape Lime mines and processes limestone and dolomite on Remainder of Portion 1 of Farm Vaderlandsche Rietkuil 308, Farm Nuwedrif 450, Portion 21 of Farm KYS 301, Portion 26 of Farm KYS 301 and Portion 162 of the Farm Karoo Vlakte 299, situated approximately 8 km south-east of Vredendal. The current activities entail, apart from mining, the crushing and screening of all mined material as well as calcination of limestone in an existing Fluid Bed Lime Kiln.

The Vredendal limestone and dolomite ore are of an exceptionally high quality and are the only current operating source suitable as raw materials for the production of high quality glass and refractory materials in South Africa. The high quality limestone is also suitable for the production of lime for water treatment and the manufacture of Precipitated Calcium Carbonate (PCC). The lime would otherwise have to be imported. The markets currently served are:

- Water treatment (potable and effluent)
- Glass Industry (Flat glass and container glass)
- Aggregates
- Chemical Industries
- Mineral Fillers Industries
- Metallurgical industry

Cape Lime is also a holder of the mining rights for the mining of limestone from within a 321 ha area on the Remainder of Farm 511 (Farm Welverdiend) in Vanrhynsdorp. Awarded in June 2012, in terms of Section 22 of the Mineral and Petroleum Resources Development Act 2002 (Act No. 28 of 2002), No processing takes place at Farm Welverdiend, all product material is transported to the existing Vredendal plant (± 15km west of the site) for processing.

The proposed project will also include the following new developments;

- The construction of two new kilns (calciners) in addition to the existing Kiln which has been in operation since 2004 and;
- The construction of a haul road between the two Cape Lime mining rights Farm 511/4 Welverdiend and Farm Vaderlandshce Rietkuil 308/1, see figure 2. The road will be used to transport material from Farm Welverdiend to the Vredendal primary crushing plant.

The addition of new Kilns will enable the mine to increase its overall production capacity of high quality white lime products. Cape Lime is confronted on a regular basis with enquiries with regards to the supply of high quality white lime products to potential new projects in South Africa, for which Cape Lime does not have the current production capacity.

The mine currently transports about 3000 tons of material a month from Farm 511/4 Welverdiend, Vanrhynsdorp to the Vredendal Plant via the N7 and R27 roads. The new haul road is more feasible than the current road due to reduced hauling distance and will prevent the need for trucks and machinery to travel along the N7 and R27 to the Vredendal plant.

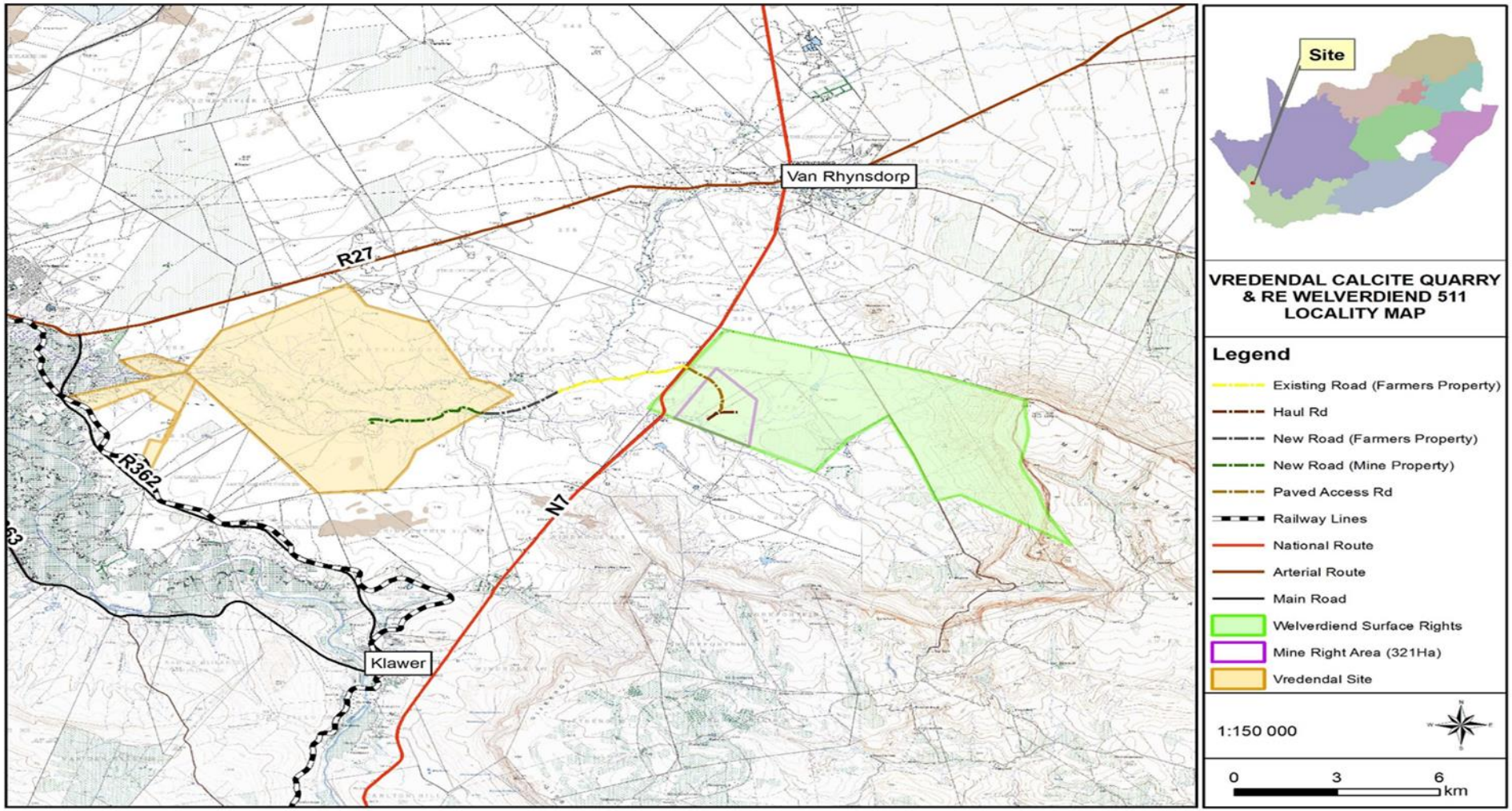

Figure 1: Locality of the proposed project.

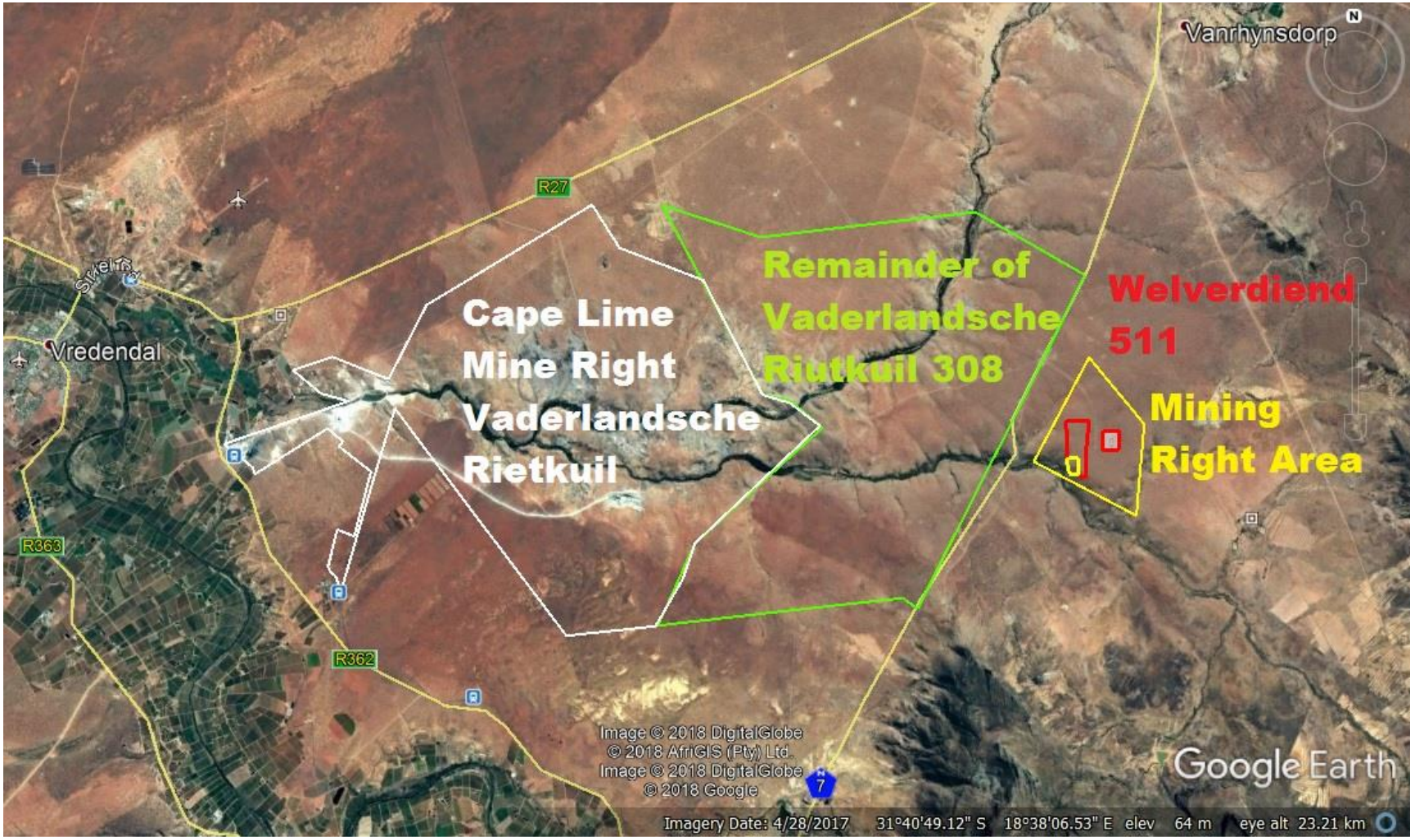

Figure 2: Google Earth Map showing the two Cape Lime mining rights: Farm Vaderlandsche Rietkuil and Welverdiend Farm

2 DETAILS OF AND EXPERTISE OF THE EAP

Table 1: Details of Environmental Assessment Practitioner (EAP)

Name	Qualification and experience
Ntsanko Ndlovu	Ntsanko is a Professional Environmental Scientist (EAPASA – 2019/1335 and Pri.Sci.Nat -127870) and holds a Masters degree in Environmental Management from North-West University with over twelve (12) years of professional experience as an Environmental Scientist in the consulting industry. Ntsanko is currently Group Environmental Specialist based at Afrimat. She has a wealth of experience in managing Environmental Impact Assessments (EIAs) with the required Public Participation Process (PPP), carrying out environmental audits and conducting environmental awareness, which she gained through the years.
Telephone Number	012 664 5649
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In terms of Section 13 (2) of the NEMA EIA Regulations 2014 the proponent must appoint an independent Environmental Assessment Practitioner (EAP) in the event where the EAP or specialist is not independent. Afrimat Aggregates (Operations) (Pty) Ltd has therefore appointed Biogeotech Environmental Consultance as an independent EAP to externally review this report. This report has been independently reviewed Mr Victor Manavhela of Biogeotech Environmental Consultance. Table 2 below provides information of the independent reviewer.

Table 2: Details of independent Reviewer

Name	Qualification and Experience
Victor Manavhela	Mr Victor Manavhela hold a Bachelor of science: Environmental Sciences, Certificate of Environmental Law and Certificate: EIA Reviewers course. He has over 20 years in the field of environmental management and sustainability. Out of the 17 years, at least over 6 years were spent on EIA regulations which include review of EIA applications to advice on EIA decisions at government level. He has also worked as an Environmental specialist for Anglo American company in Pulp and Paper industry. In addition he also holds the vast experience in ISO standards implementation and has participated in global standard development for Aluminium mining and processing sector led by IUCN.
Telephone Number	072 130 2832
e-mail	vmanavhela@biogeotech.co.za

3 PROJECT CONTEXT

Cape Lime mines and processes limestone and dolomite, on Portions 0 and 1 of the Farm Vaderlandsche Rietkuil 308, Remainder of Farm Nuwedrif 450, Remainder of Farm 510, and Portion 40 of Farm 301, situated approximately 8 km south-east of the Vredendal. The current activities entail, apart from mining, also the crushing and screening of all mined material as well as calcination of limestone in an existing Fluid Bed Lime Kiln.

