# DRAFT EIA/EMPR REPORT FOR THE PROPOSED OPENCAST EXTENSION AND ASSOCIATED INFRASTRUCTURES

For

## PHOKATHABA PLATINUM (PTY) LTD
## SMOKEY HILL PLATINUM MINE

Mining Right, number: LP 30/5/1/2/3/2/1/69 EM

Located on:
Farm Maandagshoek 254 KT
Submitted for: Public Review and Comment
2 September 2019 till 3 October 2019

Report completed: 28 August 2019

Submitted by:

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**Document Control**

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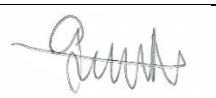
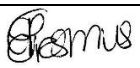
| **Compiled:** | Mr G Netshilindi |  |
| **Reviewed:** | Dr P. Erasmus*(Pri.Sci.Nat)* |  |
| **Date:** | 29/00/2019<br>28/08/2019 SHPM UG1 EIA EMPr_ Draft | |

**IMPORTANT NOTICE**

In terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002 as amended), the Minister must grant a prospecting or mining right if among others the mining "will not result in unacceptable pollution, ecological degradation or damage to the environment".

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of section 16(3)(b) of the EIA Regulations, 2014 (as amended), any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of section 17(1)(c) the competent Authority must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the competent authority to the submission of applications.

**It is therefore an instruction that** the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or a permit are submitted in the exact format of, and provide all the information required in terms of, this template. Furthermore, please be advised that failure to submit the information required in the format provided in this template will be regarded as a failure to meet the requirements of the Regulation and will lead to the Environmental Authorisation being refused.

**It is furthermore an instruction that** the Environmental Assessment Practitioner must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The EAP must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

**OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS**

The objective of the environmental impact assessment process is to, through a consultative process—

(a) Determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;

(b) Describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;

(c) Identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;

(d) Determine the—-

(i) Nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and

(ii) Degree to which these impacts—

(aa) can be reversed;

(bb) may cause irreplaceable loss of resources, and

(cc) can be avoided, managed or mitigated;

(d) Identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;

(e) Identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;

(f) Identify suitable measures to manage, avoid or mitigate identified impacts; and

(g) Identify residual risks that need to be managed and monitored.

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# PART A

# SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

## 1 CONTACT PERSON AND CORRESPONDENCE ADDRESS

### 1.1 Details

#### 1.1.1 Details of EAP

Name of The Practitioner: Prescali Environmental Consultants.

The report was compiled by Mr Gregory Netshilindi and reviewed by Dr. Petro Erasmus. The Final report will also be assessed by Ms Elaine van der Linde.

- Tel No.:
- Fax No. :
- e-mail address:

### 1.2 Expertise of the EAP

#### 1.2.1 The qualifications of the EAP

(With evidence attached as Appendix 2).

- .

#### 1.2.2 Summary of the EAP's past experience.

(Attach the EAP's curriculum vitae as Appendix 1

## 2 DESCRIPTION OF THE PROPERTY

**Table 2-1: Property description**

| | |
|---|---|
| Farm Name: | Maandagshoek 254 KT |
| Application area (Ha) | The Farm Maandagshoek 254 KT is 4277.1796 ha in extent, the mining lease area is 1135 hectares and the proposed development area is approximately 29 hectares. |
| Magisterial district: | Sekhukhune District Municipality |
| Distance and direction from nearest town | The proposed opencast mining area is located approximately 140 km from Polokwane, with its nearest towns Burgersfort (20 km to the South) and Steelpoort (18 km to the east) |
| 21-digit Surveyor General Code for each farm portion | T0KT00000000025400000 |

### 2.1 Locality Map

(show nearest town, scale not smaller than 1:250000 attached as Appendix 3

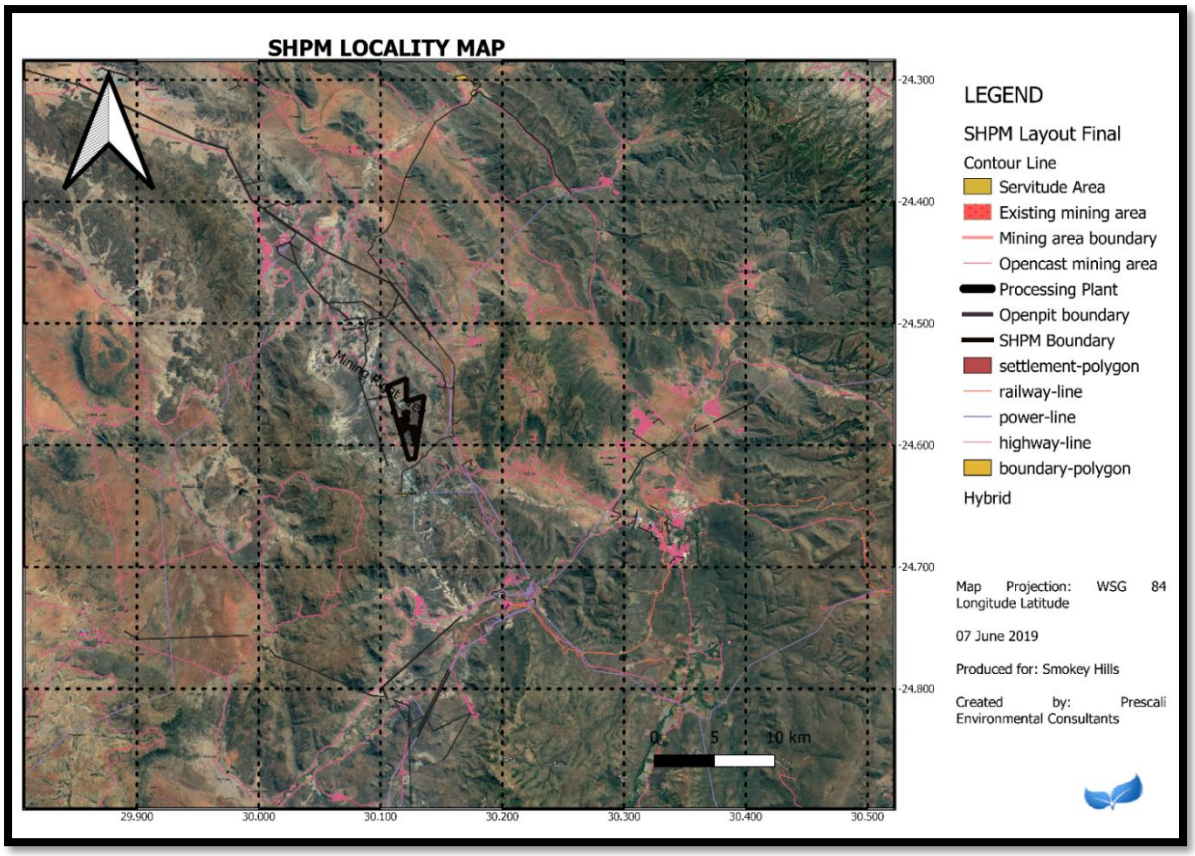


**Figure 2-1: Regional locality map for SHPM**

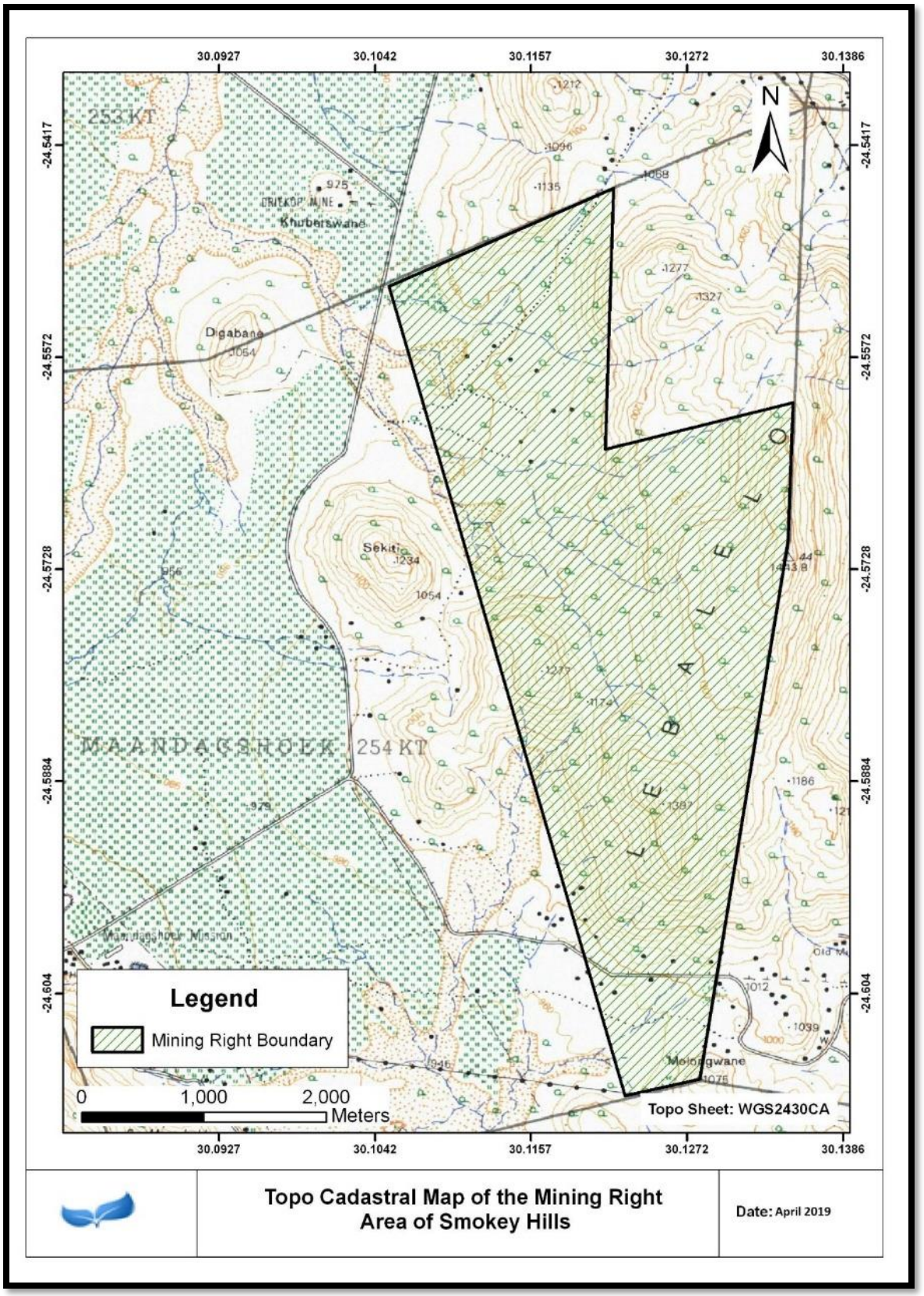


**Figure 2-2: Smokey Hills Project Mining Area**

# 3 DESCRIPTION OF THE SCOPE OF THE PROPOSED OVERALL ACTIVITY

## 3.1 Background

The Smokey Hills Platinum Mine (SHPM)also known as the Phokathaba Platinum Mine, is located on the Eastern Limb of the Bushveld Igneous Complex (BIC) in the Limpopo Province of South Africa (Figure 3-1) on the farm Maandagshoek 254 KT within the Fetakgomo-Greater Tubatse Local Municipality (FGTLM). The mine has approximately 6 km of mapped UG2 Platinum Group Metals (PGM) reef outcropping around the margin of two primary hills.

The mining activities are authorized in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA). The Environmental Management Programme (EMPR) (AGES AG-R-07-03-07) was approved by the Department of Mineral Resources (DMR) on 2007/11/13, and infrastructure establishment subsequently commenced and the mine produced its first concentrate for shipment in March 2009. The mine then went into care and maintenance in August 2012 and no mining or processing activities took place until it was reopened in January 2015. However, continuing adverse local and global economic and market circumstances led to the mine being placed in care and maintenance again at the end of March 2016.

Phokathaba Platinum (Pty) Ltd has an Integrated Water Use Licence (IWUL) (Licence No. 04/B71E/ABCGIJ/1510; File No. 16/2/7/B700/C126) that was issued on 2 March 2012.

An EIA/EMPR amendment was conducted in in 2018 and approved in June 2019 to pump tailings from the Umnotho WeSizwe Chrome Mine to the existing SHPM plant for retreatment and depositing final tailings to the existing SHPM tailings dam.

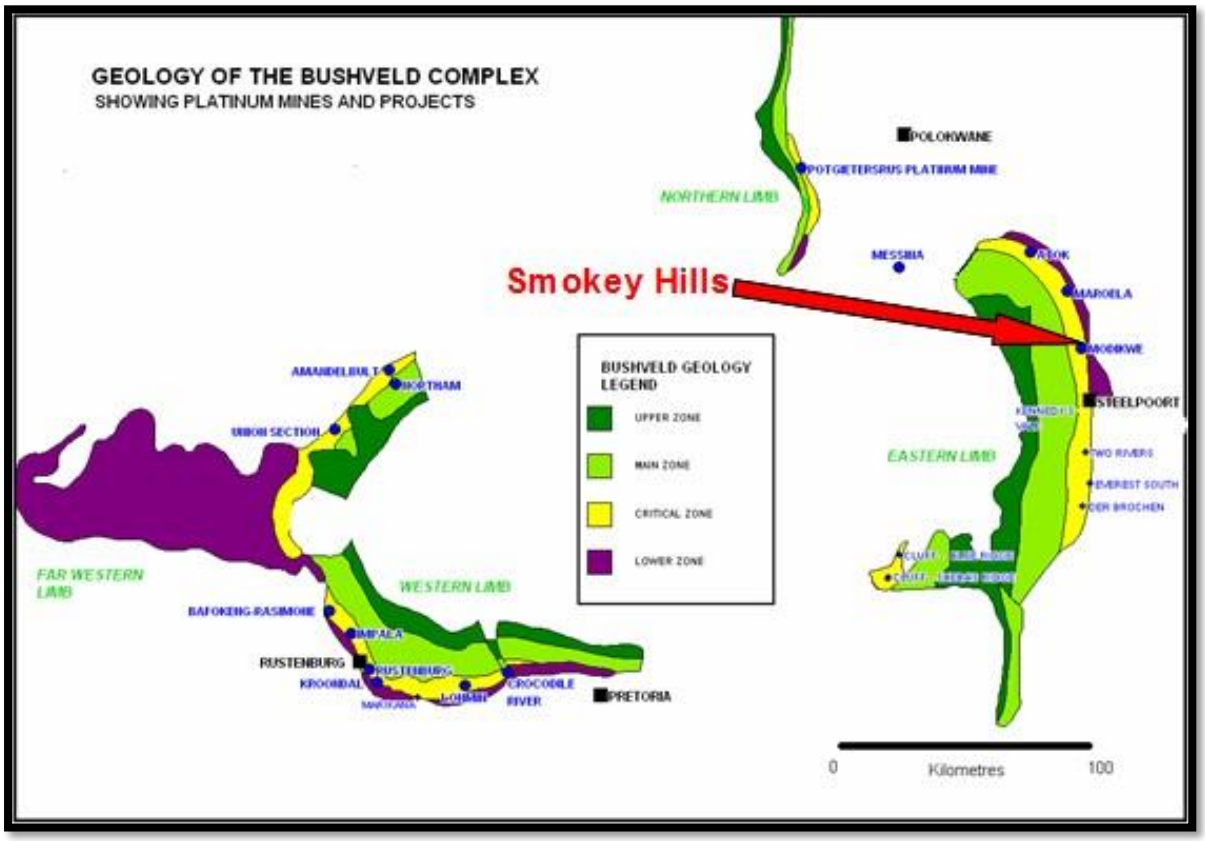


**Figure 3-1: Location of the Smokey Hills Mine on the Eastern Limb of the Bushveld Complex**

## 3.2 Existing Mining Operations

### 3.2.1 Mineral and surface rights

Phokathaba Platinum (Pty) Ltd holds mineral rights over the property for the mining of Platinum Group Metals (PGM). The surface rights of the farm Maandagshoek 254 KT are held by the National Government of the Republic of South Africa. This application is to include the UG1 chrome resource in the mineral right currently held by the applicant.

#### 3.2.1.1 *Description of the Activity*

Current mine infrastructure consists of historical opencast operations and underground operations around two Hills (Hills 2 & 3). Mining originally started as opencast operations where after the opencast areas were used to gain access to underground; with 3 Adits at each hill spaced on dip.

Open pit mining was carried out when the mine first started operating. The mine extracted and processed +/- 417 500 tons of UG2 ore from this initial open pit mining, and thus has the benefit of experience in the open pit mining of this deposit.

The mining lease area is 1 135 hectares, however the surface footprint only extents 56 hectares and is being used for infrastructure, roads, servitudes etc.

The mine site is fully fenced and the fence is inspected regularly by security personnel. Access control is strictly enforced. Individual areas (such as the plant area, offices, laboratory, maintenance yard etc.) are fenced separately.

#### *3.2.1.2 Existing Mining Infrastructure*

The infrastructure for an operating mine is in place and includes:

- Access and haul roads;
- Access control along access road;
- Pipe bridge crossing;
- Historical opencast operation around Hill 2 and 3;
- Underground operations with 6 adits comprising around Hill 2 and 3;
- Office buildings;
- Eskom electricity power supply;
- Water supply from the Lebalelo Water User Association via the Mooihoek Dam; which includes a pipeline, two diesel driven transfer pumps, diesel generator, 1 000 litre diesel tank and water reservoir (6 000 $m^3$ capacity);
- Processing plant and related infrastructure (including associated process water dam and run of mine stockpile);
- A tailings storage facility, return water sump, pollution control dam and pump station;
- The mining contractors' facilities and associated infrastructure;
- Various surface water management structures including dams, runoff control works and stream diversions;
- Potable water tanks, raw water tank, fire water tank and sewage treatment facility;
- Overburden dumps;
- Workshop, diesel and oil storage facilities and wash bays.

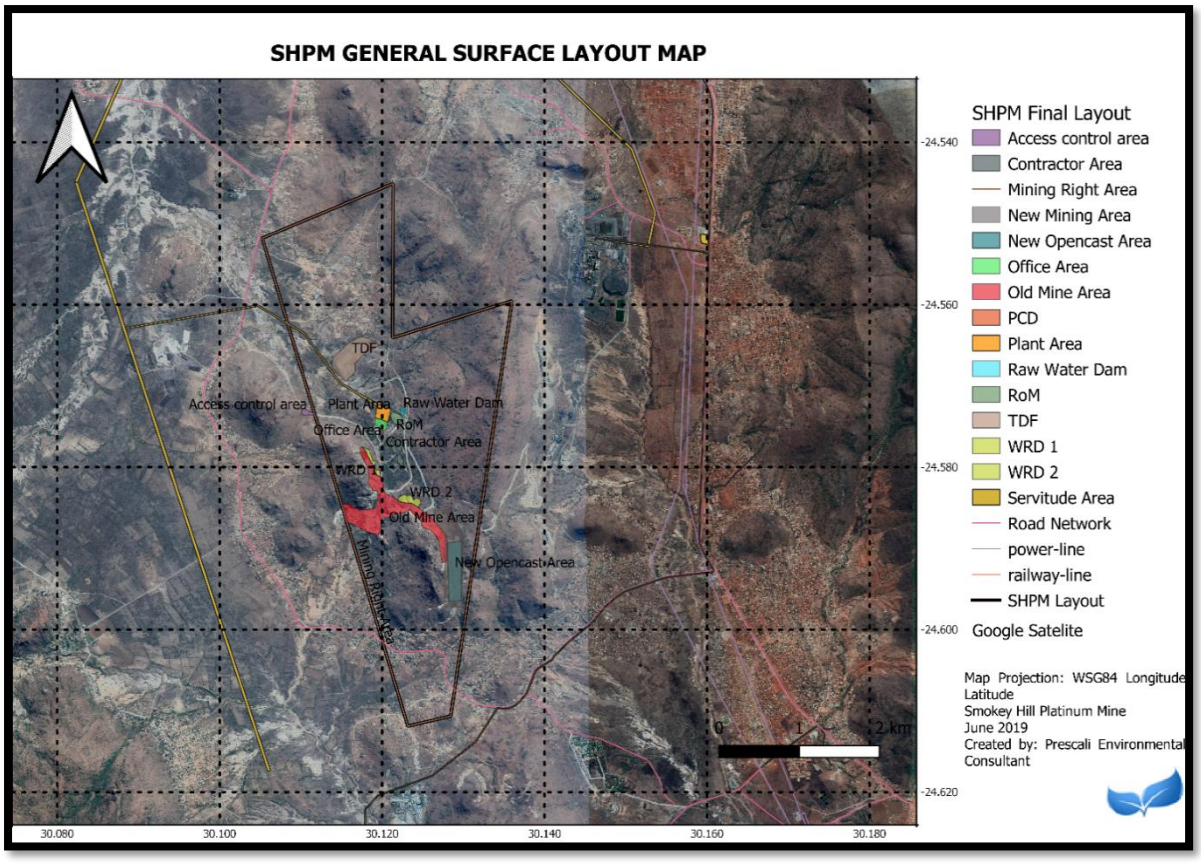


**Figure 3-2: General Surface layout including existing infrastructure and proposed opencast area**

*3.2.1.2.1 Processing Plant*

A processing plant is located at the mine and commenced production in March 2009. The plant consists of a typical UG2 processing plant with a mill-float-mill-float (or "MF2") configuration with a capacity of 60 000 tonnes/month. The concentrate has a typical grade of 200 grams per ton (gpt). The concentrate produced is trucked to Rustenburg for smelting and refinement.

Based on the EIA/EMPR approved in June 2019 the plant will be upgraded to include the following:

- Jaw crushing;
- Cone crushing in closed circuit with a screen;
- Primary ball mill in closed circuit with a screen;
- Primary flotation;
- Secondary ball mill in closed circuit with a cyclone;
- Secondary flotation;
- Chrome spirals recovery circuit;
- PGM concentrate and tails thickening;
- PGM concentrate filtering and storage;
- Reagent make-up and dosing circuits; and
- Water recycling and storage (process water dam)

The crushing circuit consist of a primary crushing with secondary crushing in a closed circuit with a screen. A storage silo is situated between the crushing and milling plants.

The milling section consists of primary and secondary milling; the mills are identical 1.5-Megawatt (MW) units. Primary mill discharge proceeds to rougher flotation and the concentrate from rougher flotation is

cleaned before reporting to final concentrate.

Tailings from the cleaner and scavenger flotation sections report to the secondary mill. The secondary mill discharges report to the secondary rougher flotation, the float tails are sent to final tailings and the concentrate to the cleaner flotation and thence to final concentrate. The final concentrate is filtered using a Larox filter and stored before being loaded and transported to the refinery.

The open pit ore mined contains both oxidized and fresh material with varying metallurgical recoveries. Batch treatment of the ore types is required to be done separately to optimize metal recovery, and also to avoid adverse impact on the ore mined from underground mining that is also taking place.

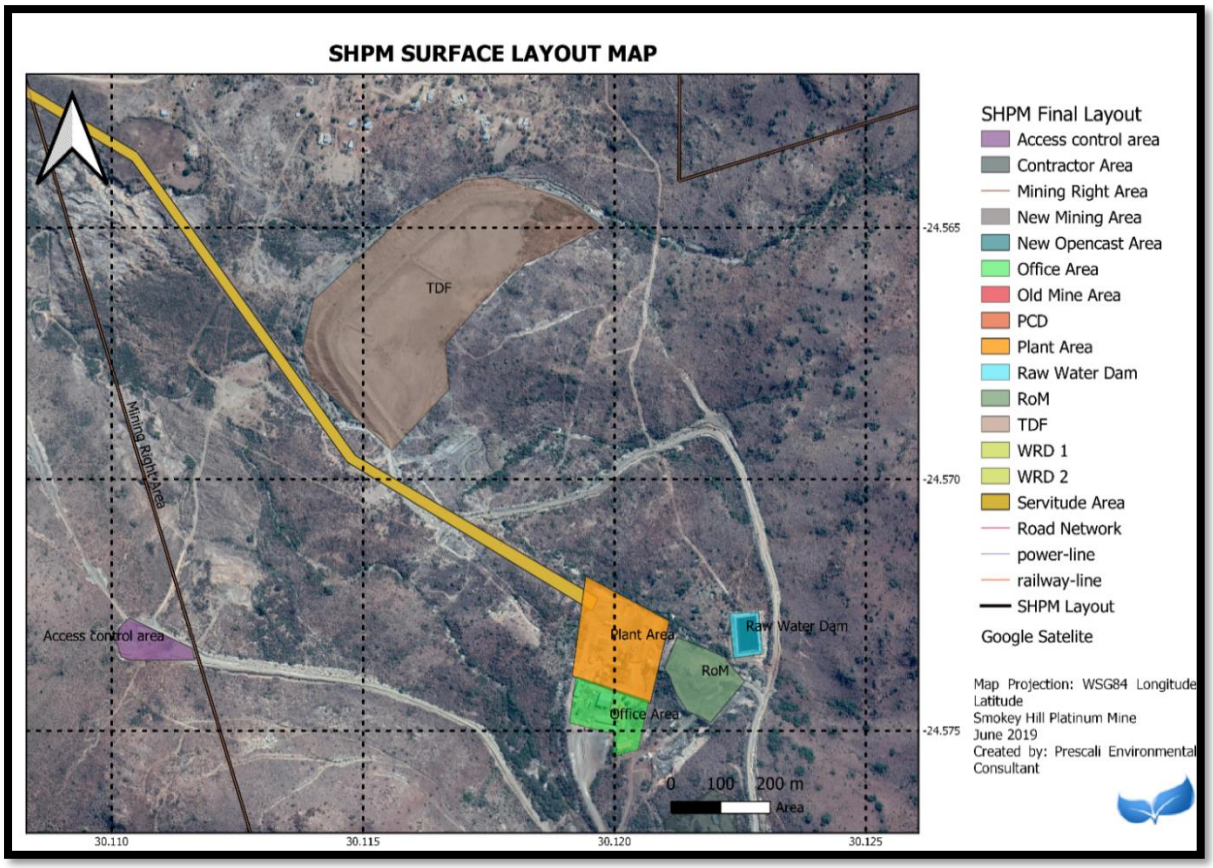


**Figure 3-3: SHPM Existing Infrastructure layout map showing the Tailings Disposal facility, Plant area, Raw Water Dam, RoM, Office Area , and servitude area**

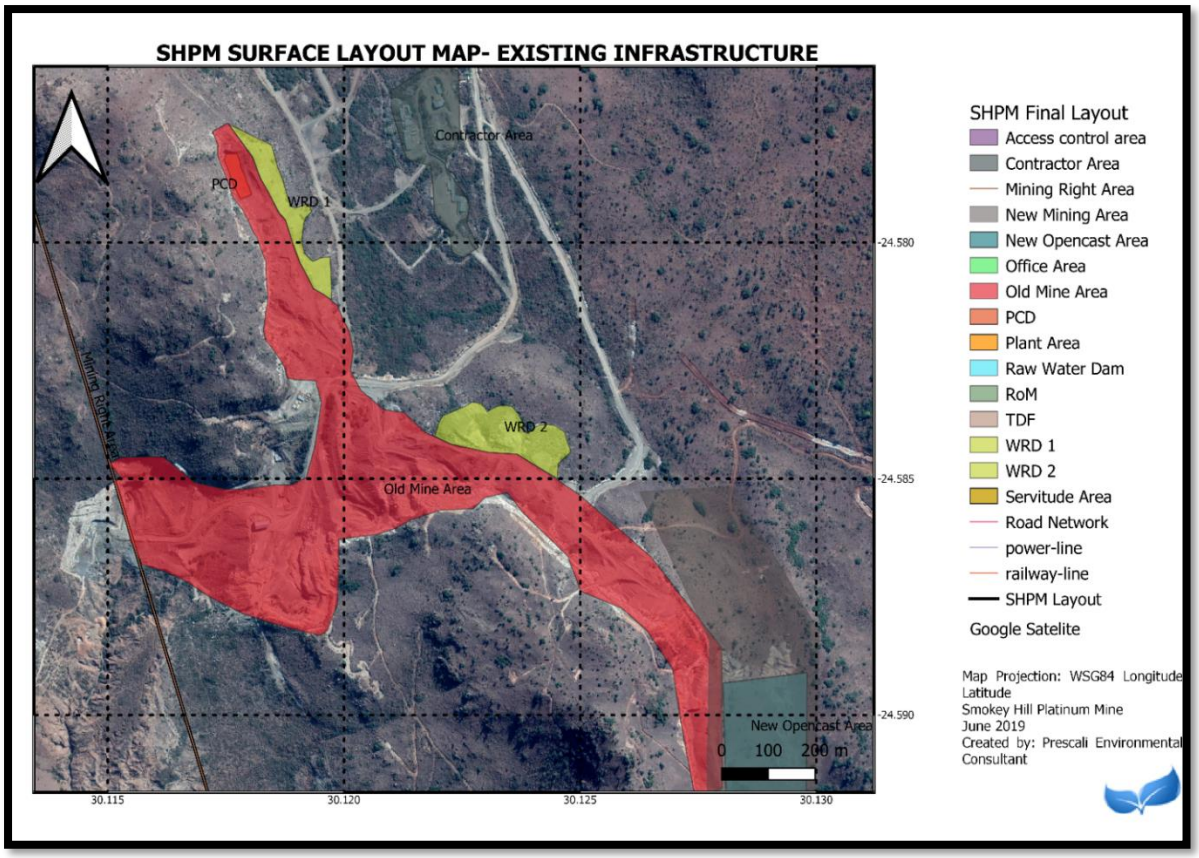


**Figure 3-4: SHPM Existing Infrastructure layout map showing the Old Mine area, Waste Rock Dump, and Contractors workshop area**

The process plant residue is pumped to an existing established Tailings Storage Facility (TSF/ Tailings Dam).

#### *3.2.1.3 Open pit and underground mining areas*

The project developed initially as an open cut operation. The shallow open pits provided waste rock for the development of the tailing's impoundment, roads and civil works on the mine site. The open pits provided ore for approximately nine months. The underground mine operation commenced towards the end of 2008. The mine area comprises of six adits developed in the side of the hills on the mine site which provide access to the UG2. The historic opencast pits, current adits and the proposed opencast pit are indicated in Figure 3-2, Figure 3-3, Figure 3-4, and Figure 3-6.

#### *3.2.1.4 Tailings Facility*

The tailings impoundment has a footprint of approximately 24 ha. The tailings facility has been designed to return water directly to the process plant.

A number of changes to the layout and designs included in the approved EMPR (AGES, 2007) took place when construction of the mine commenced in 2008; most of which relate to the tailings dam design and return water dam (RWD) that was included in the 2007 EMPR.

According to the tailings dam design report by Fraser Alexander, the final design comprises a side-hill facility initiating as a 2$^{nd}$ generation impoundment converting to a 4$^{th}$ generation upstream cyclone dam with a floating pumped decant system.

The final design comprises a waste rock starter wall to an elevation of 1 035 Meters above sea level (m.a.s.l). Construction of the Tailings Dump Facility (TDF) commenced in April 2008. The footprint

beneath the wall was first cleared of vegetation and soft soil. A key trench was excavated through soft material to hard rock along the centreline of the starter wall.

The key trench was backfilled with waste rock. The waste rock wall was developed in two sequential phases, first to approximately 1 025 m.a.s.l to allow tailings deposition to commence while the wall was raised to 1 035 m.a.s.l. The downstream slope comprises two lifts at angle of repose slopes (1:1.5) separated by a 10 m wide bench at 1 025 m to flatten the overall slope angle. The upstream slope commenced with a 2 to 3 m high compacted earth heel wall and a then the waste rock slope at around 1:3 slope to 1 025 m.a.s.l.

The rock slope was dressed with a compacted soil layer and covered with a 1.5 mm HDPE liner. The purpose of the HDPE liner, specified by SRK in the feasibility design, is to reduce seepage through the waste rock wall ( Figure 3-5).


**Figure 3-5: Construction taking place on the TDF**

An 8 m wide bench was formed on the upstream side at 1025 m where after the waste rock wall was raised at 1:1.5 to 1035 m.a.s.l. The crest width at this elevation is 10 m.

A filter drain, comprising graded sand overlying A4 Bidim wrapped stone encapsulating perforated 165 mm Cordrain collection pipes was constructed on top of the heel wall. The purpose of this heel drain is to reduce the pore pressure exerted on the HDPE liner and so reduce the seepage potential through the wall.

An elevated filter drain is constructed on the upstream bench at 1025 m.a.s.l (and higher on natural ground as the flanks of the dam extend up the side of the mountain). The purpose of this drain is to capture seepage flowing through the cyclone underflow wall developed on top of the filter drain. This filter drain prevents the phreatic surface from rising and reduces the seepage through the rock wall above the liner and is thus the key element of the design of the wall.

Both the filter drains discharge into a sump buried into the heel wall at the lowest point in the basin of the dam. An extractable borehole pump lowered into the sump extracts the filter drain discharge, depositing this back into the basin of the dam where most of it will become available for re-circulation to the process plant (process water dam at the plant).

The upstream cyclone wall development method creates substantial freeboard on the dam so storms can be readily accommodated in the basin. This in turn allows return water to be pumped directly from the basin of the tailings dam back to the process plant rather than first decanting the supernatant water through a fixed gravity penstock to downstream off dam water containment facilities (return water dam) from whence the water then has to be pumped back to the process plant. The lesser pumping head reduces the operating cost over the life of the operation and the cost of the off-dam water storage facilities, including the land sterilization, are avoided.

Although water entering the TDF basin would be pumped back to the process plant, large storms could lead to an excess of water temporarily accumulating in the basin. In order to manage the risk associated with this scenario, an emergency decant gravity penstock has been incorporated into the design. This penstock comprises two concrete penstock ring towers that will be incrementally raised as the basin level rises, feeding into a single steel outfall pipe passing through the wall. This penstock would only discharge in the event of a flood so the water will not be recovered but flow downstream to the environment

#### *3.2.1.5 Raw water dam*

The raw water dam (12 000 m³) serves to store water piped from the Mooihoek dam.

## 3.3 Listed and specified activities

Provide a plan drawn to a scale acceptable to the competent authority but not less than 1: 10 000 that shows the location, and area (hectares) of all the aforesaid main and listed activities, and infrastructure to be placed on site and attach as Appendix 4**.**

Along with the current activities as carried out under the Authorization of the Mining Right, number: LP 30/5/1/2/3/2/1/69 EM, new activities are applied for with this Scoping and Environmental Impact Assessment/ Environmental Management Programme (EIA/EMPR) amendment application.

The proposed surface mining is located on the eastern side of the ridge that parallels the eastern boundary of the Mining Right area. The planned surface mining covers the entire strike length of the UG1 present on the existing Mining Right area. The southern extremity of the opencast mining is limited to stay a safe distance away from human habitation (houses) in this area.

The opencast operation activities at Phokathaba Platinum Mine (trading as Smokey Hills will consist of the following:

- Establishment of a new opencast Section, the opencast will operation will be done by means of drilling and blasting, using the single benching method.
- The chrome ore will be trucked to the BCM plant off site or it will be sold directly to the market as run of mine (RoM) depending on the market conditions at the specific time.
- The chrome tails from BCM will be transported to and stockpiled at the Smokey Hills PGM Concentrator plant for further processing. The tailings will be discarded onto the existing tailings dam located at Smokey Hills.

The proposed open pit will be mining Chrome ore and will require an amendment of the existing authorisations as the existing mining right authorized PGMs only. The additional mineral will not change the scope of work as the mining methods will be the same.

Proposed opencast dimensions:

- The Pit will have a strike length of approximately 900 m (elongated south to north);
- A width of approximately 0.75 m;

- A safe and stable highwall of 40 m vertical height is planned;
- This configuration leads to an average waste-to-ore stripping ratio of 12; and
- The RoM tonnage planned comes to 1 613 301.22 tonnes.

The existing haul road between Smokey Hills and Black Chrome Mines will be used to transport the RoM and chrome tails between the two entities. Alternatively, the RoM will be transported using the existing roads through the villages.

In terms of rehabilitation, the following methods will be implemented:

- The rollover mining method will be practised, whereby the topsoil and overburden from the first cut of the opencast mine are stockpiled temporarily.
- As the opencast mine progresses along strike, the overburden and topsoil from each successive cut are backfilled into the void from the previous cut, the surface is shaped to be free draining, the topsoil is analysed and treated appropriately and the surface is revegetated.
- Once the last cut has been mined, the overburden and topsoil from the first cut will be used to backfill and rehabilitate the last cut.

Based on an average production rate of 8 000 tonnes of run of mine (RoM) ore per month, the life of mine for the opencast will be approximately 16 months (including 2 months start-up and 4-month rehab planning). Total RoM production from surface mining will come to 129 840.22 tonnes with a 40.3% $Cr_2O_3$ content.