The Vredendal limestone and dolomite ore are of an exceptionally high quality and are the only current operating source suitable as raw materials for the production of high quality glass and refractory materials in South Africa. The high quality limestone is also suitable for the production of lime for water treatment and the manufacture of Precipitated Calcium Carbonate (PCC). The lime would otherwise have to be imported. The markets currently served are:

- Water treatment (potable and effluent)
- Glass Industry (Flat glass and container glass)
- Aggregates
- Chemical Industries
- Mineral Fillers Industries
- Metallurgical industry

The proposed project will also include the following new developments;

- The construction of 2 new Kilns in addition to the existing Kiln which has been in operation since 2004 and;
- The lengthening of an existing road located between the two Cape Lime mining rights Farm 511/4 Welverdiend and Farm Vaderlandshce Rietkuil 308/1,. The road will be used to transport material from Farm Welverdiend to the Vredendal primary crushing plant.

The addition of new Kilns will enable the mine to increase its overall production capacity of high quality white lime products. Cape Lime is confronted on a regular basis with enquiries with regards to the supply of high quality white lime products to potential new projects in South Africa, for which Cape Lime does not have the current production capacity.

The mine currently transports about 3000 tons of material a month from Farm 511/4 Welverdiend, Vanrhynsdorp to the Vredendal Plant via the N7 and R27 roads. The new haul road is more feasible than the current road due to reduced hauling distance and will prevent the need for trucks and machinery to travel along the N7 and R27 to the Vredendal plant.

The mining and processing of lime currently takes place under the following activities:

Mining/ Mining and Excavation

The Open Pit Mining process entails removal of overburden to expose the ore before drilling and blasting takes place according to a structured mine plan. Excavation of blasted material is done by an Excavator and 18 ton trucks haul the material to the primary crushing plant.

Primary crushing

Run-of-mine material from a specific quarry (dolomite and/or limestone) is tipped into the feed bin from where the ore is fed to a jaw crusher. Thereafter the material goes through a series of screening and further crushing stages. The top size of the material may vary with respect to the product/products being produced. Crushed material is stockpiled at the primary crusher stockpile area.

Mineral Fillers

Crushed white dolomite from the primary crushing plant is fed to the Mineral Fillers plant where the size of the white dolomite is progressively reduced using crushers, ball mills, screens and air classifier. The resultant range of micro-fine products (5 microns, 15 microns, 75 microns and 300 microns) are stored in silos from where it can be packed in small bags or bulk bags for sale.

Dolomite Processing Plant

Crushed dolomite from the primary crushing plant is fed to the Dolomite Processing Plant where it is crushed and screened to -2 mm particle size. The material is then stored in silos before being loaded into bulk road trucks.

Limestone secondary crusher:

Crushed limestone from the primary crushing plant is fed to the secondary crusher and subsequently screened and air classified to yield three products. The coarser fraction (+1-6mm) is stockpiled and used as feed material for the Kiln. The middle fraction (-1mm) is stored in bins from where it is subsequently blended (after analysis) to obtain a consistent product composition before being loaded into road trucks when sold. The fine fraction (-200micron) is removed from the middle fraction before it's fed to the storage bins by passing the material through an air classifier. The fine fraction (-200micron) are routed to silos for storage before dispatched in road tankers when sold.

Fluid Bed Kiln

Limestone (CaCO3) is calcined in a Kiln at ±920˚C to obtain quicklime (CaO) using coal as fuel. All exhaust gas streams pass through bag filter units to be cleaned before being released into the atmosphere. The plant is fully automated to monitor all the process parameters. Quicklime is stored in silos before being bagged, sold in bulk or conveyed to the Oxide Processing Plant or Hydrator plant for

further processing. The material obtained at the bag filter units are sold as a low grade quicklime or passed through the hydrating plant to produce a low grade hydrated lime product.

Hydration Plant:

Quicklime is mixed with water in a process reactor to yield dry hydrated lime (Ca(OH)2), which is air classified to remove oversize material. The oversize material separated by the air classifying system passes through a milling section to reduce its particle size. The final product is then bagged or dispatched in bulk road tankers.

Service departments:

Laboratory:

All basic analysis for product composition and grading are done in a fully equipped laboratory on site to ensure compliance to Cape Lime's ISO 9002 quality system. Analysis from external laboratories are obtained annually or on special request to verify our test results.

Workshops:

All maintenance is done with the aid of three fully equipped workshops for electrical, mechanical and automotive disciplines.

The layout of the site is indicated on the figure below:

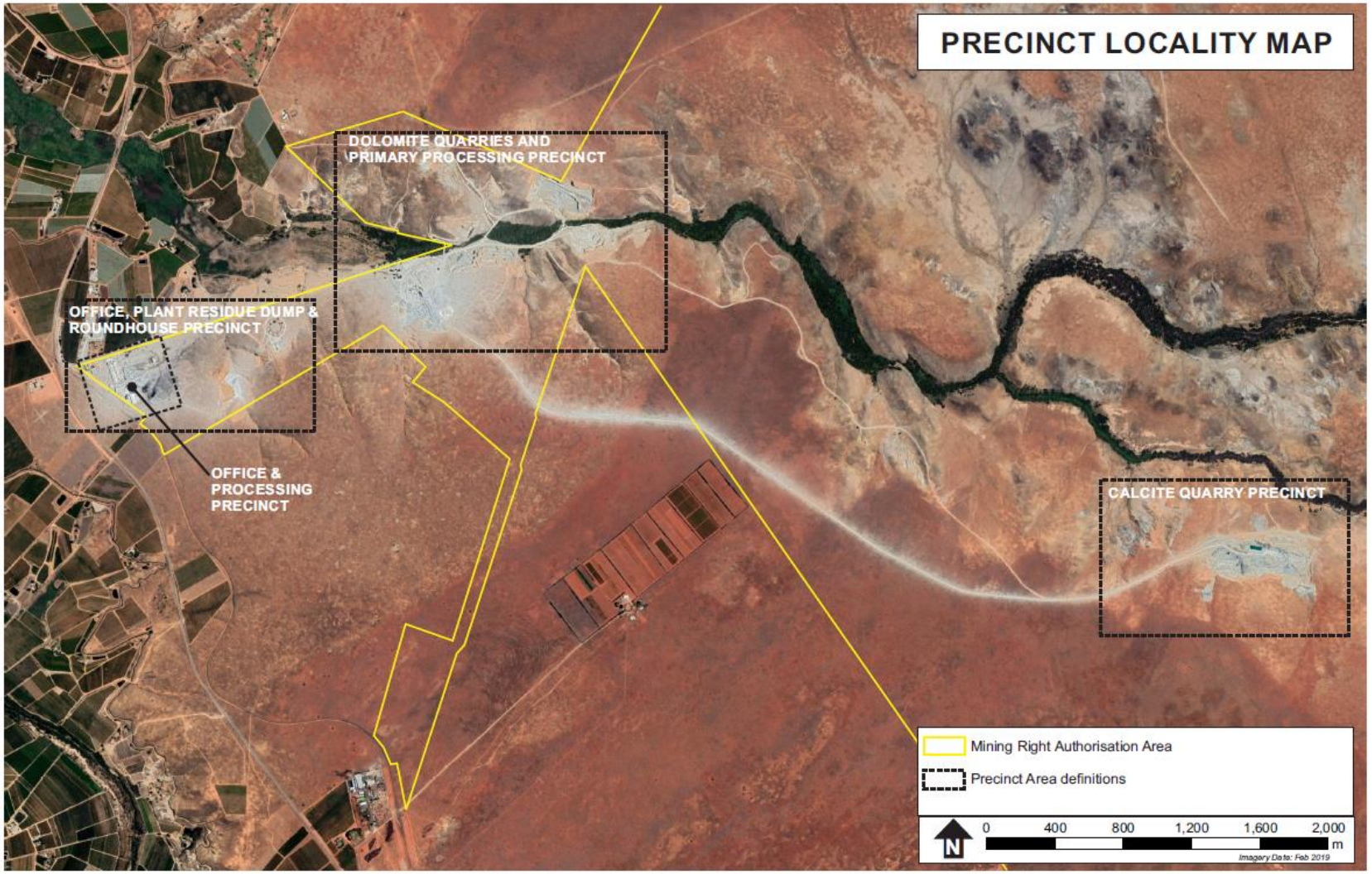

Figure 3: Overview and precinct layout

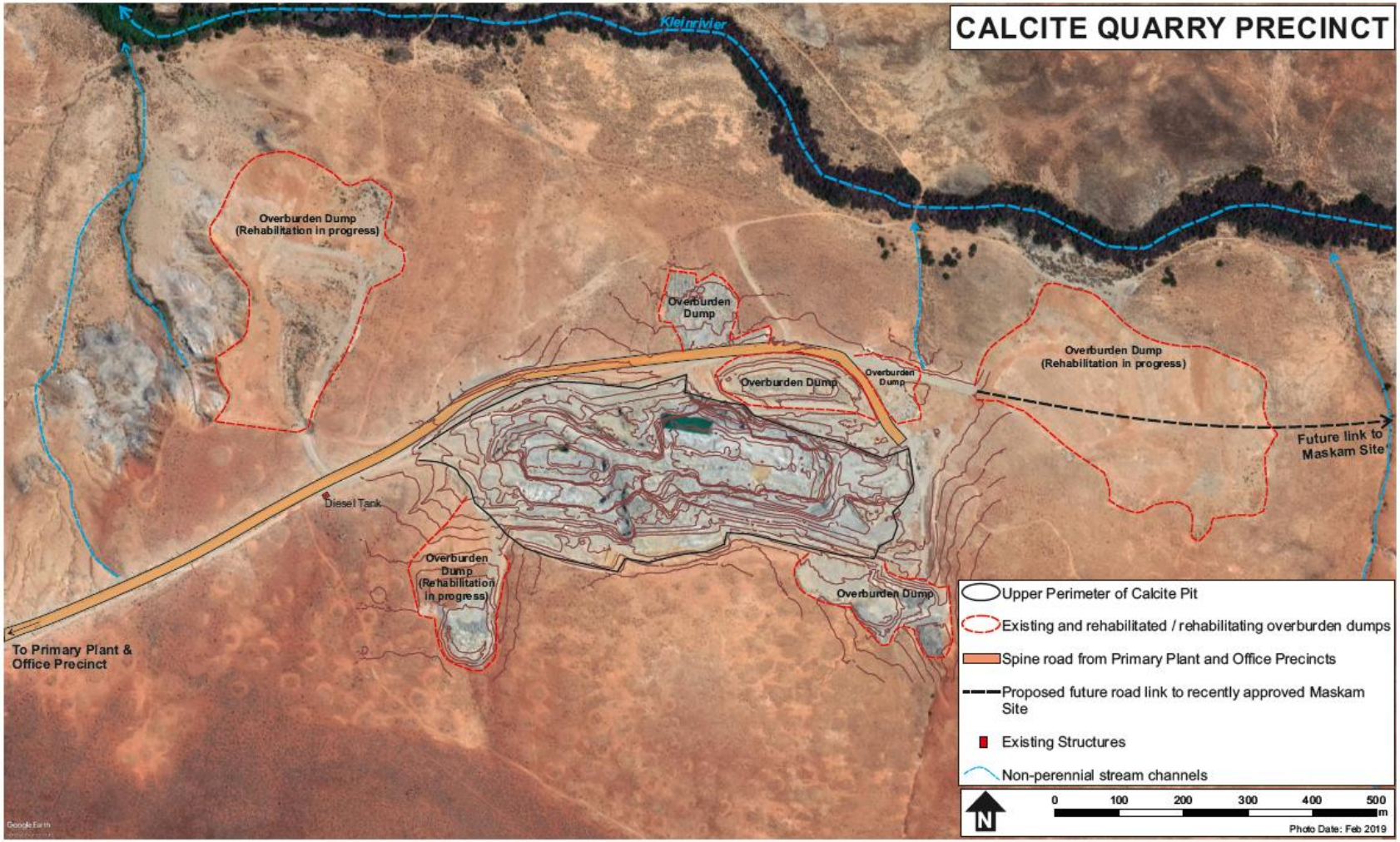

Figure 4: Layout showing the calcite quarry precinct

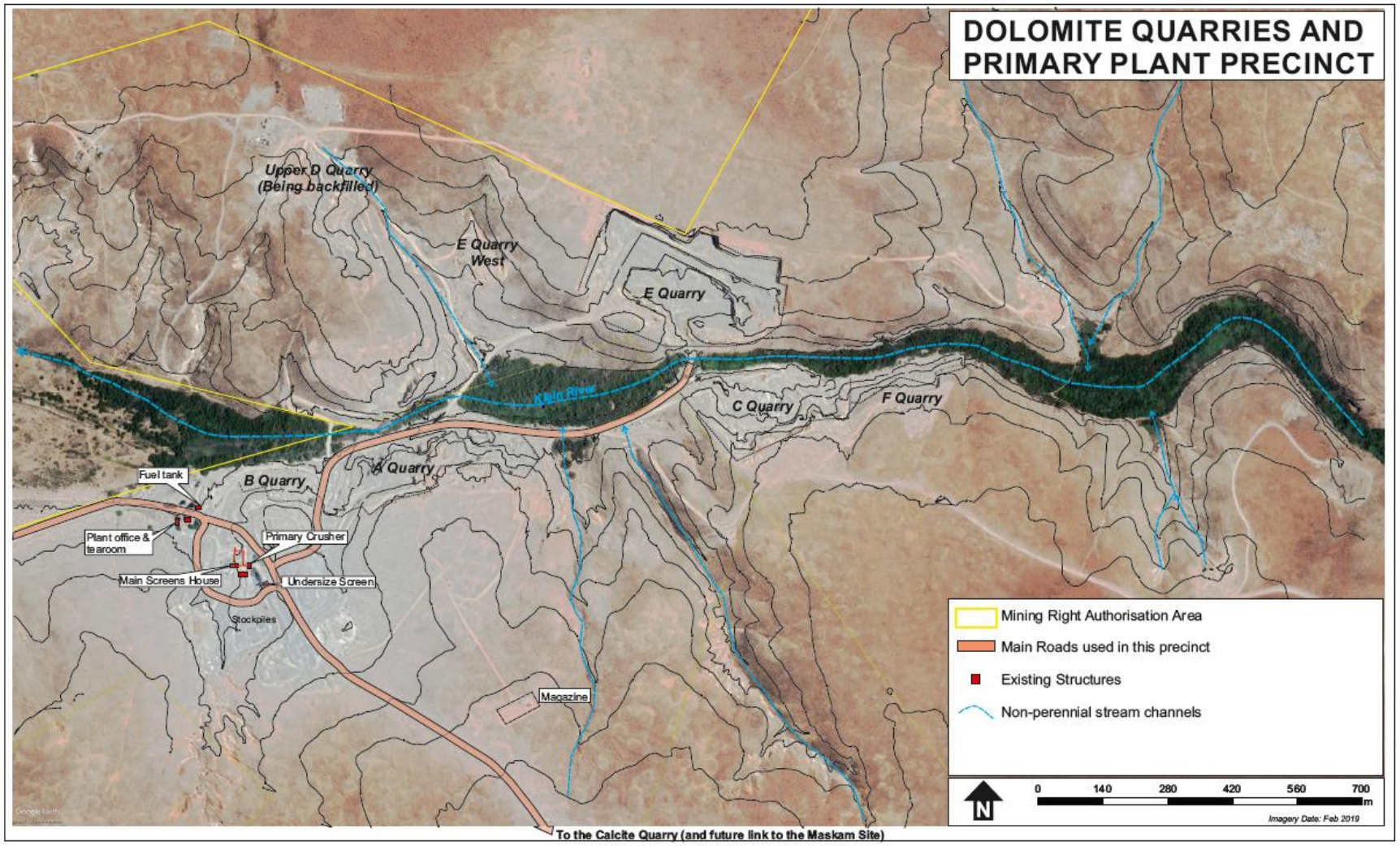

Figure 5: Layout showing the dolomite quarries and primary plant precinct

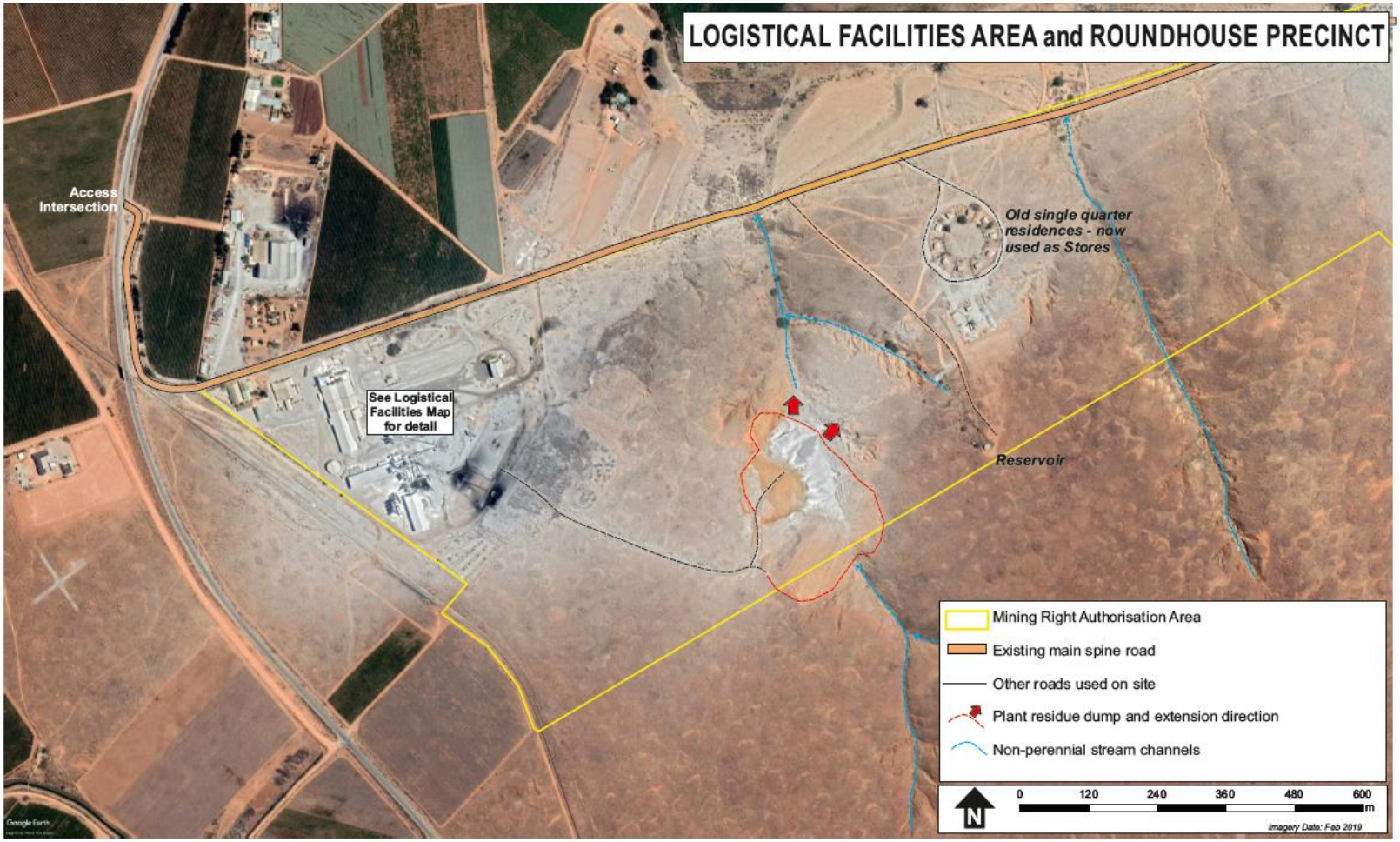

Figure 6: Layout showing logistical facilities area

Figure 7: Layout showing logistical and secondary processing facilities

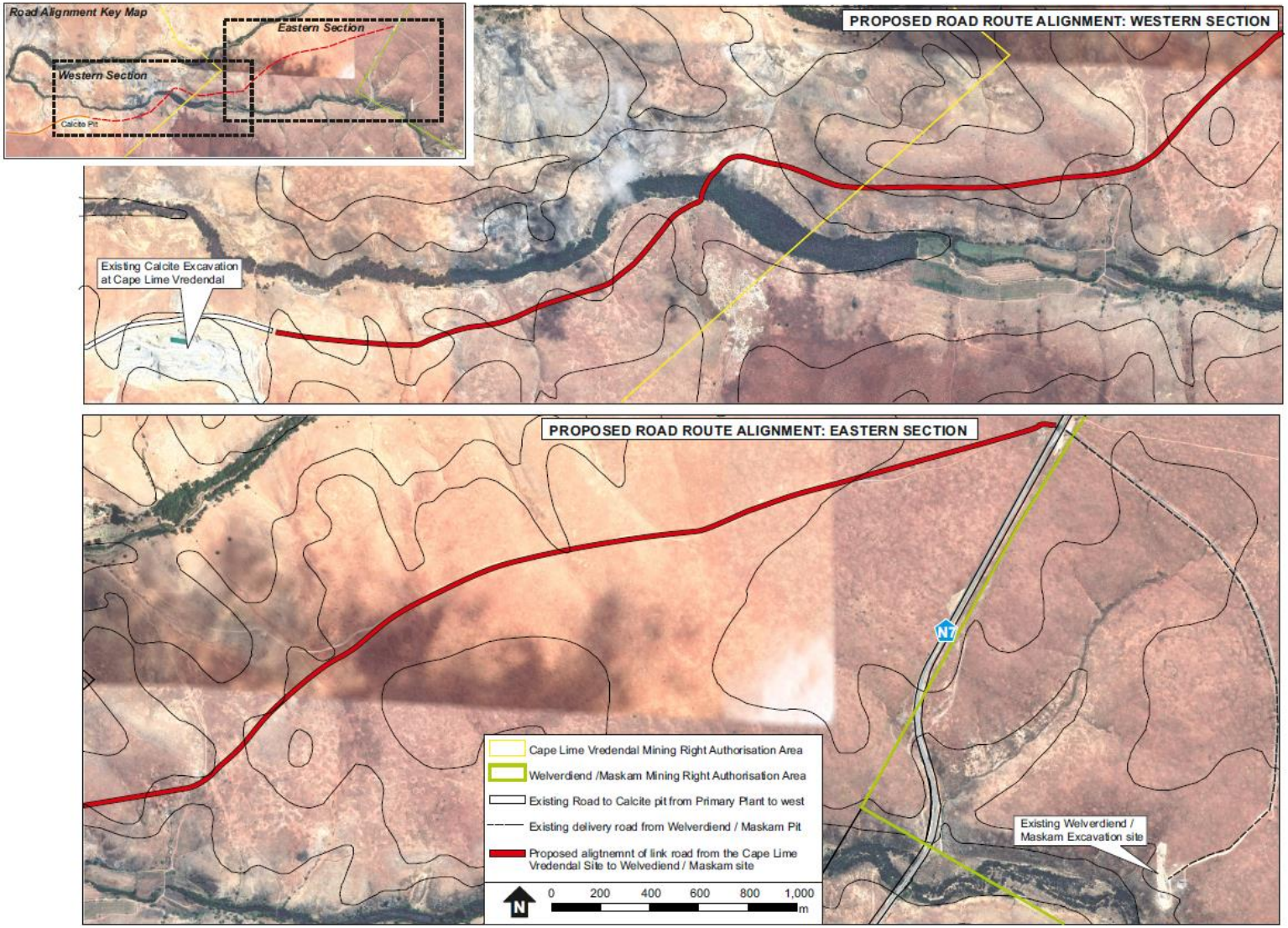

Figure 8: Layout showing the proposed haul road alignment to link Vaderlanche and Welverdiend mines

4 ENVIRONMENTAL CONTEXT

4.1 Topography

The site is located in the Knersvlakte, a topographically uniform area or plain that stretches from Klawer in the south to Kliprand in the north. The surrounding area is relatively flat with a few steep dips down into the Troe Troe and Wiedou Rivers, which cut through the centre of the property. The latter have its source in the Matzikama Mountains, which form a dramatic backdrop 15 km to the east.