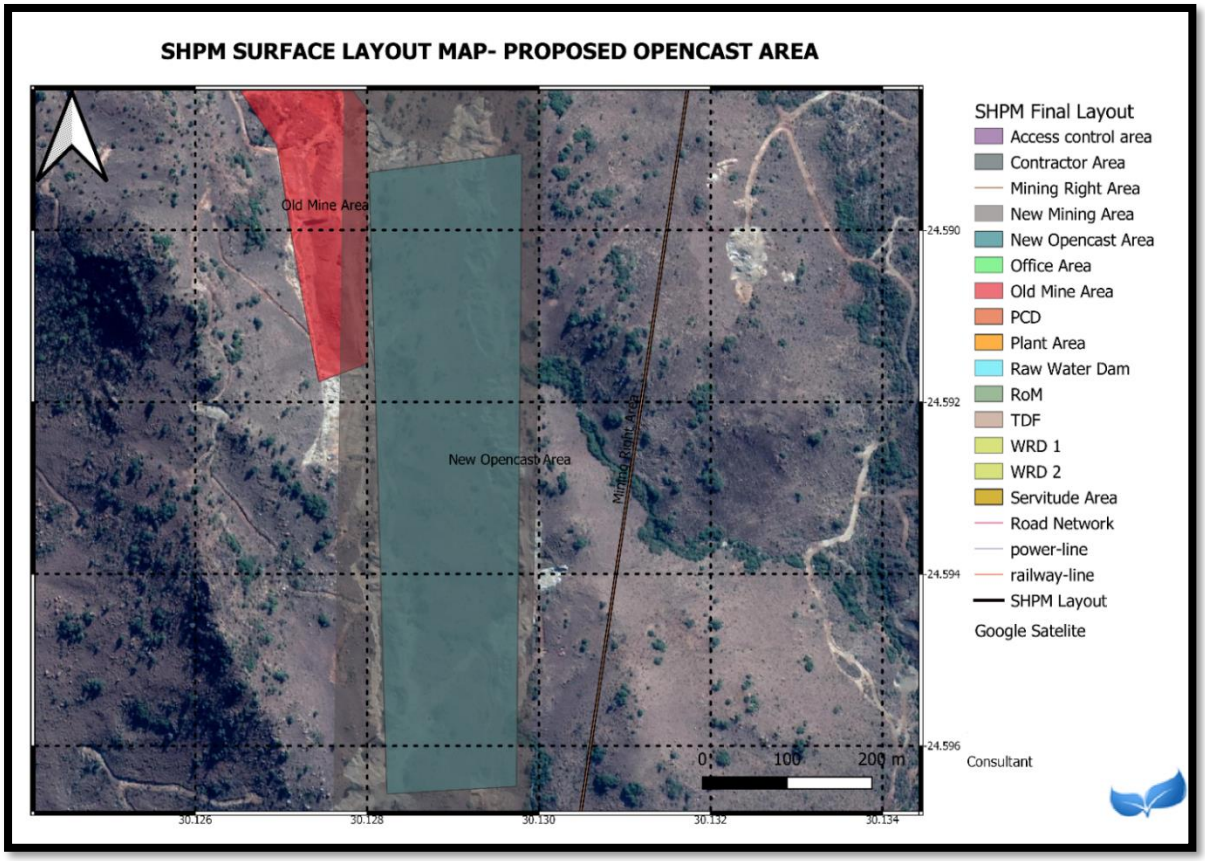


**Figure 3-6: SHPM Layout map showing proposed opencast area.**

**Table 3-1: Listed and Specified Activities already Approved**

| NAME OF ACTIVITY | Aerial extent of Activity $m^2$ or Ha | LISTED ACTIVITY[1] | APPLICABLE LISTING NOTICE |
|---|---|---|---|
| **Previously approved activities in terms of the 2006 NEMA Listed activities** | | | |
| The construction of facilities of infrastructure, including associated structures or infrastructure where the electricity output is more than 10 megawatts but less than 20 megawatts. | | x | GN.386 Activity number 1(a) |
| The construction of facilities or infrastructure, including associated structures or infrastructure, for: (k) the bulk transportation of sewage and water, including storm water, in pipelines with - (i) an internal diameter of 0,36 metres or more; or (ii) a peak throughput of 120 litres per second or more. | | x | GN. 386 Activity number 1 (k)(i) |
| The construction of facilities or infrastructure, including associated structures or infrastructure for the transmission and distribution of electricity above ground with a capacity of more than 33 kilovolts and less than 120 kilovolts. | | x | GN.386 Activity number 1(l) |
| The construction of facilities or infrastructure, including associated structures or infrastructure, for: (m) any purpose in the one in ten-year flood line of a river or stream, or within 32 meters from the bank of a river or stream where the flood line is unknown, excluding purposes associated with existing residential use, but including - (iii) bridges; | | x | GN. 386 Activity number 1(m) |
| The construction of facilities or infrastructure, including associated structures or infrastructure, for: (s) the treatment of effluent, wastewater or sewage with an annual throughput capacity of more than 2 000 cubic meters but less than 15 000 cubic meters. | | x | GN.386 Activity number 1(s) |
| The above ground storage of dangerous goods, including petrol, diesel, liquid paraffin, in containers with a combined capacity of more than 30 cubic meters, but less than 1000 cubic meters at any one location or site. | | x | GN.386 Activity number 7 |
| The abstraction of groundwater at a volume where any general authorization issued in terms of the National Water Act, 1998 (Act no 36 of 1998) will be exceeded. | | x | GN.386 Activity number 13 |
| The construction of a road that is wider than 4 metres or that has a reserve wider than 6 metres, excluding roads that fall within the ambit of another listed activity or which are access roads of less than 30 metres long. | | | GN.386 Activity number 15 |
| **Previously approved activities in terms of the 2017 NEMA Listed activities** | | | |
| Storm water on site will be directed via channels to a | 0.4 ha | X | GN R 983: |

[1] Mark with an X where applicable or affected.

| NAME OF ACTIVITY | Aerial extent of Activity $m^2$ or Ha | LISTED ACTIVITY[1] | APPLICABLE LISTING NOTICE |
|---|---|---|---|
| Pollution Control Dam in order to ensure the separation of dirty and clean water. | | | Activity 9 |
| Indigenous vegetation will be cleared where the pollution control dams will be constructed. | 2 ha | X | GN R 983: Activity 27 |
| The construction of the Pollution Control Dams will require an amendment to the Water Use License | 2 ha | X | GN R 984: Activity 6 |
| A pollution control dam with a height of more than 5 metres is proposed. | 1.5 ha | X | GN R 984: Activity 16 |

**Table 3-2: New activities to be approved**

| NAME OF ACTIVITY | Aerial extent of Activity $m^2$ or Ha | LISTED ACTIVITY[1] | APPLICABLE LISTING NOTICE |
|---|---|---|---|
| **Proposed Opencast excavation in terms of 2017 NEMA Listed Activities** | | | |
| Excavation of proposed opencast pit | 30 ha | X | GN 325- NEMA Listing Notice 2 Activity 17 |
| Site Clearance | 30 ha | X | GN 325- NEMA Listing Notice 2 Activity 15 |
| Blasting | 30 ha | | GN 325- NEMA Listing Notice 2 Activity 17 |
| Hauling and Transporting of RoM to BCM | TBC | X | GN 325- NEMA Listing Notice 2 Activity 17 |
| Indigenous vegetation will be cleared where the UG1 opencast | 30 ha | X | GN R 983: Activity 27 |
| Rehabilitation and Closure | 30 ha | X | GN 327- NEMA Listing Notice 1 Activity 22 |
| **Waste Management License** | | | |
| Overburden stockpiles and backfilling and the Storing of the tailings at the plant | 30 Ha | X | GNR 921. Category A 13 |

# 4 POLICY AND LEGISLATIVE CONTEXT

**Table 4-1: Applicable legislation and guidelines used to compile the report.**

| **APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process);** | **REFERENCE WHERE APPLIED** |
|---|---|
| The Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996)<br>Section 2 of the Constitution of the Republic of South Africa, 1996 (Act No.108 of 1996) (CA) states that: "This Constitution is the supreme law of the Republic; law or conduct inconsistent with it is invalid, and the obligations imposed by it must be fulfilled." Section 24 of the CA, states that everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:<br>• prevent pollution and ecological degradation;<br>• promote conservation; and<br>• secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.<br>Section 24 guarantees the protection of the environment through reasonable legislative (and other measures) and such legislation is continuously in the process of being promulgated. Section 33(1) concerns administrative justice which includes the constitutional right to administrative action that is lawful, reasonable and procedurally fair. | The draft EIA Report was accordingly prepared and considered within the constitutional framework set by Section 24 and 33 of the Constitution. |
| The National Environmental Management Act, 1998 (Act No. 107 of 1998) and the Environmental Assessment Regulations, 2014 (as amended)<br>The overarching principle of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) is sustainable development. It defines sustainability as meaning the integration of social, economic and environmental factors into planning, implementation and decision making so as to ensure the development serves present and future generations.<br><br>Section 2 of NEMA (Act No. 107 of 1989) provides for National Environmental Management Principles. These principles include:<br>• Environmental management must place people and their needs at the forefront of its concern.<br>• Development must be socially, environmentally and economically sustainable.<br>• Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated.<br>• Environmental justice must be pursued. | The Draft EIA Report and Draft EIA & EMPR will be distributed for public review for periods stipulated in NEMA as part of the environmental impact assessment process. |

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|---|---|
| • Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing must be pursued.<br>• Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle.<br>• The participation of all Interested and Affected Parties (I&APs) in environmental governance must be promoted.<br>• Decisions must take into account the interests, needs and values of all I&APs.<br>• The social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment.<br>• Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law.<br>• The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage.<br>• The costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.<br>The EIA process to be undertaken in respect of the authorization process of the proposed mining operations is in compliance with the MPRDA, as well as the NEMA read with the Environmental Impact Assessment Regulations of 2014 (as amended). The proposed development involves 'listed activities', as identified in terms of the NEMA and in terms of section 24(1), the potential consequences for or impacts on the environment of listed activities must be considered, investigated, assessed and reported on to the Minster of Mineral Resources or to the relevant office of the Department responsible for mineral resources, except in respect of those activities that may commence without having to obtain an environmental authorisation in terms of the NEMA. | |
| <u>GNR 1147 (20 November 2015) of the National Environmental Management Act, 1988 (Act No. 107 of 1998) - Financial Provisioning Regulations</u><br>In accordance with the above legislation, the holder of a mining right must make the prescribed financial provision for the costs associated with the undertaking of the management, rehabilitation and remediation of the negative environmental impacts due to prospecting, exploration and mining activities and the latent or residual environmental impacts that may become known in future. | The Final Rehabilitation, Decommissioning and Mine Closure plan was compiled in accordance with GNR 1147. |
| <u>Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)</u> | An application to include |

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| Previously South African mineral rights were owned either by the State or the private sector. This dual ownership system represented an entry barrier to potential new investors. The current Government's objective is for all mineral rights to be vested in the State, with due regard to constitutional ownership rights and security of tenure. The MPRDA was passed in order to make provision for equitable access to and sustainable development of the nation's mineral and petroleum resources, and to provide for matters connected therewith. The Preamble to the MPRDA inter alia affirms the State's obligation to:<br>• protect the environment for the benefit of present and future generations;<br>• ensure ecologically sustainable development of mineral and petroleum resources; and<br>• promote economic and social development.<br>The aforesaid preamble affirms the general right to an environment provided for in section 24 of the Constitution (as set out hereinabove).<br><br>The objects of the MPRDA, as set out in section 2 thereof serve as a guide to the interpretation of the Act.<br><br>The objects of the MPRDA are as follows:<br>• recognise the internationally accepted right of the State to exercise sovereignty over all the mineral and petroleum resources within the Republic;<br>• give effect to the principle of the State's custodianship of the nation's mineral and petroleum resources;<br>• promote equitable access to the nation's mineral and petroleum resources to all the people of South Africa;<br>• substantially and meaningfully expand opportunities for historically disadvantaged persons, including women, to enter the mineral and petroleum industries and to benefit from the exploitation of the nation's mineral and petroleum resources;<br>• promote economic growth and mineral and petroleum resources development in the Republic;<br>• promote Employment and advance the social and economic welfare of all South Africans;<br>• provide for security of tenure in respect of prospecting, exploration, mining and production operations;<br>• give effect to section 24 of the Constitution by ensuring that the nation's mineral and petroleum resources are developed in an orderly and ecologically sustainable manner while promoting justifiable social and economic development; and<br>• ensure that holders of mining and production rights contribute towards the socio-economic development of the areas in which they are operating.<br>The national environmental management principles provided for in section 2 of the NEMA apply to all prospecting and mining operations and any matter relating to such operation. These principles apply throughout the Republic to the actions of all organs | the chrome rights on the said property have been submitted to the DMR and it is the intent to start mining the UG1 chrome and related PGM reserves alongside the eastern side of the most southern hill on the said farm. The legislation will be heeded throughout the proposed mining operations and will be considered in the compilation of the EIA Report. |

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| of state including inter alia the Department of Mineral Resources that may significantly affect the environment.<br><br>Any prospecting or mining operation must be conducted in accordance with generally accepted principles of sustainable development by integrating social, economic and environmental factors into the planning and implementation of prospecting and mining projects in order to ensure that exploitation of mineral resources serves present and future generations.<br><br>Section 38 of the MPRDA states that the holder of inter alia, a prospecting right, mining right or mining permit:<br>• Must at all times give effect to the general objectives of integrated environmental management laid down in Chapter 5 of NEMA;<br>• Must consider, investigate, assess and communicate the impact of his or her prospecting or mining on the environment as contemplated in section 24(7) of NEMA;<br>• Must manage all environmental impacts –<br>o In accordance with an environmental management plan or approved environmental management programme, where appropriate, and<br>o As an integral part of the prospecting or mining operations, unless the Minister directs otherwise.<br>• Must as far as reasonably practicable, rehabilitate the environment affected by the prospecting or mining operations to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and<br>• Is responsible for any environmental damage, pollution or ecological degradation as a result of prospecting or mining operations and which may occur inside and outside the boundaries of the area to which such right, permit or permission relates. | |
| <u>National Water Act, 1998 (Act No. 36 of 1998) (NWA)</u><br>In terms of the NWA, the national government, acting through the Minister of Water and Environmental Affairs (previously the Minister of Water Affairs and Forestry), is the public trustee of South Africa's water resources, and must ensure that water is protected, used, development, conserved, managed and controlled in a sustainable and equitable manner for the benefit of all persons (section 3(1)).<br><br>In terms of the NWA a person may only use water without a license under certain circumstances. All other use, provided that such use qualifies as a use listed in section 21 of the Act, require a water use license. A person may only use water without a license if such water use is permissible under Schedule 1 (generally domestic type use) if that water use constitutes a continuation of an existing lawful water use (water uses being undertaken prior to the commencement of the NWA, generally | An IWUL has been applied for during the previous authorization. Section 21 (g) water uses for the backfilling of the opencast will need authorization from DWS. |

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| in terms of the Water Act of 1956), or if that water use is permissible in terms of a general authorisation issued under section 39 (general authorisations allow for the use of certain section 21 uses provided that the criteria and thresholds described in the general authorisation is met). Permissible water use furthermore includes water use authorised by a license issued in terms of the NWA.<br><br>Section 21 of the NWA indicates that "water use" includes:<br>• taking water from a water resource (section 21(a));<br>• storing water (section 21(b));<br>• impeding or diverting the flow of water in a water course (section 21(c));<br>• engaging in a stream flow reduction activity contemplated in section 36 (section 21(d));<br>• engaging in a controlled activity which has either been declared as such or is identified in section 37(1) (section 21(e));<br>• discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit (section 21(f));<br>• disposing of waste in a manner which may detrimentally impact on a water resource (section21(g);<br>• disposing in any manner of water which contains waste from, or which has heated in, any industrial or power generation process (section 21 (h));<br>• altering the bed, banks, course or characteristics of a water course (section 21(i));<br>• removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people (section 21(j)); and<br>• using water for recreational purposes (section 21(k)).<br>In addition to the above and in terms of section 26 of the NWA, Regulations on the Use of Water for Mining and Related Activities Aimed at the Protection of Water Resources were published in GN R. 704 of 4 June 1999 (GN R. 704). The aforesaid GN R. 704 provides for *inter alia* the capacity requirements of clean and dirty water systems (regulation 6), the protection of water resources by a person in control of a mine (regulation 7), security and addition measures (regulation 8) and temporary or permanent cessation of a mine or activity (regulation 9).<br><br>According to GN R. 704 "no person in charge of a mine may carry on any underground or opencast mining, prospecting or any other operation or activity under or within the 1:50 year flood-line or within a horizontal distance of 100 metres from any watercourse or estuary, whichever is the greatest". Insofar as the undertaking of section 21 water uses is concerned, it is anticipated that application for registration and water use licensing will be undertaken. | |

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| National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA)<br>The National Heritage Resource Agency (NHRA) established the South African Heritage Resources Agency (SAHRA) as well as provincial heritage resources agencies. In terms of the NHRA, no person may destroy, damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of any heritage site without a permit issued by the heritage resources authority responsible for the protection of such site.<br><br>No person may damage, disfigure, alter, subdivide or in any other way develop any part of a protected area unless, at least 60 days prior to the initiation of such changes, he/she/it has consulted with the relevant heritage resources authority. Section 34 of the NHRA provides for the protection of immovable property by providing for a prohibition on altering or demolishing any structure or part of any structure, which is older than 60 years, without a permit issued by the relevant provincial heritage resources authority. Accordingly, should the proposed activities, prospecting or mining activities or the closure and rehabilitation of mined land involve the altering or demolishing of any structure or part of any structure, which is older than 60 years, a permit issued by the relevant provincial heritage resources authority is required.<br><br>No person may, without a permit issued by the responsible heritage resources authority destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite; destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite; trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.<br><br>No person may, without a permit issued by SAHRA or a provincial heritage resources authority destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves; destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or bring onto or use at the burial ground or grave referred to above any excavation equipment or any equipment which assists in the detection or recovery of metals.<br><br>Section 38 of the NHRA states that any person who intends to undertake developments categorised in Section 38 of the NHRA must at the very earliest stages of initiating such development, notify the responsible heritage resources authority and furnish | An Archaeological Impact Assessment was conducted for the project. |

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| it with details regarding the location, nature and extent of the proposed development. By way of example, the developments referred to in Section 38 of the NHRA include:<br>• the construction of a road, wall, power-line, pipeline, canal or other similar form of linear development or barrier exceeding 300 metres in length;<br>• the construction of a bridge or similar structure exceeding 50 metres in length;<br>• any development or other activity which will change the character of a site as specified in the regulations;<br>• any other category of development provided for in regulations by SAHRA or the provincial heritage resources authority.<br>However, the abovementioned provisions are subject to the exclusion that section 38 does not apply to a development as described in subsection (1) if an evaluation of the impact of such development on heritage resources is required in terms of the Environment Conservation Act, 1989 (Act No. 73 of 1989) (EIA) (now presumably the NEMA in view of the repeal of the listed activities under the ECA): Provided that the consenting authority must ensure that the evaluation fulfils the requirements of the relevant heritage resources authority in terms of subsection (3), and any comments and recommendations of the relevant heritage resources authority with regard to such development have been taken into account prior to the granting of the consent. | |
| <u>National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA)</u><br>The NEMBA aims to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA; the protection of species and ecosystems that warrant national protection; the sustainable use of indigenous biological resources; the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources; the establishment and functions of a South African National Biodiversity Institute; and for matters connected therewith.<br><br>The NEMBA provides for the publishing of various lists of species and ecosystems by the Minister of Environmental Affairs and Tourism (now the Minister of Water and Environmental Affairs) as well as by a Member of the Executive Council responsible for the conservation of biodiversity of a province in relation to which certain activities may not be undertaken without a permit. In terms of Section 57 of the NEMBA, no person may carry out any restricted activity involving any species which has been identified by the Minister as "critically endangered species", "endangered species", "vulnerable species" or "protected species" without a permit. The NEMBA defines "restricted activity" in relation to such identified species so as to include, but not limited to, "hunting, catching, capturing, killing, gathering, collecting, plucking, picking parts of, cutting, chopping off, uprooting, damaging, destroying, having in possession, exercising physical control over, moving or translocating".\<br><br>The Minister has made regulations in terms of section 97 of the NEMBA with regards to Threatened and Protected Species which came into effect on 1 June 2007. Furthermore, the Minister published lists of critically endangered, endangered, vulnerable and protected species in terms of section 56(1) of the NEMBA. | The legislation was considered throughout the EIA process and in particular the Ecological Impact Assessment which will comply with the Biodiversity Act. |

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| National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEMAQA)<br>The NEMAQA came into power on the 24th of February 2005. Additionally, the amendment to the Minimum Emission Standards (GN R 893) also came into effect on the 12 June 2015. This Notice provides a list of activities that may cause atmospheric emissions which have or may have a significant detrimental effect on the environment as well as the minimum emission standards ("MES") for these activities as contemplated in section 21 of NEMAQA.<br><br>The effect of the commencement of the NEMAQA and the listed activities, listed in GN 964 is that an atmospheric emission licence (AEL) is now required for conducting these listed activities. | Currently there are no listed activities that require registration/permitting according to National Environmental Management: Air Quality Act, 2003 (Act No. 39 of 2004) for the proposed open cast |
| | |
| | |
| National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEMWA)<br>The NEMWA commenced on 1 July 2009 and as a result of its commencement the relevant provisions in the ECA in respect of waste management, were repealed. The NEMWA sets out to reform the law regulating waste management and deals with waste management and control more comprehensively than was dealt with in the ECA. It also introduces new and distinct concepts never before canvassed within the realm of waste management in South Africa, such as the concept of contaminated land and extended producer responsibility. It also provides for more elaborate definitions to assist in the interpretation of the Act.<br><br>Section 19 of the NEMWA provides for listed waste management activities and states in terms of section 19(1), the Minister may publish a list of waste management activities that have, or are likely to have a detrimental effect on the environment. Such a list was published in GNR 921 of 29 November 2013.<br><br>In accordance with section 19(3), the Schedule to GNR 921 provides that a waste management licence is required for those activities listed therein prior to the commencement, undertaking or conducting of same. In addition, GNR 921 differentiates between Category A, B, and Category C waste management activities. Category A waste management activities are those which require the conducting of a basic assessment process as stipulated in the EIA Regulations, 2014 promulgated in terms of the NEMA as part of the waste management licence application and Category B waste management activities are those that require the conducting of a scoping and environmental impact assessment process stipulated in the EIA Regulations, 2014 as part of the waste management licence application. Category C waste management activities do not require a waste management licence, however a person who wished to commence, undertake or conduct a waste management activity listed | The scope of the original application included various opencast pits as well as associated overburden dumps. The newly proposed overburden dumps would require a waste management licence (WML) as listed in GNR 921 of 29 November 2013. |

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| under this category, must comply with the relevant requirements and standards,<br><br>Section 20 of the NEMWA pertains to the consequences of listing waste management activities and states that no person my commence, undertake or conduct a waste management activity, except in accordance with the requirements or standards for that activity as determined by the Minister or in accordance with a waste management licence issued in respect of that activity, if a licence is required.<br><br>In terms of the current statutory framework with regards to waste management, a waste management licence is required for those waste management activities identified in the Schedule to GNR 921. Certain of the waste management activities listed in the Schedule are governed by specific thresholds. Where any process or activity falls below or outside the thresholds stipulated, a waste management licence is not required. | |
| Limpopo Environmental Management Act, 2003 (Act No. 7 of 2003) (LEMA)<br>According to this Act, no person may pick, import, export, transport, possess, cultivate or trade in a specimen of a specially protected or protected plant species. The Appendices to the Act provide an extensive list of species that are protected, comprising a significant component of the flora expected to occur on site. Communication with Provincial authorities indicates that a permit is required for all these species, if they are expected to be affected by the proposed project. | This act was taken into consideration during the fauna and flora assessment |
| National Noise Control Regulations (GN R154 of 1992)<br>In terms of section 25 of the ECA, the national Noise Control Regulations (GN R 154 of 1992) were promulgated. The NCRs were revised under Government Notice Number R. 55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations. Subsequently, in terms of Schedule 5 of the Constitution of South Africa of 1996 legislative responsibility for administering the noise control regulations was devolved to provincial and local authorities. Provincial noise control regulations exist in the Free State, Gauteng and Western Cape provinces. | This was taken into consideration by the Noise Assessment report |
| **Integrated Development Plans** | |
| Greater Sekhukhune District Municipality (DM) 2014/15 Final Integrated Development Programme (IDP) Review: Greater Tubatse Local Municipality (LM) Draft IDP 2017 – 2018<br><br>Legislation was enacted to guide the establishment of and functions of metropolitan, district and local municipalities, including the promulgation of integrated development planning as a tool for development in district and local municipal IDP reports. Section 25 of the Municipal System Act, 2000 (Act No. 32 of 2000) (MSA) requires that an IDP must be compatible with national and provincial development plans and planning requirements. | The proposed development fall under the jurisdiction of the Fetakgomo-Greater Tubatse Local Municipality which is located in the Greater Sekhukhune District Municipality. The |

<table>
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<tr><td>The above municipalities are characterised by similar developmental constraints highlighted in the Integrated Development Plans for the respective districts:<ul><li>Large portions of the population reside in rural areas with limited access to opportunities for social and economic upliftment;</li><li>Due to its rural nature; the Tubatse Municipality is confronted with a high service delivery backlog. Majority of the settlements are far apart which; makes the provision and maintenance of services very costly. Some of these areas are too small to attain the economic threshold required to provide social facilities in a cost-effective manner.</li><li>There are extensive skills shortages in the areas and limited provision of human resource development programmes that would address the skills gap, specifically in the mining sector that is an important revenue generator for both local municipalities;</li><li>Existence of large infrastructure backlogs.</li></ul>Together with the identified agriculture and tourism potential, mining is delineated as a priority sector for both municipalities. District municipalities endorse and promote communication and partnerships in the mining industry. It is widely recognised that investment within the mining industry is paramount for the creation of social and economic upliftment within the municipalities.</td><td>need and desirability of the project is in line with the IDP`s of these municipalities.</td></tr>
<tr><td>LEGISLATION REFERRED TO IN THE SPECIALIST STUDIES CONDUCTED</td><td></td></tr>
<tr><td>National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) - National Dust Control Regulations (Government Gazette No. 36794 - No. R 827)<br><br>Water and Environmental Affairs Minister published the National Dust Control Regulations on 1 November 2013, in terms of the National Environmental Management Air Quality Act, which prescribes general measures for the control of dust.<br>Dust Fallout permitted rates
<table>
<tr><th>Restriction Areas</th><th>Dust Fall Rate (mg/m³/day - 30-day average)</th><th>Permitted Frequency of exceeding dust fall rate</th></tr>
<tr><td>Residential Areas</td><td>D < 600</td><td>2 within a year, not sequential months</td></tr>
<tr><td>Non-Residential Area</td><td>600 < D < 1200</td><td>2 within a year, not sequential months</td></tr>
</table>
According to regulations, any person conducting any activity in such a way that would give rise to dust in quantities and concentrations that exceeded the dust fall standard set out in the regulation was impelled to, upon receipt of a notice from an air quality officer, implement a dust fall monitoring programme.</td><td>The Air Quality Report (Appendix 7) make reference to this regulation.</td></tr>
<tr><td>SOUTH AFRICAN NATIONAL STANDARD – SANS1929:2011<br>Ambient Air Quality – Limits for Common Pollutants</td><td>The Air Quality Report (Appendix 7) make</td></tr>
</table>

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<tr><td>Limits for $PM_{10}$ in ug/$m^3$
<table>
<tr><th>Average period</th><th>Concentration (µg/$m^3$)</th><th>Frequency of exceedances</th></tr>
<tr><td>Target</td><td></td><td></td></tr>
<tr><td>24 hours</td><td>75</td><td>4</td></tr>
<tr><td>1 year</td><td>40</td><td>0</td></tr>
</table>
Four-band scale evaluation criteria for dust deposition in mg/m2/day
<table>
<tr><th>Band Number</th><th>Band Description Label</th><th>Dust Fall Rate (mg/$m^2$/day - 30 day average)</th><th>Comment</th></tr>
<tr><td>1</td><td>Residential</td><td>D < 600</td><td>Permissible for residential and light commercial.</td></tr>
<tr><td>2</td><td>Industrial</td><td>D < 1200</td><td>Permissible for heavy commercial and industrial.</td></tr>
<tr><td>3</td><td>Action</td><td>1200 < D < 2400</td><td>Requires investigation and remediation if two sequential months lie in this band, or more than three occur in a year.</td></tr>
</table></td><td>reference to this regulation.</td></tr>
<tr><td>The National Forest Act 1998 (Act No. 84 of 1998<br>The NFS 1998<ul><li>Promotes the sustainable management and development of forests for the benefit of all;</li><li>Creates the conditions necessary to restructure forestry in State Forests;</li><li>Provide special measures for the protection of certain forests and protected trees;</li><li>Promotes the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes.</li><li>Promotes community forestry.</li></ul>In terms of the NFA, forest trees or protected tree species may not be cut, disturbed, damaged, destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold – except under license granted by the Department of Agriculture, Forestry and Fisheries (DAFF).</td><td>The Fauna and Flora Assessment Report (Appendix 7) make reference to this regulation.</td></tr>
<tr><td><u>National Biodiversity Assessment (NBA 2011)</u><br><br>The latest National Biodiversity Assessment (2011) provides an assessment of South Africa’s biodiversity and ecosystems, including headline indicators and national maps for the terrestrial, freshwater, estuarine and marine environments. The NBA (2011) was led by SANBI in partnership with a range of organisations. It follows on from the National Spatial Biodiversity</td><td>The Fauna and Flora Assessment Report (Appendix 7) make reference to this regulation.</td></tr>
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| **APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process);** | **REFERENCE WHERE APPLIED** |
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| Assessment (2004), broadening the scope of the assessment to include key thematic issues as well as a spatial assessment. The NBA (2011) includes a summary of spatial biodiversity priority areas that have been identified through systematic biodiversity plans at national, provincial and local levels (SANBI, BGIS). | |
| In addition to the above the Smokey Hills Platinum Mine also needs to adhere to Government Notice 704 as published on 4 June 1999. Regulation 704 (Government Gazette 20118) was drawn up to address the issues in relation to mining activities. Most impacts must be managed according to Condition 4, which describes the locality of infrastructure and mining activities: Condition 6, which deals with the capacity requirements of clean and dirty water systems; and Condition 7, which describes the measures which must be taken to protect water resources. The Regulation requires containment to ensure that clean and dirty water systems cannot spill into each other more than once in 50 years. However, without detailed hydrographs it is not possible to apply this condition. To assist in planning and design, this condition has been interpreted as requiring containment of the 1:50 year storm event, over and above standard operating levels as detailed in DWS's M6.1 Guideline.<br><br>In terms of the linkages of GN704 with other requirements of the National Water Act, 1998, it is stated in Operational Guideline No. M6 that should an exemption from any requirements of GN704 imply the necessity for a water use licence, the person in control of the mine or activity needs only apply for a licence. The licence has higher authority than the GN704. | The Surface water Assessment and Groundwater Report (Appendix 7) make reference to this regulation. |
| **National Noise Control Regulations (GN R154 of 1992)**<br><br>In terms of section 25 of the ECA, the national Noise Control Regulations (GN R 154 of 1992) were promulgated. The NCRs were revised under Government Notice Number R. 55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations. Subsequently, in terms of Schedule 5 of the Constitution of South Africa of 1996 legislative responsibility for administering the noise control regulations was devolved to provincial and local authorities. Provincial noise control regulations exist in the Free State, Gauteng and Western Cape provinces.<br><br>The National Noise Control Regulations (GN R154 1992) defines:<br>"controlled area" as: a piece of land designated by a local authority where, in the case of— a) road transport noise in the vicinity of a road- i. the reading on an integrating impulse sound level meter, taken outdoors at the end of a period extending from 06:00 to 24:00 while such meter is in operation, exceeds 65 dBA; or ii. the equivalent continuous | The Noise Assessment and Groundwater Report (Appendix 7) make reference to this regulation. |

| **APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process);** | **REFERENCE WHERE APPLIED** |
|---|---|
| "A"-weighted sound pressure level at a height of at least 1,2 meters, but not more than 1,4 meters, above the ground for a period extending from 06:00 to 24:00 as calculated in accordance with SABS 0210-1986, titled: "Code of Practice for calculating and predicting road traffic noise", published under Government Notice No. 358 of 20 February 1987, and projected for a period of 15 years following the date on which the local authority has made such designation, exceeds 65 dBA; industrial noise in the vicinity of an industry- the reading on an integrating impulse sound level meter, taken outdoors at the end of a period of 24 hours while such meter is in operation meter is in operation, exceeds 61 dBA; or the calculated outdoor equivalent continuous "A"-weighted sound pressure level at a height of at least 1,2 meters, but not more than 1,4 meters, above the ground for a period e, exceeds 61 dBA.<br><br>"disturbing noise" as: noise level which exceeds the zone sound level or, if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dBA or more.<br><br>"zone sound level" as: a derived dBA value determined indirectly by means of a series of measurements, calculations or table readings and designated by a local authority for an area. This is the same as the Rating Level as defined in SANS 10103.<br><br>*In addition:*<br>In terms of Regulation 2 -<br>*"A local authority may –*<br>*(a) establish a new township unless the lay-out plan concerned, if required by a local authority, indicates in accordance with the specifications of the local authority, the existing and future sources of noise, with concomitant dBA values which are foreseen in the township for a period of 15 years following the date on which the erection of the buildings in and around the township commences;*<br>*(c):" if a noise emanating from a building, premises, vehicle, recreational vehicle or street is a disturbing noise or noise nuisance, or may in the opinion of the local authority concerned be a disturbing noise or noise nuisance, instruct in writing the person causing such noise or who is responsible therefor, or the owner or occupant of such building or premises from which or from where such noise emanates or may emanate, or all such persons, to discontinue or cause to be discontinued such noise, or to take steps to lower the lever of the noise to a level conforming to the requirements of these Regulations within the period stipulated in the instruction: Provided that the provisions of this paragraph shall not apply in respect of a disturbing noise or noise nuisance caused by rail vehicles or aircraft which are not used as recreational vehicles;*<br>*(d): before changes are made to existing facilities or existing uses of land or buildings, or before new buildings are erected, in* | |

| **APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process);** | **REFERENCE WHERE APPLIED** |
|---|---|
| *writing require that noise impact assessments or tests are conducted to the satisfaction of that local authority by the owner, developer, tenant or occupant of the facilities, land or buildings or that, for the purposes of regulation 3(b) or*<br>*(f) designate a controlled area in its area of jurisdiction or amend or cancel an existing*<br>*controlled area by notice in the Official Gazette concerned.*<br><br>In terms of Regulation 4 of the Noise Control Regulations:<br>*"No person shall make, produce or cause a disturbing noise, or allow it to be made, produced or caused by any person, machine, device or apparatus or any combination thereof"*. | |
| **Noise Standards**<br><br>There are a few South African scientific standards (SABS) relevant to noise from developments, industry and roads. They are:<br>• SANS 10103:2008. 'The measurement and rating of environmental noise with respect to annoyance and to speech communication'.<br>• SANS 10210:2004. 'Calculating and predicting road traffic noise'.<br>• SANS 10328:2008. 'Methods for environmental noise impact assessments'.<br>• SANS 10357:2004. 'The calculation of sound propagation by the Concave method'.<br>• SANS 10181:2003. 'The Measurement of Noise Emitted by Road Vehicles when Stationary'.<br>• SANS 10205:2003. 'The Measurement of Noise Emitted by Motor Vehicles in Motion'.<br><br>The relevant standards use the equivalent continuous rating level as a basis for determining what is acceptable. The levels may take single event noise into account, but single event noise by itself does not determine whether noise levels are acceptable for land use purposes. With regards to SANS 10103:2008, the recommendations are likely to inform decisions by authorities, but non-compliance with the standard will not necessarily render an activity unlawful *per se.* | The Noise Assessment and Groundwater Report (Appendix 7) make reference to this regulation. |

# 5 NEED AND DESIRABILITY OF THE PROPOSED ACTIVITIES

(Motivate the need and desirability of the proposed development including the need and desirability of the activity in the context of the preferred location).

Limpopo has rich mineral resources, making mining a critical sector of the economy of the province, contributing 22% to its Growth Domestic Product (GDP). Unemployment in the region is high with an estimated 42% of the economically active population in the Fetakgomo-Greater Tubatse Local Municipality being unemployed.

Although there are several mines in the area, the proposed minerals mined remain unexploited. Expansion in this sector is important as it brings with its investment in infrastructure, results in creation of job opportunities and generates many other economic spin-offs. The lack of economic growth in the region warrants special attention and support to optimize the available opportunities. However, cognizance should be taken of the outflow of money from the mines in Greater Tubatse to other regions.

Fetakgomo-Greater Tubatse Local Municipality has significant mining in existence and manufacturing (ferrochrome smelters) sectors, but unemployment is still significantly above the provincial average. Information from different sources suggests that new mining developments could reduce unemployment from 73% (expanded unemployment rate definition) in 2001 to 44% in 2010 and 23% in 2015. Further reduction in the unemployment rate will depend on effective intervention by public sector institutions to facilitate economic sector diversification through competitive cluster value-chain development. This implies upstream development in the manufacturing and trade sector to provide essential items in the mining supply chain by local entrepreneurs. It also implies side-stream development in the form of construction and Urban renewal. This approach is consistent with the Limpopo Employment Growth and Development Plan (Fetakgomo Greater Tubatse Municipality , 2016).

The economy of the Sekhukhune District is a mixture of very negative features (such as the highest unemployment rate in Limpopo) and very positive opportunities (like the enormous mining potential within the area). The region is also characterised by a weak economic base, poor infrastructure, major service backlogs, dispersed human settlements and high poverty levels.

The extraordinary physical properties of the platinum group make its metals almost indispensable in a wide range of industrial applications. Auto catalysts, which account for more than 40% of the total demand for platinum, are the major demand sector for PGMs. Around 38% of the world's platinum finds its way into jewellery, and the electrical and electronics industry accounts for 50% of the annual palladium and ruthenium demands. Growth is associated with PGMs playing a role in fighting viral, bacterial and parasitic infections in the future and even being used as diagnostic tools. The use of clean and efficient fuel cells in the future, in which platinum catalysts are used to convert the chemical energy of a fuel into electrical energy, has for some time been sees as the next new major demand sector for platinum (Mineral Council South Africa, 2008)

An expected increase in the demand for platinum and palladium is expected for the future due to stricter emissions legislation globally and a rise in the growth of vehicle production and sales. In addition, with global energy demand expected to grow by more than 60% by 2030, the security of energy supply has become a concern and has led to the diversification of energy sources. This has created new opportunities for PGMs in the development of fuel cell technology, which could lead to significant socio-economic development as it will result in job creation in terms of manufacturing, installation and maintenance, as well as skills development (Mining Weekly, 2012).

Southern Africa hosts about 90% of the world's chromite reserves and resources and accounts for

approximately 60% of global chrome ore production. South African output rose above 20Mt for the first time ever in 2018. Most chrome ores are mined as a primary product although, in South Africa, around 30% of chrome ore output in 2018 was derived as a by-product from UG2 tailings of platinum group metal (PGM) operations.