4.2 Geology

The underlying geology comprises a mixture of Namibian age Gariep Supergroup metasediments, including limestone, dolomite, marble, greywacke, quartzite, phyllite and schist. These are the oldest sediments in the area, even older than the sandstone formations associated with Matsikamma (Table Mountain Group). These sediments are overlain by calcareous and gypsiferous soil, red aeolian sand, small deposits of silcrete, and recent alluvium in the riverbeds, which are all of Quaternary and Tertiary age. Limestone and dolomite are exposed on the steeper slopes above the Troe Troe and Wiedou Rivers. Also found in the area are patches of weathered out quartz and iron oxide (hematite/magnetite!). These appear to originate from quartz/iron veins found in the Gariep metasediments.

4.3 Vegetation & Flora

The study area is covered by a mixture of Vanrhynsdorp Gannabosveld, Namaqualand Spinescent Grassland, Knersvlakte Dolomite Vygieveld, Knersvlakte Quartz Vygieveld and Namaqualand Riviere (see Photos 1-5). Gannabosveld is arguably the dominant vegetation type, covering the flatter areas away from the Troe Troe and Widou Rivers. Namaqualand Riviere, Dolomite Vygieveld and Quartz Vygieveld are more closely associated with the rivers (see Map 6). Dolomite Vygieveld is typically found on the exposed dolomite/limestone slopes above the rivers, while the riverbeds support Namaqualand Riviere. Adjacent to these, Quartz Vygieveld is found in the quartz and iron oxide (hematite/magnetite!) strewn deflations. Gannabosveld and Spinescent Grassland are associated with the flat sandy areas to the north and south of the rivers away from the mining activities.

Outside the riparian areas, vegetation height varies between 0.3 to 1 m, with emerging species (e.g. *Lycium and Prosopis glandulosa*) reaching 2 m or more. Vegetation cover ranges between 30 and 70% (70% for Dolomite Vygieveld). Structurally, the vegetation can be described as a low open to mid-dense succulent shrubland, following Campbell's (1981) classification. Bare soil can be 80% or more depending on the substratum or past disturbances. Quartz Vygieveld has the lowest vegetation cover (<10%), while that of Namaqualand Riviere approaches 100%. Succulent shrubs are dominant in Gannabosveld and Dolomite Vygieveld, with *Drosanthemum, Mesembryanthemum* and *Ruschia* species especially common (see Appendix 1 of the Biodiversity study). A characteristic of Quartz Vygieveld is the abundance of dwarf vygies (quartz specialists), such as *Argyroderma cf.*

congregatum, *A. fissum* and Conophytum uviforme, most of which are Knersvlakte endemics. Of the 129 indigenous species recorded on site, 20 (16%) are regional/local endemics (see appendix 1 of the Biodiversity study)

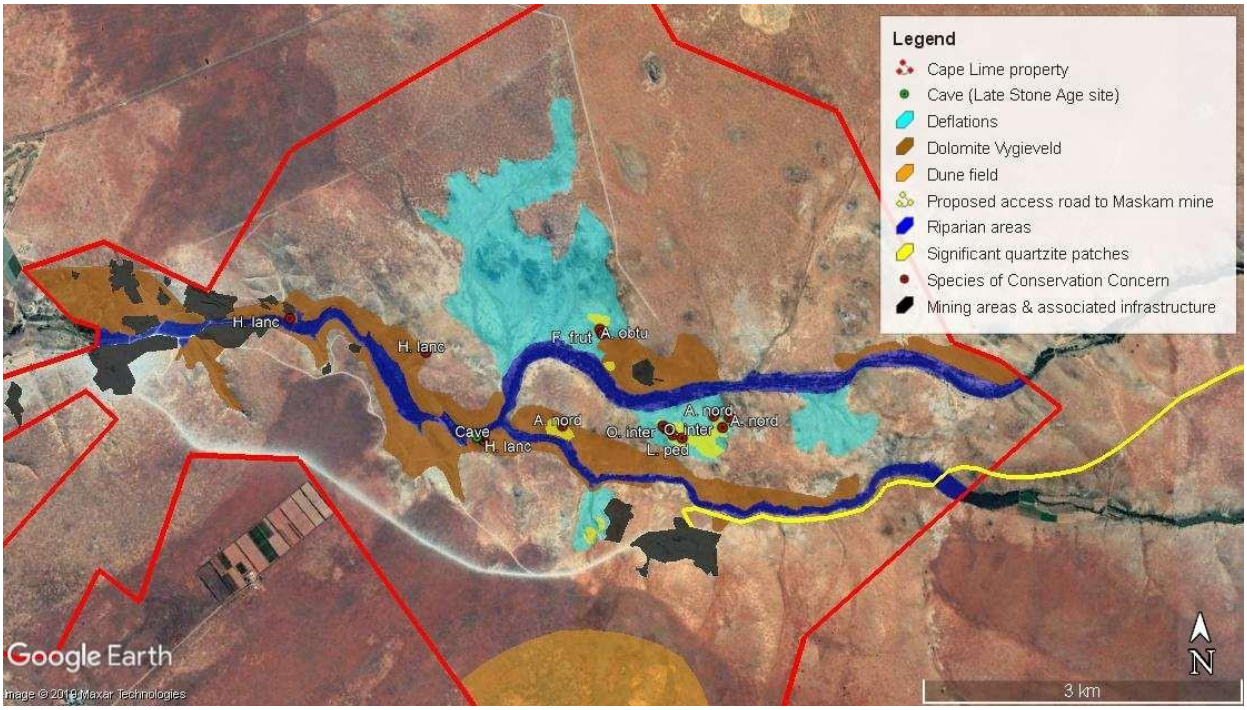

Figure 9: Botanical features map, showing the mining areas in relation to significant botanical features and recorded Species of Conservation Concern.

Photo 1 Typical Gannabosveld in the northern part of study area. Insert: *Lachenalia splendida*

Photo 2 Dolomite Vygieveld overlooking the Troe Troe River east of the dolomite mines. Insert:*Haemanthus lanceifolius.*

Photo 3: Quarts Vygieveld north of the Troe Troe River. Insert: *Argyroderma cf. congregatum*

Photo 4: An existing passage through riverine bush in the vicinity of the proposed river crossing for new access road to the Maskam mine.

Photo 5: Dune area south of the limestone mine, with a *Euclea tomentosa* in the foreground.

The highest species diversity and number of endemics appear to be associated with Dolomite Vygieveld and Quartz Vygieveld, in other words the more gravelly/stony areas (see figure 8). These areas are therefore regarded as the most sensitive and home to all the recorded Species of Conservation Concern (see appendix 1 of the Biodiversity study). The predominant families are Aizoaceae and Asteraceae, which represent a third of the recorded flora. Mining activities appear to be concentrated in the areas historically covered by Dolomite Vygieveld.

The Wiedou and Troe Troe Rivers (seasonal) which run through the property accommodate *Vachellia karroo* thicket (see Photo 3). The latter has been invaded by *Prosopis glandulosa* in places. From a distance it is impossible to distinguish between the V. *karroo* and P. *glandulosa* due to their similar growth form and armed branches. Other indigenous species mixed in with the *Vachellia karroo* include Salicornia cf. *pillansii, Suaeda plumosa, Gomphocarpus fruticosus*, *Tamarix ramosissima, Juncus acutus* and *Phragmites australis*. Erosion does not seem to be a great problem in the area (due to low rainfall), although there are signs of sheet and gully erosion in a few places.

The proposed access road (8.7 km) to the Maskam mining site passes through mainly Gannabosveld, with a ±180 m passage through Namaqualand Riviere. The eastern half of the route

follows an existing farm road through an area that shows significant degradation from overgrazing (see Photo 6). This is a flat area with 50-60% grass cover and 5% shrub cover. Species recorded here include grasses *(Stipa capensis), Mesembryanthemum guerichianum, Asparagus capensis a*nd the invasive shrub *Atriplex nummularia* (1.8 m tall). The latter was planted along the farm road nearby the eastern end.

The western part of the proposed access road leaves the farm road to skirt the southern slope of a low koppie angling down towards the Widou River, which is crossed (see Photo 7). The vegetation height on the koppie is <0.5 m, while vegetation cover ranges from 30-40%. Here, grasses (*Stipa capensis), Caroxylon zeyheri, Mesembryanthemum species, Drosanthemum species, Didelta carnosa* and *Oncosiphon suffruticosum* dominate.

The passage through the Widou River comprises dense Vachellia karroo thicket, infested with Prosopis glandulosa. The remainder of the road will follow a route on compact red sand parallel to the river, but setback from its floodplain. On this side, the vegetation is higher (0.3-1 m) and dominated by *Caroxylon zeyheri*, with *Mesembryanthemum guerichianum and M. junceum/dinteri.*

Photo 6 Eastern part of proposed access road to the Maskam mine.

Photo 7 Western part of proposed access road skirting low koppie. Insert: western section of proposed road on southern side of the Widou River.

The following Species of Conservation Concern were recorded inside Knersvlakte Dolomite Vygieveld and Quartz Vygieveld:

- Antimima nordenstamii (rare)
- Ruschia bipapillata (vulnerable)
- Haemanthus lanceifolius (vulnerable)
- Othonna intermedia (near threatened)
- Aspalathus obtusata (vulnerable)
- Lasiosiphon pedunculatus (vulnerable)

All these species were recorded in Dolomite and Quartz Vygieveld, with none of them abundant.
No Species of Conservation Concern were recorded along the proposed access road.

New distributions records were made for *Frankenia fruticosa* (a local endemic, previously only known from the Moedverloren Nature Reserve area 14 km northeast of Lutzville) and *Erythrophysa alata* (previously known from Kotzesrus in the Northern Cape northwards to the Richterveld). *Frankenia fruticosa* was recorded on a quartzite patch north of the Troe Troe River, while the latter was recorded nearby the cave (Late Stone Age site).

Several alien species were recorded (mostly inside the riverine areas), including *Prosopis glandulosa, Nicotiana glauca, Tamarix ramosissima, Nerium oleander* and the naturalised weed *Atriplex lindleyi* subsp. *inflata. Prosopis glandulosa* is a declared alien invader under the Conservation of Agricultural Resources Act

(Act 43 of 1983). It is considered the most important woody invader species in Namaqualand (Mucina & Rutherford 2006). In terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) Alien and Invasive Species List (2016), the harbouring of *Atriplex nummularia* on a property requires a permit.

4.4 Fauna

With regards to mammal and reptile fauna, evidence of aardvark, porcupine, rock hyrax (steep, rocky areas above Troe Troe River), mole/molerat, angulate tortoise and grysbok activity was noted throughout the area (see Photo 8). Several sightings of grysbok were made in the riverine areas. Other mammal species that may frequent the area include the common duiker, steenbok, suricate (meerkat), striped polecat (stinkmuishond), bat-eared fox, black-backed jackal, Cape fox (draaijakkals), caracal (rooikat), African wild cat and hare. Termite (snout harvester termite mounds) nests were also noted. The property was utilised as a sheep farm prior to mining.

4.5 Soils

The soils are shallow sandy gravel and stone chips over solid rock, which precludes them from being used as arable land. The proposed development will have no effect on the physical or chemical properties of the soils. The soils at the site have a relative agricultural theme sensitivity of 1 to 2.

According to a study conducted by Bla Pau Managamenet Consulting, the entire site is covered by shallow, non-arable stony soils of the Mispah Soil Form. Topsoil depth ranged from a nominal 50 mm to 250 mm With the exception of one small area of a few hundred m^2. Rehabilitation of similar soils has been successfully carried out in other parts of the Karroo, the closest being at nearby Nieuwoudtville.

Table 3: Description of Site Soil Families

Mispah	Highly erodible, exceptionally good surface water management is required. Topsoil depth is often less than 200 mm, covering a stratum of densely bedded shale or solid rock. Often found in proximity are Glenrosa soils. Mispah soils also carry a high erosion hazard.

Table 4: Physical Properties of the Mispah soil

Soil Form / Family	Clay % of Topsoil	Water Holding Capacity (mm/m)	Water Intake Rate	Drainage Capacity	Erosion Hazard	Tillage Constraints
Mispah	6 to 35	< 80	Medium	Moderate	Moderate to high	Cr, co, mw, sh

The soils constitute shallow, non-arable land, the major difference being that the new portion of road traverses steeper slopes. The river floodplains are covered by waterborne coarse sand and dense stands of Sweethorn (Acacia karoo ssp. karroo). There is a narrow strip of arable alluvium along the upper floodplain and lower foot slopes, which is being assessed for hemp production.

4.6 Land use

The current land use of Vaderlancshe operations comprises of mining and mining related activity such as open pits, related infrastructure, overburden dumps and stockpiles. Previous land use before the development of the area into a mining operation included agricultural land, grazing land and wilderness.

4.7 Social aspects influencing closure

Legacy Issues

Mining legacies are understood in relation to the completion of success criteria as set out by Stakeholders, in the context of the Closure Plan. When there is failure in the meeting the specific success criteria and therefore failure for effective closure it results in a negative mining legacy.

It is essential for a mine to ensure that the future public health and safety are not compromised and that the end product of mine closure results in beneficial and sustainable end-use for communities in the long term so that adverse socio-economic impacts are minimised, and socio-economic benefits are maximised.

Human Capital

The Mining Charter requires mines to formulate and implement a Human Resource Development Plan (HRDP) to enable transformation and empowerment of the workforce, in particular the HDSA employees, to progress to higher levels of employment in the organisation, and to be able to exploit alternative income generating opportunities outside of the organisation.

The Mine requires a skilled workforce for daily activities, and therefore offers training support and career development opportunities to its employees, in particular to the Historically Disadvantaged South African (HDSA) employees from the local labour sending areas. The Mine complies with the requirements of the Skills Development Act (No 97 of 1998) and submits Workplace Skills Plans and Annual Training Reports to the Mining Qualifications Authority (MQA).

Loss of Employment

The closure phase of any mining company results in the massive downgrade of workforce as relevant positions become irrelevant with the decommissioning of mining processes. Social aspects associated with the loss of employment include:

- Poor social risks management regarding communities not being properly prepared or the loss of employment (improper implementation of assessment and counselling services, comprehensive self-employment training programmes and comprehensive training and re-employment programmes).
- Since all mining operations will one day come to an end, the Mine will equip those employees with mining-specific skills with non-mining-related portable skills to enable them to find other forms of livelihood in other sectors of the economy. Only those lower level employees working at the plant can be considered as having mining-specific skills and would therefore have been given the opportunity to acquire a non-mining-related portable skill. Cape Lime will assist these miners in acquiring self-marketing skills through CV writing and interview skills, and also assist them in order to obtain employment in the surrounding industries

5 LEGISLATIVE FRAMEWORK

South Africa's legislation unambiguously places the responsibility of mitigating environmental damage as a result of mining operations on mining companies. The liability exists throughout the life of the mine, and beyond in terms of residual impacts. It includes commitments for remediation and/or rehabilitation. This includes compulsory legislative commitments for remediation and/or rehabilitation and ultimate close out. The key relevant legislation applicable to rehabilitation and closure includes the following:

- Constitution of the Republic of South Africa (Act 108 of 1996) (Constitution);
- Mineral and Petroleum Resources Development Act (Act 28 of 2002) (MPRDA);
- National Environmental Management Act (Act No. 107 of 1998) (NEMA);
- National Water Act (Act 36 of 1998) (NWA).
- National Heritage Resources Act No. 25 of 1999
- National Environmental Management Biodiversity Act No. 10 of 2004 (NEMBA)

5.1 Constitution of the Republic of South Africa (Act 108 of 1996)

Chapter 2 of the Constitution of the Republic of South Africa, 1996 outlines the Bill of Rights. The chapter addresses all constitutional rights of the citizens of South Africa and confirms the democratic values of human dignity, equality and freedom (Section 24 of the Constitution). A constitutional mandate to have an environment that is not harmful to health or wellbeing is provided for in this Section. This section of the Constitution provides the framework for the formulation and interpretation of other legislation which control environmental management.

5.2 Mineral and Petroleum Resources Development Act (Act 28 of 2002)

The following extracts relate to the closure of a mine and for any right issued under the MPRDA:

- *Section 43(1): The holder of a prospecting right, mining right, retention permit, mining permit, or previous holder of an old order right or previous owner of works that has ceased to exist, remains responsible for any environmental liability, pollution, ecological degradation, the pumping and treatment of extraneous water, compliance to the conditions of the environmental authorisation and the management and sustainable closure thereof, until the Minister has issued a closure certificate in terms of this Act to the holder or owner concerned.*
- *Section 43(4): An application for a closure certificate must be made to the Regional Manager in whose region the land in question is situated within 180 days of the occurrence of the lapsing, abandonment, cancellation, cessation, relinquishment or completion contemplated in subsection (3) and must be accompanied by the required information, programmes, plans and reports prescribed in terms of this Act and the National Environmental Management Act, 1998.*
- *Section 43 (5): No closure certificate may be issued unless the Chief Inspector and each government department charged with the administration of any law which relates to any matter affecting the environment have confirmed in writing that the provisions pertaining*

to health and safety and management pollution to water resources, the pumping and treatment of extraneous water and compliance to the conditions of the environmental authorisation have been addressed.

- *Section 43 (7): The holder of a prospecting right, mining right, retention permit, mining permit, or previous holder of an old order right or previous owner of works that has ceased to exist, or the person contemplated in subsection (2), as the case may be, must plan for, manage and implement such procedures and such requirements on mine closure as may be prescribed.*
- *Section 43 (8): Procedures and requirements on mine closure as it relates to the compliance of the conditions of an environmental authorisation, are prescribed in terms of the National Environmental Management Act, 1998.*

5.3 Mineral and Petroleum Resources Development Regulations

The following extracts from the MPRDA Regulations are specifically applicable to the preparation of this Financial Provisioning and Closure of a mine:

- *Regulation 51 (a)(i): An environmental management programme contemplated in section 39(1) of the Act must include the following: A description of the environmental objectives and specific goals for mine closure;*
- *Regulation 54: Quantum of financial provision:*

  (1) The quantum of the financial provision as determined in a guideline document published by the Department from time to time, include a detailed itemization of all actual costs required for-

  a. premature closure regarding- (i) the rehabilitation of the surface of the area; (ii) the prevention and management of pollution of the atmosphere; and (iii) the prevention and management of pollution of water and the soil; and (iv) the prevention of leakage of water and minerals between subsurface formations and the surface.

  b. decommissioning and final closure of the operation; and

  c. post closure management of residual and latent environmental impacts.

  (2) The holder of a prospecting right, mining right or mining permit must annually update and review the quantum of the financial provision –

  a. *in consultation with a competent person;*
  b. *as required in terms of the approved environmental management programme or environmental management plan; or*
  c. *as requested by the Minister.*
- *Regulation 56: Principles for mine closure: In accordance with applicable legislative requirements for mine closure, the holder of a prospecting right, mining right, retention permit or mining permit must ensure that -*

  a. *the closure of a prospecting or mining operation incorporates a process which must start at the commencement of the operation and continue throughout the life of the operation;*

b. *risks pertaining to environmental impacts must be quantified and managed pro-actively, which includes the gathering of relevant information throughout the life of a prospecting or mining operation;*
c. *the safety and health requirements in terms of the Mine Health and Safety Act, 1996 (Act No. 29 of 1996) are complied with;*
d. *residual and possible latent environmental impacts are identified and quantified;*
e. *the land is rehabilitated, as far as is practicable, to its natural state, or to a predetermined and agreed standard or land use which conforms with the concept of sustainable development; and*
f. *prospecting or mining operations are closed efficiently and cost effectively.*

- *Regulation 61: Closure objectives- Closure objectives form part of the draft environmental management programme or environmental management plan, as the case may be, and must –*
    d. *identify the key objectives for mine closure to guide the project design, development and management of environmental impacts;*
    e. *provide broad future land use objective(s) for the site; and*
    f. *provide proposed closure costs.*
- *Regulation 62: Contents of closure plan: A closure plan contemplated in section 43(3)(d) of the Act, forms part of the environmental management programme or environmental management plan, as the case may be, and must include -*
    g. *a description of the closure objectives and how these relate to the prospecting or mine operation and its environmental and social setting:*
    h. *a plan contemplated in regulation 2(2), showing the land or area under closure;*
    i. *a summary of the regulatory requirements and conditions for closure negotiated and documented in the environmental management programme or environmental management plan, as the case may be;*
    j. *a summary of the results of the environmental risk report and details of identified residual and latent impacts;*
    k. *a summary of the results of progressive rehabilitation undertaken;*
    l. *a description of the methods to decommission each prospecting or mining component and the mitigation or management strategy proposed to avoid, minimize and manage residual or latent impacts;*
    m. *details of any long-term management and maintenance expected;*
    n. *details of a proposed closure cost and financial provision for monitoring, maintenance and post closure management;*
    o. *a sketch plan drawn on an appropriate scale describing the final and future land use proposal and arrangements for the site;*
    p. *a record of interested and affected persons consulted; and*
    q. *technical appendices, if any.*

5.4 National Environmental Management Act 107 of 1998 (as amended)

Sections 28 (1) and (3) of NEMA set out the duty of care principle, which is applicable to all types of pollution and must be taken into account in considering any aspects of potential environmental degradation.

Section 24(P)(1) of NEMA states that (paraphrased) an applicant for an environmental authorisation relating to mining on a mining area must make the prescribed financial provision for the rehabilitation, management and closure of environmental impacts, before the Minister responsible for mineral resources issues the environmental authorisation. This Interim Closure Plan "Closure Plan" has therefore been prepared as part of the Environmental Authorisation process in order to determine the rehabilitation, management and closure requirements for the proposed Friersdale Project. This Closure Plan is a component of the EMPr, and will be subjected the same requirements in terms of stakeholder review and comment. Aspects of this Closure Plan relating to monitoring and reporting must be adhered to throughout the Life of Mine (LoM). The Closure Plan is to be audited annually and updated when necessary (i.e. if changes in the mine layout occur or additional potential residual impacts arise).

The mining industry will therefore remain liable for the damage or degradation caused by its activities throughout the life cycle of the mining operations until decommissioning and rehabilitation.

5.5 National Water Act (Act 36 of 1998)

Section 19 of the Act sets out the principles for "an owner of land, a person in control of land or a person who occupies or uses land" to:

- Cease, modify or control any act or process causing pollution;
- Comply with any prescribed waste standard or management practice;
- Contain or prevent the movement of pollutants;
- Eliminate any source of pollution;
- Remedy the effects of the pollution;
- Remedy the effects of any disturbance to the bed and banks of a watercourse.

It also describes the actions that can be taken by the catchment management agency to enforce the requirements of the Act.

The regulations contained in GN R704 published in terms of NWA consist of regulations on the "use of water for mining and related activities "and are aimed at the protection of water resources". GN R704 acknowledges the principle of co-operative governance and the respective roles for the DMR, the Department of Environmental Affairs (DEA) and the Department of Water Affairs (DWA) in regulating pollution from mining activities

5.6 National Heritage Resources Act (No 25 of 1999)

This Act serves to protect manage South African heritage and cultural resources which includes places, buildings, structures and equipment of cultural significance.

5.7 National Environmental Management Biodiversity Act [NEMBA] (No.10 of 2004)

The NEMBA provides conservation and management of South Africa's biodiversity within the framework of the NEMBA. This includes: the protection of species and ecosystems; the sustainable use of indigenous biological resources; the equitable sharing benefits arising from bioprospecting involving indigenous biological resources and the establishment of a South African National Biodiversity Institute (SANBI)

6 REHABILITATION AND CLOSURE OBJECTIVES

It is widely recognised that landscape rehabilitation after mining is essential in order to reinstate a functional end land use which positively contributes towards the future biophysical and societal demands of the people and the animals living in proximity to a disturbed environment. Mining activity in South Africa has a legacy of poor rehabilitation post extraction however this has changed substantially in recent years due to legislative requirement, enforcement and environmental responsibility by mining houses.

Mine rehabilitation must be considered as an on-going process aimed at restoring the physical, chemical and biological quality or potential of air, land and water regimes disturbed by mining to a state acceptable to the regulators and to post mining land users (Whitehorse Mining Initiative, 1994).

6.1 Closure Objectives

In the South African context and the world as a whole, the broad closure objectives include the three schools of thought, outlined below:

- Restoration of previous land capability and land use;
- No net loss of biodiversity; and
- Maintain peaceful relations with the affected community

The main objective for the Cape Lime project proposal for the end land use of the mining area is to rehabilitate the land to a non-hazardous waste disposal site or a recreational dam.