Over 90% of chromium consumption is attributable to metallurgical applications. Stainless steel alone represents more than 75% of consumption. Trends in stainless steel production are, therefore, the main determinant for the outlook of chromium demand. Ferrochrome is the intermediate chromium-iron alloy used in the steel industry. Most of the ferrochrome production is in the form of high-carbon ferrochrome and charge chrome, of which 80-90% is consumed directly in stainless steel. The balance of ferrochrome production is in the form of low- and medium-carbon ferrochrome used to trim the final chromium composition within specified Cr:C ratios of stainless and other steel products.

The chromium chemical and refined metal industry accounted for just over 3% of the total market in 2018. Prices for these niche products have followed different trends to metallurgical chrome ores and ferrochrome. China hosts by far the largest capacity of chromium chemicals production, although producers with less than 10ktpy capacity were largely eliminated a decade ago because of more stringent environmental regulations. As environmental inspections have ramped up in China in recent years, further closures and suspensions have allowed Kazakhstan, Turkey, the USA and India to gain a combined market share of 45% in chromium chemicals in 2018, up from 30% a decade ago. Demand for chromium chemicals is estimated to have consumed just over 1.5 Mt of chrome ores in 2018 (Roskill, 2019).

The benefits of the development of the Phokathaba Platinum Mine is apparent from the above, with the expected increase in demand for chrome and platinum-group metals on a global basis. In addition to the global socio-economic benefits, the Phokathaba Platinum Mine will also provide the local communities with various benefits relating mainly to job creation and skills development. Unemployment in the region is high and mining is seen to hold major possibilities for the area. The opening of the Phokathaba UG1 opencast will result in more Employment opportunities in the area. EMPR

Without the implementation of this project, the mentioned benefits would not be realised. The realization of the outcome the Mining Charter (2004), within the context of the MPRDA (2002), would therefore also not be reached and this has potentially significant negative impacts on national economic growth and social well-being. The Mining Charter's main objectives, which the Phokathaba Platinum Project will assist to reach, are:

- to promote equitable access to South Africa's Mineral Resources for all South Africans;
- to substantially and meaningfully expand opportunities for historically disadvantaged South Africans (HDSAs);
- to utilize the existing skills base for the Empowerment of HDSAs (Reference is made to the Social and Labour Plan (SLP) as part of the Mining Right Application submission);
- to expand the skills base of HDSAs to serve the community; (Reference is made to the SLP conducted according to the MPRDA);
- to promote Employment and advance the social and economic welfare of mining communities and areas supplying mining labour; (Reference to the SLP as part of the Mining Right); and
- to promote beneficiation of South Africa's mineral commodities beyond mining and processing, including the production of consumer products.

The proposed Phokathaba Platinum Mine is currently in care and maintenance therefore the provision of job opportunities and training in the local community as part of the opencast project will have a positive impact. Currently the need in the local community is significant and this will be reviewed as part of the overall assessment of the community needs as per the 2012 SLP. A service provider will be identified to assist with this aspect and a commitment will be made to assisting the service provider to

provide effective services to the community from entry level to successful completion of Adult Basic Education Training (ABET) Level 4 (Phokathaba Platinum Mine SLP, 2012).

Phokathaba Platinum Mine is striving to build positive and lasting relationships with the communities of which it forms a part. Phokathaba Platinum Mine has historically chosen to focus on people development and have placed particular Emphasis on improving schools in the communities surrounding the proposed mine. The following projects have been identified as part of the Phokathaba Platinum Mine (Social and Labour Plan, 2012):

- Local Economic Development (LED) Project to Multi-Purpose Community Centre;
- LED Project to Morokadieta Classrooms;
- LED Project to Ablution Blocks and infrastructure;
- LED Project to Brickmaking Project;
- LED Project to Access bridge and road to Morokadieta Primary School; and
- LED Project to Supply of Water at Maandagshoek.

# 6 DESCRIPTION OF THE PROCESS FOLLOWED TO REACH THE PROPOSED PREFERRED SITE

NB!! – This section is not about the impact assessment itself; It is about the determination of the specific site layout having taken into consideration (1) the comparison of the originally proposed site plan, the comparison of that plan with the plan of environmental features and current land uses, the issues raised by interested and affected parties, and the consideration of alternatives to the initially proposed site layout as a result.

The identification of alternatives is a key aspect of the success of the EIA process. All reasonable and feasible alternatives must be identified and screened to determine the most suitable alternatives to consider and assess in the EIA phase. There are however some significant constraints that have to be taken into account when identifying alternatives for a project of this scope. Such constraints include financial, environmental and social issues, which will be discussed in the evaluation of the alternatives. Alternatives can typically be identified according to:

- Location alternatives;
- Process alternatives;
- Technological alternatives; and
- Activity alternatives (including the No-go option).

For any alternative to be considered feasible such an alternative must meet the need and purpose of the development proposal without presenting significantly high associated impacts.

Economic development in the area; and Need for the extraction of the commodities as they are in high demand.

Alternatives can also be distinguished into discrete or incremental alternatives. Discrete alternatives are overall development options, which are typically identified during the pre-feasibility, feasibility and or scoping phases of the EIA process. Incremental alternatives typically arise during the EIA process and are usually suggested as a means of addressing identified impacts. These alternatives are closely linked to the identification of mitigation measures and are not specifically identified as distinct alternatives. This section provides information on the development footprint alternatives, the properties considered, as well as the type of activity, activity layout, technological and operational aspects of the activity.

## 6.1 Details of location alternatives

The section below describes the site/location alternatives considered as part of the project. As indicated above, Smokey Hills Mine is an existing mine, and has been subjected to previous environmental processes, which considered alternatives in the form of both development and land use alternatives prior to approval.

### 6.1.1 Details of development Property

The land use of the extension area is now considered to be predominantly one of mining and mining related activities, therefore, there is no practical development alternative for the current Smokey Hills area. The proposed opencast of the current mining area has to be taken into consideration economic viability and practicality as well as the location of the resource to be mined.

### 6.1.2 Consideration of Property

The proposed opencast expansion includes areas that are already included in the existing Mining Right of Phokathaba Platinum Mine. Therefore, no other alternatives were considered with regards to consideration of property.

### 6.1.3 Site Alternatives

#### *6.1.3.1 Site Alternatives for mining area suitable for opencast excavation*

The site for the opencast mining operation was selected based on the availability of Chrome and PGM seams/reserves to be mined. Minerals can only be mined where identified and verified, therefore it was not practical to select any other sites.

Smokey Hills mine has other existing infrastructure that will be utilised during the proposed opencast mining. Existing infrastructure has been investigated during previous EIA phase of the initial mining application and subsequent environmental authorization process. The sites for the infrastructure related to the proposed mining operations are located at the various points which are practical for the mining and would have the least impact on the surrounding environment. The exact details and detailed layout plans for any new infrastructure that may be required has not yet been determined, and will be evaluated within the EIA process.

During the alternative analysis in the EIA phase, a detailed assessment will be done of all these areas, to determine which of the areas would be most suitable for aboveground infrastructure, taking into consideration environmental conditions, topography, financial feasibility, the linkage between opencast pits, adits/shafts and surface infrastructure, access to various parts of the site and existing infrastructure.

#### *6.1.3.2 Site alternative for PCD*

A full scoping and EIA (S&EAI) study has been conducted in 2017 on the storm water management and associated infrastructure including alternatives for PCD and evaporation dams at Smokey Hills. The Storm water management plan was updated and the most suitable sites for the PCDs were identified as per the 2019 report.

#### *6.1.3.3 Tailings stockpile from BCM for retreatment at SHPM plant*

The existing Run of Mine footprint area will be used and no new area will be disturbed for this stockpile thereby reducing the impact of the activity to the existing disturbed footprint area.

## 6.2 Designs and Layout Alternatives

Please refer to Section 6.1.3 above where the site alternatives for the mining infrastructure in relation to the reserves are discussed.

## 6.3 Process Alternatives

Options pertaining to the alternatives with regards to the processes to be used on site will be evaluated in more details and the options will be taken into consideration to ensure the most efficient ore extraction methods are used. Various options were also investigated pertaining to the proposed infrastructure which will be required for the proposed mining operations in determining that the correct and most viable process alternatives are acquired

### 6.3.1 Mining Method

- **Process Alternative P1a-** *Open cast*: this would involve the creation of a new pit. The opencast mining will be done by means of drilling and blasting, using the single benching method as defined in the blast design. Roll over mining will be done.
- **Process Alternative P1ab-** *Underground:* The UG1 ore resource are too shallow to allow for save underground mining of the resource.

Process Alternative P1a is the "preferred alternative" because of the extent of the ore resource and proximity to the surface. P1a is also the most cost-effective process of extracting the ore from the ground.

### 6.3.2 Disposal of waste

- **Process Alternative P2a**- *Discard*: This option means that remaining residue deposit from the UG1 will be discarded onto existing stockpiles within the mining property.
- **Process Alternative P2b**-*Stockpile*: This option involves stockpiling the waste on site at a designated overburden area specific for the UG1 opencast project.

Process alternative P2b is the "preferred alternative" to ensure that the material is similar to the existing geology of the UG1 opencast footprint area. Final stockpile will remain on site due to the swelling factor of the material.

## 6.4 Activity Alternative

The appropriateness of undertaking opencast mining methods for the proposed area has been considered and will allow for mining in smaller areas whereas underground mining techniques would not be appropriate. Furthermore, due to the topography and proximity of the resource/reserve to the surface opencast mining is considered to be the most appropriate mining method.

An alternative to the proposed mining is grazing and wilderness.

- **Activity alternative A1**- *Mining:* The land would be continued to be used for mining.
- **Activity alternative A2-** *Grazing:* This option would be to revert the land use back to its original use.
- **Activity alternative A3-** *No-go option:* The 'no-go' or 'do-nothing' alternative is the option of not undertaking the proposed activity or any of its alternative. The 'do-nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

The implication of not going through the proposed opencast to include mining additional Chrome and PGM resources includes a reduction in the existing mining operations overall Life of Mine (LoM), as well as compromising the ability of Smokey Hills to ensure consistent supply of Chrome and PGM. The area is currently viewed as a mining area and the 'no-go' option is opted for, then most likely the mine will cease to operate and the existing mining areas will be rehabilitated. An opportunity will remain for future mining applicant to apply for rights to access the Chrome and PGM remaining and thereby possibly re-activate mining at a later stage.

The 'no-go' alternative will sterilise the resource and reduce potential income in the area in terms of

salaries and the GDP for the economy and thus is not the preferred activity. The proposed extension would increase the LoM by approximately 16 months. The potential Employment and economic benefits will therefore be foregone. The no-go alternative would therefore maintain the current environmental condition at the site but would reduce the potential LoM by approximately 16 months.

## 6.5 Details of Technology Alternatives

### 6.5.1 Processing Technology to be used in the activity

- **Technology Alternative T1a**-*Mill-Float-Mill-Float configuration*: The existing plant on site consist of a typical UG2 processing plant with a mill-float-mill-float (or "MF2") configuration with a capacity of 60 000 tonnes/month and will be updated as per the approved EIA/EMPR (2019).

T1a is the "preferred alternative" because the plant is existing. The financial implications for using any alternative methods would render the opencast mining operation economically not viable due to the cost involved in changing to new alternatives

### 6.5.2 Transport Options

There are several product transports options available. The feasibility of these options would hinge on the final market for Chrome and PGMs, as well as the proximity of available transport infrastructure. The following alternatives have been considered:

- **Transport Alternative T2a**- Road: This option would involve transport of the product by existing tar road networks around the mountain to the respective destination. This is the alternative currently used to transport the Chrome and PGM. These roads include the Black Chrome Mine/Smokey Hills Platinum Mine gravel road.
- **Transport Alternative T2b**-Rail: This option would involve the transport of the product by rail utilizing the nearby Steelpoort/Burgersfort railway line.
- **Transport Alternative T2a**- Use of Conveyor: This option would involve transport of chrome and PGM by conveyor to its end destination. There is no existing and feasible chrome and PGM conveyor network within close proximity to the mine.

T2a technology is the "preferred Alternative", the chrome ore will be trucked to the Black Chrome Mine plant off site or it will be sold directly to the market as RoM depending on the market conditions at the specific time.

### 6.5.3 "No-go" option

The no-go option refers to the alternative of the proposed development not going ahead at all. This alternative will avoid potentially positive and negative impacts on the environmental condition of the area would remain which is the conditions of the current Phokathaba Platinum without any deviations or expansions.

The implications of the no-go option were evaluated as part of the EIA, focusing on comparing potential impacts from the proposed project with the status quo and will be particularly relevant should it be found that detrimental impacts cannot be managed to an acceptable level.

# 7 DETAILS OF THE PUBLIC PARTICIPATION PROCESS FOLLOWED

Describe the process undertaken to consult interested and affected parties including public meetings and one on one consultation. NB the affected parties must be specifically consulted regardless of whether or not they attended public meetings. (Information to be provided to affected parties must include sufficient detail of the intended operation to enable them to assess what impact the activities will have on them or on the use of their land. Summary of issues raised by I&APs

Prescali appointed Gudani consulting to undertake the public participation process for the proposed UG1 Opencast application. Gudani Consulting conducted the public participation in such a way to involve the necessary interested and affected parties (I&APs). On-going public meetings have been held between Gudani, the tribal authority and mine management (Refer to attached Public Participation Report in Appendix 8).

## 7.1 NOTIFICATION OF I&APs

Gudani has utilised several methods to identify I&Aps including communicating with tribal authorities, non-governmental agencies, community-based organizations, advertising in a local newspaper, and distribution of background information documents.

All I&AP identified were registered on Gudani`s stakeholder database.

### 7.1.1 Newspaper advertisement

To inform a broader base of individuals who might want to register as I&Aps, the newspaper advert was placed on the Sekhukhune times published between 13th-19th June 2019.

### 7.1.2 Site notices

Site notices were placed in the following locations (refer to) for photographic evidence:

| | | | |
|---|---|---|---|
| A3 Posters placed within the project area | **Villages** | **Strategic Places** | **Co-ordinates** |
| | Mpuru Area 13/06/2019 | Mpuru Restaurant | S 24°35.171<br>E 030°03.972´ |
| | | Baropedi Tuck Shop | S 24°35.999<br>E 030°03.972 |
| | | Swale Self Service | S 24°35.852<br>E 030°04.433 |
| | | Makhulela Liquor Restaurant | S 24°34.104<br>E 030°05.907 |
| | | Shekhani Trading | S 24°32.723<br>E 030°06.384 |
| | | Munhall | S 24°33.001<br>E 030°03.529 |
| | | Papa’s Tavern | S 24°33.930<br>E 030°03.774 |
| | | J.J Tavern | S 24°34.570<br>E 030°03.706 |

### 7.1.3 Direct Notification of I&Aps

A Background Information Document (BID) was compiled giving detail on the applicant, the Environmental Assessment Practitioner (EAP), the scope and locality of the proposed project, the environmental impact assessment process, purpose and process of public participation and included an invitation to register as an I&AP and provide comment. Pre-identified I&APs were directly informed of the application processes by means of email and hand delivery of Background Information Documents (BIDs). Refer to for the BIDs in both English and Sepedi. Proof of Background Information Documents sent is attached in Appendix 8.

In addition, site notices and background information documents (BID) were distributed for various stakeholders, farmers and I&APs within Phokathaba Mining Project areas. Distribution was done on the 14th May 2019, 16th May 2019 and 13th June 2019.

The purpose of a BID was to provide stakeholders with introductory information on the Phokathaba

Mining Project, the Environmental Impact Assessment (EIA) and environmental management programme (EMPR) being undertaken and the stakeholder engagement process. The BID also provided stakeholders who are interested in the project with the opportunity to register as stakeholders by way of requesting and completing the registration sheet distributed with the BID. Information on the registration sheet has been used to register stakeholders on a database to receive all project-related information and invitations to meetings. The registration sheet included a section for comments and issues, which allows stakeholders an opportunity to provide the consultants with written comments and feedback.

Consultation letters and BIDs were distributed at the following sites informing interested and affected parties about the Phokathaba Mining Project.

- Consultation letter were distributed to Ward Councillor;
- Background Information Documents were also distributed to the ward committees; and
- Tribal Authorities.

### 7.1.4 Public meeting

Several meetings have been held between Gudani, the tribal leaders and mine management. Details of meetings held so far is as follows:

- Ward Councillor and Ward Committee were held on the 03rd May 2019 at Phuti-Nare Sec School from 10h00 to 11h00, pictures where taken and also attendance register was signed;
- Kgwete Traditional Council were held on the 14th May 2019 and 05th June 2019 at Kgoshi Kgwete's yard, pictures and attendances registers were not allowed to be taken;
- Mpuru Traditional Council were held on the 16th May 2019 and 04th June 2019 at Mpuru Traditional Council Hall, pictures where taken and also attendance register was signed;

The concept of open meetings was adopted to allow more interaction between project proponent and members of the councils and entail one to one discussions and small group discussions, Plate and map illustrations about the proposed Phokathaba Mining Project and the EIA/EMPR processes in pursuit of full comprehension by I&APs about the proposed project was available during the meetings. The public participation meeting minutes and comments from the meetings are attached Appendix 8. A summary of issues raised is tabled below.

**Table 7-1: Public meeting discussion outcomes from the Ward councillor and ward committee**

| Issue Raised – | Date | Commentator | Response |
|---|---|---|---|
| Which gate will be used at the mine? | 03/05/2019 | Greatewell Seroke | The gate is at the Mandagshook area. |
| The people that were supposed to be consulted are the chiefs as they are the once owns the land, but even if the committee and ward councillor consulted first is not a problem and plea that all the affected chiefs be consulted | 03/05/2019 | Cllr Mahlake | noted |
| The committee Emphasised that there were Mr Motimele and Mr Mpoyane whom they wanted to mine at the area and the community and chiefs didn't agree with them as they wanted the mine to be open cast and they stopped | 03/05/2019 | Greatewell Seroke | Noted |
| Who is the director of Phokathaba Trading and where is he from? | 03/05/2019 | Johannes Lekwadi | Noted |
| Black Chrome didn't want to hire people of Maandagshoek area as they said the mine that is operating is at Ga-Maroga and people who are considered first should come from Ga-Maroga, so | 03/05/2019 | Gladys Vuma | Noted. |

| Issue Raised – | Date | Commentator | Response |
|---|---|---|---|
| the committee also hopes the mine would consider them first; | | | |

**Table 7-2: Discussion outcomes from the Kgwete Tribal council**

| Issue Raised – | Date | Commentator | Response |
|---|---|---|---|
| We request a presentation in writing on how are you going to convince the community to trust Phokathaba again. | 14/05/2019 | Mr Solly Kgwete | Noted |
| We request a presentation in writing on how are you going to convince the community to trust Phokathaba again. | 05/06/2019 | Mr Mike Kgwete | Noted |
| Are you Phokathaba Platinum or are you appointed by Phokathaba Platinum? | 05/06/2019 | Mr Solly Kgwete | We are Phokathaba Platinum (New Management) |
| We do not have problem with the mine but we want you to acknowledge our problems.<br>The presentation must also outline what will happen with the waste (chrome), because the community is under the impression that chrome from platinum mine belongs to them. | 05/06/2019 | Mr Solly Kgwete | Noted |

**Table 7-3: Public meeting discussion outcomes from Ga- Mpuru Tribal council**

| Issue Raised – | Date | Commentator | Response |
|---|---|---|---|
| May we have another meeting where other Moshates (chiefs) will be available? | 16/05/2019 | Mr Nyeu Mpuru | Noted |
| What do we do with the illegal miners? | 16/05/2019 | Mr Nyeu Mpuru | You can report them to the Department of Mineral Resources. |
| Is it an open cast or shaft mining method? | 16/05/2019 | Mr M.E Mpuru | The mine will be underground method and it will be by means of Audit. |
| Which Moshate (chief) did you consult first before you come to us? | 16/05/2019 | Mr James Mabilo | That question won't be answered. What's important is that all tribes must be or will be consulted |
| Who appointed you between Phokathaba Platinum (Pty) Ltd and Black Chrome? | 16/05/2019 | Mr Nakedi Madingoane | Phokathaba Platinum (Pty) Ltd |
| How many people are you going to employ? | 04/06/2019 | Mr Nyeu Mpuru | To be confirmed |
| How many people are you going to appoint for mineral valuation tests? | 04/06/2019 | Mr James Mabilo | Still need to confirm with the specialists.<br>The specialist report will illustrate how many people they will need during the process. |
| Which mining method are you going to use? | 04/06/2019 | Mr Mpuru M | It will be an open cast at this stage, we still need to conduct the mineral valuation tests. |

| Issue Raised – | Date | Commentator | Response |
|---|---|---|---|
| | | | If the minerals are valuable, we will change the mining method to large scale mining. |
| How are you going to transport mined minerals to the plant? | 04/06/2019 | Mr James Mabilo | Short term- we will be using the trucks. Long term- pipeline pumping method. |
| Is there a joint venture between Phokathaba Platinum and Black Chrome? | | | They are two separate companies with two separate SLPs and Mining Rights; but they will be working together. |
| When are you intending to open the mine because the community is starving, they need jobs? | 04/06/2019 | Mr D Mabilo | It's difficult to say at this stage; there are various specialist studies that needs to be done before we can start mining. |
| | | | The process may seem to be taking long because we are following the right procedure. |

# 8 BASELINE ENVIRONMENT

## 8.1 TYPE OF ENVIRONMENT AFFECTED BY THE PROPOSED ACTIVITY.

(its current geographical, physical, biological, socio-economic, and cultural character)

### 8.1.1 Climate

The site experiences a microclimate which is hotter and drier than typical for the region due to its location in the foothills of the Lebalelo, Sekhukhune and Drakensberg Mountains. Temperatures around 40 ºC have been described in the summer while winter temperatures drop below freezing point.

Rainfall during winter months is erratic (between 0 mm and 40 mm monthly) while evapotranspiration is never less than 80 mm per month. This implies that the area has a precipitation deficit and can therefore be classified as a dry area for agricultural purposes.

#### *8.1.1.1 Temperature*

Based on an evaluation of the meteorological data simulations run from the global NEMS weather model at ~30 km resolution from 1985 to current of the project area. The following deductions can be made; In the summer months' maximum average daily temperatures are expected to be 26°C to 29°C on average with a maximum of 35°C possible during hot days, dropping to 12°C to 17°C on average at night and 6°C minimum on cold nights. During winter months the average day time temperature are in the 21°C to 24°C range while cold winter night time temperatures can drop to 1°C.

Falling in a summer rainfall area, the location is predicted to receive the most precipitation in the summer months of October to March overall. November to January are the highest rainfall months with an average of 50 mm to 61 mm per month during these months. February, March and October are predicted to receive 27 mm to 38 mm precipitation. All other months are predicted to receive less than 14 mm precipitation on average during the month.

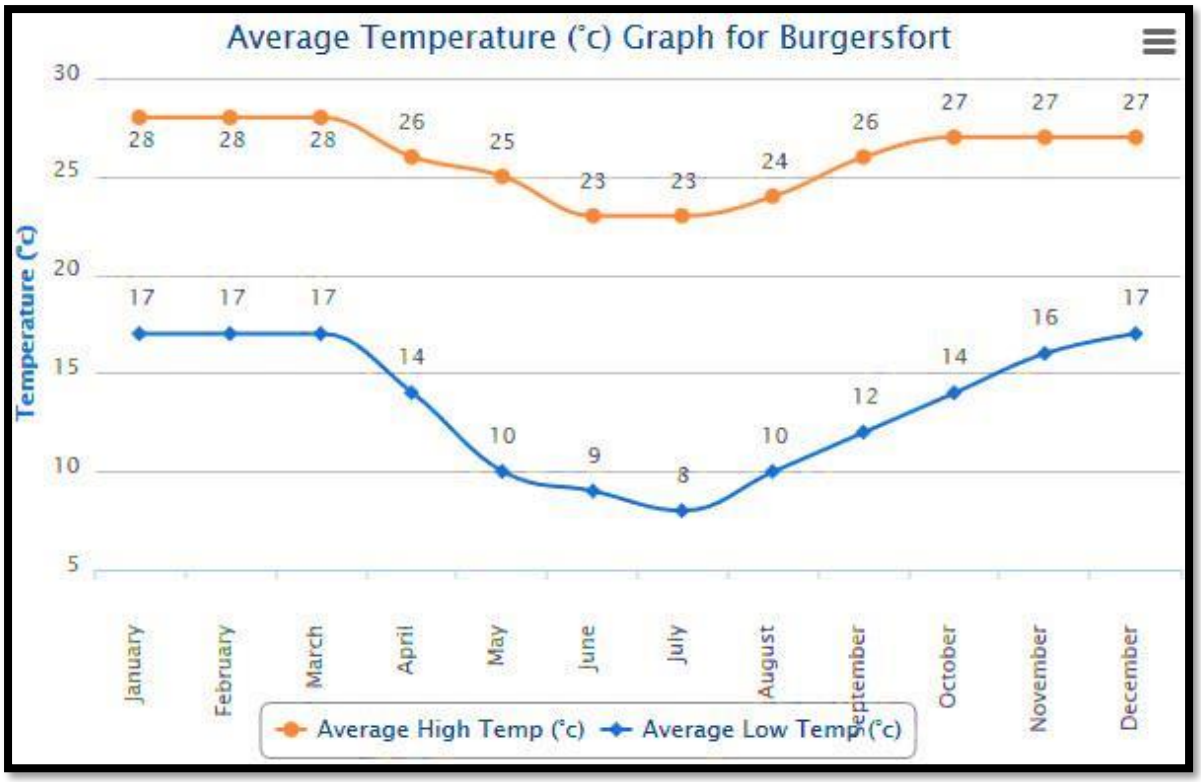


**Figure 8-1: Smokey Hills Average Monthly Temperatures**

#### *8.1.1.2 Precipitation and Evaporation*

Smokey Hills is located on the water divide between the B71E and B41J quaternary catchments. The Water Resources of South Africa 2012 (WR2012) database indicates a mean annual precipitation (MAP) of 591 mm/a for the B71E catchment and a MAP of 598 mm/a for the B41J catchment. The WR2012 data per quaternary catchment was compiled from a number of rainfall stations per quaternary catchment and reviewed to get a final patched rainfall dataset per rain zone (applicable to one or more quaternary catchments that are grouped based on similar rainfall micro climatic zones) that stretched from 1925 to 2010.

The Maandagshoek rainfall station 0593126W is the closest South African Weather Service (SAWS) rainfall station to the Smokey Hills mine site. It operated from October 1924 to December 1993 totalling 69 years of unpatched monthly rainfall data with 2.62% missing months, indicating a comparably complete rainfall record over the 69 years. The MAP calculated for the Maandagshoek rainfall station is 593 mm/a.

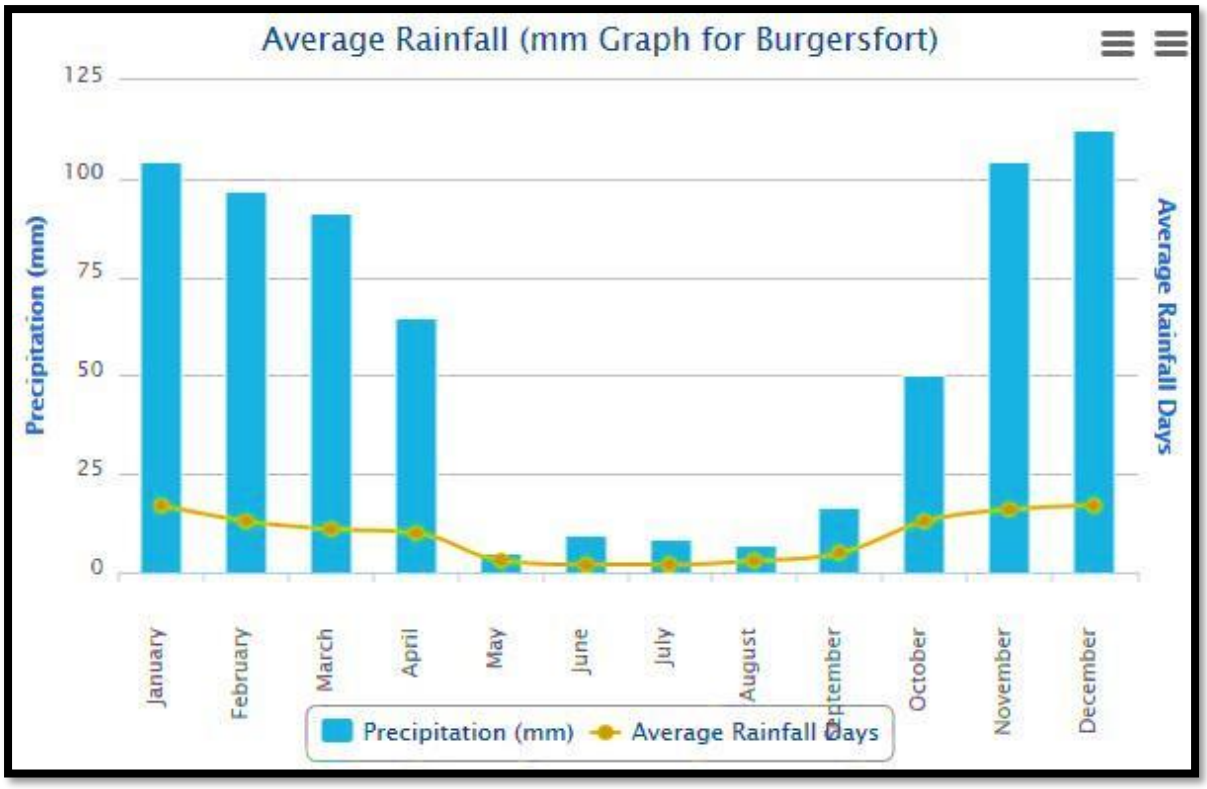


**Figure 8-2: Average Rainfall per annum for Burgersfort**

Based on the correlation between the WR2012 and Maandagshoek rainfall station MAP's, a decision was made to use the Maandagshoek 0593126W rainfall station's unpatched data for further rainfall statistical analysis and modelling.

Evaporation data for the Smokey Hills mine is obtained from the quaternary catchment data in the WR2012 dataset. The mean annual evaporation (MAE) for the B71E catchment is 1 650 mm/a and the MAE for the B41J catchment is 1 552 mm/a. The mean average evaporation for the Maandagshoek weather station is 1 731 mm according to the current data.

**Table 8-1: Mean climatic rainfall conditions for the project area**

| Month | Average Monthly Rainfall (mm) | Mean Monthly Evaporation (mm) |
|---|---|---|
| January | 118.8 | 193 |
| February | 88.5 | 164.3 |
| March | 59.2 | 156.9 |
| April | 44.5 | 122.8 |
| May | 11.8 | 101.5 |
| June | 5.4 | 80.5 |
| July | 2.2 | 87.6 |
| August | 3.9 | 122.7 |
| September | 16.7 | 161.8 |
| October | 46.9 | 191.8 |
| November | 93.6 | 184.6 |
| December | 124.6 | 193.4 |
| Annual | 617.2 | 1 760.9 |

#### *8.1.1.3 Wind*

Airshed Planning Professions used a model to determine the wind direction and speed at the mine site. CALMET ready MM5 modelled meteorological data (2013 to 2015) for a 50 km by 50 km area surrounding the Smokey Hills mine was processed with the CALMET model, taking into account topography and land use in the study SHPM (Grobler & Enskin, 2016).

Surface meteorological data for a 3 km by 3 km area surrounding the Smokey Hills mine was extracted from the CALMET processed data and used to generate wind roses based on 16 spokes, representing the directions from which winds blew during the period (Figure 8-3). The colours reflected the different categories of wind speeds with the dotted circles indicating the frequency of occurrence. The flow field is dominated by winds from the easterly sector. During day-time conditions winds from the north-easterly sector are more frequent, while winds from the easterly and south-easterly sector are more common at night.

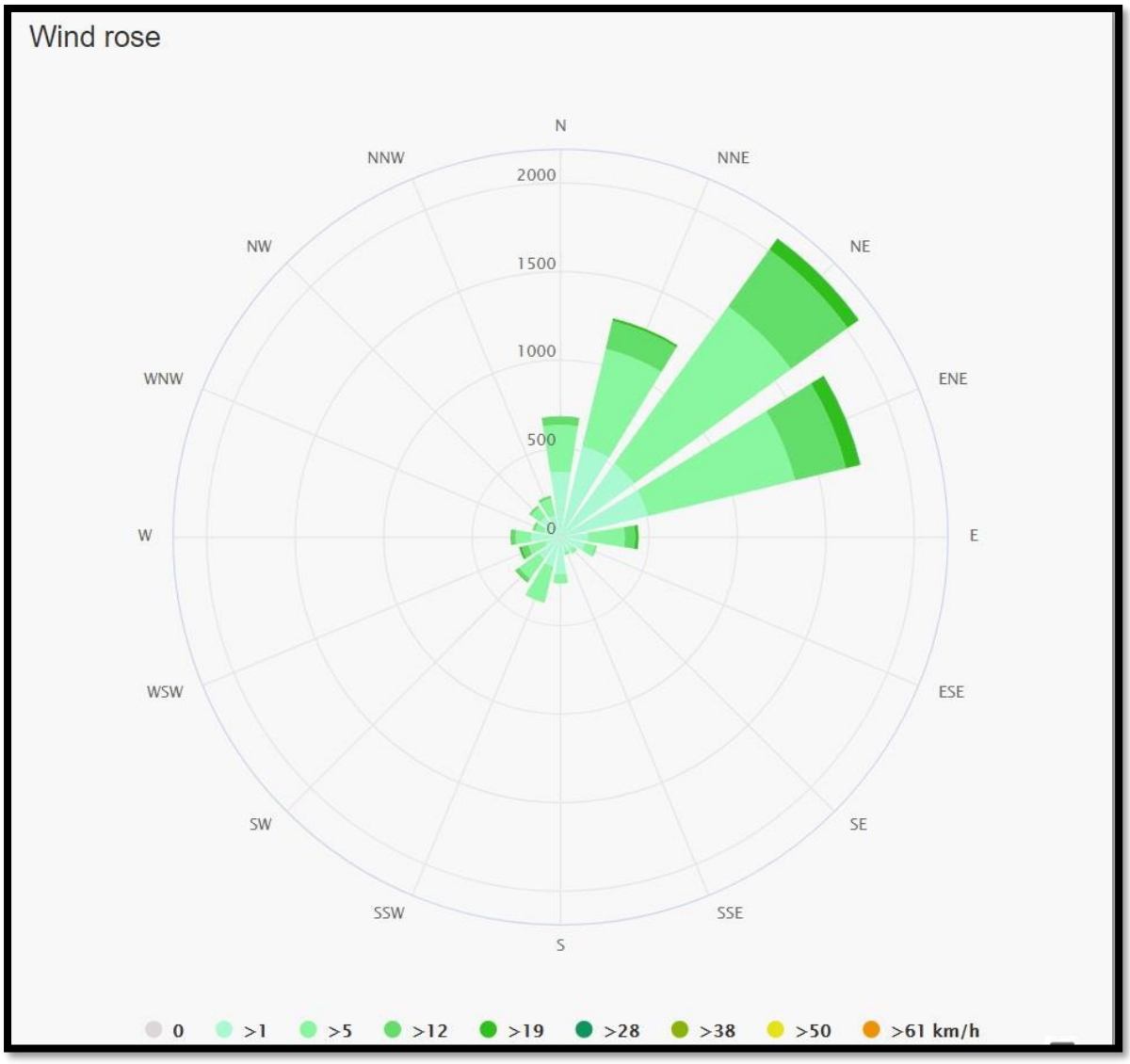


**Figure 8-3: NEMS 30 km simulation model wind rose for the proposed Smokey Hill project rea for the period 1985 to current**

#### *8.1.1.4 Wind speed, Temperature and Precipitation Validation*

To validate the NEMS model simulation results, only weather stations with more than 10 years'

consistent data are considered for validation. The validation is thus not necessarily the closest station with actual measured data but rather the closest reliable station. The measurements from the chosen station is then aggregated on a weekly or monthly data.

Figure 8-4 below show the closest station to the SHPM project area that fall within the validation criteria as stated above, in this case Polokwane, 105 km away and at a similar altitude. The distance is significant enough not to be able to compare the modelled with the measured data. It is still included in this report and do however show fairly good correlation to the modelled data.