By ensuring the following, a physically stable and sustainable landscape post-mining is achievable:

- All temporary infrastructure, foreign material and stockpiles will be removed, reshaped and de-compacted as close to the original landscape profile as to ensure the capability to sustain indigenous vegetation.
- Ensure that community safety is not adversely impacted (i.e. the pit area is adequately fenced off to restrict entry by humans and animals).
- Maintain and restore biodiversity levels as to provide appropriate habitats.
- Shape all channels and drains to smooth slopes and integrate into natural drainage patterns.
- Remove alien and/or invasive vegetation.
- The stockpiles around the opencast pit will be shaped and re-vegetated only on the outward facing sides of the stockpiles. A security fence will be constructed on top of these stockpiles to ensure no trespassing or dangerous access to the open pit and the steep pit section of the stockpiles.

Advantages and disadvantages of the proposed final closure objective are detailed on the table below

Table 5: Motivation for closure option

Advantage	Disadvantage
• Concurrent rehabilitation has commenced (Dust emissions, soil erosion reduction). • Open pit will fill with water and the surrounding farmers could have access of water for the vineyards • No footprint increase (Topography). • Reduce height of stockpiles (Topography).	• Open pit must be made safe. • Visual impact not as pre-mining actions. • Monitoring required on physical infrastructure. • Breaching of security fence could have safety issues.

Rehabilitation requires on-going monitoring and evaluation of the objectives to validate the effectiveness of rehabilitation techniques and management measures. In rehabilitation planning it is important that goals, objectives and success criteria (key performance indicators – KPI's) are clearly defined. This allows the task to be approached in a systematic way, leaving room for adaptive management as on-going rehabilitation yields results (Hobbs, 2003; Johnson and Tanner, 2005).

7 ANNUAL REHABILITATION PLAN

7.1 Concurrent Rehabilitation commitments

Mining operations are currently takin place and the following figure shows the area where concurrent rehabilitation is taking place.

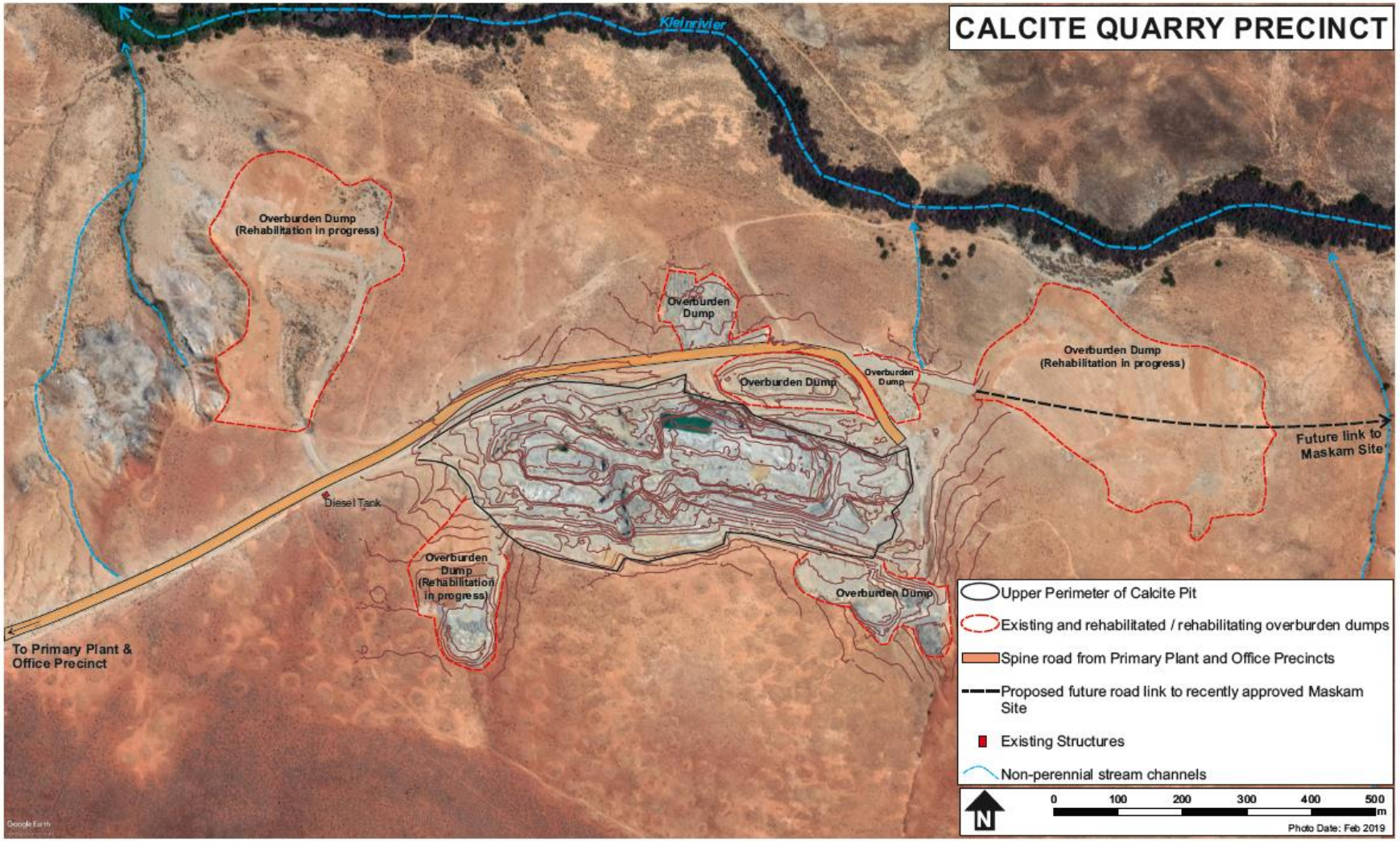

Figure 10: Concurrent rehabilitation around the calcite quarry

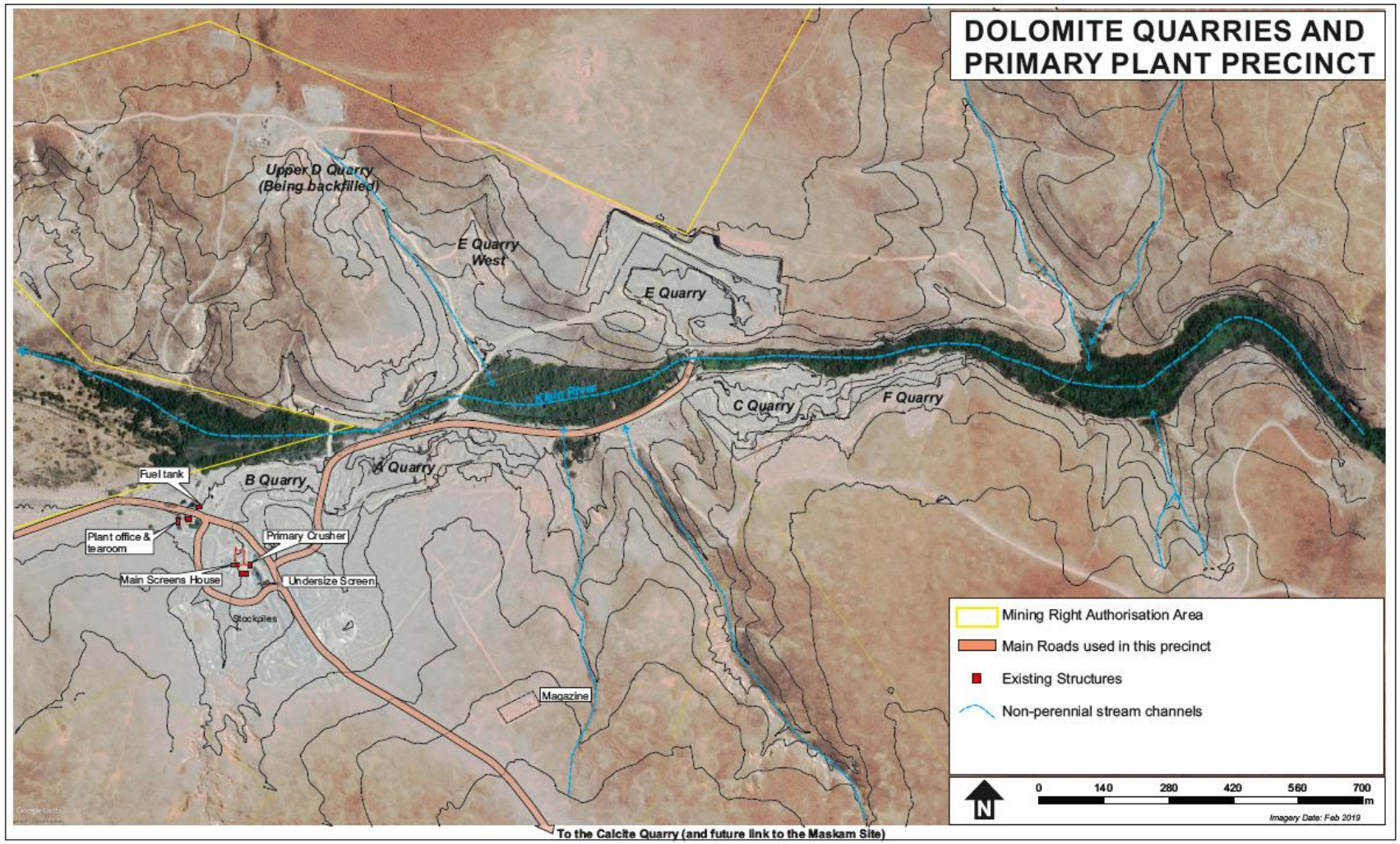

Figure 11: Rehabilitation around the dolomite quarries

7.2 Risks impacting rehabilitation and closure

The aim of this section of this Risk Assessment is to provide information regarding the potential environmental impacts associated with the current activities/current conditions in the mine.

The objective of the environmental risk assessment is to—
(a) Ensure timeous risk reduction through appropriate interventions;
(b) Identify and quantify the potential latent environmental risks related to post closure;
(c) Detail the approach to managing the risks;
(d) Quantify the potential liabilities associated with the management of the risks; and
(e) Outline monitoring, auditing and reporting requirements.

The risks that were identified during the assessment are documented below. After all impacts have been identified, the nature and scale of each impact can be predicted. The impact prediction aim to provide a basis from which the significance of each impact can be determined and appropriate mitigation measures can be developed. Table 4 below provide a summary of the identified the risks as well as the as the consequence of the risk occurring. Criteria used to assess consequence and probability of the risk is outlined is Annexure A.

There are a number of challenges associated with rehabilitating this landscape due to the unique vegetation type and dune type of the environment. The risks that were identified during the assessment are documented below.

Top soil: The main impact on the environment will result from the shortage of top soil to backfill the mined areas. The mine has limited topsoil since the site is mainly covered with rocky outcrops. It cannot be quantified if the available top soil will fill the already disturbed areas.

Wind Erosion: The primary erosive force in the area is wind. Stabilisation of bare slopes and the prevention of wind erosion is therefore another challenge in this area. Studies in other area show that landscaping the natural topography and preventative measures, such as the erection of rows of shade cloth during the initial stages of restoration, have been successful in mitigating this challenge, as soon as suitable cover has been established, the windbreaks must be removed (van der Merwe, 2004).