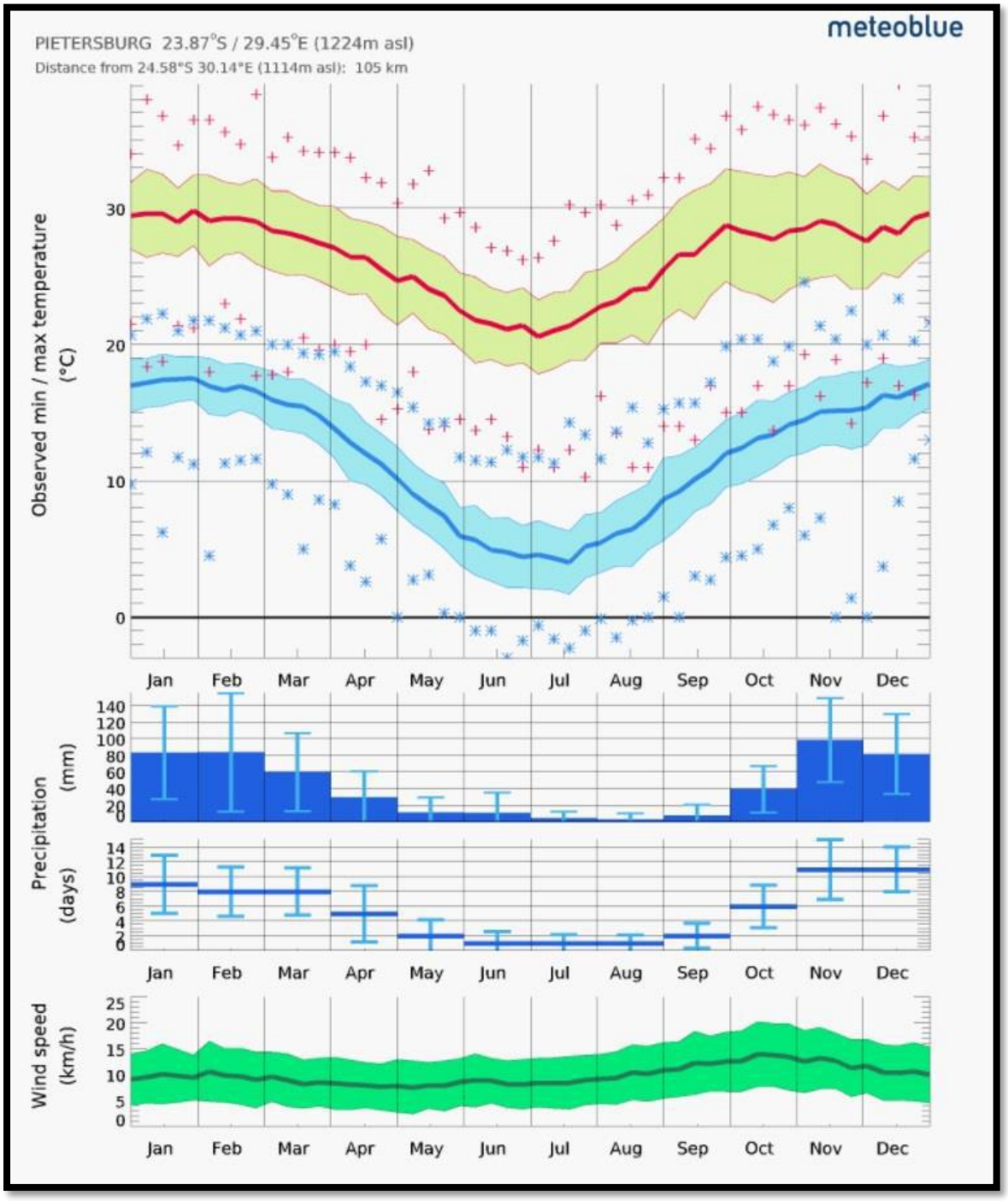


**Figure 8-4: Measurement of the data closest measurement location with enough data to verify the NEMS model result**

**Table 8-2: Summary of mean monthly wind directions from Lydenburg Station**

| Month | N | NE | E | SE | S | SW | W | NW |
|---|---|---|---|---|---|---|---|---|
| January | 49 | 21 | 79 | 87 | 26 | 21 | 15 | 63 |
| February | 34 | 13 | 91 | 133 | 38 | 26 | 11 | 48 |
| March | 28 | 21 | 78 | 95 | 31 | 23 | 18 | 56 |
| April | 41 | 14 | 40 | 65 | 19 | 21 | 26 | 58 |
| May | 32 | 16 | 31 | 50 | 25 | 21 | 25 | 67 |
| June | 33 | 14 | 37 | 63 | 18 | 28 | 25 | 54 |
| July | 32 | 23 | 45 | 55 | 14 | 22 | 17 | 77 |
| August | 57 | 20 | 55 | 56 | 15 | 20 | 28 | 102 |
| September | 64 | 30 | 66 | 78 | 11 | 17 | 23 | 105 |
| October | 86 | 40 | 79 | 56 | 14 | 18 | 29 | 109 |
| November | 75 | 34 | 59 | 68 | 15 | 11 | 25 | 109 |
| December | 69 | 24 | 60 | 79 | 19 | 17 | 14 | 79 |
| Average | 50 | 23 | 60 | 74 | 20 | 20 | 21 | 77 |

### 8.1.2 Air Quality

An Air Quality impact assessment was conducted in June 2019 by Mr. Neel Breytenbach from Eco Elementa (Pty) Ltd (Appendix 7). South Africa is located in the sub-tropics where high pressures and subsidence dominate. However, the southern part of the continent can serve as a source of hot air that intrudes sub-tropics, and that sometimes lead to convective movement of air masses. On average, a low pressure will develop over the southern part of the continent, while the normal high pressures will remain over the surrounding oceans. These high pressures are known as Indian High-Pressure Cells and Atlantic High-pressure Cells. The intrusion of continents will allow for the development of circulation patterns that draw moisture (rain) from either tropic (hot air masses over equator) or from the mid-latitude and temperate latitudes.

Southern Africa is influenced by two major high-pressure cells, in addition to various circulation systems prevailing in the adjacent tropical and temperate latitudes. The mean circulation of the atmosphere over Southern Africa is anticyclonic throughout the year (except near the surface) due to the dominance of the three high pressure cells, namely South Atlantic High Pressure, off the west coast, the South Indian High Pressure off the east coast and the Continental High Pressure over the interior.

It is these climatic conditions and circulation movements that are responsible for the distribution and dispersion of air pollutants within the proposed Smokey Hills II project area and between neighbouring provinces and countries bordering South Africa.

Existing sources of emissions in the study area include (Grobler & Enskin, 2016):

- Other mining activities in the area;
- Vehicle exhaust and entrainment emissions from nearby paved and unpaved roads;
- Wind erosion from open areas, (including wind erosion emission from the dormant tailings storage facility at the Smokey Hills mine);
- Small scale crop farming and livestock rearing in the study area, including emissions form land tilling operations, fertiliser and pesticide applications, harvesting, entrainment emissions form farming vehicles and wind erosion from exposed areas.
- Domestic fuel burning in the communities surrounding the Smokey Hills mine; and
- Biomass burning particularly veld fires which may represent significant seasonal sources of combustion emissions.

### 8.1.3 Topography

The study area is found on the south-eastern slopes of the Lebalelo mountain range. The topography

of the site is highly variable, varying between a maximum altitude of 1 274 m above mean sea level (mamsl) and 1 108 mamsl. The range of altitude within the study area is 170 m. The average height of the study area is 1 215 mamsl.

The study area runs in parallel (north to south) between the highest point of the Lebalelo mountain range found to the west and a ridge down the south-eastern slope. The area is characterised by a shallow valley running from north to the south with shallow sloping to the north, increasing in gradient to the south before evening out further south through the nearby settlement. This valley branches out to the south east, connecting to a valley on a lower ridge to the east. All the valleys in the area are non-perennial streams.

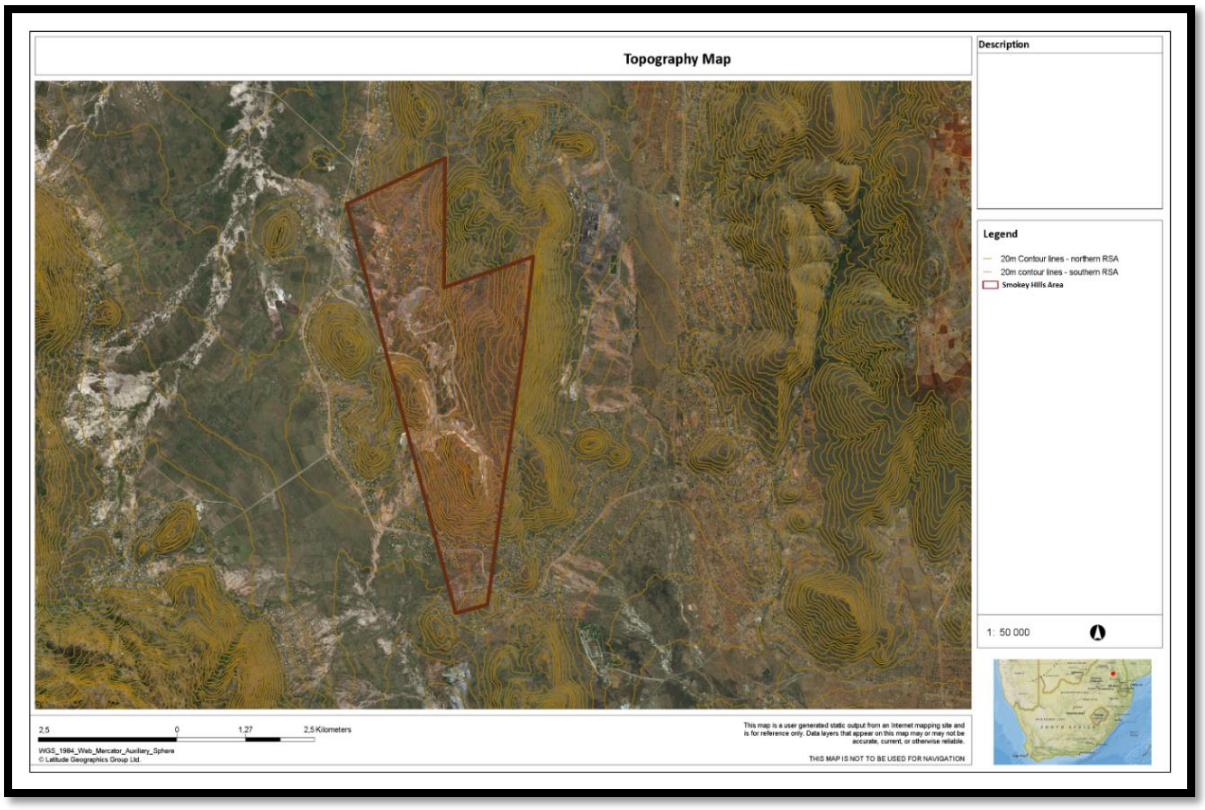


**Figure 8-5: Shows the regional topography of Phokathaba Platinum mining right area**

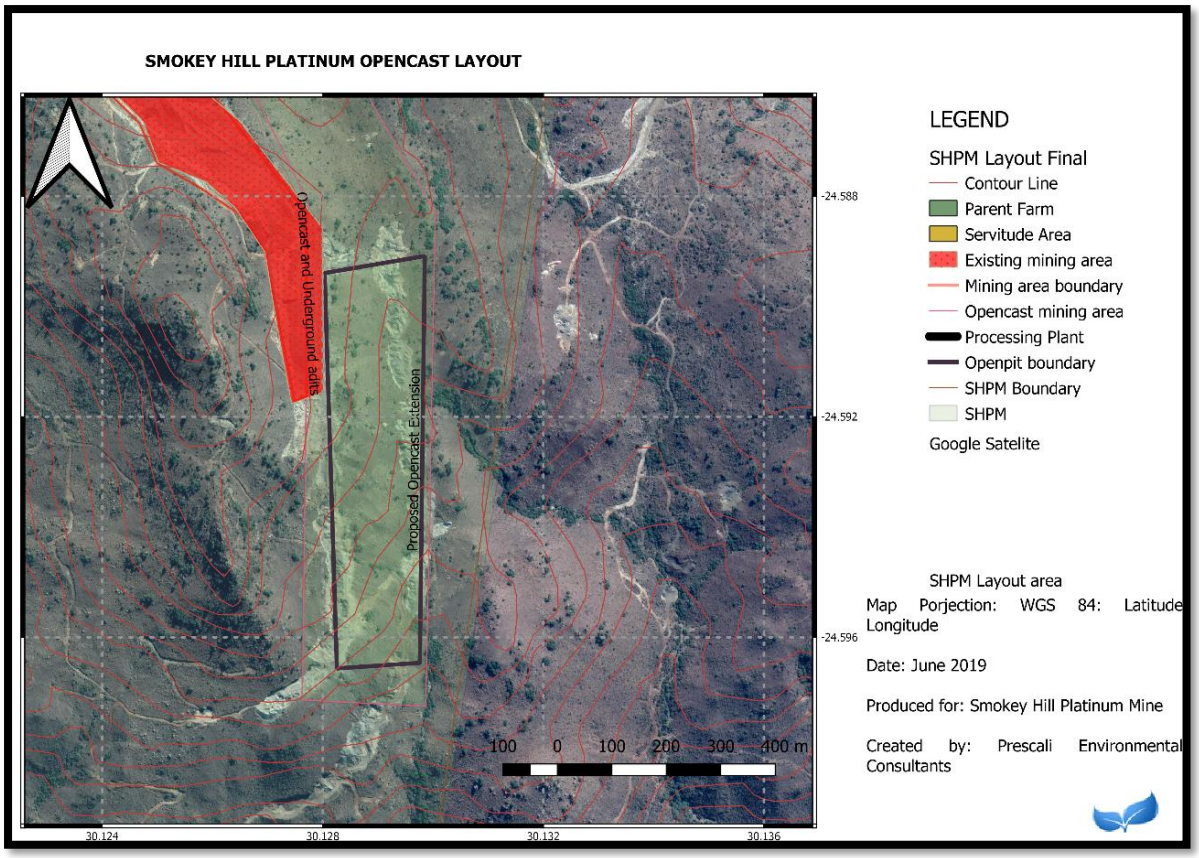


**Figure 8-6: Shows the topography of the proposed opencast area**

### 8.1.4 Geology

#### *8.1.4.1 Regional Geology*

The BIC is a world-renowned deposit that hosts PGEs, chromite, vanadium and titanium mineralisation. The BIC is dated at between 2.06 billion years ago (Ga) to 2.058 Ga and is the largest layered igneous complex in the world. Situated within the north-central Kaapvaal Craton, this massive Proterozoic intrusive body, or, more likely, a series of interconnected intrusive, has a surface area of approximately 66 000 km$^2$ and consists of a mafic-ultramafic succession of layered and massive rocks known as the RLS, a series of granitic rocks, termed the Lebowa Granite Suite (“LGS”) and felsic extrusive rocks of the Rooiberg Group (“RG”). For the majority of the area of the BIC, the Transvaal Supergroup forms the floor. The Smokey Hills transgresses in the northern limb into the Archaean granites.

The true thickness of the mafic-ultramafic layered rocks in the BIC varies from 7 000 m to 12 000 m. The BIC was intrusively Emplaced within and exhibits a transgressive relationship to the Transvaal Supergroup sequence, a large sedimentary basin of late Archaean-Proterozoic age (ca. 2.5 to 2.06 Ga) located within the north-central Kaapvaal Craton. The mafic-ultramafic layered rocks of the Smokey Hills outcrop in three main arcuate complexes or limbs, namely the western, eastern and northern limbs. The three limbs of the Smokey Hills have been further subdivided into a set of geographic sectors, based on the major geological characteristics of the RLS.

The magmatic layering of the ultramafic-mafic rocks is remarkably consistent and can be traced over several hundreds of kilometres of strike. The layering may be correlated throughout most of the BIC. The dip of the igneous layering is generally shallow and towards the centre of the BIC. It is generally accepted that, rather than being a single body, BIC comprises several overlapping lopolith-shaped intrusions. The similarity of geology across large areas within each of the three limbs, particularly the

sequence of igneous layering that includes both the Merensky Reef and the UG2, is probably indicative of simultaneous differentiation and replenishment of a basaltic magma under essentially identical conditions.

The eastern and western limbs of the Smokey Hills show a broad ellipse when viewed in plan, each measuring approximately 200 km north-south and 370 km east-west. The SHP falls within the eastern limb of the BIC. Granites and related felsic volcanic occur in the central area between these limbs. Post BIC sedimentary successions of the Waterberg Group and Karoo Supergroup, as well as more recent alluvial deposits of Holocene age, cover large parts of the BIC.

The RLS stratigraphy is divided into five major units (from deepest to shallowest):

- The Marginal Zone comprises a heterogeneous succession of generally unlayered basic rocks dominated by norites. These rocks contain quartz and hornblende believed to be a result of contamination of the basic magmas by the enclosing host rocks. The Marginal Zone ranges in thickness from several metres to several hundred metres, and field exposures of this zone are generally poor.
- The Lower Zone ("LZ") is dominated by ultramafic rocks. The most complete exposure is in the north- eastern part of the eastern limb of the BIC. In this area, the LZ occurs as a series of dunite-harzburgite cyclically layered units. The unit varies in thickness, having a trough-like geometry with the thinnest succession developed over structural highs in the basin floor.
- The Critical Zone ("CZ") is particularly remarkable for containing the largest Resources of chromium and PGEs in the world. The CZ is subdivided into the Lower Critical Zone ("LCZ") and the Upper Critical Zone ("UCZ") and is made up of cyclic units consisting of chromitite, pyroxenite, norite and anorthosite. Cycles in the LCZ are entirely ultramafic in character and are dominated by pyroxenite with interlayered harzburgite and chromitite layers. The UCZ represents a mixed mafic-ultramafic cyclic unit comprising layered pyroxenites, norites, anorthosites and chromitites. The base of the UCZ is marked by the appearance of cumulus plagioclase. The igneous layering within the CZ is remarkably uniform over much of the BIC and occurs on a variety of scales, with individual layers traceable for tens to hundreds of kilometres, and may also be locally regular to highly irregular in aspect. Chromitite layers occur throughout the CZ, usually at the base of crystallization cycles. The chromitite layers have been classified into lower, middle and upper groups, with the lower group occurring in the pyroxenitic LCZ, the upper group in the anorthositic UCZ and the middle group straddling the boundary between lower and upper divisions. The layers are identified according to their location within the layered succession, with numbers commencing from the bottom up. The lowermost group is known as the LG1 (Lower Group 1), followed by LG2, LG3 to LG7. This sequence progresses upwards from the MG1 (Middle Group 1) through to the MG4 and, finally, to the UG1 (Upper Group 1), UG2, and UG3. The thickness of these chromitite layers ranges from several millimetres to several meters. The chromitite layers may comprise multiple layer of chromitite separated by intercalated silicate rocks. The thickest chromitite layers, specifically the LG6 and MG1, are mined for their chromite content. All of the chromitite layers in the BIC contain anomalous concentrations of PGEs, with a general increase in PGE content upward in the sequence, with the UG2 currently one of two reefs of commercial interest for its PGE content. The other main PGE layer, the Merensky Reef, occurs above the UG chromitites, close to the top of the UCZ. The distance between the UG2 and the Merensky Reef is variable across the BIC and in the eastern limb it can attain stratigraphic distance of between 170 m and 400 m. The top of the CZ is characterised by the Giant Mottled Anorthosite, a robust anorthosite.
- The Main Zone ("MZ") is the thickest unit within the RLS. In general, approximately half the RLS stratigraphic interval is occupied by this zone. The MZ consists of gabbro-norites with some anorthosite and pyroxenite layering. The Pyroxenite Marker is located approximately in the top third of the Zone. Layering is not as well-developed as in the CZ and LZ.

- The Upper Zone ("UZ") is dominated by gabbros. However, layered anorthosite and magnetite sequences are also present. There is no chilled contact with the roof rocks, which comprise rhyolites and granophyres. The base of the UZ is typically taken as the first appearance of cumulus magnetite above the Pyroxenite Marker. The extent and regional geology (with the relative location of the SHP) of the eastern limb of the BIC is illustrated in Figure 8-7.

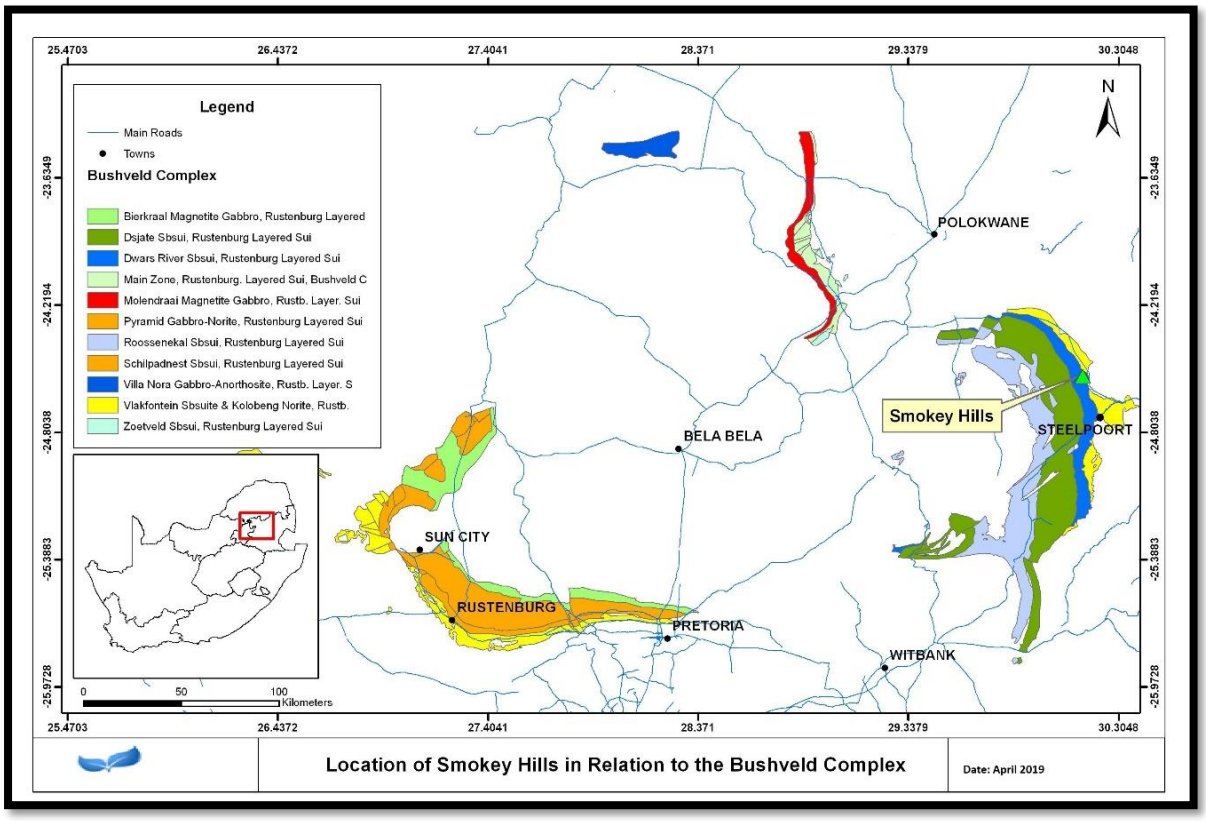


**Figure 8-7: Location of Smokey Hills Mine in Relation to the Eastern Limb of the Bushveld Complex**

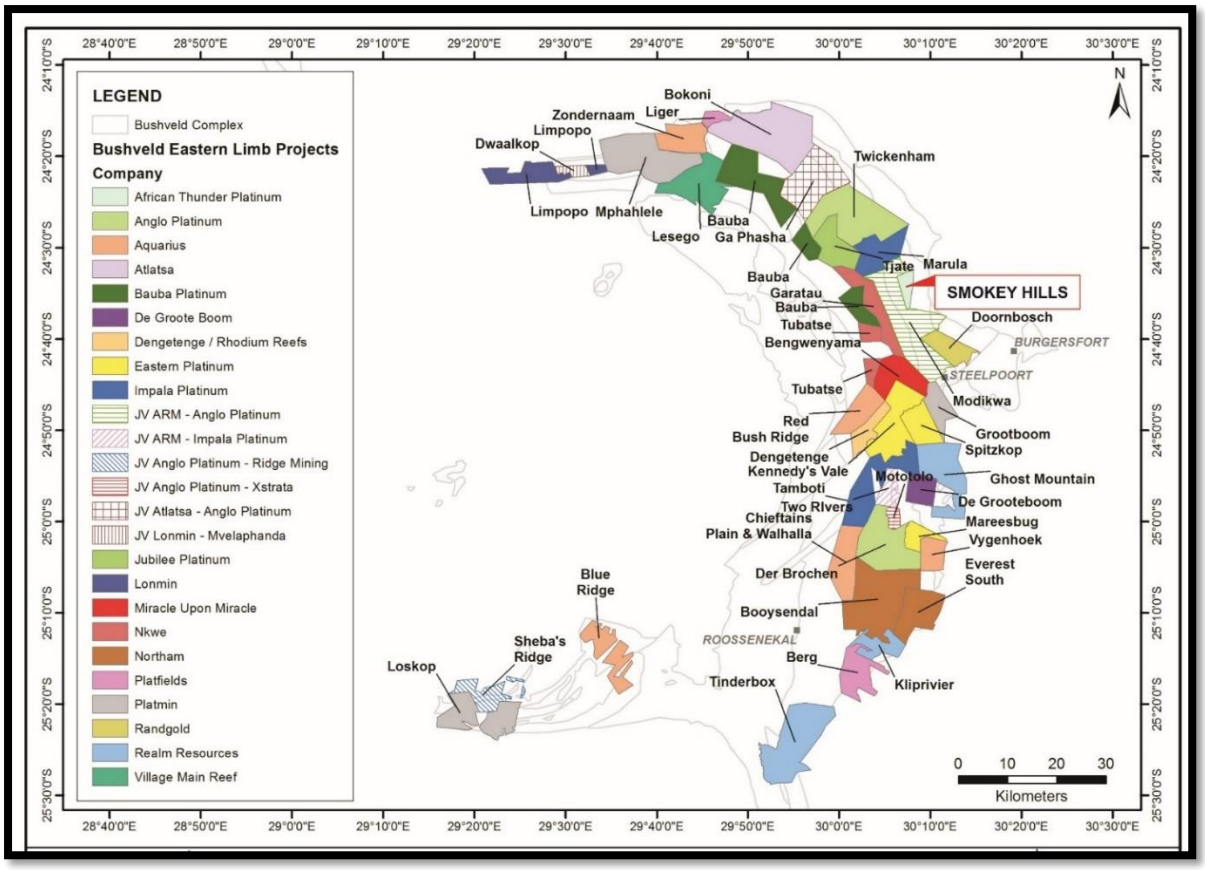


**Figure 8-8: Smokey Hills Mine Location in Relation to other Mining Operation**

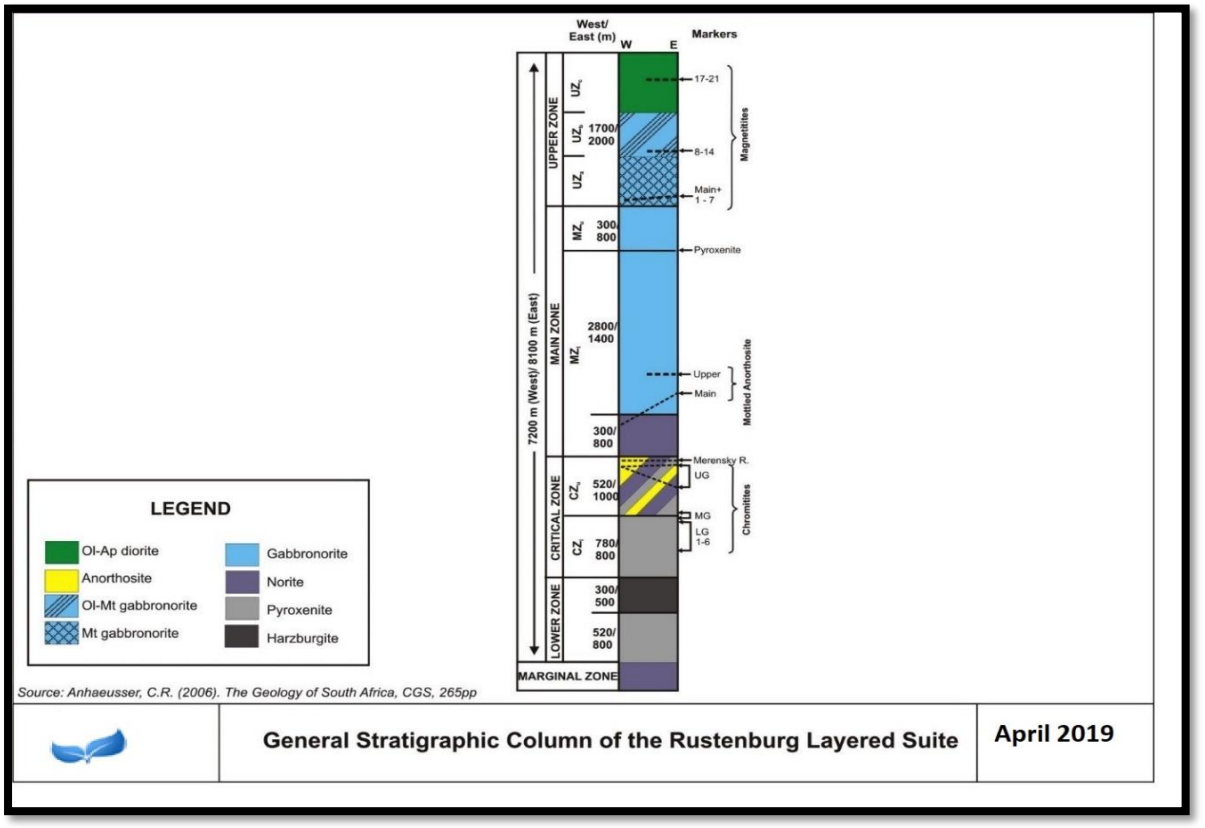


**Figure 8-9: Generalized Stratigraphy of the Rustenburg Layered Suite**

### *8.1.4.2 Local Geology*

The eastern limb of the BIC stretches from the towns of Zebedelia in the north to Bethal in the south and is subdivided from north to south into the western, central and southern geographical sectors. A major linear feature, named the Steelpoort Fault zone, separates the central from the southern sector. Each sector has distinct stratigraphic and structural characteristics which impact the economics of the various mining activities carried out in the region. The Smokey Hills Mine Area is located in a geological and structurally complex area of the central sector of the eastern limb of the BIC. The Project Area is underlain by MZ and CZ lithologies. Both the CZ and MZ outcrop on the Project Area. Only the UG2 forms the PGE-bearing unit of economic interest in the UCZ at the SHP (Odendaal, 2016).

In the area north of the town of Steelpoort, the RLS intruded sub-concordantly into the Pretoria Group, which is located immediately above the Magaliesberg Formation; both units belong to the Transvaal Supergroup. To the south of Steelpoort, the RLS is in contact with progressively younger rocks of the Transvaal Supergroup as opposed to the north of Steelpoort.

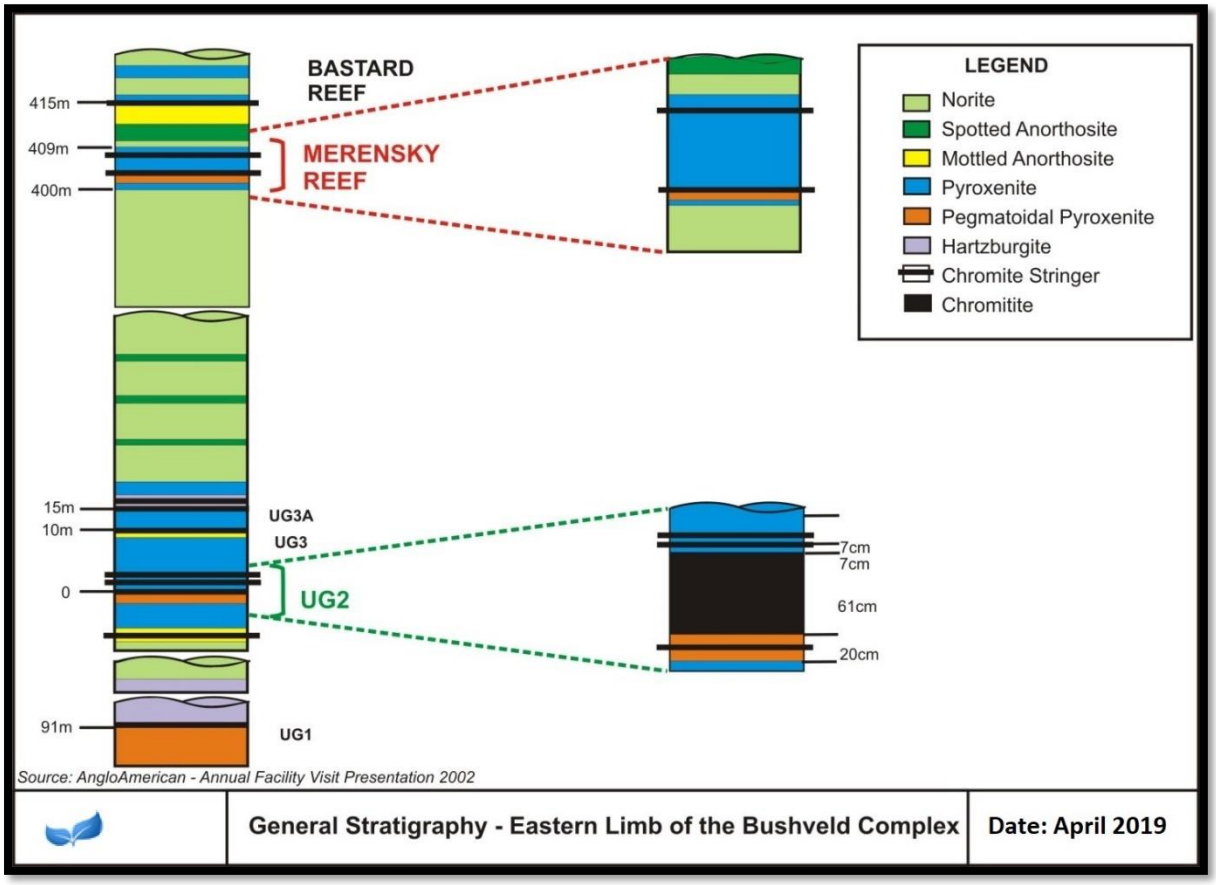


**Figure 8-10: Generalized Stratigraphy of the Eastern Limb of the Bushveld Complex**

### *8.1.4.3 Property Geology*

The SHPM is located in the central portion of the eastern limb of the BIC and is underlain by rocks of the UCZ, which hosts two of the more important PGE-bearing units in the RLS: the Merensky Reef and the UG2. In the Smokey Hills Project Area, the Merensky Reef is expected to occur approximately 300 m above the UG2. However, a minimum of approximately 140 m of the Merensky Reef footwall units have been removed by erosion and therefore no Merensky Reef is preserved in the Smokey Hills Project Area.

In the central portion of the eastern limb of the BIC, five chromitite layers have been identified in the UCZ, each of which forms the base of a cyclic unit. The cyclic units are termed, from oldest to youngest, the UG1, UG2, UG3 UG3A and UG3B. Each of these chromitites carries varying concentrations of PGEs. However, concentrations in the UG1 chromitite layer in all areas of the RLS have been found to be sub economic. The UG3, UG3A and UG3B chromitite layers are generally too thin and contain insufficient concentrations of PGE mineralisation to have any reasonable expectation to support economic extraction.

The UG1 chromitite layer occurs over 100 m below the UG2. The UG3 chromitite layer is approximately 0.25 m thick and occurs approximately 15 m above the UG2. The UG3A and UG3B chromitite layers are approximately 0.1 m thick, occur approximately 5 m above the UG3 and are separated by approximately 0.3 m of pyroxenite.

Individual layers in the UCZ can generally be correlated over several kilometres and as such, detailed local stratigraphic nomenclature can be established. PLA has compiled detailed stratigraphy, from the UG2 Footwall 5 Unit to the Merensky Reef Footwall 5 Unit at Smokey Hills. This stratigraphy is broadly consistent with the adjacent Modikwa Mine stratigraphy although there are small differences, which are not considered unusual.

The immediate footwall to the UG2 comprises a pegmatoidal harzburgite, which can be a pegmatoidal pyroxenite in places. This unit is known as the UG2 FW1 Unit and averages 0.9 m in thickness. It contains two chromitite stringers, known as FS1 and FS2, which are generally less than 2 cm in thickness. Disseminations and irregular blebs of chromite are common within the UG2 FW1 Unit and thin protuberances of chromitite from the UG2 into the footwall harzburgite can occur.

The UG2 chromitite layer is a massive layer of cumulus chromite with some interstitial pyroxene and plagioclase. Sulphide minerals are rarely visible although very fine-grained interstitial sulphide occurrences have been observed in several intersections. In structurally undisturbed areas this chromitite layer varies from between 0.45 m and 0.99 m thick. Immediately overlying the UG2 is a medium-grained poikilitic feldspathic pyroxenite layer that is approximately 1.25 m thick. This unit has been termed the UH1A Unit at Smokey Hills and contains several thin chromitite stringers. Between two and five of these stringers generally occur. The L1 stringer generally occurs between 2 cm and 5 cm above the UG2 and is approximately 1 cm thick. The L2 stringers occur between approximately 0.2 m and 0.4 m above the L1. The L2 stringers are two thin (less than 0.5 cm) chromitite layers that are spaced approximately 3 cm apart. The L3 stringers form a 5 cm to 10 cm zone of anastomosing thin chromitite stringers and disseminations commonly occurring between 0.3 m and 0.5 m above the L2 stringers. The L4 and L5 stringers are usually not developed and occur at varying distances above the L3 where they do occur.

#### *8.1.4.4 Structure*

Structural disruptions that affect the economic horizons include faults, dykes, potholes, iron replacement ultramafic pegmatoids (“IRUPS”), and doming of the BIC footwall units.

Dykes in this area are primarily composed of dolerite, which is generally fine-grained and of good competence, with associated areas of dense jointing and alteration. Underground dyke intersections are generally less than 10 m in width. An airborne magnetic survey has successfully identified several swarms of northeast-striking dolerite dykes. No serious problems were encountered during historic mining through these features, and no significant displacements have been associated with them.

Potholes are defined as areas where normal reef characteristics are destroyed and hence, pothole areas are believed to be un-mineable and considered a geological loss. The position and size of potholes are typically unpredictable. In most instances, the potholes affect only one of the economic

units. However, in minor instances, the underlying or overlying economic unit may be affected by the development of the pothole. The BIC stratigraphy is occasionally replaced by late-stage pegmatite bodies. These pegmatite bodies have a range of compositions, from highly ultramafic to felsic (Robinson, 2009).

### 8.1.5 Soil

#### *8.1.5.1 Soil Potential*

A Soils, Agricultural Potential and Land Capability Assessment by Marine Pienaar (UG1 Soil Report, 2019, Appendix 7) classified the soils at SHPM into the soils are described using Soil Classification: A Natural and Anthropogenic System for South Africa (Soil Classification Working Group, 2018 as referenced By Ms Pienaar). This system is the most recent publication on soil classification nomenclature in South Africa and incorporates the previous version of the classification system (Soil Classification: A Natural System for South Africa, 1991) with "A Classification of Anthropogenic Soil Materials for South Africa").

Six different soil forms are present within the proposed mining area (Figure 8-11). These forms consist of a combination of shallow, lithic soil forms and shallow to medium-deep structured soil profiles. Some areas have already been affected previously by stripping of vegetation and topsoil and most likely originate from previous prospecting activities and the construction of a gravel access road through this area to the Black Chrome Mine. Below follows a description of each of the soil profiles identified:

- Darnall: The Darnall soil form is one of the new soil forms included in 2018 update (Soil Classification Working Group, 2018 as referenced by Ms Pienaar) and occupies 6.3 ha of land within the Smokey Hills UG1 mining area. This form consists of a melanic A horizon (10 cm deep), overlying a pedocutanic B horizon that is distinguished on the basis of an increase in clay as a result primarily of illuviation and accumulation and visually expressed as curtains. The pedocutanic B1 horizon is underlain by lithic subsoil horizon (B2) which is a mixture of gravel, weathering parent material and rock. The Darnall soil form on site has grazing land capability.
- Glenrosa: The Glenrosa soil form is present on 6.1 ha of land and consists of an orthic A horizon underlain by a hard lithostatic B horizon. The cutanic character of the B horizon of the Glenrosa soil form as was visible in open profiles in the study area, take the form of tongues of topsoil extending into the partly weathered parent rock. The Glenrosa soil profiles on site are shallow to very shallow and occur in two pockets in the north-west and south of the pit area. Topsoil stripping for stockpiling will result in very little topsoil to be stored for rehabilitation purposes. This soil group supports indigenous vegetation that is currently used for cattle grazing. The grazing capacity in these areas are low as a result of the combination of shallow soil depth and erratic rainfall patterns. The land capability of this soil group is low to moderate.
- Mayo: The Mayo soil form occupies 2.5 ha of land and consists of a melanic A horizon (15 cm to 25 cm deep in the study area), overlying a lithostatic B horizon. More than 70% by volume of the hard lithostatic B horizon consists of parent bedrock, fresh or partly weathered, with a hard consistence in the dry, moist and wet states. The melanic A horizon lacks slickensides that are diagnostic of vertical horizons but has structure that is strong enough so that the major part of the horizon is not both massive and hard or very hard when dry. Land use is normally confined to livestock grazing or wildlife conservation. The Mayo soil form on site has grazing land capability.
- Shortland's: The Shortland's form (0.9 ha of the study area) consists of an orthic A horizon on a red structured B horizon. The red structured (pterorhodin) B horizon, although of mixed clay mineralogy, is strongly dominated by kaolinite with a high proportion of iron oxides which explains the red colour. The Shortland's soil form (a pterorhodin oxidic soil) is a fertile soil once the P status has been corrected and can be very productive under irrigation where slope and the availability of irrigation water permits. However, in the Smokey Hills Mining Area, the steeper slopes on which the Shortland's form occurs, makes it less suitable for crop production and more suitable for grazing. The high clay content also makes the Shortland's soil form less

stable and more susceptible to erosion. The susceptibility to erosion is a fact which should be kept in mind when stripping and stockpiling topsoil during mining operations. Due to the position in the landscape and the nature of the terrain, the Shortland's forms on site have grazing land capability.

- Stanger: The Stanger soil form is present on 6.2 ha and is also one of the new soil forms included in the 2018 soil classification system. The B1 horizon is similar to that of the Shortland's form (a red structured horizon) but it is overlain by a melanic A horizon and underlain by lithic material. Natural veld on these soils provides sweet grazing and ecosystems dominated by melanic soils are highly productive. Therefore, the Stanger soil form within the study area has grazing land capability.
- Technosol/Anthrosol: The new South African Soil Classification System (released February 2018) has a more elaborate section on different on soil forms affected by a variety of anthropogenic land uses. Approximately 8.8 ha of soil within the Smokey Hills UG1 mining area has already been disturbed by the previous construction of a gravel access road together with small patches where vegetation was cleared and mining infrastructure were stored. Due to the variety of visible causes of soil disturbance, these soils have been grouped together as Technosol and/or Anthrosol and no differentiation was made between the origin of disturbance. These areas have low to very low grazing capacity and according the Chamber of Mines Classification, belong to the wilderness land capability.

#### *8.1.5.2 Soil chemical conditions*

The pH levels of the analysed soil samples in the study area ranges indicate that the soil present are moderately acidic (pH levels between 5.48 and 5.72). For successful crop production, a pH of between 5.8 and 7.5 is optimum and crops produced in soils with lower pH may suffer aluminium (Al) toxicities if toxic levels of Al are present. The danger of Al toxicity only exists when the pH (KCl) is lower than 4.5.

Phosphorous levels were as low as expected for natural veld conditions and in soils which are strongly acid (ranging between 0.9 mg/kg and 2.7 mg/kg P).

Calcium and magnesium levels are high, ranging between 1 1398 mg/kg and 2 410.5 mg/kg for calcium, and between 447.7 mg/kg and 668.2 mg/kg for magnesium.

The potassium levels are low (levels range between 28.0 mg/kg and 83.1 mg/kg), especially when compared to the levels of the dominant cations (calcium and magnesium).

No serious soil chemical issues such as soil salinity or sodicity occur in the study area. Where the sodium (Na) concentration is more than 15 % of the sum of all cations, crop production may be impaired. However, the sodium concentration at all the sampling points ranges from 0.75 % to 1.68 %.

#### *8.1.5.3 Site sensitivity to the proposed development*

The entire project area of the proposed Smokey Hills UG1 Project has high to medium-high sensitivity to impacts that cause sedimentation. In addition to this, severe soil erosion in areas covered by shallow soils on hard rock or hard pedocrete (e.g. Mispah soil form) can result in a total and permanent loss of the soil resource. Other areas are occupied by shallow soils on weathered rock, relatively soft geological sediments, clays or soft pedocrete. In these areas soil can still be regenerated, although soil-forming processes are too slow for regeneration to be substantial within a number of human lifetimes. The areas on site with high water erosion potential coincide with areas identified to have low soil regeneration potential.

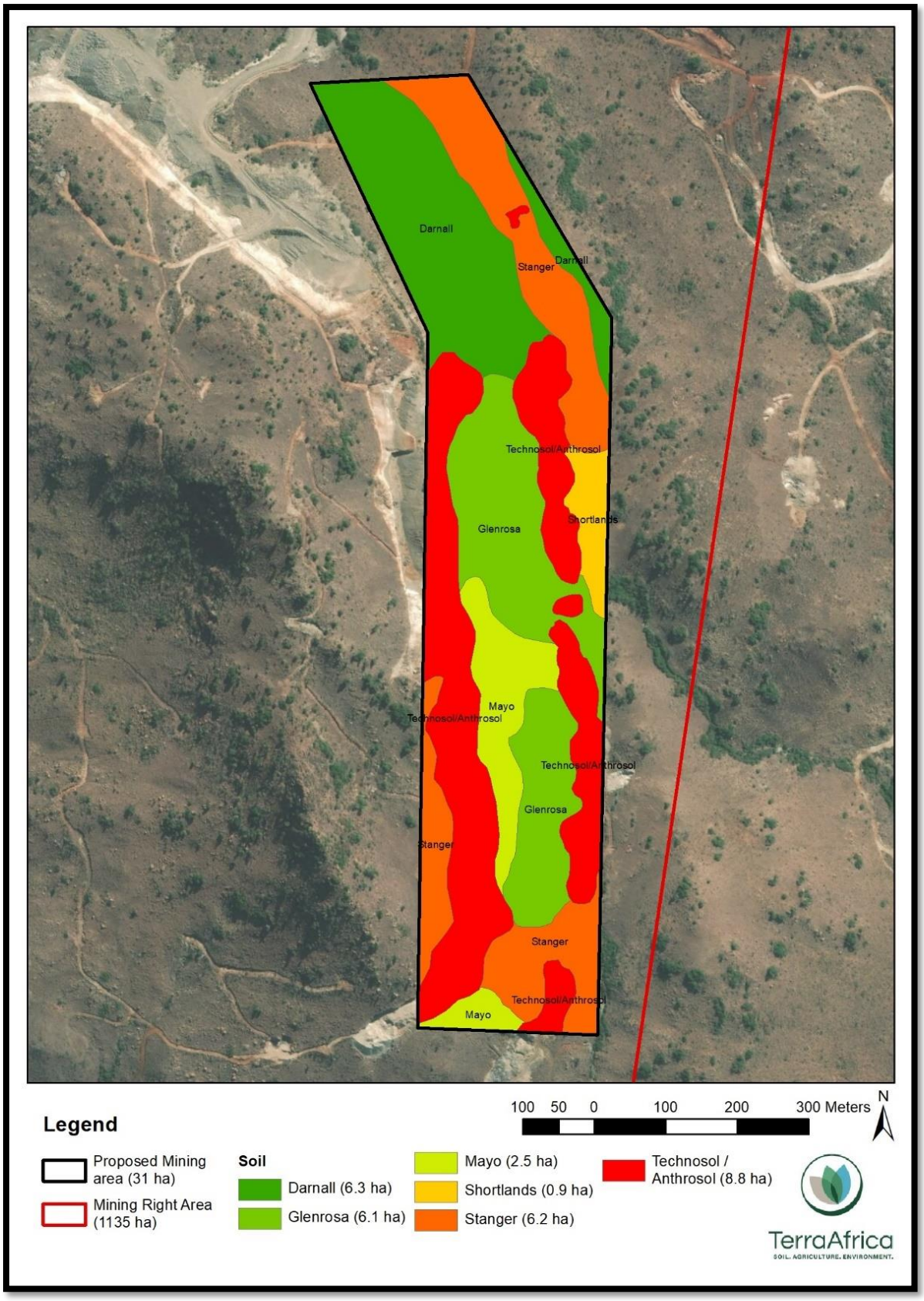


**Figure 8-11 :Soil map of the proposed Mining Area of the Smokey Hill UG1 project**

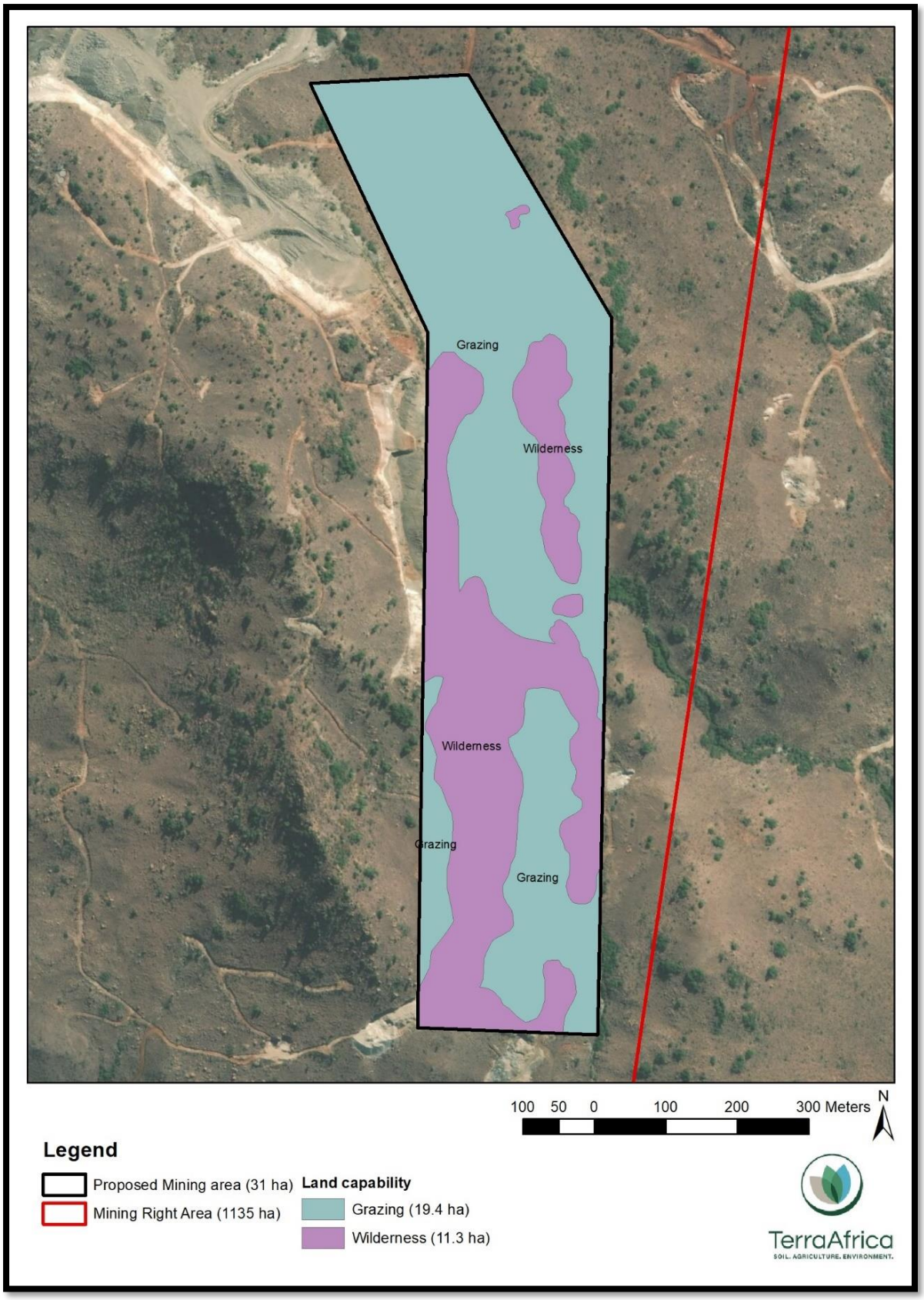


**Figure 8-12 Land capability classification of the Smokey Hills UG1 Project (following the Chamber of Mines Classification System)**

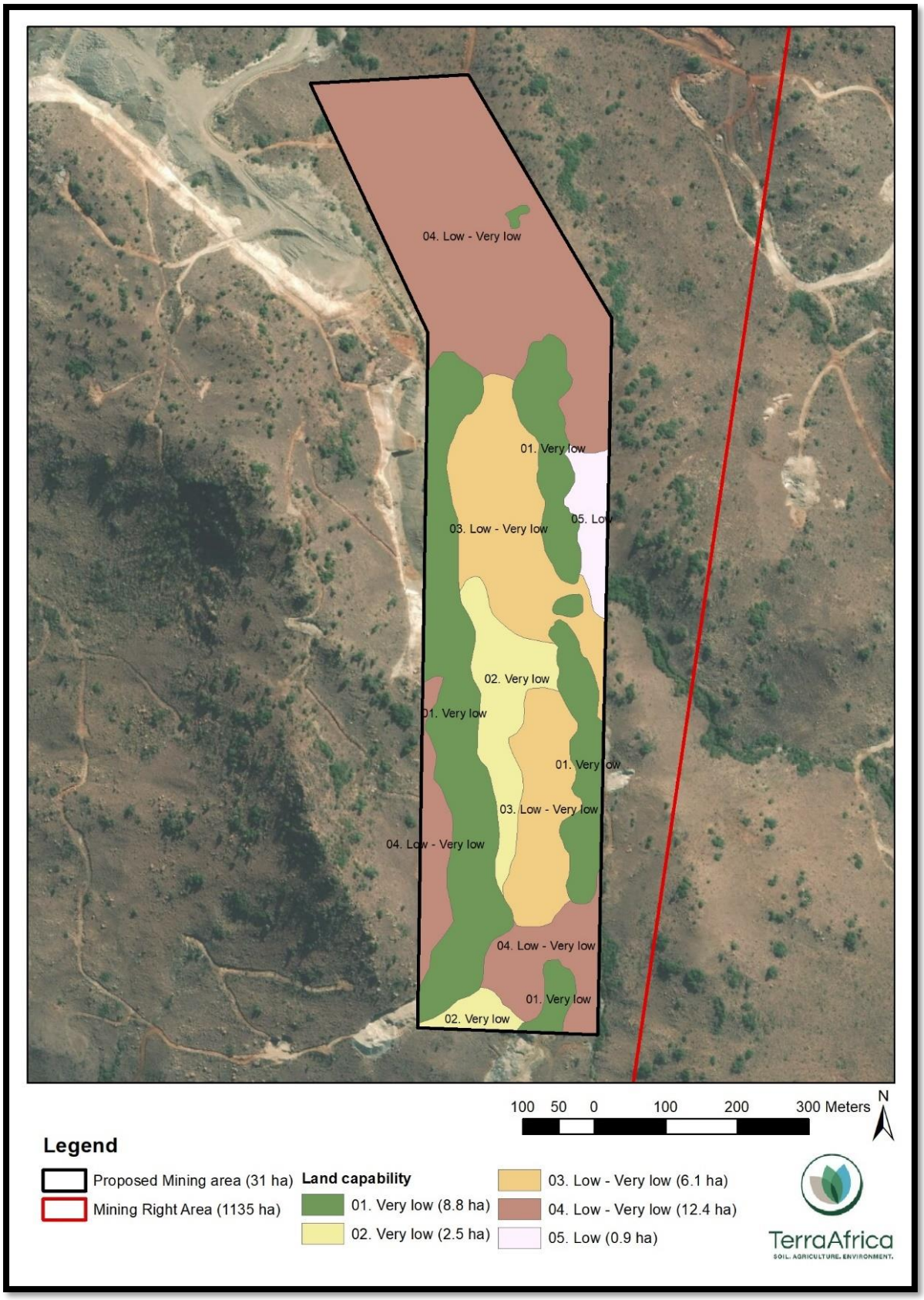


**Figure 8-13: Land capability map of the proposed Mining Area of the Smokey Hill UG1 project (following the DAFF classification system)**

### 8.1.6 Land Capability

Agricultural potential is described through the term land capability. Land capability means "the most intensive long-term use of land for purposes of rainfed farming, determined by the interaction of climate, soil and terrain and makes provision for eight land capability classes". For this assessment, the area was classified using two different land capability classification systems i.e. the system developed by the South African Chamber of Mines as well as the newly developed land capability classification system that was released by the Department of Agriculture, Forestry and Fisheries (DAFF) in 2017 as referenced by Ms Pienaar (Appendix 7).

The new system developed by DAFF consists of fifteen land capability classes where Classes 1 to 7 are considered to be of very low land capability making it only suitable for wilderness and grazing with a variety of management measures. The remaining classes (Class 8 to 15) is considered to have arable land capability with the potential for high yields increasing with the number of the land capability class.

In addition to this, land capability classes were also determined using the guidelines outlined in Section 7 of "The Chamber of Mines Handbook of Guidelines for Environmental Protection (Volume 3, 1981 as referenced by Ms Pienaar)". The Chamber of Mines pre-mining land capability system differs from the DAFF system in that it classifies the capability of land only into four major classes that includes wetland land capability but ignores different grades of suitability for agricultural production. Table 8-3indicates the set of criteria as stipulated by the Chamber of Mines to group soil forms into different Land capability classes.

**Table 8-3: Summary of land capability classification criteria as per the Chamber of Mines Guidelines**

| Land | Criteria |
|---|---|
| Criteria for Wetland | Land with organic soils or<br>A horizon that is gleyed throughout more than 50 % of its volume and is significantly thick, occurring within 750mm of the surface. |
| Criteria for Arable Land | Land, which does not qualify as a wetland,<br>The soil is readily permeable to the roots of common cultivated plants to a depth of 750mm,<br>The soil has a pH value of between 4,0 and 8.4,<br>The soil has a low salinity and SAR,<br>The soil has a permeability of at least 1,5-mm per hour in the upper 500-mm of soil,<br>The soil has less than 10 % (by volume) rocks or pedocrete fragments larger than 100-mm in diameter in the upper 750 mm,<br>Has a slope (in %) and erodibility factor (K) such that their product is <2.0,<br>Occurs under a climatic regime, which facilitates crop yields that are at least equal to the current national average for these crops, or is currently being irrigated successfully. |
| Criteria for Grazing Land | Land, which does not qualify as wetland or arable land,<br>Has soil, or soil-like material, permeable to roots of native plants, that is more than 250-mm thick and contains less than 50 % by volume of rocks or pedocrete fragments larger than 100 mm,<br>Supports, or is capable of supporting, a stand of native or introduced grass species, or other forage plants, utilizable by domesticated livestock or game animals on a commercial basis. |
| Criteria for Wilderness Land | Land, which does not qualify as wetland, arable land or grazing land. |

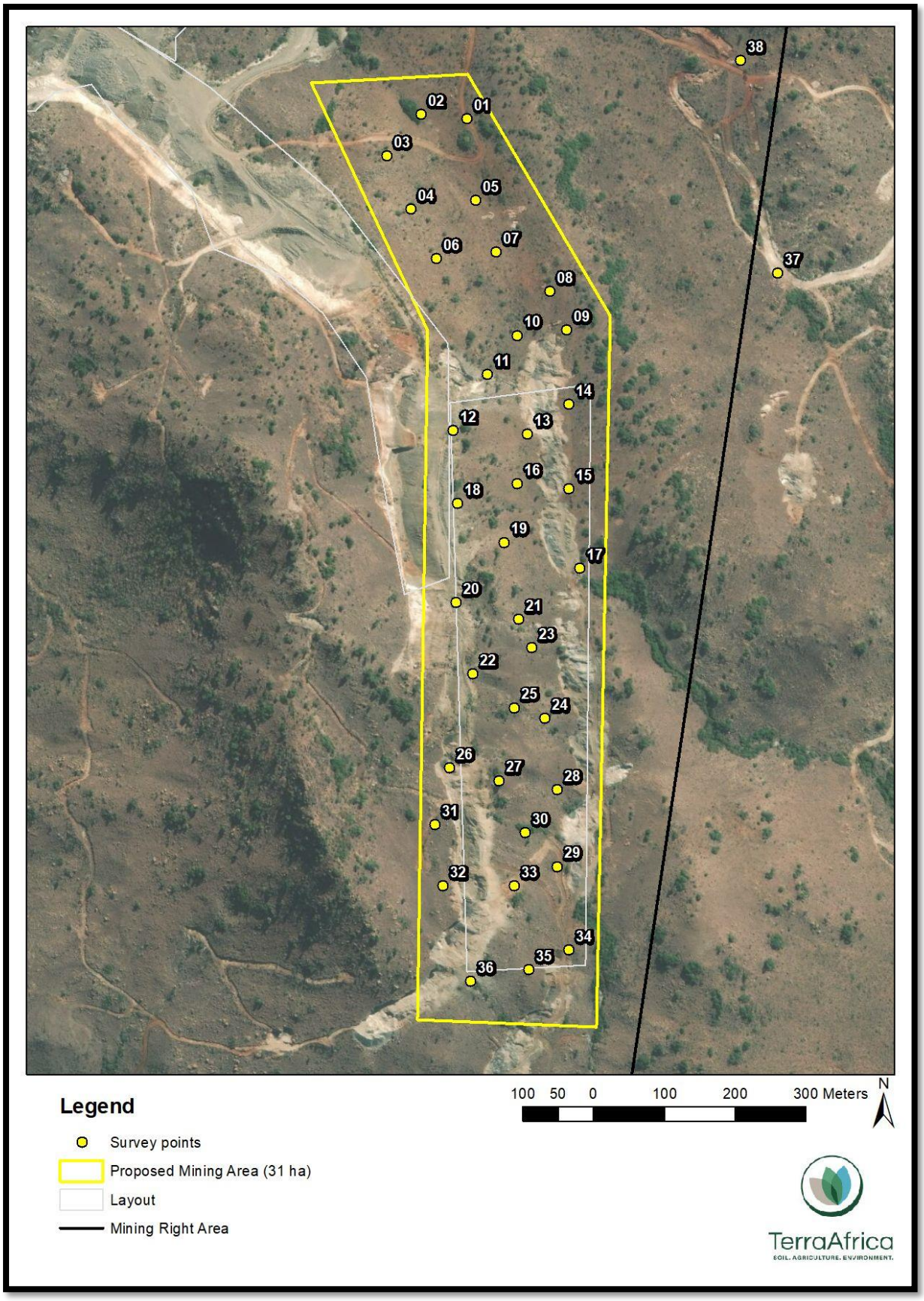


**Figure 8-14 Survey points map of the Proposed Mining Area of Smokey Hill UG1 Project (UG1 Soil Report, 2019)**

#### *8.1.6.1 Crop production*

The soils at SHPM vary from being shallow and rocky in the ridges to sandy on the surrounding plains, with isolated areas where deeper, more fertile soils occur associated with the plains and valleys of the project site.

The typical landscape of the project site is dominated by shallow, rocky soils associated with rocky ridges or very sandy / gravelly soils associated with plateaus, ridges and foot slopes. These soils have a low clay content and water holding capacity, and in combination with the climatic conditions render this section of the proposed development site unfavourable for effective crop production which could result from high moisture demands by planted crops.

The isolated pockets of ravines have shallow sandy-clay or clay soils that are seasonally flooded or have a perched water table. These areas are unsuitable for crop cultivation.

The climatic conditions in combination with the shallow nature of the soils render SHPM unfavourable for effective crop production which could result from high moisture demands by planted crops. SHPM is also expected to receive an annual total rainfall of about 400 mm which is relatively low and highly variable. In addition, SHPM is considered to be located in an area which is marginal for rain-fed arable crop production. Economically viable farming is thus restrictive to irrigated cropping due the high risk that could be associated with dry-land farming. Higher day temperatures in summer months may hamper soil moisture storage for crop use. At present no irrigation or functional centre pivots occur on the property.

#### *8.1.6.2 Livestock production / wildlife grazing*

The natural vegetation at SHPM has a grazing capacity that varies from low (shallow, rocky or sandy soils) to medium (seasonally wet soils, deeper loamy soils). The different sections at SHPM can support grazing according to the soil nutrient content as follows:

- The shallow, rocky soils associated with the slopes of outcrops has low quality grazing and at present game species utilize these areas, especially during the early summer months (September to December) when the grasses re-sprout in burned areas.
- The deep sandy and gravelly soils associated with the foot slopes, valley floors and plateaus have low quality grazing with limited potential for livestock farming. These areas are however suitable grazing for specialized grazers such as sable antelope.
- The red-yellow apedal soils associated with SHPM has a medium potential for livestock grazing due to the slightly higher nutrient content of the soil supporting a mixture of palatable and unpalatable grasses. Grazing value decreases as the season changes from summer to winter though, with the lowest grazing potential available to livestock at the end of the season.

The seasonally wet soils at SHPM support palatable grass species and these areas have a medium suitability for livestock or game grazing. These soils have a good water holding capacity and grass species that grow in these areas vary from having a medium to high palatability depending on the seasonal changes.

### 8.1.7 Biodiversity

A Fauna and Flora Assessment study was undertaken by Nicole Upton from Red Kite Environmental Solutions (Appendix 7). The sections below provide an overview of the biodiversity baseline of the mining area.

The project area lies within the Savanna Biome which is the largest biome in Southern Africa. It is characterized by a grassy ground layer and a distinct upper layer of woody plants (trees and shrubs). The environmental factors delimiting the biome are complex and include altitude, rainfall, geology and soil types, with rainfall being the major delimiting factor. Fire and grazing also keep the grassy layer

dominant (Dr. Henning, 2016b). In addition, the UG1 area is located within an area classified as ***Ecological Support Area 1***.

#### *8.1.7.1 Flora*

##### *8.1.7.1.1 Vegetation Types*

The most recent classification of the area by Mucina & Rutherford (as referenced by Ms Upton) shows that the SHPM site is classified as Sekhukhune Mountain Bushveld with small section representative of the Sekhukhune Plains Bushveld. The Sekhukhune Mountain Bushveld has a 'Least Threatened' conservation status with 0.4% conserved and nearly 15% transformed, while the Sekhukhune Plains Bushveld has a vulnerable conservation status, with 2% statutorily conserved and some 25% that has been transformed. Transformation is mainly through dryland subsistence cultivation and urban build up.

The vegetation structure of the Sekhukhune Mountain Bushveld varies from open to dense woody layer, with associated woody and herbaceous shrubs and closed to open grass layer. The landscape topography is mainly moderate to steep slopes on mountainsides and sometimes deeply incised valleys. Flat terrain occurs dispersed in between the sloping terrain.

The landscape features of the Sekhukhune Plains Bushveld vegetation type are mainly semi-arid plains and open valleys between chains of hills and small mountains running parallel to the escarpment. The vegetation structure is mainly short, open to closed thornveld with an abundance of *aloe* species and other succulents. The area is often heavily exploited by man for cultivation, mining and urbanization. Both man-made and natural erosion dongas occur in areas containing clay rich in heavy metals.

##### *8.1.7.1.2 Sekhukhune land Centre of Endemism*

The site forms part of the Sekhukhune land Centre of Endemism (SCOE). The importance to evaluate the vegetation on the site as part of the Sekhukhune land Centre of Endemism cannot be underestimated. Most of southern Africa's endemic plants are concentrated in only a few, relatively small areas, known as regions or centres of endemism. Not only do these centres hold clues to the origin and evolution of the botanical diversity within a particular area, but these are also areas that, if conserved, would safeguard the greatest number of plant species. Sekhukhune land has been identified through previous studies as one of the most important centres of endemism in the Mpumalanga and Limpopo Provinces. The centre falls within the rainfall shadow of the Drakensberg Escarpment, and it is relatively more arid than the areas to the east. The endemic plants of this area are primarily edaphic specialists that are derived from a unique ecology.

Endemics are both herbaceous and woody with endemism high in the anacardiaceae, euphorbiaceae, liliaceae and lamiaceae. The shallow, rocky areas of the development site can be considered especially sensitive as part of the centre of endemism, and will almost certainly show similar vegetation patterns to the endemic regions, especially since the vegetation is still in a natural state. Other important attributes of this region's flora are summarized in Table 8-4 below:

**Table 8-4: Attributes of the Sekhukhune land Center of plant endemism**

| | |
|---|---|
| **Centre of Endemism size:** | 5 449.4 km$^2$ |
| **Total Number of Species/Taxa** | ± 2 200 |
| **Endemic/Near endemic taxa** | >100 |
| **Rate of endemism** | 4.5% |
| **Area in Limpopo Province** | 2 794 km$^2$ |
| **Proportion in Limpopo Province** | 51.7% |
| **Total % transformed** | 28.57% |

#### *8.1.7.2 Fauna*

As a result of anthropogenic disturbance in the larger area and the limitations created by game fences, only the most tolerant generalists of the larger vertebrates still occur in the project area outside the nature reserves. Examples are grey duiker, bushbuck, steenbok and baboon. The more sensitive habitat-specialist species like honey badger, leopard, brown hyena and caracal have retreated into areas of lower disturbance such as the surrounding ridges and riparian woodland. Four major bird habitat systems were identified at SHPM, including riparian vegetation, microphyllous woodland, broadleaf woodland and degraded grassland.

Species such as the southern rock python, the black mamba, puff adder, boomslang, vine snake, spotted bush snake and several members of the green snakes (*Philothamnus* spp.) is expected to occur at SHPM, although the presence of these snakes is dependent on the presence of their prey species (rodents, frogs etc.). The general habitat type for reptiles consists of open shrubveld to denser bushveld, with limited available habitat for diurnally active and sit-and-wait predators, such as terrestrial skinks and other reptiles. Arboreal species are the more prominent components of the local herpetofauna.

The amphibians appear to be poorly represented in the area. The most probable habitat to find frogs is in the seasonal pools associated with the drainage channels although this do not represent optimal habitats due to a lack of breeding habitat and water plants which will attract insect for foraging.

#### *8.1.7.3 Site Survey findings of the Fauna and Flora assessment*

##### *8.1.7.3.1 Flora*

Vegetation units were identified according to plant species composition, previous land use and topography. The state of the vegetation of the proposed mining area varies from being natural to completely degraded. The farms are currently zoned for mining.

The following broad classification of Vegetation Units (VU) were found to occur on the proposed UG1 opencast area and 200 m buffer:

- Mountain slopes and valleys shrubveld (VU1);
- Watercourses and riparian woodland (VU2); and
- Degraded areas (VU3).

The vegetation units as identified during site visit, databases and aerial imagery are indicated in Figure 8-15. Flora species identified during the site survey is included in Table 8-5.

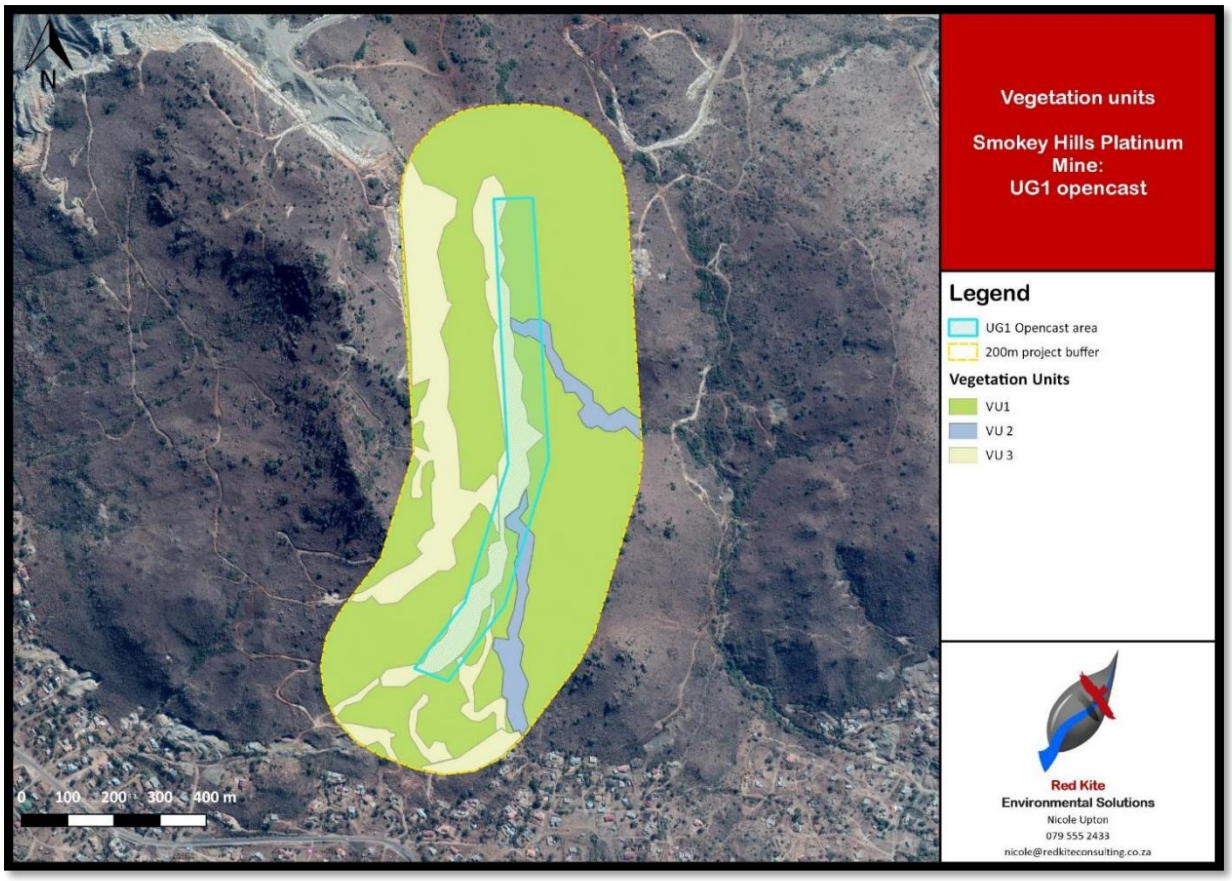


**Figure 8-15: Identified Vegetation Units**

**Table 8-5: Identified plant species on site**

| Species | Common name | Conservation |
|---|---|---|
| *Aloe cryptopoda* | Geelaalwyn | Red List status: LC |
| *Andropogon chinensis* | Hairy blue grass | Red List status: LC |
| *Aristida bipartita* | Rolling grass | Red List status: LC |
| *Aristida canescens* | Pale three-awn | Red List status: LC |
| *Asclepias sp.* | | Red List status: LC |
| *Asparagus suaveolens* | Bushveld asparagus | Red List status: LC; Medicinal species |
| *Berkeya sp.* | | Red List status: LC; Medicinal species |
| *Berkheya seminivea* | | Red List status: LC |
| *Cenchrus ciliaris* | Blue buffalo grass | Red List status: LC |
| *Chlorophytum transvaalense* | | Red List status: LC |
| *Cymbopogon pospischilii* | Narrow-leaved turpentine grass | Red List status: LC |
| *Cynodon dactylon* | Couch grass | Red List status: LC |
| *Dodonaea viscosa* | Sandolive | Red List status: LC; Medicinal species |
| *Elephanthorhiza praetermissae* | Sekhukhune Elephant-root | Red List status: LC |
| *Enneapogon cenchroides* | Nine-awned grass | Red List status: LC |
| *Euphorbia tirucalli* | Rubber euphorbia | Red List status: LC; Medicinal species |
| *Gladiolus dalenii* | African gladiolus | Red List status: LC |
| *Gymnosporia buxifolia* | Spikethorn | Red List status: LC |
| *Heteropogon contortus* | Spear grass | Red List status: LC |
| *Hippobromus pauciflorus* | False-horsewood | Red List status: LC; Medicinal species |

| Species | Common name | Conservation |
|---|---|---|
| *Hyparrhenia tamba* | Blue thatching grass | Red List status: LC |
| ***Jamesbrittenia macrantha*** | | **Red llst status: NT** |
| ***Lydenburgia cassinoides*** | **Sekhukhuni Boesmanstee** | **Red List status: NT; NFA: Protected tree** |
| *Melinis repens* | Natal red-top | Red List status: LC |
| *Mimusops zeyheri* | Moepel | Red List status: LC |
| *Nicotiana glauca* | Wild tobacco | NEMBA Category 1b AIP |
| *Ochna pretoriensis* | Magalies plane | Red List status: LC |
| *Pavetta zeyheri* | Small-leaved bride's bush | Red List status: LC |
| *Pechuel-loeschea leubnitziae* | Stinkbush | Red List status: LC |
| *Pennisetum setaceum* | Fountain grass | NEMBA Category 1b AIP |
| *Protea caffra* | Common sugarbush | Red List status: LC |
| *Rhoicissus sekhukhuniensis* | Sekhukhune Grape | Red List status: LC |
| *Schizachyrium sanguineum* | Red autumn grass | Red List status: LC |
| ***Sclerocarya birrea*** | **Marula** | **Red List status: LC; NFA: Protected tree; Medicinal species** |
| *Searsia keetii* | Slender karee | Red List status: LC |
| *Searsia pyroides* | Firethorn crowberry | Red List status: LC |
| ***Searsia sekhukhuniensis*** | | **Red List status: Rare** |
| *Searsia zeyheri* | Blue crowberry | Red List status: LC |
| *Stipagrostis hirtigluma* | Blue bushman's grass | Red List status: LC |
| *Stipagrostis uniplumis* | Silky bushman grass | Red List status: LC |
| *Tarconanthus camphoratus* | Camphorbush | Red List status: LC; Medicinal species |
| *Tecoma stans* | Yellow bells | NEMBA Category 1b AIP |
| *Themeda triandra* | Red grass | Red List status: LC |
| *Tristachya leucothrix* | Hairy trident grass | Red List status: LC |
| ***Vachellia ormocarpoides*** | **Leolo thorn** | **Red List status: NT** |
| *Xerophyta humilis* | Reenmetertjie | Red List status: LC |
| *Xerophyta retinervis* | Black-stick lily | Red List status: LC; Medicinal species |

**Mountain slopes and valleys shrubveld (VU1)**

This vegetation unit occurs on the lower slopes and valleys on rocky terraces of the mountain. The areas of this VU that are located on the proposed project footprint will be cleared entirely as part of the opencast preparation. The woody structure is a low shrubveld, with a land use largely related to grazing and wilderness. Current impacts to the vegetation composition of this VU are from gravel roads, footpaths, grazing and possibly wood harvesting. The VU is considered to be largely natural with few disturbances to the vegetation composition.