Alien vegetation:

Table 6: Identified risk, mitigation measures and mitigated quantified severity

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION	SIGNIFICANCE if mitigated
Sand burial by not stockpiling top soil	Loss of top soil	Top soil	Operation and rehabilitation and closure	Medium	• Topsoil of at least 300mm depth (0.3m) must be set aside for rehabilitation purposes, • Soil stripping must be limited to areas required for the construction activities • Ensure subsoil stripping and stockpiling for future rehabilitation purposes are conducted correctly under supervision. • Identify and demarcate a stockpiling area for topsoil • Over-seed the permanent stockpiles	Low
Wind erosion on stockpiled topsoil and rehabilitated area	Soil and land capability	Top soil	Operation and rehabilitation and closure	Medium	• Replacing topsoil on the stripped land before the next strip is opened and mined. • Stabilise exposed (bare) areas with vegetation and/or erosion control blankets. Establishing and maintaining vegetation as a soil cover is the most common practical technique for controlling erosion on disturbed soils. A 70 % dead grass or reed cover will slow down flow, minimise wind erosion and suppress weed growth. • All areas susceptible to erosion (including roads, bare areas and drainage channels) must be monitored on a monthly basis to ensure that there is no undue soil erosion resultant from activities. If erosion is identified it must not be allowed to develop on a large scale before effecting repairs.	Low

Establishing seedlings	Impact on vegetation type and habitat Alien vegetation spreading into disturbed soil, especially in the absence of successful rehabilitation	Vegetation	Operation and rehabilitation and closure	High	• Assess the need for in-planting and the establishment of woody vegetation as functional plant groupings. These plants must be harvested from the veld, and directly planted into the rehabilitation areas. • Control alien species through ongoing alien invasive eradication programme	Medium
Rehabilitation of the area	Altered topography	Topography	Decommissioning and Closure Phase	High	• Demolish and remove structures and infrastructure. • Demolish all structures and removing terracing and foundations to a predetermined minimum depth below the final rehabilitated ground level. • • Shape and vegetate the area in such a manner that it ensures a stable slope and blends into the surrounding surface topography. • Shape final landforms to a maximum slope gradient not exceeding 18°. • Ensure that the rehabilitated area is free-draining, and runoff is routed to natural drainage lines as far as possible. • Ensure that the pit is made safe	Medium

Management of surface water run-off and erosion through gully formation	Soil erosion	Top soil	Decommissioning and Closure Phase	Medium	• Topsoil and contour/bench rehabilitated areas as to prevent wind and water erosion. • Monitor the impact from erosion after a severe rainfall event and implement repairs immediately. Where appropriate, allow for energy dissipation structures or sedimentation traps to be constructed. • Stabilise all open slopes immediately to prevent erosion and gully formation. Ensure that gradients of the slopes are planned in such a way so that the run-off water will not cause wash ways. • Allow for the natural succession of indigenous species. Should it seem that indigenous species battle to colonise the areas, consideration should be given to the establishment of vegetation by means of a seed mix.	Low
Spills/leaks of minerals and improper waste handling, storage and disposal.	Soil contamination	Soil	Decommissioning and Closure Phases		• Provide spill containment kits across the operation in suitable locations and train staff how to use these.	

					• Maintain and implement an Incident Management and Emergency Procedure/s. • Maintain the vehicle and equipment maintenance plan. Vehicles and machinery must be regularly serviced and operated according to manufacturer's specifications. When an emergency breakdown occurs, adequate drip plates shall be used to prevent oils / lubricants / fuels from spilling onto exposed soils. • Vehicles only to be services at dedicated areas located outside of the development area. No servicing or repairs to take place on bare soil. • Burying of waste to be strictly prohibited. • Any general waste that cannot be recycled must be disposed of at an approved landfill site as general waste. Make use of a licensed/permitted waste contractor. • Hazardous waste should be placed into hazardous waste skips and should then be removed together with other hazardous waste by a licensed/permitted waste management contractor and disposal of at a licensed hazardous landfill site.	
Hydrocarbons management	Hydrocarbon Contamination - Spillages / leaks of oil, grease, diesels etc	Water Quality	Decommissioning and Closure Phases	Medium	Repairs: • Repairs must take place in designated areas where there are adequate facilities to contain spills and leaks of the hydrocarbon products. • Drip trays must be used where spills/leaks are likely to occur. • Drip trays must be placed under vehicles/machinery. • If spills or leaks do occur, they must be cleaned up immediately.	Low

					• Drainage Systems, Sumps and Separators: • • No dirty or contaminated water must be discharged into the surrounding environment. • • All channels and drains should be shaped to smooth slopes and integrated into natural drainage patterns. Disposal: • No oil is to be disposed of in the veld or down any drains. • A reputable hazardous waste removal company must collect waste oil for recovery. • Hazardous waste contaminated with oil must be correctly disposed of. Spills and leaks • All commitments as provided for under "spills and leaks".	
Revegetation	Alien and Invasive Plant Colonisation	Vegetation	High	Concurrent Rehabilitation, Decommissioning and Closure Phases	• Recurring invasive species must be controlled and removed (Category 1a and 1 b (NEM:BA) and Category 1 and 2 (CARA)). • Any action taken to control and eradicate a listed invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment. • The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material and re-growth of such invasive species in order to prevent such species from producing off-spring, forming seed, regenerating or re-establishing itself in any manner. • A programme should be implemented in order to identify, manage and eradicate alien and invasive species. • The use of herbicides and pesticides must be limited as far as possible. • Herbicides should only be applied in the concentrations prescribed by the product labels and the safety instructions on the	Medium

					product labels should be followed at all times. • Only contractors with a valid pest control operator (PCO) certificate (certified by the Department of Agriculture, for a specific field of pest control) will be permitted to oversee the application of chemicals for the eradication of alien vegetation. Copies of these valid certificates must be kept	
Retrenchments	Rehabilitation and closure at the end of operation may result in job losses	Job losses	Decommissioning and Closure Phase	High	• Consideration must be given to measures that will reduce retrenched employees' difficulties in finding work elsewhere and consequent unemployment for long periods. • Ensure that skills transfer programmes are successful • Ensure that the closure objectives are incorporated into the Closure Plan.	Medium

7.3 Rehabilitation Activities

In order to gain the best possible rehabilitation outcomes from the mining processes, different actions are required to occur at different times within the life of the project from commencement to closure. Similarly, there are management and monitoring actions that is required throughout the life of the mining project and for years after decommissioning and closure.

Traditional mining phases include Construction-, Operational- and Closure phase. Outlined below are the actions to occur through the Operational and Closure phases that are needed to ensure successful rehabilitation

7.3.1 Land Preparation

The overall aim of land preparation is to ensure that the mining area is limited as far as possible, pollution or contamination does not occur and maximise the recovery and effective storage of those mining profile materials that could be used for rehabilitation after mining operations have been completed. The following points should be considered for the current operational phase of the project:

- Mine planning should be designed in a way so as to ensure the area to be occupied by mine infrastructure is minimized.
- The affected area should be kept as small as is practically possible and should be clearly defined and demarcated.
- Mine operators should restrict their activities to planned areas. Clear instructions and control systems should be in place and compliance to the instructions should be policed by inter alia the mine manager.
- All stockpiles should be located in demarcated and approved areas where they will not have to be removed far prior to final placement.
- Soils which cannot be replaced directly onto rehabilitated land should be stockpiled
- All stockpiles should be clearly and permanently demarcated and located in defined no-go areas, revegetated and monitored on an annual basis.

7.3.2 Removal and Disturbance of Soils

7.3.2.1 Soil Stockpiling

The correct handling of topsoil is one of the most critical determining factors for successful rehabilitation. Soil disturbance is only envisaged within the demarcated stockpile area. Sufficient soil through soil stockpiling should be available for rehabilitation of mined area and of adequate quality to support vegetation growth and thus ensure successful rehabilitation.

The stripping of soil must be carefully planned, executed and monitored by the Mine manager. This to ensure soils are being stripped from the correct areas within the mining footprint, at the correct depths and placed in the correct location. The stockpiles should be used to help buffer the mine site during operation against the elements. The locations of the stockpile area should be on

a topographical crest to ensure free drainage in all directions. If this is not possible then an alternative is a side slope location with suitable cut-off berms constructed upslope. Soils are further at risk to compaction when there is a high moisture content. The dry winter months are thus preferred to commence stockpiling during the site establishment phase. If soil stripping can only occur during the wet months there should be the adoption of methods that cause minimum compaction.

The steps that should be taken during sand stockpiling are as follows:

1. Mark stockpile locations accurately on a plan to ensure that re-handling is minimized (i.e. soil will not have to be moved a second or third time);
2. The soils should be stockpiled on the parent soils and demarcated mining area close to stripped and final rehabilitation areas as possible;
3. Ensure that the location is free draining to minimize erosion loss and waterlogging;
4. Erosion control measure and berms be installed;
5. Minimize compaction during stockpile formation; and
6. Ensure that the stockpiled sand is only used for the intended purposes.

Soils should be exposed for the minimum time possible once cleared of vegetation, i.e. the timing of clearing and grubbing should be coordinated as much as possible to avoid prolonged exposure of soils to wind and water erosion. The latter will facilitate the succession of indigenous vegetation.

Once soils are stockpiled they should be managed and monitored progressively (during the mine operation phase) to ensure no damage or degradation of the soils occur. The soil stock pile areas should be strictly no-go areas and security measures in place to ensure there is no theft of the fertile soil. Assessing post-mining soil characteristics and associated land capability and land uses is necessary to ensure that the end land uses goals can be met.

7.3.3 Erosion Control

During all the phases of the mine, active soil erosion prevention and rehabilitation should occur. Active monitoring by the Mine Manager must occur to ensure prevention or early detection of soil erosion. Early detection will increase the successful chances of rehabilitation of that area. Surrounding vegetation must be kept to act as screens that reduces erosion. Stockpiles that remain in the same location for more than one growing season and have not re-vegetated naturally have to be re-vegetated to prevent erosion losses (Chamber of Mines, 2004).

7.3.4 Infrastructure Removal

After mining has ceased, processing facilities; administration; mining; transport and storage facilities should be removed in order to re-establish land to a sustainable usable condition. Safety should be the leading factor during infrastructure removal as this is a dangerous operation.

Mine infrastructure that cannot be used by a subsequent landowner or third party should be removed. Where buildings can be used by a third party, arrangements will be made to ensure long term sustainable use.

7.3.5 Re-Vegetation and Biodiversity Establishment

The main aim when re-vegetating is to restore the area back to the pre-mining environmental state.

7.4 Threats and opportunities

A list of threats and opportunities as well as uncertainties for rehabilitation are a conscious issue that must be updated yearly, or as new issues are identified. Current identified threats, opportunities and uncertainties are described on table

Table 7: Threats, Opportunities and Uncertainties for Vaderlanche Mine

Item	Threat	Opportunity after rehabilitation	Uncertainties
Open pits	Safety risk to environment	Water source supporting surrounding vineyards	Water quality must be monitored after closure until stable and safe quality could be confirmed.
Stockpiles	None	Well vegetated and maintained to blend with surrounding natural area	
Fencing	Breaching and removal of fence will endanger the safety of community and animals	Surrounding vineyards farmers to use pit water can be utilised to ensure maintenance of fence	The type of security fence must be investigated to reduce the occurrence of theft. Concrete poles with barbed wire is an option
Rehabilitated areas	Low vegetative growth	Create employment opportunities for locals to re vegetate	The growth medium properties must be analysed, and a fertilizer requirement designed

8 POST-CLOSURE MAINTENANCE, AFTERCARE, MONITORING AND REPORTING

The closure period can be defined as the period when mining operations has ceased and all rehabilitation in terms of the final rehabilitation plan is completed. The post closure monitoring will then commence.

8.1 Post mine land use

The rehabilitation of the Vaderlanche Mine will aim to ensure the re-establishment of specific disturbed areas to ensure landforms that has the capability to sustain indigenous vegetation as to limit water and wind erosion whilst enabling the gradual reestablishment of indigenous vegetation for a more diverse natural species composition.

8.2 Closure maintenance

Maintenance and aftercare must be planned for 2-3 years after the land preparation and replanting of vegetation has been completed. Maintenance will specifically focus on annual fertilising the rehabilitated area, control of all other alien plants and general maintenance, including rehabilitation of cracks, subsidence and erosion gullies. Continuous erosion monitoring of rehabilitated areas and slopes should be undertaken and zones with excessive erosion should be identified. The cause of the erosion should be identified, and rectified. Zones with erosion will need to be repaired with topsoil and re-vegetated.

8.3 Post-Closure Monitoring and Reporting

The purpose of monitoring is to ensure that the objectives of the rehabilitation programme are met and that the rehabilitation process is followed. A post-closure monitoring and maintenance period of five years after decommissioning and closure is assumed. It should be noted however that the Competent Authority (CA) will ultimately determine the period required. Monitoring and maintenance will be conducted until a closure certificate is issued. Table 7 summarises the post-closure monitoring programmes.

Table 8: Monitoring and reporting post-closure

Aspect	Detail	Authority reporting to	Monitoring Frequency	Completion
Groundwater	Groundwater Level	DWS	Quarterly	Monitoring should take place for five years or until a long term acceptable trend can be determined
	Groundwater Quality	DWS	Quarterly	Monitoring should take place for five years or until a long term acceptable trend can be determined
Biodiversity	Alien invasion of the	DMR &	Twice a year	2 years after closure

	disturbed areas	DEA&DP	(November and March)	
	Biodiversity establishment and rehabilitation success	DMR & DEA&DP	Biodiversity assessments mid wet season should be undertaken by a qualified ecologist / botanist to monitor the rehabilitation progress with regards to flora	2 years after closure
Soil	Erosion and associated degradation	DMR	Annually especially after the rainy	2 years after closure
	Soil fertility	DMR	Once prior to rehabilitation	Decommissioning Phase
Security fence	Maintenance to ensure safety of animals	DMR	Twice a year	A year after closure

A record of all rehabilitation and closure requirements and actions should be kept by the ECO. These records will be important during any auditing process. The records will further provide information where care and maintenance is required during the post-closure period. If records indicate that residual impacts are being realised, the appropriate specialist should be consulted and the recommended management measures implemented.

Water monitoring reports must be submitted to the DWS as they become available after each monitoring survey as indicated in Table 8. An annual post-closure report must be prepared, including all of the monitoring data recorded. This must be submitted to the DMR. The relinquishment criteria for the awarding of a closure certificate by the DMR will be that the closure objectives are met. Annual post-closure reporting by the ECO must include whether the relinquishment criteria have been achieved. Refer to Table 5 below for the reporting criteria and indicators. Recommendations for actions to be taken must also be included in the annual report.

8.4 Relinquishment Criteria

Following the implementation of the Action Plan (AP) described in the previous section, it is necessary to have measurable criteria against which to assess the effectiveness of the plan and

its implementation. These criteria will assist Welverdiend limestone mine project in identifying when the standard of closure achieved is sufficient to relinquish responsibility for a specific area. The site specific relinquishment criteria for the mine area are documented in Table 8.These criteria relate mainly to the biophysical environment. Also included in the table are the indicators required to demonstrate achievement with the relinquishment criteria and the reporting requirements. The reporting requirements are those that are expe

Table 9: Relinquishment criteria for closure of the Welverdiend Project

ENVIRONMENTAL ATTRIBUTE	RELINQUISHMENT CRITERIA	INDICATORS	REPORTING REQUIREMEMBTS
Groundwater	Ensure groundwater levels and quality are not adversely affected	Groundwater levels return to the baseline levels and groundwater quality returns to baseline uncontaminated quality	Monitoring results signed off by a qualified Geohydrologist (after at least 5 years)
Soil and Land Capability	Ensure that the agricultural potential is returned to the present or improved potential (low agricultural potential) and the land is acceptable for the end land use in line with planning objectives (agriculture and urban development)	No erosion taking place, established and self-sustaining vegetation, land use and land capability rendered suitable for the planned end land uses	Photographic evidence of land returned to agricultural use, or development in line with planning objectives
Safety	Decommissioning of all structures and roads	Roads should be removed and sloped to blend in with the natural landscape. No visible man-made structures should remain	Photographic evidence that infrastructure has been removed
	Ensure that community safety is not adversely affected	The area is stable, the pit is fenced off with visible weather durable danger signs, all surface infrastructure is dismantled and	Photographic evidence of the fenced off pit and rehabilitated areas

		removed from site and no waste remains on site	
Vegetation	Return the affected area to the baseline or improved ecological state (i.e. low ecological sensitivity)	Successful rehabilitation (established and self-sustaining vegetation), increased species diversity compared to the pre-mining state and not invasive to the region	Monitoring report compiled by qualified botanist / ecologist confirming successful rehabilitation
Aesthetic quality	Develop a landform that is aesthetically acceptable	All surface infrastructure must be dismantled and removed from site, no waste remains on site, the landscape is unobtrusive in relation to the existing landscape	Photographic evidence of removal of all surface infrastructure and non-conspicuous project site

9 COST ESTIMATES

Closure liability costs were calculated by means of the cost methodology that has been applied was according to the DMR Guidelines for Calculating the Quantum of Financial Provision as per the MPRDA. The approach to calculating the closure quantum as specified in the DMR Guideline which was utilised in this assessment is as summarised as follows and is reported in Table 4.

- Step 1: Determine the ineral Mined
  - In the first step the mineral mined has been identified in the tables provided in the DMR guideline (Table B.13) as **"Limestone."**
- Step 2A: Determine Primary Risk Class
  - The "Primary Risk Class" has been determined from Table B.12 of the DMR Guideline as "**B (Medium Risk)".**
- Step 2B: Revision of Primary Risk Class
  - The Primary Risk Class can be revised on the basis of saleable by-products if required. However, this is not applicable at the proposed Olympic Project.
- Step 3: Determine Environmental Sensitivity
  - The "Environmental Sensitivity" has been determined by reference to Table B.4 of the DMR Guideline as "**Low**".
- Step 4.4 determination of weighting factors:
  - **Weighting Factor 1**: The nature of the terrain where the operation is located is **flat**.
  - **Weighting Factor 2**: The proximity of the operation to an urban centre. In this instance the Olympic Project is considered **urban**.

Table 10: Calculation of the quantum for Cape Lime

CALCULATION OF THE QUANTUM

Applicant :	**Cape Lime**		
Evaluator:	**Tali Tshikhovhokhovho**	**Location:**	**Vredendal**
Reference :	**WC 30/5/1/2/3/2/1 (294) MR**	**Date:**	**Dec 2019**

Environmental Parameters

Risk Class	B
Area sensitivity	Low
Nature of terrain	Undulating
Proximity to Urban Ara	Urban

No.	Description	Unit	A Quantity	B Master Rate	C Multiplication factor	D Weighting factor 1	E=A*B*C*D Amount (Rands)
1	Dismantling of processing plant and related structures (including overland conveyors and powerlines)	m3	640	R 15.87	1	1.1	R 11 170.11
2 (A)	Demolition of steel buildings and structures	m2	0	R 221.02	1	1.1	R 0.00
2(B)	Demolition of reinforced concrete buildings and structures	m2	0	R 325.71	1	1.1	R 0.00
3	Rehabilitation of access roads	m2	0	R 39.55	1	1.1	R 0.00
4 (A)	Demolition and rehabilitation of electrified railway lines	m	0	R 383.87	1	1.1	R 0.00
4 (B)	Demolition and rehabilitation of non-electrified railway lines	m	0	R 209.38	1	1.1	R 0.00
5	Demolition of housing and/or administration facilities	m2	0	R 442.03	1	1.1	R 0.00
6	Opencast rehabilitation including final voids and ramps	ha	34	R 224 971.28	0.04	1.1	R 336 557.04
7	Sealing of shafts adits and inclines	m3	0	R 118.65	1	1.1	R 0.00
8 (A)	Rehabilitation of overburden and spoils	ha	0.5	R 154 478.73	1	1.1	R 84 963.30
8 (B)	Rehabilitation of processing waste deposits and evaporation ponds (non-polluting potential)	ha	0	R 192 400.46	1	1.1	R 0.00
8 (C)	Rehabilitation of processing waste deposits and evaporation ponds (polluting potential)	ha	0	R 558 822.15	0.55	1.1	R 0.00
9	Rehabilitation of subsided areas	ha	0	R 129 352.67	1	1.1	R 0.00
10	General surface rehabilitation	ha	5	R 122 373.21	1	1.1	R 673 052.65
11	River diversions	ha	0	R 122 373.21	1	1.1	R 0.00
12	Fencing	m	0	R 139.59	1	1.1	R 0.00
13	Water management	ha	0	R 46 529.74	0.41	1.1	R 0.00
14	maintenance and aftercare	ha	3	R 16 285.41	1	1.1	R 53 741.85
15 (A)	Specialist study	Sum	1	R 27 917.84	1	1.1	R 30 709.63
15 (B)	Specialist study	Sum	1	R 27 917.84	1	1.1	R 30 709.63
					Sub Total 1		R 1 220 904.21
1	Preliminary and General		R 146 508.50		**weighting factor 2** 1		R 146 508.50
2	Contingencies		R 122 090.42				R 122 090.42
					Subtotal 2		R 1 489 503.13
					VAT (15%)		R 223 425.47
					Grand Total		**R 1 712 928.60**

10 CONCLUSION AND RECOMMENDATIONS

The Rehabilitation Plan and Closure Cost Calculation was based on the current conditions of the site. This document does not serve as a final closure plan, but rather as a starting point for consideration towards the various aspects of closure. This document must be assessed annually and updated as necessary, with the end target being a closed mine having minimal residual impact on the environment or safety of people.

Cape Lime mine will provide for the closure liability associated with the project through the purchase of a Bank Guarantee.

11 REFERENCES

- Constitution of the Republic of South Africa (Act 108 of 1996) (Constitution).
- DME, 2005: Guideline Document for the Evaluation of the Quantum of Closure- Related Financial Provision Provided by a Mine, Pretoria, Department of Minerals and Energy.

ANNEXURE A – DETERMINATION OF MAGNITUDE OF IMPACT

The significance of both positive and negative potential impacts were determined through

the evaluation of impact consequence and likelihood of occurrence.

The significance of an impact is defined as a combination of the **consequence** of the impact occurring and the **probability** that the impact will occur. The following risk assessment model has been used for determination of the significance of impacts.

SIGNIFICANCE = CONSEQUENCE X PROBABILITY

WHERE Consequence = Extent + Intensity + Duration

The criteria used to determine impact consequence are presented on the table below. Each rating has been allocated a score weighting

Table 1: Criteria used to determine the Consequence of the Impact

Rating	Definition of Rating	Score
A. *Extent - the area over which the impact will be experienced*		
Local	limited to the immediate area(s) around the project site -	1
Regional	extends over a larger area that would include a major portion of an area or province	2
National/International	nationally or beyond	3
B. *Intensity - the magnitude of the impact in relation to the sensitivity of the receiving environment, taking into account the degree to which the impact may cause irreplaceable loss of resources*		
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1
Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way	2
High	Site-specific and wider natural and/or social functions or processes are severely altered	3
C. Duration– the lifetime of the impact, that is measured in relation to the lifetime of the proposed development and its reversibility		
Short-term	(0 to 3 years)	1
Medium-term	(3 to 10 years) confined to the construction period	2
Long-term	(more than 10 years)	3
Permanent	beyond the anticipated lifetime of the project	4

The combined score of these three criteria corresponds to a **Consequence/Magnitude Rating**, as follows:

Table 11: Method used to determine the Consequence/Magnitude Score

Combined Score (A+B+C)	3 – 4	5	6	7	8 - 9
Consequence Rating	Very low	Low	Medium	High	Very high

Once the consequence was derived, the probability of the impact occurring was considered. Probability of impact occurrence - this describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the life cycle of the activity, and not at any given time

- Improbable (very low to low likelihood).
- Possible (likely).
- Probable (distinct possibility).
- Definite (the impact would occur regardless of prevention or mitigation measures)

The probability of the impact using is presented in the table below.

Table 12: Probability Classification

Probability– the likelihood of the impact occurring	
Improbable	1
Possible	2
Probable	3
Definite	4

The overall significance of impacts was determined by considering consequence and probability using the rating system prescribed below

Table 13: Impact significance ratings

		Probability			
		1 Improbable	2 Possible	3 Probable	4 Definite
Consequence/Magnitude	Very Low	INSIGNIFICANT	INSIGNIFICANT	VERY LOW	VERY LOW
	Low	VERY LOW	VERY LOW	LOW	LOW
	Medium	LOW	LOW	MEDIUM	MEDIUM
	High	MEDIUM	MEDIUM	HIGH	HIGH
	Very High	HIGH	HIGH	VERY HIGH	VERY HIGH

Practicable mitigation and optimisation measures are recommended and impacts are

rated in the prescribed way both without and with the assumed effective implementation of mitigation and optimisation measures.

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

- **Insignificant:** the potential impact is negligible and will not have an influence on the decision regarding the proposed activity/development.
- **Very Low:** the potential impact is very small and should not have any meaningful influence on the decision regarding the proposed activity/development.
- **Low:** the potential impact may not have any meaningful influence on the decision regarding the proposed activity/development.
- **Medium:** the potential impact should influence the decision regarding the proposed activity/development.
- **High:** the potential impact will affect the decision regarding the proposed activity/development.
- **Very High:** the proposed activity should only be approved under special circumstances