No Alien Invasive Species were observed to occur in this vegetation unit at the time of the site survey. Dominant woody plant species in this VU include: *Searsia keetii* (Slender karee), *Elephantorrhiza praetermissa* (Sekhukhune Elephant-root), *Rhoicissus sekhukhuniensis* (Sekhukhune Grape), *Protea caffra* (Common sugarbush) and *Vachellia ormocarpoides* (Leolo thorn).

The vegetation unit is classified as having a high sensitivity due to the largely natural state of this vegetation unit andthe species of conservation concern occurring in it.


**Figure 8-16: Shows evidence of vegetation Unit 1**

**Watercourses and riparian woodland (VU2)**

Due to the terrain of the surrounding area as well as the presence of illegal miners at the time of the site visit, no physical survey of the drainage lines could be undertaken at the headwaters of the drainage lines. However, the lower reaches of the drainage lines could be accessed. Information in this section is supported by a previous study undertaken at Black Chrome Mine by Red Kite (2017).

The watercourses identified on site are ephemeral in nature and as such no significant difference between the surrounding vegetation and the vegetation in the riparian areas were found other than vegetation being denser in the riparian areas as expected from A Section streams.

The upper reaches of both the southern tributary and northern tributary falls within the proposed opencast pit and will therefore be cut-off upon construction of the opencast void.

Typical woody species of the riparian include *Lydenburgia cassinoides* (Sekhukhune bushman's tea), *Hippobromus pauciflorus* (False Horsewood), *Mimusops zeyheri* (Red Milkwood) and *Rhoicissus sekhukhuniensis* (Sekhukhune Grape).

The vegetation unit is classified as having a high sensitivity due to the largely natural state of this vegetation unit and the species of conservation concern occurring in it. Due to the characteristics of the watercourses found on site a 30 m buffer is suggested and considered conservative in the site context.

**Figure 8-17 Photographs of the northern drainage line downstream of the proposed mining area**

**Figure 8-18: Photographs of southern line downstream of proposed mining area**

**Degraded areas (VU3)**

The old haul roads, previously mined areas and areas immediately adjacent to previously mined areas represent low sensitivity degraded areas characterised by plant species such as *Stipagrostis hirtagluma* (Blue bushman's grass), *Vachellia ormocarpoides* (Leolo thorn), *Ochna pretoriensis* (Magalies plane) and *Searsia sekhukhuniensis.*

The area has been degraded through current and past mining activities and the majority of VU3 is bare or sparsely vegetated. AIP species such as *Nicotiana glauca* (Wild tobacco), *Pennisetum setaceum* (Fountain grass) and *Tecoma stans* (Yellow bells) were identified in the vegetation unit. Fountain grass was found at moderate to low densities, however only scattered individuals of Wild tobacco and Yellow bells was observed.

The vegetation unit is classified as having a low sensitivity due to the state of degradation, development can be supported in the area. Care should however be taken regarding impacts on the adjacent riparian woodland and sensitive mountainous terrain.


**Figure 8-19: Landscape of degraded Vegetation Unit 3 (VU3)**

**Plant Species of conservation concern**

A total of 47 plant species were recorded in the studied area during the site survey (Table 8-5). Of this number five plant species are considered to be of conservation concern. None of the floral species recorded during the site survey are listed in the ToPS list. Three species are categorised as Near Threatened according to the SANBI Red Data List and one as Rare. Two Protected Tree species were identified to occur within the project area.

The table below lists the floral species of conservation concern identified to occur on the proposed UG1 opencast mining area during the site survey:

| Species | Common name | IUCN Red List Category |
|---|---|---|
| *Jamesbrittenia macrantha* | | Red List status: NT |
| *Lydenburgia cassinoides* | Sekhukhuni Boesmanstee | Red List status: NT;<br>NFA: Protected tree |
| *Sclerocarya birrea* | Marula | Red List status: LC;<br>NFA: Protected tree; |
| *Searsia sekhukhuniensis* | | Red List status: Rare |
| *Vachellia ormocarpoides* | Leolo thorn | Red List status: NT |

**Invasive Plant Species**

Invasive and exotic species tend to increase in disturbed environments (DEA & DMR, 2013 as referenced by Ms Upton). Therefore, the construction and operational phases of developments can increase the spread and growth of invasive species. Only three Alien Invasive Plant (AIP) species, as per the NEMBA, were recorded during the site survey and are presented below.

| Species | Common Name | NEMBA AIP Category |
|---|---|---|
| *Nicotiana glauca* | Wild tobacco | NEMBA Category 1b AIP |
| *Pennisetum setaceum* | Fountain grass | NEMBA Category 1b AIP |
| *Tecoma stans* | Yellow bells | NEMBA Category 1b AIP |

None of the AIP species identified during the site survey occurred in dense clusters, but rather as a few scattered individuals. It will be important to implement an AIP Management Plan during the life of the development, to maintain and restore the ecological integrity of the remaining natural vegetation.

**Medicinal Plant Species**

Some of the species that were encountered during the field survey have cultural and/or medicinal use. Various medicinal books and peer-reviewed articles were used to verify whether the species have any medicinal uses. Eight species were found to occur on site that have medicinal uses:

| Species | Common name |
|---|---|
| *Asparagus suaveolens* | Bushveld asparagus |
| *Berkeya sp.* | |
| *Dodonaea viscosa* | Sandolive |
| *Euphorbia tirucalli* | Rubber euphorbia |
| *Hippobromus pauciflorus* | False-horsewood |
| *Sclerocarya birrea* | Marula |
| *Tarconanthus camphoratus* | Camphorbush |
| *Xerophyta retinervis* | Black-stick lily |

These plants are important from a cultural perspective and are used for traditional/cultural purposes. Traditional medicine in South Africa is an important practice on which seventy two percent of the Black African population relies, that accounts for 26.6 million consumers (Mander *et al*., 2007 as referenced by Ms Upton). Approximately 133 000 people are Employed in the trade of traditional medicine, especially rural women (Mander *et al.,* 2007 as referenced by Ms Upton).

*8.1.7.3.2 Fauna*

The site where the UG1 Outcrop is proposed is fairly impacted due to the site falling over the illegal mining activities currently taking place on-site. Koppie/Rocky mountain terrain is usually highly sensitive, but since most of the natural habitat has been cleared along this section, sensitivity in this area is decreased.

Animal communities expected are not likely to use the area as breeding and roosting sites as a result of constant movement and human noise and smells in close proximity of the site. Specifically, the illegal mining activity on the footprint itself have would have vastly impacted any species or communities which could have occurred within this section. The constant movement up and down the mountain of the illegal miners using the community at the foot of the mountain to access the site will also have impacted on the diversity found within this section.

Other impacts include the Smokey Hills Mine itself, however, the mine has been closed for a few years and is in the process of restarting its plant to receive material from the neighbouring Black Chrome Mine.

Signs of species of conservation concern found:

- No signs of animals of conservation concern were sighted during the field assessment. Those identified during the Desktop Assessment and Literature assessment (refer to the applicable appendices in the specialist report in Appendix 7) may occur in the region and these will need to be watched out for during all stages of the development. The UG1 opencast footprint itself

has almost no habitat remaining since it was already mined by illegal mining activities as may be seen from the image provided above (Figure 8-20) and the photographs below (Figure 8-22).

- The Photographs shown in Figure 8-21 indicate the typical condition of the mountainous terrain and habitat found surrounding the footprint as well as a typical dry drainage feature within these areas on top of the mountain slopes.

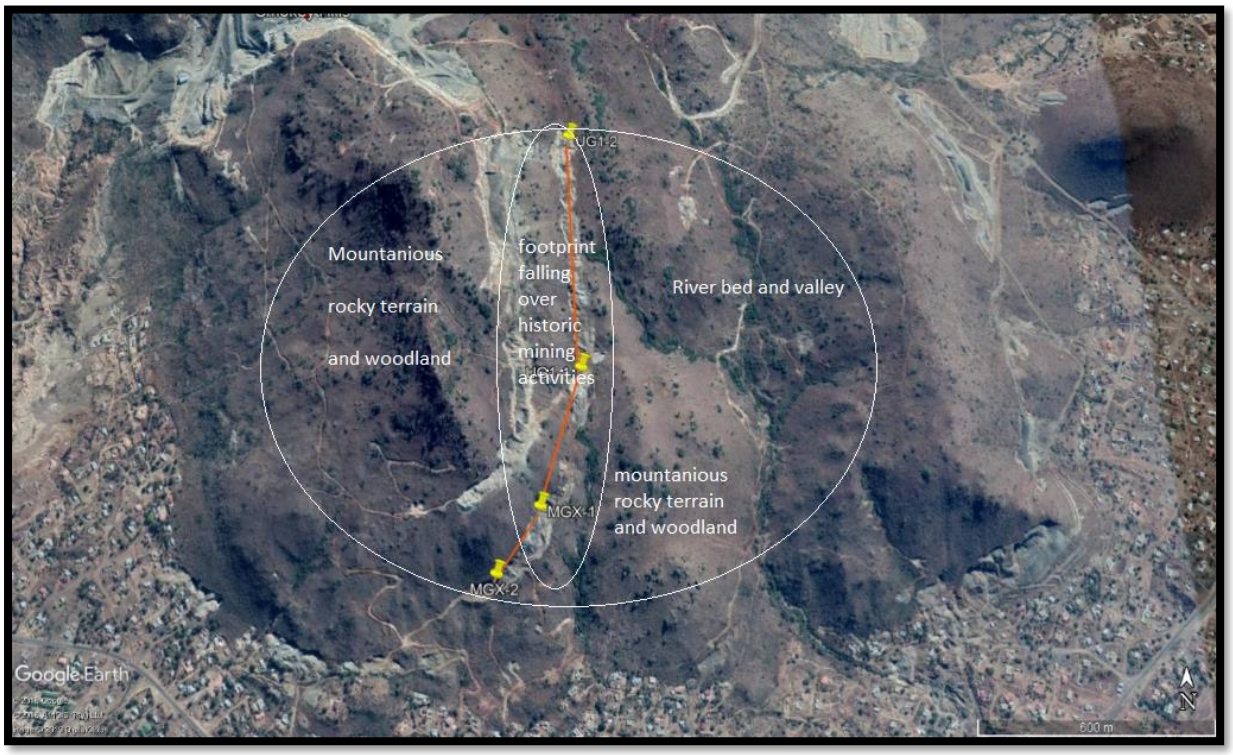


**Figure 8-20: Habitat types and characterisation found in and around the footprint**

**Figure 8-21: Photographs of the typical habitat conditions surrounding the new footprint proposed**

**Figure 8-22: Footprint of the UG1 Outcrop showing illegal mining activity "opencast"**

**Table 8-6: Fauna species observed at and around the footprint and surrounds**

| Family | Species | Common Name | Sighting/Finding | Status and IUCN |
|---|---|---|---|---|
| **Invertebrate species** | | | | |
| Coccinellidae | *Oenopia cinctella* | Black-ringed Ladybird | Sighting | Least Concern |
| Nymphalidae | *Hamanumida daedalus* | Guinea-fowl Butterfly | Sighting | Least Concern |
| Geometridae | *Chiasmia simplicilinea* | Oblique Peacock | Sighting | Least Concern |
| Nymphalidae | *Byblia ilithyia* | Spotted Joker | Sighting | Least Concern |
| Nymphalidae | *Danaus chrysippus* | African Monarch | Sighting | Least Concern |
| Nymphalidae | *Junonia orithya madagascariensis* | Eyed Pansy | Sighting | Least Concern |
| Nymphalidae | *Junonia hierta* | Yellow Pansy | Sighting | Least Concern |
| **Reptilian species** | | | | |
| No Reptilian species were sighted during the assessment, however habitat for reptilian species are ideal. | | | | |
| **Mammalian species** | | | | |
| Leporidae | *Lepus saxatilis* | Scrub Hare | Droppings | Least Concern |
| **Avifauna** | | | | |
| Turnicidae | *Turnix sylvaticus* | Common buttonquail | Sightings | Least Concern |
| Estrildidae | *Estrilda astrild* | Common waxbil | Sightings | Least Concern |
| Ploceidae | *Euplectes albonotatus* | Widowbird White-winged | Sightings | Least Concern |
| Numididae | *Numida meleagris* | Helmeted guineafowl | Feathers, Sightings | Least Concern |
| Ploceidae | *Plocepasser mahali* | White browed sparrow-weaver | Sightings | Least Concern |
| Alaudidae | *Eremopterix leucotis* | Chestnut-backed sparrow-lark | Sightings | Least Concern |
| Columbidae | *Columba arquatrix* | African Olive (Rameron) Pigeon | Sightings | Least Concern |
| Viduidae | *Vidua funerea* | Dusky Indigobird | Sightings | Least Concern |
| Leiothrichidae | *Turdoides bicolor* | Southern Pied Babbler | Sighting | Least Concern |

### 8.1.8 Surface Water

A surface water assessment was conducted by Nicole Upton from Red Kite Environmental Solutions. The Smokey Hills Platinum Mine is located across both the B41J and the B71E catchments. Quaternary catchment B41J drains towards the Steelpoort River, while B71E drains towards the Olifants River. The proposed project area is located within an unnamed non-perennial tributary of the Moopetsi River in the Steelpoort River catchment in the quaternary drainage region B41J catchment, and as such will be the only catchment referenced in the baseline description.

B41J is a quaternary sub-catchment area within the Olifants Water Management Area (WMA) which may be divided into four sub-areas, namely the Upper Olifants, Middle Olifants, Lower Olifants and Steelpoort sub-areas. The main tributaries of the Olifants River are the Wilge, Elands, Ga-Selati, Klein Olifants, Steelpoort, Blyde, Klaserie and Timbavati Rivers. The Olifants River is a tributary of the Limpopo River which is shared by South Africa, Botswana, Zimbabwe and Mozambique. The Olifants

WMA excludes the Letaba River catchment.

The UG1 Opencast area is located in the Middle Olifants Sub-WMA and the Steelpoort Sub-WMA, which are lately being characterised by a large number of platinum and chrome mines being developed. The mines have increased the water requirements in the area both due to their direct industrial water use and increased potable use caused by influx of people.

Based on the water balance reconciliation study performed by the former Department of Water Affairs and Forestry it was predicted that the water deficit of 241 million $m^3/a$ will grow to 279 million $m_3/a$ by the year 2025. As per the NWRS 2nd Edition, the Olifants WMA is a highly stressed WMA, fast growing in terms of population and need for improved services. There is very little opportunity for further water resource development and no realistic opportunity to import significant volumes of additional water from elsewhere.

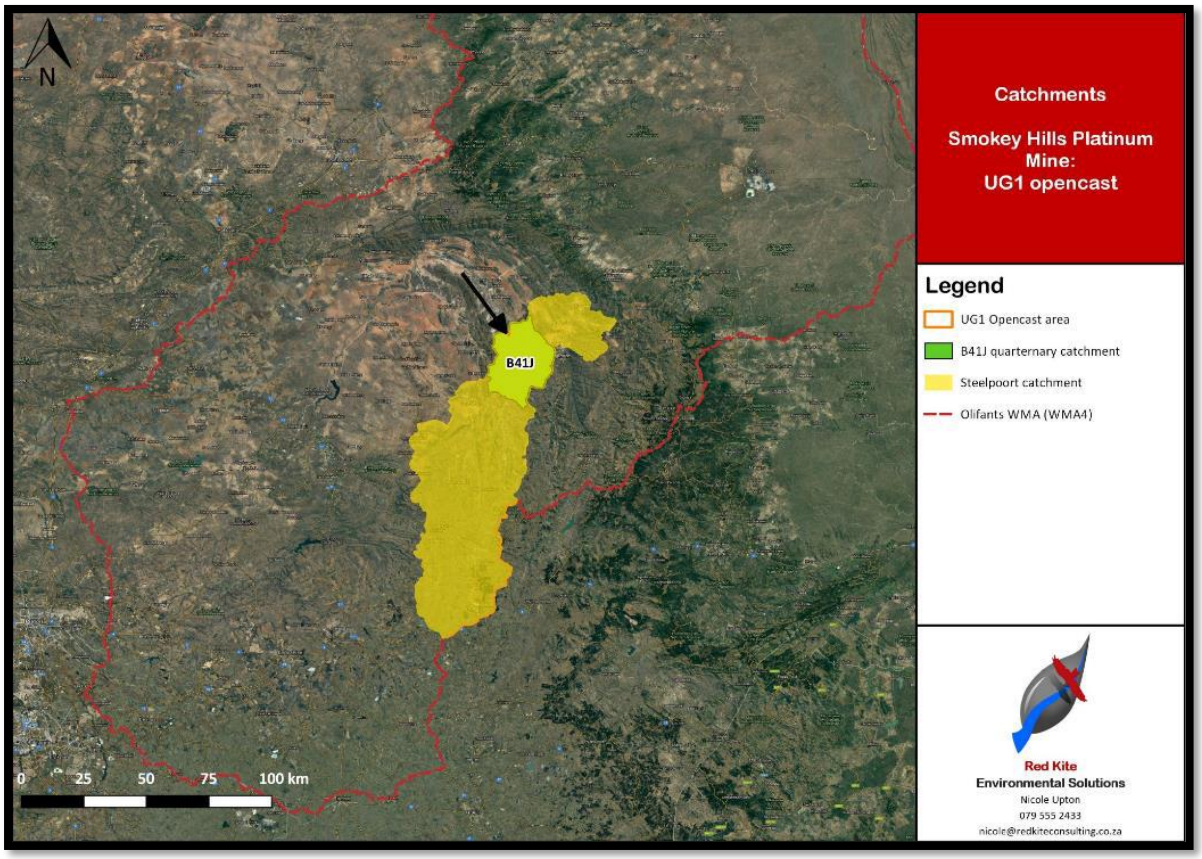


**Figure 8-23: Catchments**

### *8.1.8.1 Surface Water quality and Condition*

The field investigation confirmed that the non-perennial drainage lines transecting the project area contain no water for the majority of the year. During field survey a water sample was acquired at 24°35'57.20"S, 30° 8'5.52"E (refer to Figure 8-24). This sample is from the unnamed watercourse (north tributary), branching out to the east of the project area. The unnamed watercourse draining the bulk of the run-off in the project area (south tributary) was dry at the time of the site survey. The water sample was analysed by an SANAS accredited lab.

The water flowing down from the Lebalelo mountain, originating and passing through the project area, EMPRties into the Moopetsi river and from there the Steelpoort river in the B41J quaternary catchment. This is relevant for both watercourses mentioned above.

Water quality data was benchmarked against the RWQO for the Steelpoort River Catchment (Olifants_EWR9) released 7 September 2018. The Steelpoort Resource Water Quality Objectives (RWQO) compared with the sample is detailed in Table 8-7. All levels recorded fall within acceptable levels.

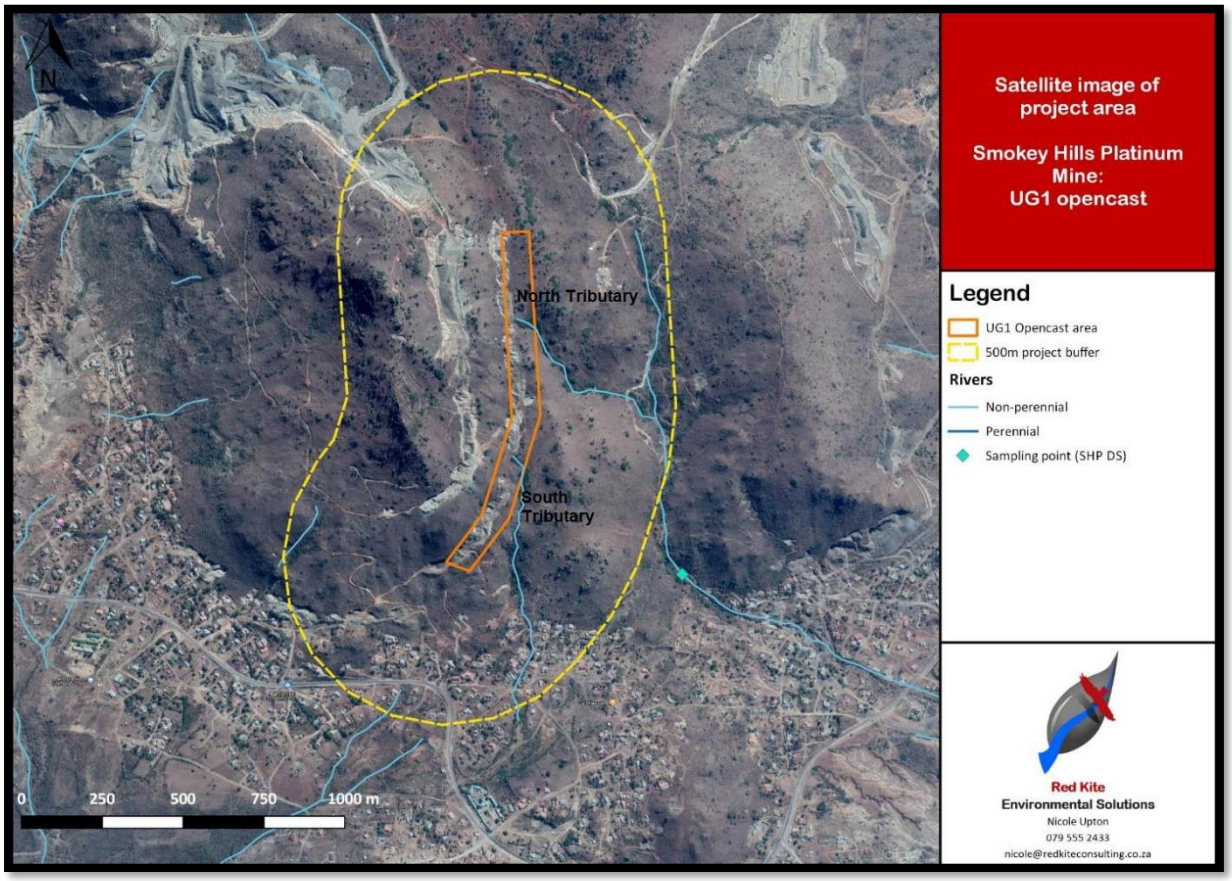


**Figure 8-24: Project area and surface water sampling point**

**Table 8-7: Baseline water quality vs RWQO for the Steelpoort River catchment**

| Water Quality Metrics | RWQO | Baseline Sample |
|---|---|---|
| pH – Value @ 25 ºC | 5.0 - 10.0 | 8.6 |
| Electrical Conductivity in mS/m @ 25°C | < 85 | 59.5 |
| Total Dissolved Solids @ 180°C | NA | 386 |
| Turbidity in N.T.U | Minor silting of upstream habitats acceptable | 1.2 |
| Chloride as Cl | < 175 | 9 |
| Sulphate as $SO_4$ | < 250 | < 2 |
| Nitrate as N | NA | < 0.1 |
| Nitrite as N | NA | < 0.05 |
| Ortho Phosphate as P | < 0.125 | < 0.1 |
| Magnesium as Mg | < 70 | 57 |
| Total Chromium as Cr | NA | < 0.25 |

Unfortunately, the watercourses could not be assessed in terms of the SASS scoring system:

- Northern tributary: the tributary was dry; and

- Southern tributary: only a small amount of stagnant water was found.

#### *8.1.8.2 Riparian and Stream ecology*

Omernik (2004) (as referenced by Ms Upton) defines ecoregions as: "areas within which there is spatial coincidence in characteristics of geographical phenomena associated with differences in the quality, health, and integrity of ecosystems". "Characteristics of geographical phenomena" may include geology, physiography, vegetation, climate, hydrology, terrestrial and aquatic fauna, and soils, and may or may not include the impacts of human activity (e.g. land use patterns, vegetation changes).

The ecoregional information of South Africa as depicted in the figure below was sourced from Kleynhans, Thirion & Moolman (2005) (as referenced by Ms Upton).

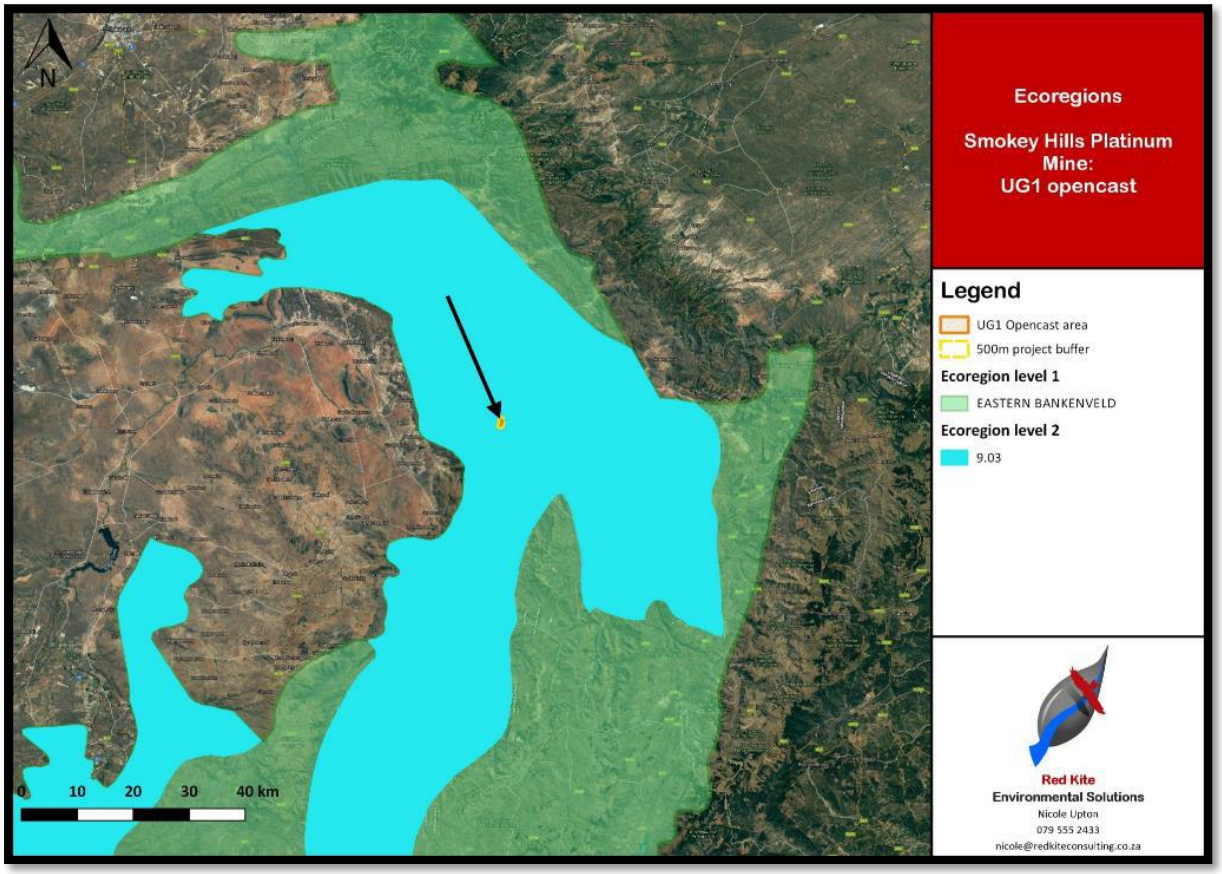


**Figure 8-25: Location of the UG1 area in the level 1 and 2 ecoregions**

The Eastern Bankenveld ecoregion is a mountainous area characterised by moderate to high relief together with North-eastern Mountain Grassland and Mixed Bushveld. The characteristics of this eco-region are described in Table 8-8.

**Table 8-8: Characteristic of the Eastern Bankenveld level 1 ecoregions (Kleynhans, Thirion & Moolman, 2005 as referenced by Ms Upton)**

| MAIN ATTRIBUTES | EASTERN BANKENVELD (dominant types in bold) |
|---|---|
| Terrain Morphology: Broad division | Plains; Low Relief; (very limited)<br>Plains; Moderate Relief;<br>Lowlands; Hills and Mountains; Moderate and High Relief; (limited)<br>Open Hills; Lowlands; Mountains; Moderate and High |

| MAIN ATTRIBUTES | EASTERN BANKENVELD (dominant types in bold) |
|---|---|
| | Relief; (Limited)<br>Closed Hills; Mountains; Moderate and High Relief |
| Vegetation types (Primary) | Sour Lowveld Bushveld; **Mixed Bushveld**; Clay Thorn Bushveld (Limited)<br>Rocky Highveld Grassland; Moist Sandy Highveld Grassland;<br>North Eastern Mountain Grassland;<br>Patches Afromontane Forest. |
| Altitude (mamsl) | 500 – 2 300 |
| MAP (mm) | 300 to 1 000 |
| Coefficient of variation (% of annual precipitation) | < 20 to 34 |
| Rainfall concentration index | 55 to > 65 |
| Rainfall seasonality | Early to Mid-summer |
| Mean annual temp(°C) | 10 to 22 |
| Mean daily max temp (°C) February | 18 to 30 |
| Mean daily max temp (°C) July | 12 to 24 |
| Mean daily min temp (°C) February | 8 to 20 |
| Mean daily min temp (°C) July | 0 to 8 |
| Median annual simulated runoff (mm) for quaternary catchment | 20 to 150; 200 to > 250 |

The Eastern Bankenveld ecoregion is also sub-divided into smaller regions known as Level 2 ecoregions, which categorises regional or sub-catchment scale ecotypes (Table 8-9).

**Table 8-9: Characteristics of the Eastern Bankenveld Level 2 Ecoregion (Klyenhans, Thirion & Moolman 2005 as referenced by Ms Upton)**

| MAIN ATTRIBUTES | EASTERN BANKENVELD 9.03 (dominant types in bold) |
|---|---|
| Terrain Morphology: Broad division | Open Hills, Lowlands, Mountains, Moderate to High Relief<br>Closed Hills, Mountains; Moderate and High Relief; |
| Terrain Morphology | Hills and Lowlands, Parallel Hills and Lowlands Low Mountains |
| Vegetation types (Primary) | **Mixed Bushveld**; Clay Thorn Bushveld; |
| Altitude (mamsl) | 500 to 2 300 |
| MAP (mm) | 400 to 700 |
| Coefficient of variation (% of annual precipitation) | 20 to 34 |
| Rainfall concentration index | 55 to 64 |
| Rainfall seasonality | Early summer |
| Mean annual temp (°C) | 14 to 22 |
| Mean daily max temp (°C) February | 20 to 30 |
| Mean daily max temp (°C) July | 16 to 20 |
| Mean daily min temp (°C) February | 12 to 19 |
| Mean daily min temp (°C) July | 2 to 7 |
| Median annual simulated runoff (mm) for quaternary catchment | 20 to 150 |

From the data available from SANBI it was confirmed that the UG1 opencast area is not located within

any of the following areas:

- Freshwater Ecosystem Priority area;
- Fish Sanctuary; and
- Upstream management area.

#### *8.1.8.3 Drainage systems*

Due to the terrain of the surrounding area as well as the presence of illegal miners at the time of the site visit, no physical survey of the drainage lines could be undertaken at the headwaters of the drainage lines. However, the lower reaches of the drainage lines could be accessed. Information in this section is supported by a previous study undertaken at Black Chrome Mine by Red Kite (2017).

A site survey was conducted on the 18th of April 2019, during which all watercourses identified on site were mapped using GPS coordinates (refer to Figure 8-26). Most of the watercourses located on the study site are drainage channels which only flow for a short period during and after rain events (refer to Figure 8-26below). These “A” watercourse sections are the least sensitive watercourses in terms of impacts on water yield from the catchment.

A watercourse is defined by the NWA as:

- River or spring.
- A Natural channel in which water flows regularly, or intermittently.
- A Wetland, lake or dam into which, or from which water flows.
- Any collection of water that the Minister may, by notice in the Gazette, declare to be a water course, and a reference to a watercourse includes where relevant, its bed and banks.

Based on the above definition, smaller drainage lines such as discontinuous V-shaped topographical features were subsequently identified on the detailed survey map and all of these are classified as “streams”.

River channels may be classified according to guidelines by DWS in "A practical field procedure for identification and delineation of wetlands and riparian areas". Three sections along the length of a watercourse are defined, with the upper Section “A” defined as being above the zone of saturation and it therefore does not carry baseflow. They are mostly too steep to be associated with alluvial deposits and are not flooded with sufficient frequency to support riparian habitat or wetlands. This type does however carry storm runoff during rainfall events, but the flow is of short duration, in the absence of baseflow. The “A” watercourse sections are the least sensitive watercourses in terms of impacts on water yield from the catchment.

Most of the watercourses identified on site were ephemeral in nature and as such no significant difference between the surrounding vegetation and the vegetation in the riparian areas were found other than vegetation being denser in the riparian areas as expected from A Section streams.

The drainage lines form shallow channels in some areas where they bisect rocky areas, although in the lower lying areas they often divert into deeper ravines with well-defined banks. The channels have sandy riverbeds with some small pebbles and rocks along its bottom in the upper reaches with the channels becoming rockier toward the lower slopes. No herbaceous vegetation grows in the deeper ravines other than woody riparian species. Typical woody species of the riparian include *Lydenburgia cassinoides*, *Hippobromus pauciflorus*, *Mimusops zeyheri* and *Rhoicissus sekhukhuniensis.*

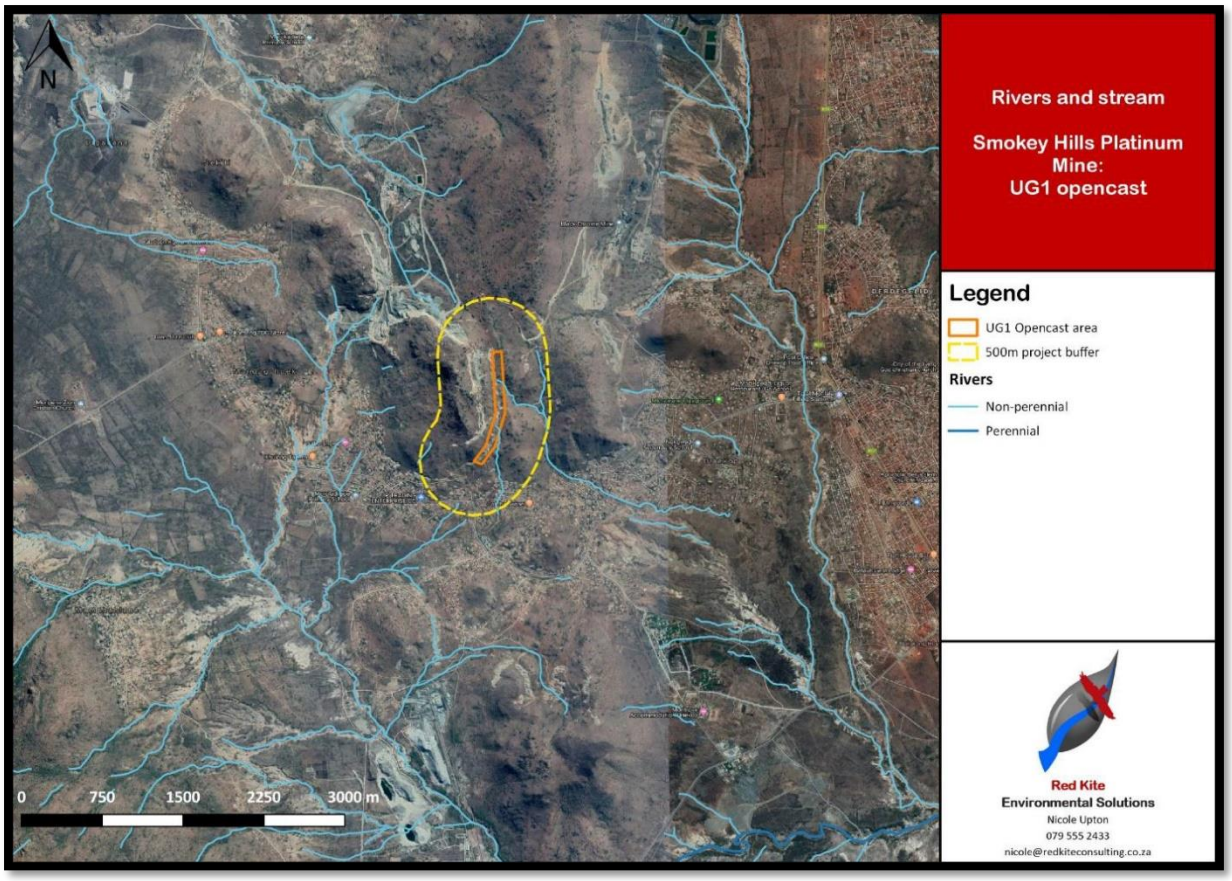


**Figure 8-26: Watercourses surrounding the project area**

### 8.1.9 Wetlands

There are no wetlands on the study area which was confirmed by the site survey, 1:50,000 ortho-maps as well as the NFEPA database. However, each stream, including the riparian zone (approximately 100 m from the centre of the stream) must be considered as a sensitive aquatic environment as seepage and drainage areas in close proximity to these seasonal streams qualify as hydromorphic grasslands. The surface water sensitivity map is indicated in Figure 8-27.

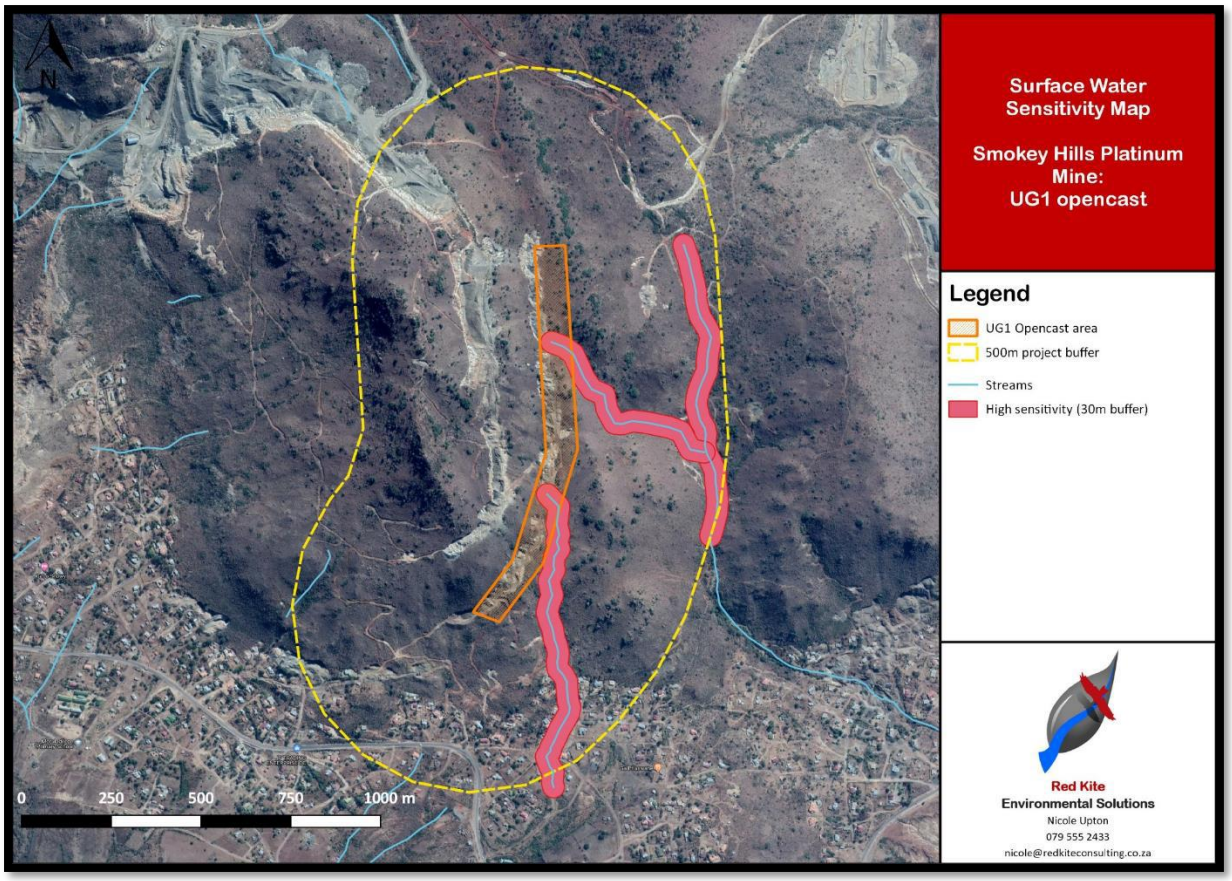


**Figure 8-27: Surface water sensitivity map**

### 8.1.10 Groundwater

An updated Groundwater assessment was conducted for the proposed UG1 project and was concluded in July 2019 by Mr. A. van Heerden from Geo Pollution Technologies. The previous groundwater study was conducted in 2017 by Exigo. This report contains baseline information from both the 2017 and 2019 report for groundwater and geohydrology of the UG1 project.

#### *8.1.10.1 Aquifer types*

The DWS 1:500 000 hydrogeological map series of South Africa provides spatial description of the types of aquifers found across South Africa. According to the hydrogeological map of the area, the type of aquifers that occur at the Smokey Hills site are predominantly fractured rock aquifers.

The aquifers and main hydrogeologic units that were defined for the Smokey Hills mine site are indicated in Table 8-10.

**Table 8-10: Aquifers and hydrological zones found at the SHPM**

| No | Aquifer | Typical thickness | Aquifer type |
|---|---|---|---|
| 1 | Shallow alluvial aquifer | <5m | Porous |
| 2 | Weathered and fractured norite aquifer | 5-10m | Intergranular and fractured |
| 3 | Dyke contact aureole aquifer | 20-50m | Fractured rock |
| 4 | Fresh norite aquitard (bedrock) | >100m | Aquitard (unfractured) |

#### *8.1.10.2 Aquifer Classification*

The aquifer classification was compiled in 2006 by SRK and was guided by the principles set out in the

South African Aquifer System Management Classification (1995) by R. Parsons as referenced by Mr van Heerden. The conditions of the aquifer system are unchanged from the original assessment and thus the classification is still valid. The assessment found the aquifer to be a sole source aquifer, moderately vulnerable and therefore must be considered as strictly non- degradation.

According to Parsons (1995) (as referenced by Mr van Heerden), aquifer classification is based on the aquifer characteristics and the non-technical and water-supply considerations. The classifications and definitions for each aquifer system are summarized in Table 8-11 below.

**Table 8-11: Definitions of Aquifer System Management Classes (After Parsons (1995)**

| | |
|---|---|
| **Sole source aquifer** | An aquifer which is used to supply 50% or more of domestic water for a given area, and for which there are no reasonable available alternative sources should the aquifer be impacted upon or depleted. Aquifer yields and natural water quality are immaterial. |
| **Major aquifer system** | Highly permeable formations, usually with a known probable presence of significant fracturing. They may be highly productive and able to support large abstractions for public supply and other purposes. Water quality is generally very good (less than 150 mS/m). |
| **Minor aquifer system** | These can be fractured or potentially fractured rocks, which do not have a high primary permeability, or other formations of variable permeability. Although these aquifers seldom produce large quantities of water, they are important both for local supplies and supplying base flow to rivers. |
| **Non aquifer system** | These are formations with negligible permeability that are generally regarded as not containing groundwater in exploitable quantities. Water quality may also be such that it renders the aquifer as unusable. However, groundwater flow through such rocks, although imperceptible, does take place, and needs to be considered when assessing the risk associated with persistent pollutants. |
| **Special aquifer system** | An aquifer designated as such by the Minister of Water Affairs, after due process has been followed. |

The aquifer system and the aquifer vulnerability are assigned a value as defined in Table 8-12 below. Through multiplying the aquifer system value by the vulnerability value, the Groundwater Quality Management (GQM) index is determined. Based on this value the level of protective action that must be upheld is recommended. The values shaded in blue indicate the rating of the aquifer.

**Table 8-12: Aquifer classification system**

| **Aquifer system** | | **Aquifer vulnerability** | |
|---|---|---|---|
| **Management qualification** | | **Classification** | |
| **Class** | **Points** | **Class** | **Points** |
| Sole source aquifer system | 6 | High | 3 |
| Major Aquifer System | 4 | Medium | 2 |
| Minor Aquifer System | 2 | Low | 1 |
| Special Aquifer system | 0-6 | | |
| **GQM INDEX** | | **Level of protection** | |
| <1 | | Limited Protection | |
| 1 to 3 | | Low level protection | |
| 3 to 6 | | Medium Level Protection | |
| 6 to 10 | | High Level Protection | |
| >10 | | Strictly Non-degradation | |

#### *8.1.10.3 Groundwater Monitoring Results*

Groundwater and surface water are being actively monitored at the Smokey Hills mine. Groundwater variables being monitored include hydraulic head changes at ten boreholes and groundwater quality changes at seven boreholes. The information below also indicates the results from previous hydrocensuses. Hydraulic heads and groundwater qualities were also measured at these boreholes where possible.

##### *8.1.10.3.1 Groundwater levels (Hydraulic heads)*

A total of 12 boreholes are being actively monitored and their hydraulic heads available from 24 June 2016 to 20 September 2016). The shallowest (minimum) hydraulic head measured is 3.17 metres below collar height (mbch), the deepest (maximum) is at 21.35 mbch and the mean hydraulic head at 8.4 mbch. There is in general, a lack of hydraulic head information to the south of the site, in the location of the processing plant and change houses.

Table 8-13 provides information of the hydraulic heads being monitored at the mine. The graph in Figure 8-28 describes the groundwater level change over time. The map shows the location of the boreholes and also provides with colour, an indication of the current status of groundwater monitoring boreholes. The mine was already in Care and Maintenance when water level measurements were taken.

**Table 8-13: Hydraulic head monitoring results summary for Smokey Hills**

| | Hydraulic heads or groundwater levels (mbch) | | | |
|---|---|---|---|---|
| **Date measured:** | **24-Jun-2016** | **26-Jul-2016** | **22-Aug-2016** | **20-Sep-2016** |
| BH2 | 2.96 | 3.29 | 3.64 | |
| BH3S | 2.33 | 2.95 | 3.22 | 3.51 |
| BH3D | | 2.59 | 2.89 | 3.17 |
| BH4S | | 6.48 | 6.88 | 7.27 |
| BH4D | 5.61 | 5.97 | 6.39 | 6.76 |
| BH5S | | 5.43 | 5.84 | 6.21 |
| BH5D | 4.94 | 5.53 | 5.90 | 6.30 |
| SH02 | | 20.39 | 21.05 | 21.35 |
| SH03 | | 15.30 | 15.45 | 15.58 |
| SH04 | | 5.41 | 5.54 | 5.49 |
| Minimum | 2.3 | 2.6 | 2.9 | 3.2 |
| Maximum | 5.6 | 20.4 | 21.1 | 21.4 |
| Mean | 4.0 | 7.3 | 7.7 | 8.4 |

##### *8.1.10.3.2 Groundwater quality results*

At the time that the groundwater assessment was undertaken (latter half of 2016), groundwater quality was actively monitored on a monthly basis at 7 boreholes from April 2014 to September 2016. Table 8-14 and Figure 8-28 summarizes the latest water quality results per borehole.

In general, the groundwater qualities at the Smokey Hills site are good when compared to the South African National Standards (SANS) 241 with rare exceedances over time. One element and especially one of its compounds is however of concern when using the SANS 241 standards and that element is nitrogen (N) from its compound $NO_3$.

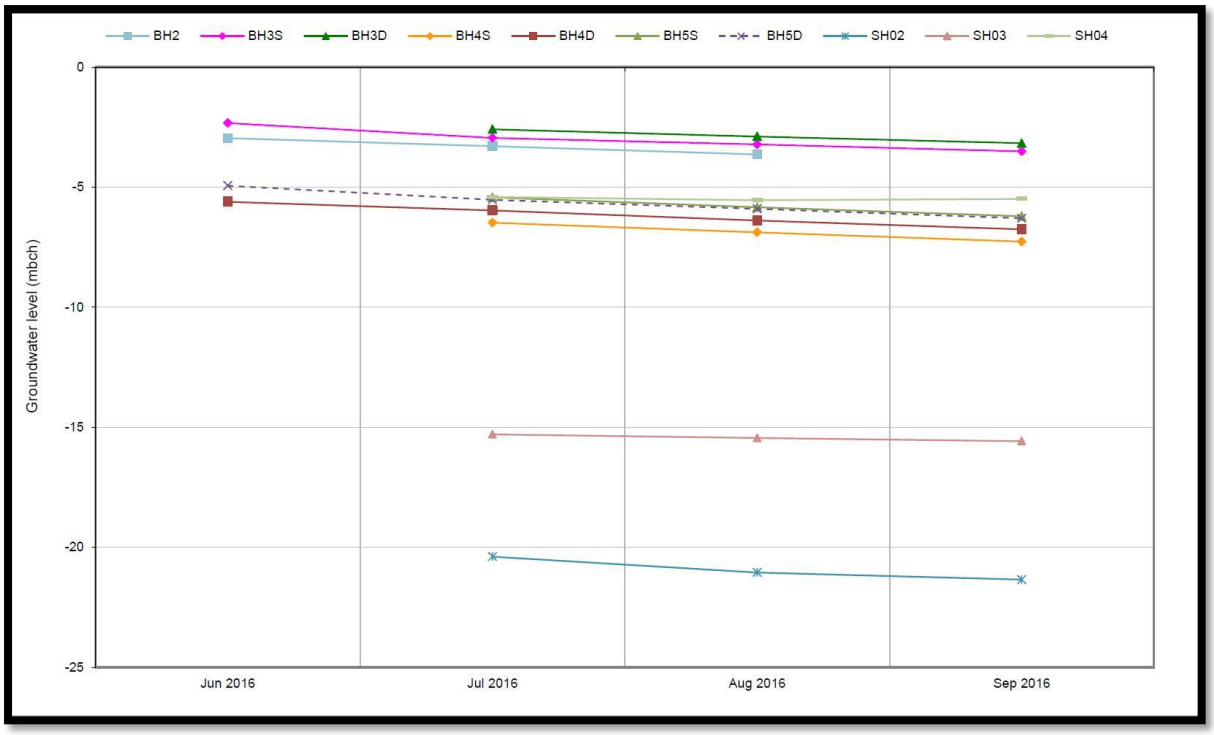


**Figure 8-28: Hydraulic heads monitored over the winter period at Smokey Hills mine**

**Table 8-14: Table showing latest groundwater quality analysis results for Smokey Hills mine**

| Borehole Number | $HCO_3$ | Ca | Cl | F | Mg | K | Na | $SO_4$ | $NO_3$- N | $NH_4$- N | $CO_3$ | pH | EC | TDS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mg/ℓ | mg/ℓ | mg/ℓ | mg/ℓ | mg/ℓ | mg/ℓ | mg/ℓ | mg/ℓ | mg/ℓ | mg/ℓ | mg/ℓ | [ ] | mS/m | mg/ℓ |
| BH3D | 428 | 89 | 58 | <0.263 | 91 | 0.2 | 27 | 79 | 7.5 | 0.143 | 1.5 | 7.6 | 113 | 754 |
| BH5S | 402 | 31 | 39 | <0.263 | 74 | 5.4 | 26 | <0.141 | 1.36 | 0.853 | 5.1 | 8.1 | 74 | 406 |
| H12-1790 | 378 | 96 | 47 | <0.263 | 75 | 0.1 | 21 | 88 | 9.4 | 0.121 | 5.3 | 8.2 | 106 | 696 |
| H12-2361 | 487 | 108 | 27 | 0.333 | 68 | 0.1 | 20 | 58 | 7.8 | 0.022 | 2.8 | 7.8 | 96 | 610 |
| SH02 | 186 | 135 | 23 | <0.263 | 64 | 0.5 | 22 | 91 | 79 | 1.010 | 0.5 | 7.5 | 135 | 930 |
| SH03 | 202 | 131 | 24 | <0.263 | 63 | 1.0 | 25 | 89 | 71 | 0.960 | 0.8 | 7.6 | 130 | 1008 |
| SH04 | 367 | 102 | 7.9 | <0.263 | 71 | 0.2 | 18 | 25 | 36 | 0.147 | 0.8 | 7.4 | 100 | 664 |
| SANS 241 (2015)* | N/A | N/A | ≤ 300 | ≤1.5 | N/A | N/A | ≤ 200 | ≤ 500 | ≤ 0. 9 | N/A | N/A | ≥ 5; ≤ 9. 7 | ≤ 170 | ≤1200 |
| IWUL Limits | N/A | 46.35 | 61.49 | 0.13 | 74.44 | N/A | 38.17 | 28.17 | | N/A | N/A | 9.11 | 102.52 | N/A |

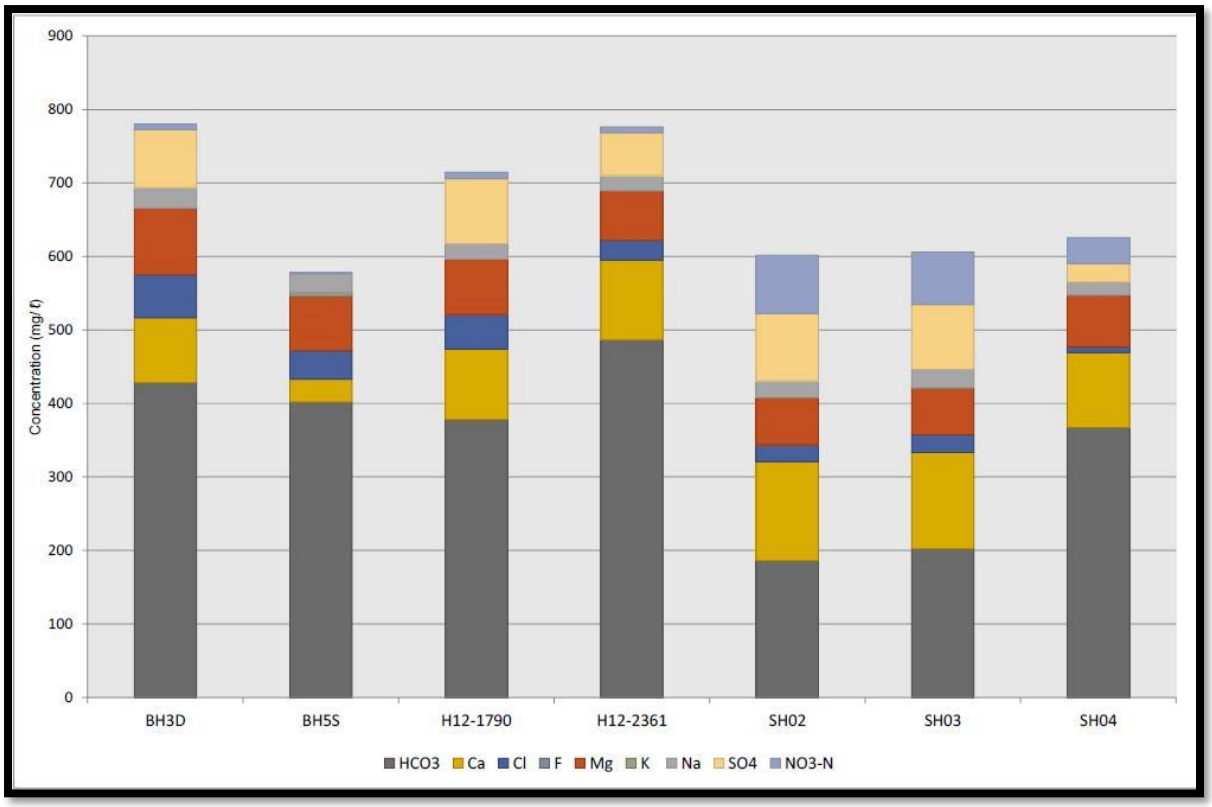


**Figure 8-29: Composite bar chart of groundwater quality results from monitoring on 20 September 2016**

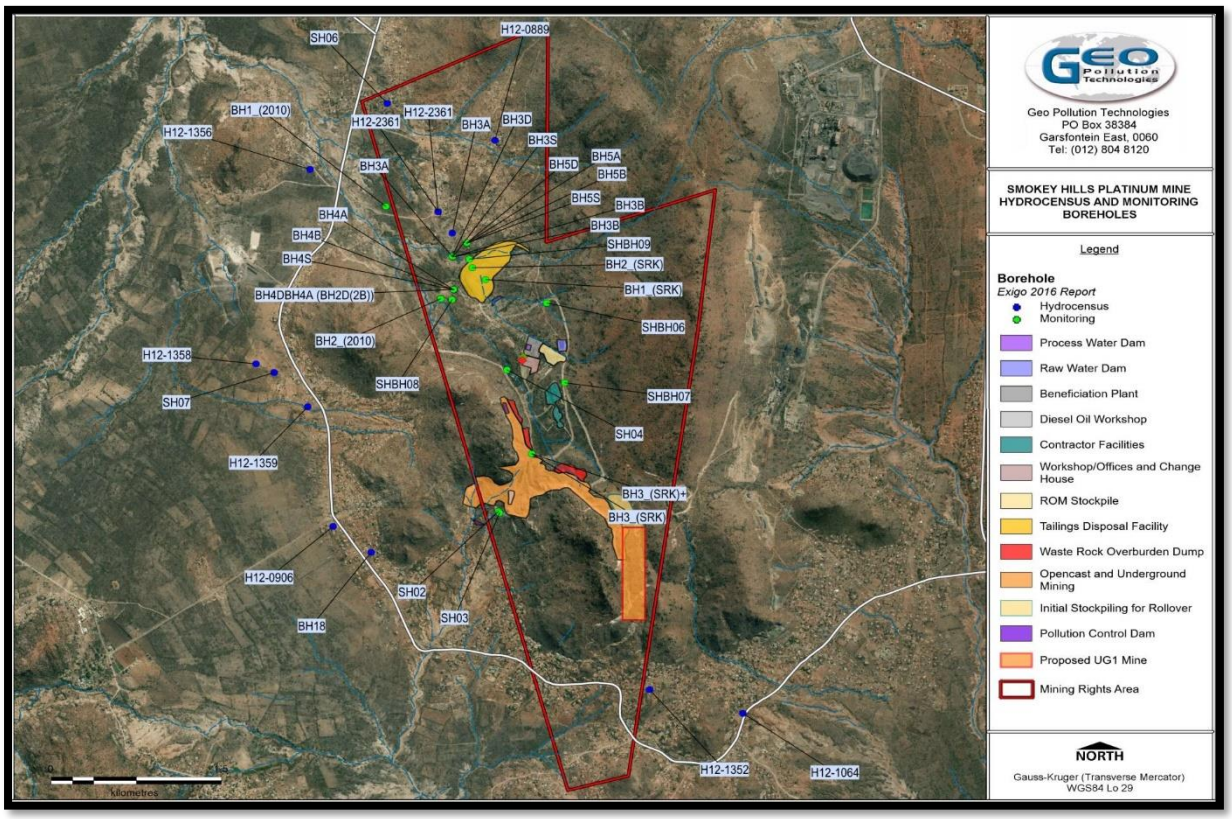


**Figure 8-30: Location of all the boreholes indicating the monitoring and hydrocencus boreholes**

### 8.1.11 Heritage Resources

A Phase 1 Archaeological Impact Assessment was conducted by Mr. A.J Pelser from Apesler Archaeological Consulting in May 2019. The history and archaeology of the larger Sekhukhune region around Steelpoort is primarily well known for the occurrence of Stone Age and Iron Age farmer occurrences. As noted in the initial HIA report for Maandagshoek (Roodt, 2006 as referenced by Mr Pelser) the area is rich in archaeological sites, dating from the Early Iron Age (800AD) to the Pedi occupation of the area. This is most probably due to the safety the valley offered from outside attacks, but also as a result of the deep and rich sedimentary soils of the low-lying area. It is also of historical importance due to the activities of the Berlin Missionary Society who entered the area in the time of Chief Sekwati.

No sites of heritage potential were noted in the respective proposed project footprints. The absence of heritage sites in these areas might be attributed to the fact that the surroundings at the Smokey Hills mine have been transformed in places by mining and prospecting and mining at the site occurs on steep slopes which would probably be unsuitable for prolonged human settlement.

- The Stone Age: In this area, Stone Age material generally occurs along drainage lines and exposed surfaces in dongas in the landscape. During the original site survey, no Stone Age material was documented along the proposed Smokey Hills Project footprint areas.
- The Iron Age Farmer Period: A frontier zone between the north and the south, the Steelpoort landscape is rich in precolonial Iron Age Farmer Period remnants. However, the original site inspection produced no Iron Age farmer sites, probably since sites of past human occupation generally occur in valley bottoms and flatter parcels of land near sources of water.
- Historical / Colonial Period: European and local farming communities settled in the Steelpoort during the Colonial Period in the last century. However, no Historical / Colonial Period occurrences were observed previously.
- Graves: No graves or human burials were noted in the proposed Project footprint areas. It should be noted that, in the rural areas of the Limpopo Province graves and cemeteries often occur within settlements or around homesteads but they are also randomly scattered around archaeological and historical settlements. The probability of human burials encountered during development should thus not be excluded. In addition, human remains and burials are commonly found close to archaeological sites; they may be found in "lost" graveyards, or occur sporadically anywhere as a result of prehistoric activity, victims of conflict or crime. It is often difficult to detect the presence of archaeological human remains on the landscape as these burials, in most cases, are not marked at the surface.

### 8.1.12 Noise

A noise study was conducted by Enviro Acoustic Research cc in April 2019. The following is the baseline noise information for the area and the findings from the noise study.

Ambient sound levels were measured at five (5) localities using two class-1 Sound Level Meters (SLM). The measurement locations were numbered SHLM01 and SHLM02 (long-term measurements over 6 days each) and SHSM01 - SHSM03 (short-term measurements). The long-term measurement locations were selected to represent a quiet environment, which may not be typical of the larger area. The short-term measurements were collected within the community and may be more representative of typical daytime ambient sound levels.

SHLM01 - Measurement representing sound levels in the Mine Area with no mining activities taking place:

- Considering the average $L_{Aeq}$ daytime data, sound levels are typical of a rural noise district (average daytime levels of 40 dBA);

- Considering the average $L_{Aeq}$ night-time data, sound levels are slightly higher than typical of a rural noise district (average night-time levels of 38 dBA) but less than a typical sub-urban noise district;
- Spectral data indicated that natural noises (faunal) were significant and likely the dominant ambient sound level.

SHLM02 – Measurement representing sound levels in the Maandagshoek and Driekop Communities:

- Considering the average $L_{Aeq}$ daytime data, sound levels are typical of a rural noise district (average daytime levels of 42 dBA);
- Considering the average $L_{Aeq}$ night-time data, sound levels are slightly higher than typical of a rural noise district (average night-time levels of 38 dBA) but less than a typical sub-urban noise district;
- Spectral data indicated that natural noises (faunal) were significant and likely the dominant ambient sound level at night.

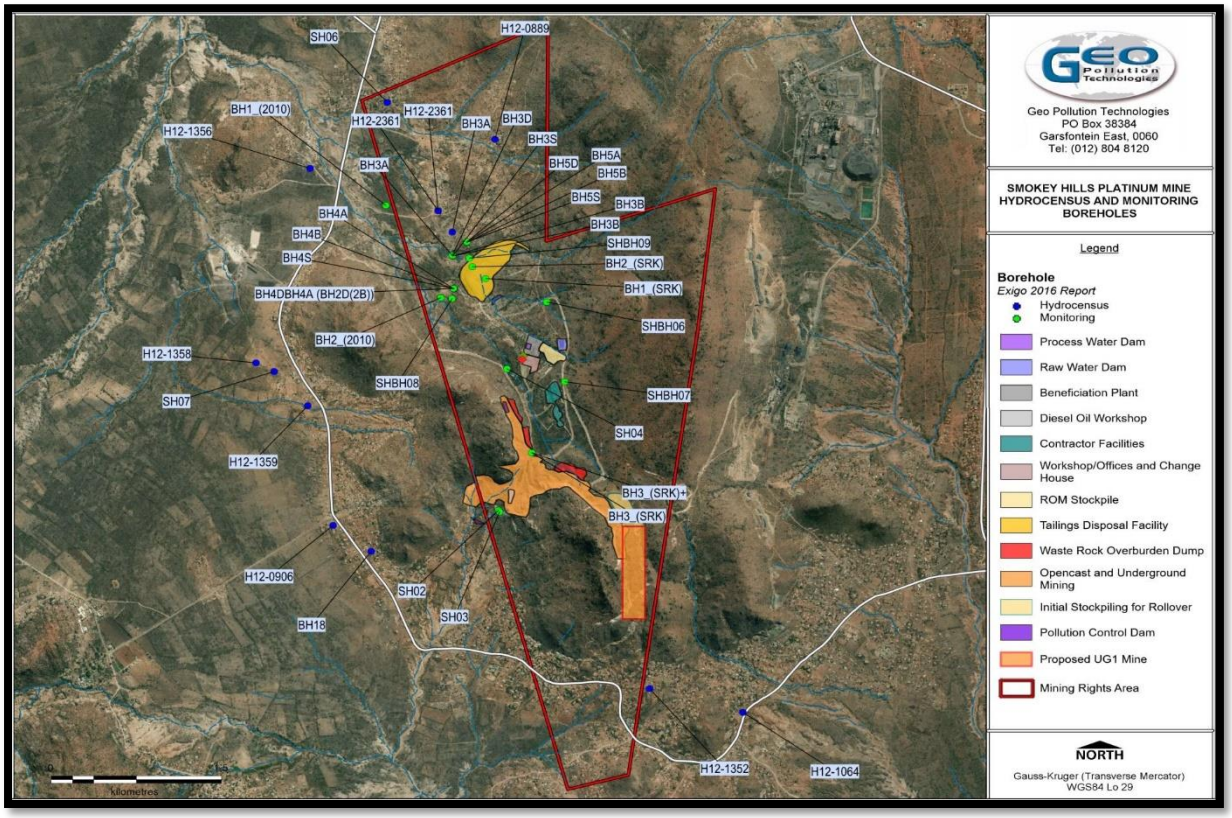


**Figure 8-31: Ambient sound level measurement locations**

Short-term sound level measurements during the day indicated elevated sound levels, typical of a suburban noise district with an average sound level of 51.8 dBA. Considering the results of the measurements, this report will use the following sound levels as the typical “background” sound level;

- 40 dBA for daytime sound levels, and
- 38 dBA for night-time sound levels.

Ideally, the activities of the proposed mining activity should not change the ambient sound levels with more than 7 dBA. This would set the acceptable rating level at less than 47 dBA for daytime noise levels and 45 dBA for night-time noise levels.

#### *8.1.12.1 Sensitive receptors*

Residential areas and potential noise-sensitive developments/receptors/communities were identified using tools such as Google Earth® with the areas up to a distance of up to 1 000 m (recommendation SANS 10328:2003) from development footprint.

Three communities, namely the Maandagshoek, Maapea and Driekop communities are present around the project footprint (see **Error! Reference source not found.**). A number of the closest dwellings were s elected to represent the potential noise levels within the communities due to the activities of the mine.

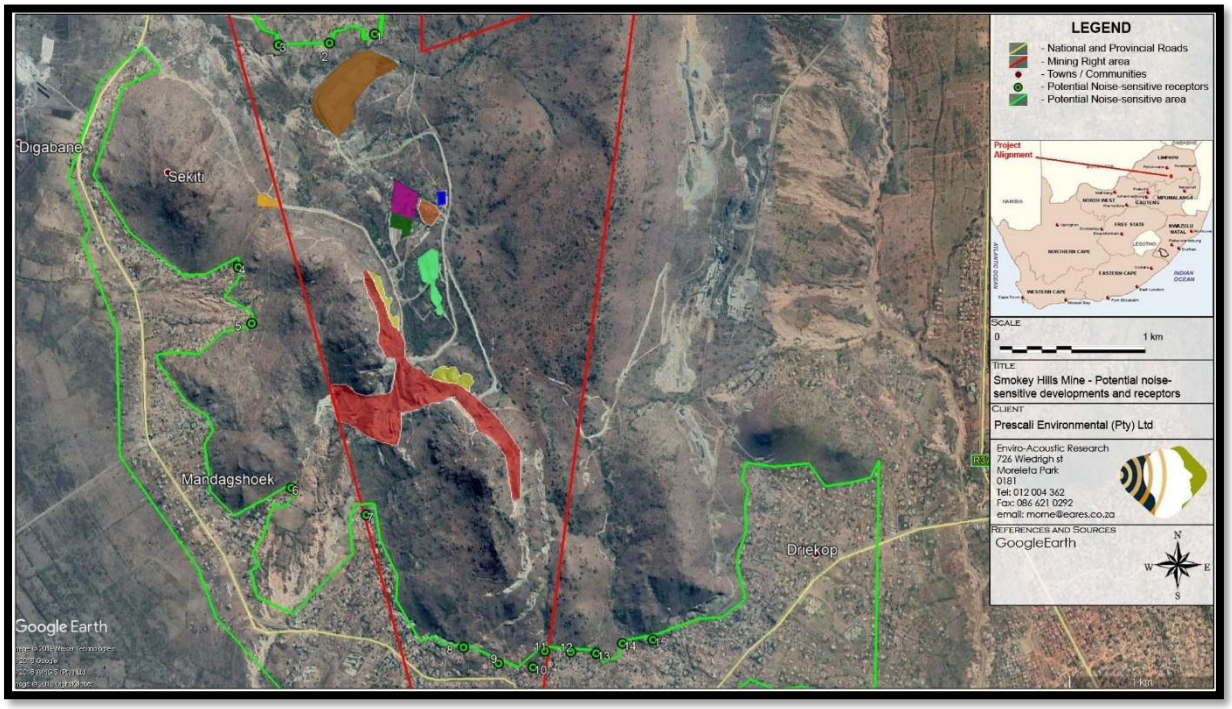


**Figure 8-32: Study area and potential noise-sensitive receptors close to mine**

### 8.1.13 Socio economic aspect

The community adjacent to the proposed Phokathaba Mining Project is Maandagshoek and surround farm homesteads situated around the project site, within Fetakgomo-Greater Tubatse Local Municipality in Sekhukhune District Municipality. According to the 2011 census data area covers an area of approximately 3.73 km$^2$ and all has a population of approximately 1,698 residents comprised by 390 households. The prominent languages are Sepedi.

The Sekhukhune District Municipality economy is a strange mixture of overwhelmingly negative features. It has the high unemployment and poverty rates and extensive positive opportunities – including abundance of mining and agricultural potential within the area. The major economic drivers in the municipality are mining and agriculture. It would therefore suffice to say that mining (both large and small scale) and agriculture has a huge potential for the immediate future.

The low level of education will have serious implications for the potential of local people to gain employment. This is worsened by the general shortage of skills in the local community, compounded by the lack of training opportunities in areas of science, computer literacy, technical and technological expertise. With the potential employment opportunities from Phokathaba Mining Project, there will be

few qualified persons available to fulfil the job specifications.

The level of infrastructure in the affected community – in Maandagshoek and surrounding farm home steads - is very low. Commercial infrastructure is sparse. Except for the paved streets, tower and the Eskom powerline, there are only few shops. Access through the affected settlement and farm homesteads is by gravel or small dirt roads, tarred road and paved road. Transport is mainly by Taxi, Bus and privately-owned vehicles. There is electricity power which is mainly used for lighting in most households and other uses such as heating and cooking.

According to the Social Scoping Report drafted by Kruger (2016) SHPM is situated along rugged hills within a number of rural settlements in the Steelpoort Valley. The villages of Gamagabane, Mahlokwane, Mampahlane, Sehlako and Mpuru border the mine to the north, west and south. The terrain consists predominantly of mountainous areas with flatter parcels of developable land on the plateaus, terraces and areas adjacent to the rivers. The proposed opencast mining footprints are situated in areas that have been altered extensively as a result of earlier opencast mining, prospecting and the establishment of mine roads. The areas at the base of the Hill 2 and Hill 3 are densely populated and most of the valley area is under cultivation. Generally, human impact has resulted to the degradation of the environment as a result of over-exploitation and overgrazing. This manifests in large-scale surface soil loss both as donga and sheet erosion which is prevalent throughout the region.

The proposed site falls within the Fetakgomo-Greater Tubatse Local Municipality (FGTLM) area which forms part of the Sekhukhune District Municipality.

FGTLM has a council that consists of a total of 77 councillors. Of these, 39 are ward councillors while 38 were proportionally elected. The Executive Committee of the municipality is led the Mayor while the Municipal Speaker presides over the Council in terms of Section 49 and 37 of the Local Government: Municipal Structures Act, 1998 (Act No 117 of 1998) respectively.

This large municipality comprises of 39 wards and 297 villages. The municipality is largely dominated by rural landscape with only 06 (six) proclaimed townships.

The area of jurisdiction of FGTLM is approximately 4 550 km$^2$ (2016/17 Draft Consolidated IDP for Fetakgomo Greater Tubatse Municipality). The FGTLM the northern part has inferior social and engineering infrastructure which impacts on the stability of the economy in this area. This may be attributed to the rural nature of the area. As such, upliftment in the area is of critical importance. There is also virtually no economic base in the northern part of the area and the area is solely dependent on government handouts and migrant labour income for survival.

#### *8.1.13.1 Population Profile*

According to the 2011 STASA information, the total population of the former FGTLM combined is approximately 429 471 with 106 050 households. In 2016 a community survey was undertaken for FGTLM, making it the most highly populated municipality within the Sekhukhune district. It also appears from in the current 2016 Community Survey as compared to the 2011 STASA results that the Fetakgomo Tubatse Local Municipality there has been a population of 490 381 with household increase of 125 454. As per the current community survey 2016 the former Greater Tubatse local Municipality increased with 0.037% and the former Fetakgomo local municipality increase slightly with 0.007. The total percentages of FGTLM as combined increased with 0.043% which put the municipality as the highest in the District.

The population in the district per genders is shown below in Table 8-15.

**Table 8-15: Sekhukhune District Population group by gender (FGTLM IDP, 2016/17)**

| 2011 STATSA | | | 2016 Community Survey | | | |
|---|---|---|---|---|---|---|
| Male | Female | Total | Male | Female | Total | Growth Rate |
| 497648 | 579191 | 1076840 | 548463 | 621299 | 1169762 | 0.019 |

### *8.1.13.2 Language*

The languages that are spoken within the GTLM include Sepedi (94%) and isiZulu (1.2%). Other languages make up the remaining 4.8% (StatsSA, 2011). Table 8-16 below provides more detail the languages spoken by the people of GTLM.

**Table 8-16: Languages Spoken**

| **Afrikaans** | **English** | **IsiXhosa** | **IsiZulu** | **Sepedi** |
|---|---|---|---|---|
| 0.5% | 0.5% | 0.3% | 1.2% | 94% |
| **Sesotho** | **SiSwati** | **Xitsonga** | **Tshivenda** | **Others** |
| 0.1% | 0.4% | 0.6% | 0.1 | 0.4 |

### *8.1.13.3 Gender & Age Distribution*

Table 8-17 shows that the total population is dominated by young people below 18. The age categories below the age of 18 comprise 51% of the population. The ratio for females is almost equal at ages between 0-17 years and then this makes a change. Male-female distribution is then dominated by females for example, from ages 19-65 years.

**Table 8-17: Gender and age distribution within former GTLM (GTLM IDP, 2017/18 as referenced by Kruger)**

| Age | Male | Female | Grand Total |
|---|---|---|---|
| 0-4 | 22 878 | 21 999 | 44 877 |
| 5-9 | 20 271 | 22 517 | 42 788 |
| 10-14 | 22 440 | 23 354 | 45 794 |
| 15-19 | 19 349 | 19 811 | 39 160 |
| 20-24 | 15 907 | 19 112 | 35 019 |
| 25-29 | 13 245 | 14 505 | 27 750 |
| 30-34 | 10 667 | 11 582 | 22 249 |
| 35-39 | 7324 | 8828 | 16 152 |
| 40-44 | 6076 | 9519 | 15 595 |
| 45-49 | 4952 | 7109 | 12 061 |
| 50-54 | 4180 | 6448 | 10 628 |
| 55-59 | 3241 | 3993 | 7234 |
| 60-64 | 2552 | 4075 | 6627 |
| 65-69 | 2256 | 3015 | 5271 |
| 70-74 | 1484 | 3086 | 4570 |
| 75-79 | 1124 | 2618 | 3742 |
| 80-84 | 362 | 1322 | 1684 |
| 85+ | 335 | 1911 | 2266 |
| Grand Total | 158 663 | 184 804 | 335 676 |

### *8.1.13.4 Education Levels*

Education levels in the Limpopo Province lag behind those of other provinces of South Africa. While average literacy levels for South Africa were 82.2%, literacy levels for Limpopo were 73.6% in 1991.

The Greater Tubatse Local Municipality has 163 primary schools, 92 secondary schools and 8 private schools with a total of 114 723 learners and 3 689 educators. Burgersfort, Ohrigstad and Steelpoort each have a primary school and Burgersfort has additional private primary and secondary schools. Two state of the art schools have been developed by the Department of Education Limpopo, i.e. Nthame Primary School at Riba and Batubatse primary school in Prakitiseer.

In rural areas, an abundance of Primary Schools tends to be common as many pupils leave school early in search of Employment in order to support their families. Those that can afford to continue to secondary school do so within the area or in more developed towns outside the municipality (GTLM IDP, 2016/17). 22.6% of people above the age of 20 have completed matric (grade 12); while 6.6% have higher education (STATSSA, 2011). Figure 8-33 shows education levels in Greater Tubatse Local Municipality.

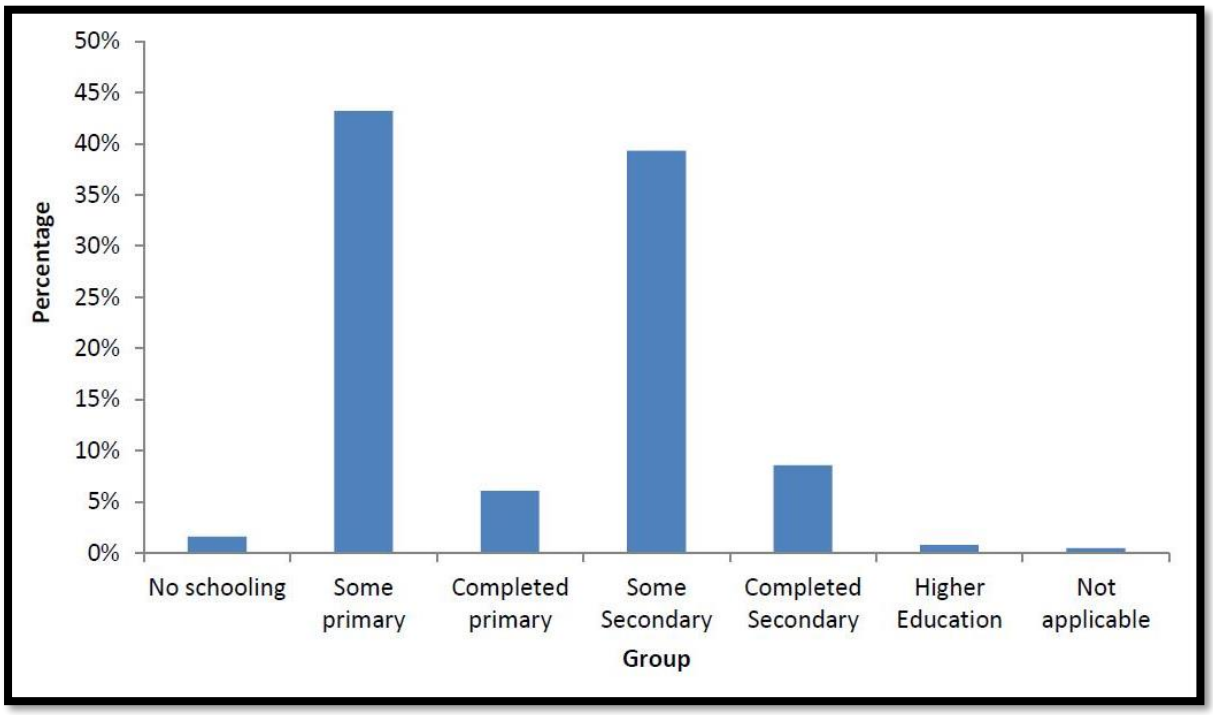


**Figure 8-33: Education levels in Greater Tubatse Local Municipality (StatsSA, 2011 as referenced by Kruger)**

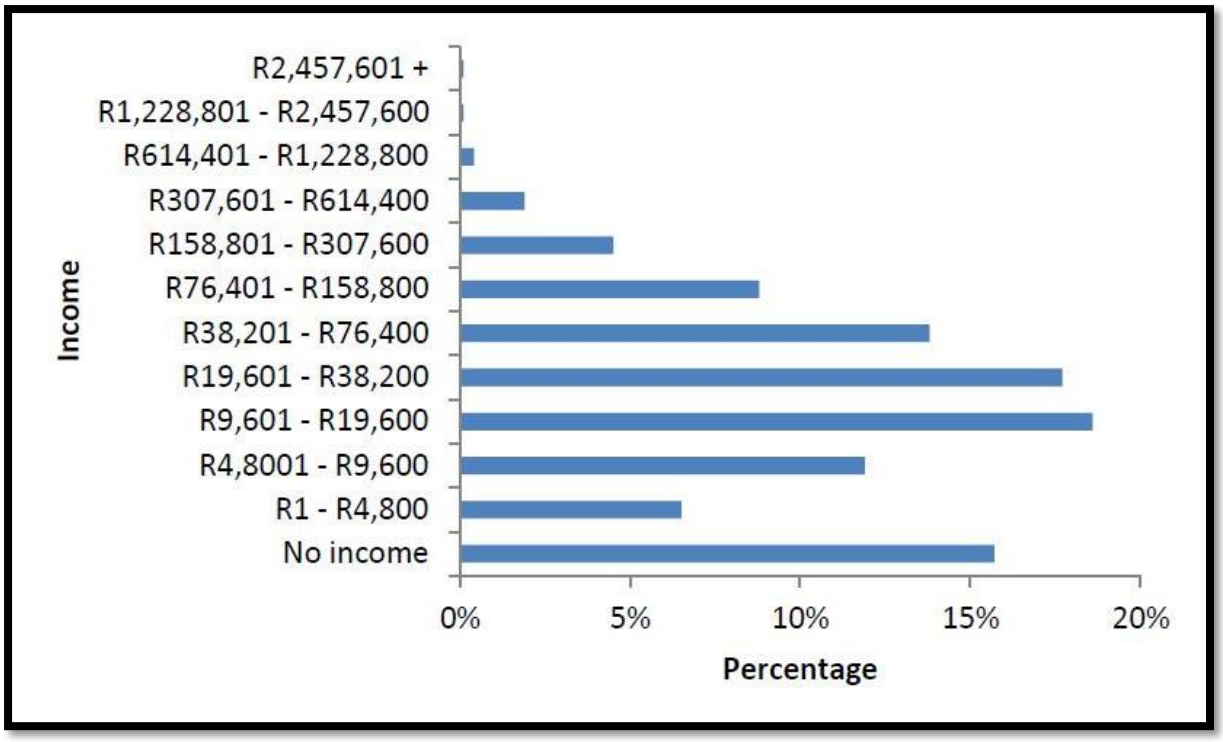


**Figure 8-34: Average household income in GTLM (StatsSA, 2011 as referenced by Kruger)**

### *8.1.13.5 Employment Status*

The Former Greater Tubatse Local Municipality has a youth unemployment rate of 59.6%. In 2009, The Greater Tubatse Local Municipality had the highest rate of unemployment at 28 022 and in 2015 it still had the highest with 22 264 people unemployed (LED, 2015). Figure 8-35 illustrates the Employment status of the people of GTLM.

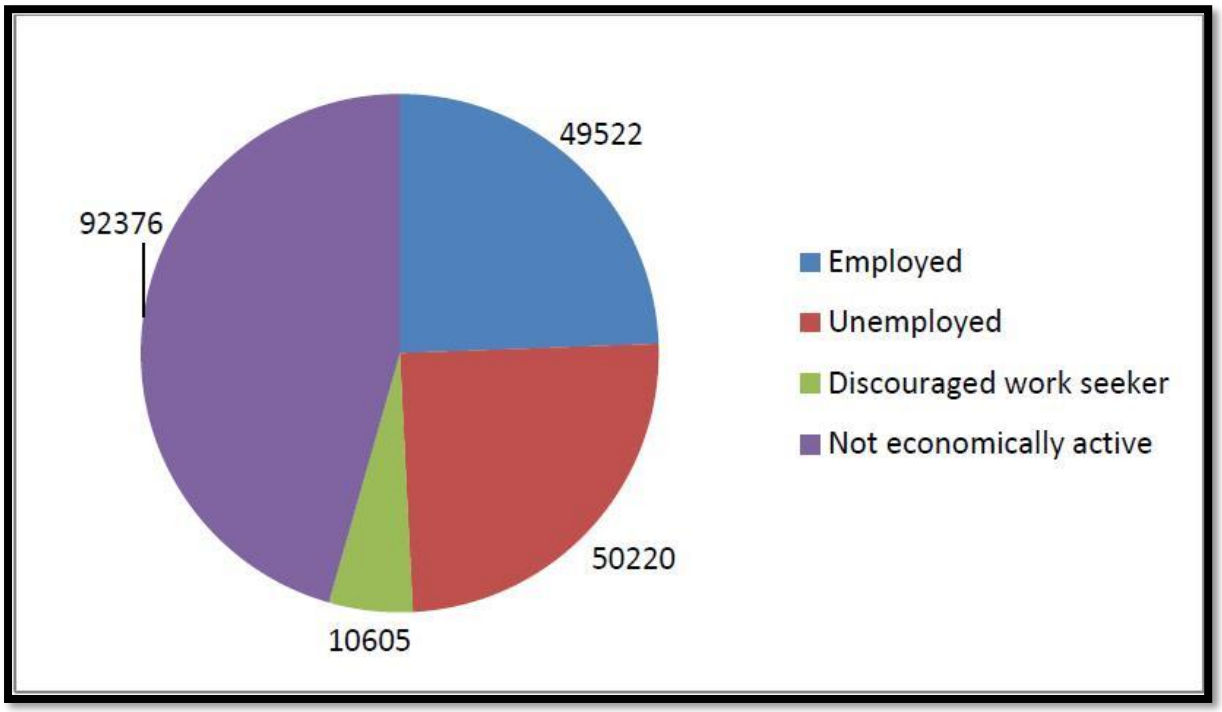

**Figure 8-35: Employment status of people aged 15-64 in GTLM (StatsSA, 2011as referenced by Kruger)**

#### *8.1.13.6 Infrastructure and Services*

Owing to FGTLM's rural nature, the municipality is plagued by challenges of poor or backlogged service delivery. The provision and maintenance of services become costly because most of the settlements are situated far apart. Some areas are also not large enough to achieve the economic threshold required to make social facilities available in a manner that is economically viable (FGTLM IDP, 2017/18 as referenced by Kruger). The majority of infrastructural projects within FGTLM are Expanded Public Works Programme related projects. Such projects aid in the generation of Employment opportunities and the assurance of the improvement of the socio- economic conditions within the area. 800 jobs were created in the 2018/2019 financial year through the construction of the small access bridges and other related projects.

## 8.2 Description of the current land uses

The current land-use of the proposed development is mining, with the neighbouring areas being used for grazing by livestock as well as small scale subsistence crop cultivation. The major land use of the study area as classified by the Environmental Potential Atlas of South Africa (2000) is vacant / unspecified land. The site has very limited agricultural potential and no potential for dryland crop production of grains. The terrain is rocky and has steep slopes. During the site visit, cattle busy grazing was observed. The site is suitable for cattle grazing but caution must be taken to ensure that overgrazing does not compromise the vegetation quality and lead to bare surfaces that will result in soil erosion. (Soil Report: (TerraAfrica., 2019)).

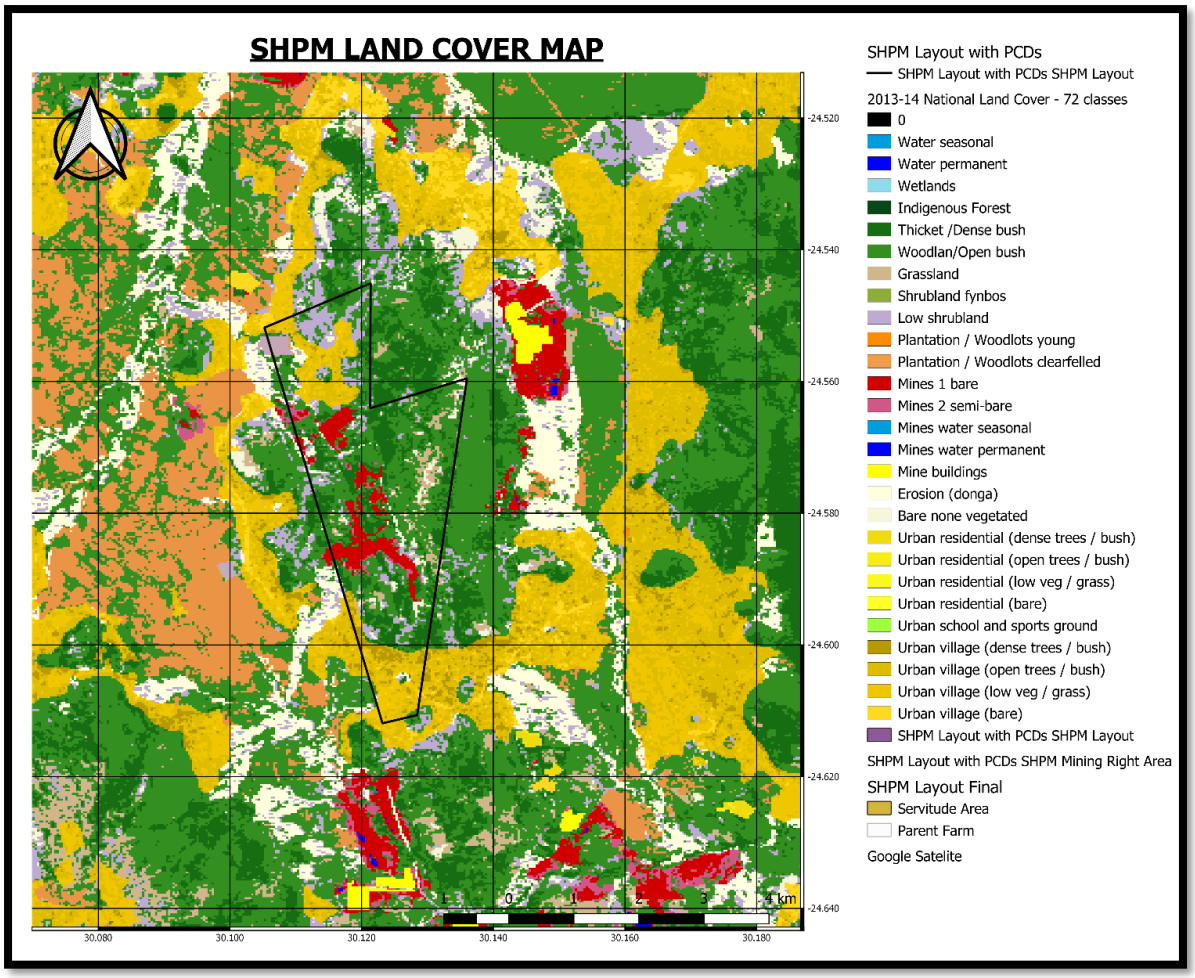


**Figure 8-36: Surrounding land uses**

## 8.3 Description of specific environmental features and infrastructure on the site

In terms of the Department of Environmental Affairs and Tourism (DEAT) guidelines for Integrated Environmental Management (IEM), sensitive landscapes are a broad term applying to:

- Nature conservation or ecologically sensitive areas – indigenous plant communities (particularly rare communities or forests), wetlands, rivers, river banks, lakes, islands, lagoon, estuaries, reefs, inter-tidal zones, beaches and habitats of rare animal species; Refer to Figure 8-37 and Figure 8 27. In addition, the UG1 area is located in an area classified as Ecological Support Area 1.
- Unstable physical environments, such as unstable soil and geo-technically unstable areas; Important nature reserves – river systems, groundwater systems, high potential agricultural land; Sites of special scientific interest; refer to Section 8.1.5.3 and Section 8.1.10.2.
- Sites of social significance or interest – including sites of archaeological, historic, cultural spiritual or religious importance and burial sites. refer to **Error! Reference source not found.** a nd Section 8.1.11and
- Green belts or public open space in municipal areas, refer to Figure 8-36.

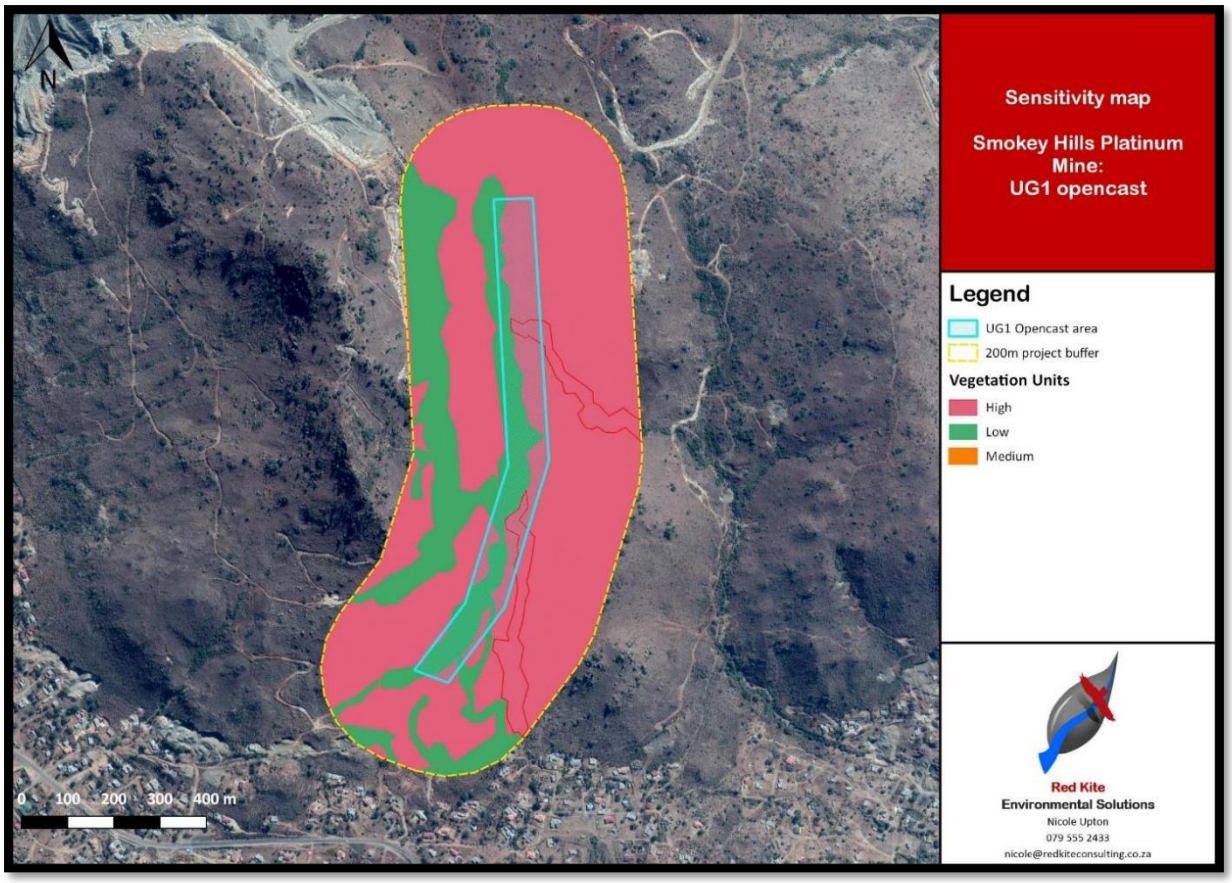


**Figure 8-37: UG1 Ecological Sensitivity Map (Fauna and Flora Assessment Report, 2019)**

# 9 IMPACTS AND RISKS IDENTIFIED INCLUDING THE NATURE, SIGNIFICANCE, CONSEQUENCE, EXTENT, DURATION AND PROBABILITY OF IMPACTS, INCLUDING THE DEGREE TO WHICH THESE IMPACTS ARE MANAGED

(Provide a list of the potential impacts identified of the activities described in the initial site layout that will be undertaken, as informed by both the typical known impacts of such activities, and as informed by the consultations with affected parties together with the significance, probability and duration of the impacts. Please indicate the extent to which they can be reversed, the extent to which they may cause irreplaceable loss of resources, and can be avoided, managed or mitigated.)

The identified impacts are described in detail in Section 10.3. The effect that the proposed mitigation measures may have been assessed and the results are provided in Section 11.

## 9.1 METHODOLOGY USED IN DETERMINING AND RANKING THE NATURE, SIGNIFICANCE, CONSEQUENCES, EXTENT, DURATION AND PROBABILITY OF POTENTIAL ENVIRONMENTAL IMPACTS AND RISKS

(Describe how the significance, probability, and duration of the aforesaid identified impacts that were identified through the consultation process was determined in order to decide the extent to which the initial site layout needs revision).

Refer to the EIA methodology as given below.

## 9.2 THE POSSIBLE MITIGATION MEASURES THAT COULD BE APPLIED AND THE LEVEL OF RISK

(With regard to the issues and concerns raised by affected parties provide a list of the issues raised and an assessment/discussion of the mitigations or site layout alternatives available to accommodate or address their concerns, together with an assessment of the impacts or risks associated with the mitigation or alternatives considered).

Please refer to the above-mentioned statements, Section 6 for evaluation of Site configuration options related to the proposed UG1 opencast excavation. Proposed mitigation measures are outlined in Section 11.2.

### 9.2.1 Motivation where no alternative sites were considered.

Not applicable as several alternatives where considered, refer to Section 6. The sites for the proposed opencast mining operations were selected based on availability of the Chromite seams/reserves to be mined. In addition, minerals can only be mined where identified and verified, therefore it was not practical to select any other sites.

### 9.2.2 Statement motivating the alternative development location within the overall site. (Provide a statement motivating the final site layout that is proposed)

The SHPM mine is already existing and several alternatives were investigated, refer to Section 6.1.

If the UG1 opencast is not approved it will result in negative impacts on the overall mine`s ability to be re-commissioned as the opencast will generate revenue and Employment for the local community. The No-Go alternative is therefore rejected.

# 10 FULL DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY, ASSESS AND RANK THE IMPACTS AND RISKS THE ACTIVITY WILL IMPOSE ON THE PREFERRED SITE (IN RESPECT OF THE FINAL SITE LAYOUT PLAN) THROUGH THE LIFE OF THE ACTIVITY

(Including (i) a description of all environmental issues and risks that where identified during the environmental impact assessment process and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.)

## 10.1 METHODOLOGY

The results of the specialist studies were analysed and interpreted in order to assess the potential impacts, which the UG1 opencast development may inflict on the bio-physical and social systems, devise potential alternatives with respect to selected activities and the development of necessary mitigation measures in order to minimise negative impacts and optimise positive impacts. The specialist recommendations were also incorporated into the Environmental Management Programme (**Part B of this report**). The activities were described in the project description were assessed in terms of direct, indirect as well as cumulative impacts, where possible.

### 10.1.1 Specialist Impact Identification and Assessment

The specialists specifically differentiated between the environmental impacts associated with the construction, operation and maintenance of the proposed mine. As far as possible, the specialists were required to quantify the suite of potential environmental impacts identified in their studies and assess

the significance of the impacts. Each impact was assessed and rated. For the purposes of this EMPREIA/EMPR process, the term 'assessment' refers to "the process of collecting, organising, analysing, interpreting and communicating data relevant to some decisions". The assessment of the data was, where possible, based on accepted scientific techniques, failing which, the specialists made judgements based on their professional expertise and experience.

### 10.1.2 Assessment Criteria

The criteria for the description and assessment of environmental impacts were drawn from the EIA Guidelines (DEAT, 1998) and as amended from time to time (DEAT, 2002).

The level of detail as depicted in the EIA Guidelines (DEAT, 1998) (DEAT, 2002)) was fine-tuned by assigning specific values to each impact. In order to establish a coherent framework within which all impacts could be objectively assessed, it was necessary to establish a rating system, which was applied consistently to all the criteria. For such purposes each aspect was assigned a value, ranging from one (1) to five (5), depending on its definition. This assessment is a relative evaluation within the context of all the activities and the other impacts within the framework of the project.

An explanation of the impact assessment criteria is defined below.

**Table 10-1: Impact Assessment Criteria**

| | |
|---|---|
| **EXTENT** | |
| **Classification of the physical and spatial scale of the impact** | |
| Footprint | The impacted area extends only as far as the activity, such as footprint occurring within the total site area. |
| Site | The impact could affect the whole, or a significant portion of the site. |
| Regional | The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns. |
| National | The impact could have an effect that expands throughout the country (South Africa). |
| International | Where the impact has international ramifications that extend beyond the boundaries of South Africa. |
| **DURATION** | |
| The lifetime of the impact that is measured in relation to the lifetime of the proposed development. | |
| Short term | The impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than that of the construction phase. |
| Short to Medium term | The impact will be relevant through to the end of a construction phase (1.5 years). |
| Medium term | The impact will last up to the end of the development phases, where after it will be entirely negated. |
| Long term | The impact will continue or last for the entire operational lifetime i.e. exceed 30 years of the development, but will be mitigated by direct human action or by natural processes thereafter. |
| Permanent | This is the only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient. |
| **INTENSITY** | |
| The intensity of the impact is considered by examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning, or slightly alters the environment itself. The intensity is rated as | |
| Low | The impact alters the affected environment in such a way that the natural processes or functions are not affected. |
| Medium | The affected environment is altered, but functions and processes continue, albeit in a modified way. |
| High | Function or process of the affected environment is disturbed to the extent where it tEMPRorarily or permanently ceases. |
| **PROBABILITY** | |

| EXTENT | |
|---|---|
| **Classification of the physical and spatial scale of the impact** | |
| 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. The classes are rated as follows: | |
| Improbable | The possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is zero (0 %). |
| Possible | The possibility of the impact occurring is very low, due either to the circumstances, design or experience. The chances of this impact occurring is defined as 25 %. |
| Likely | There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined as 50 %. |
| Highly Likely | It is most likely that the impacts will occur at some stage of the development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined as 75 %. |
| Definite | The impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied on. The chance of this impact occurring is defined as 100 %. |

The status of the impacts and degree of confidence with respect to the assessment of the significance must be stated as follows:

- **Status of the impact:** A description as to whether the impact would be positive (a benefit), negative (a cost), or neutral.
- **Degree of confidence in predictions:** The degree of confidence in the predictions, based on the availability of information and specialist knowledge.

Other aspects to take into consideration in the specialist studies are:

- Impacts should be described both before and after the proposed mitigation and management measures have been implemented.
- All impacts should be evaluated for the full-lifecycle of the proposed development, including construction, operation and decommissioning.
- The impact evaluation should take into consideration the cumulative effects associated with this and other facilities which are either developed or in the process of being developed in the region.
- The specialist studies must attEMPRt to quantify the magnitude of potential impacts (direct and cumulative effects) and outline the rationale used. Where appropriate, national standards are to be used as a measure of the level of impact.

### 10.1.3 Mitigation

The impacts that are generated by the development can be minimised if measures are implemented in order to reduce the impacts. The mitigation measures ensure that the development considers the environment and the predicted impacts in order to minimise impacts and achieve sustainable development.

### 10.1.4 Determination of Significance-Without Mitigation

Significance is determined through a synthesis of impact characteristics as described in the above paragraphs. It provides an indication of the importance of the impact in terms of both tangible and intangible characteristics. The significance of the impact “without mitigation” is the prime determinant of the nature and degree of mitigation required. Where the impact is positive, significance is noted as “positive”. Significance is rated on the following scale:

**Table 10-2: Significance-Without Mitigation**

| | |
|---|---|
| NO SIGNIFICANCE | The impact is not substantial and does not require any mitigation action. |
| LOW | The impact is of little importance, but may require limited mitigation. |

| | |
|---|---|
| MEDIUM | The impact is of importance and is therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels. |
| HIGH | The impact is of major importance. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable. Mitigation is therefore essential. |

### 10.1.5 Determination of Significance- With Mitigation

Determination of significance refers to the foreseeable significance of the impact after the successful implementation of the necessary mitigation measures. Significance with mitigation is rated on the following scale:

**Table 10-3: Significance- With Mitigation**

| | |
|---|---|
| NO SIGNIFICANCE | The impact will be mitigated to the point where it is regarded as insubstantial. |
| LOW | The impact will be mitigated to the point where it is of limited importance. |
| LOW TO MEDIUM | The impact is of importance, however, through the implementation of the correct mitigation measures such potential impacts can be reduced to acceptable levels. |
| MEDIUM | Notwithstanding the successful implementation of the mitigation measures, to reduce the negative impacts to acceptable levels, the negative impact will remain of significance. However, taken within the overall context of the project, the persistent impact does not constitute a fatal flaw. |
| MEDIUM TO HIGH | The impact is of major importance but through the implementation of the correct mitigation measures, the negative impacts will be reduced to acceptable levels. |
| HIGH | The impact is of major importance. Mitigation of the impact is not possible on a cost-effective basis. The impact is regarded as high importance and taken within the overall context of the project, is regarded as a fatal flaw. An impact regarded as high significance, after mitigation could render the entire development option or entire project proposal unacceptable. |

### 10.1.6 Assessment Weighting

Each aspect within an impact description was assigned a series of quantitative criteria. Such criteria are likely to differ during the different stages of the project's life cycle. In order to establish a defined base upon which it becomes feasible to make an informed decision, it was necessary to weigh and rank all the criteria.

### 10.1.7 Ranking, Weighting and Scaling

For each impact under scrutiny, a scaled weighting factor is attached to each respective impact (refer Table 10-4). The purpose of assigning weights serves to highlight those aspects considered the most critical to the various stakeholders and ensure that each specialist's element of bias is taken into account. The weighting factor also provides a means whereby the impact assessor can successfully deal with the complexities that exist between the different impacts and associated aspect criteria.

Simply, such a weighting factor is indicative of the importance of the impact in terms of the potential effect that it could have on the surrounding environment. Therefore, the aspects considered to have a relatively high value will score a relatively higher weighting than that which is of lower importance.

**Table 10-4: Description of assessment parameters with its respective weighting**

| EXTENT | | DURATION | | INTENSITY | | PROBABILITY | | WEIGHTING FACTOR (WF) | | SIGNIFICANCE RATING (SR) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Footprint | 1 | Short term | 1 | Low | 1 | Probable | 1 | Low | 1 | Low | 0-19 |
| Site | 2 | Short to | 2 | | | Possible | 2 | Low to Medium | 2 | Low to | 20-39 |

| EXTENT | | DURATION | | INTENSITY | | PROBABILITY | | WEIGHTING FACTOR (WF) | | SIGNIFICANCE RATING (SR) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Medium | | | | | | | | Medium | |
| Regional | 3 | Medium term | 3 | Medium | 3 | Likely | 3 | Medium | 3 | Medium | 40-59 |
| National | 4 | Long term | 4 | | | Highly Likely | 4 | Medium to High | 4 | Medium to High | 60-79 |
| International | 5 | Permanent | 5 | High | 5 | Definite | 5 | High | 5 | High | 80-100 |

| MITIGATION EFFICIENCY (ME) | | SIGNIFICANCE FOLLOWING MITIGATION (SFM) | |
|---|---|---|---|
| High | 0.2 | Low | 0 - 19 |
| Medium to High | 0.4 | Low to Medium | 20 - 39 |
| Medium | 0.6 | Medium | 40 - 59 |
| Low to Medium | 0.8 | Medium to High | 60 - 79 |
| Low | 1.0 | High | 80 - 100 |

### 10.1.8 Identifying the Potential Impacts Without Mitigation Measures (WOM)

Following the assignment of the necessary weights to the respective aspects, criteria are summed and multiplied by their assigned weightings, resulting in a value for each impact (prior to the implementation of mitigation measures).

**Equation 1:**

Significance Rating (WOM) = (Extent + Intensity + Duration + Probability) x Weighting Factor

### 10.1.9 Identifying the Potential Impacts With Mitigation Measures (WM)

In order to gain a comprehensive understanding of the overall significance of the impact, after implementation of the mitigation measures, it was necessary to re-evaluate the impact.

#### *10.1.9.1 Mitigation Efficiency (ME)*

The most effective means of deriving a quantitative value of mitigated impacts is to assign each significance rating value (WOM) a mitigation efficiency (ME) rating (refer to *Table 10-4*). The allocation of such a rating is a measure of the efficiency and effectiveness, as identified through professional experience and Empirical evidence of how effectively the proposed mitigation measures will manage the impact.

Thus, the lower the assigned value the greater the effectiveness of the proposed mitigation measures and subsequently, the lower the impacts with mitigation.

**Equation 2:**

Significance Rating (WM) = Significance Rating (WOM) x Mitigation Efficiency
or WM = WOM x ME

### 10.1.10 Significance Following Mitigation (SFM)

The significance of the impact after the mitigation measures are taken into consideration. The efficiency of the mitigation measure determines the significance of the impact. The level of impact is therefore seen in its entirety with all considerations taken into account.

## 10.2 LIMITATIONS AND ASSUMPTIONS

Assumptions and limitation applicable to the assessment process and mitigation measures proposed in the various specialist studies are discussed below.

### 10.2.1 Surface water

- Due to the extent of the areas that form part of the study area, use was made of aerial photographs, digital satellite imagery as well as provincial and national databases to identify areas of interest prior to the field survey. Any additional drainage lines noted during the field survey were also assessed as part of the surface water study. Although all possible measures were undertaken to ensure all wetland features, riparian zones and drainage lines were assessed and delineated, some smaller ephemeral drainage lines may have been overlooked.
- Aquatic, wetland and riparian ecosystems are dynamic and complex and as a result some aspects of the ecology of these systems, some of which may be important, may have been overlooked. The findings of this study were largely based on a single site visit. A more reliable assessment would have required that seasonal assessments take place. It is assumed that a Storm Water Management Plan will be drawn up for the project by a professional engineer to expand the current storm water system to incorporate the expansion area.
- A Storm Water Management Plan will not form part of this assessment, it is assumed that a Storm Water Management Plan will be drawn up for the project by a professional engineer.

### 10.2.2 Fauna and Flora

- The desktop study was conducted with up to date resources. It might however be possible that additional information become available in time, because environmental impact assessments deal with dynamic natural ecosystems. It is therefore important that the report be viewed and acted upon with these limitations in mind. Red Kite Environmental Solutions (Pty) Ltd cannot be held responsible for conclusions and pro-active mitigation measures that are made in good faith based on the available resources and information provided at the time of the study.
- The results, typical herpetofauna, avifauna and mammalian communities found within the study should/can therefore only be used as a general guideline.
- In order to obtain a comprehensive understanding of the dynamics of the ecology of the study area, surveys should ideally have been replicated over several seasons and over a number of years. However, due to project time constraints such long-term studies are not feasible and this fauna and flora survey was conducted in one season.
- Species flowering only during specific times of the year could be confused with a very similar species of the same genus and some plant species that emerge and bloom during another time of the year or under very specific circumstances may have been missed entirely.
- No scientific data was collected or analysed for the calculation of ecological veld condition. Any comments or observations made in this regard are based on observations, the expert knowledge and relevant professional experience of the specialist investigator.
- Due to the terrain of the surrounding area as well as the presence of illegal miners at the time of the site visit, no physical survey of the drainage lines could be undertaken at the headwaters of the drainage lines. However, the lower reaches of the drainage lines could be accessed. The description and information presented in this report with regard to the drainage lines on site are based on the downstream areas of the watercourses which could be access and supplemented by previous studies undertaken in the area.
- Limitations should always be kept in mind and therefore management should focus on pro-active measures and the implementation of the precautionary principle.
- The specialist responsible for this study reserves the right to amend this report, recommendations and/or conclusions at any stage should any additional or otherwise significant information come to light.

### 10.2.3 Noise

#### *10.2.3.1 Limitations - Acoustical Measurements*

Please also refer to Section 10.3.2.6.

Limitations due to environmental acoustical measurements include the following:

- Ambient sound levels are the cumulative effects of innumerable sounds generated at various instances both far and near. High measurements may not necessarily mean that noise levels in the area are high. Similarly, a low sound level measurement will not necessarily mean that the area is always quiet, as sound levels will vary over seasons, time of the day, faunal characteristics, vegetation in the area and meteorological conditions (especially wind). This is excluding the potential effect of sounds from anthropogenic origin. It is impossible to quantify and identify the numerous sources that influenced a measurement using the reading result at the end of the measurement. Therefore, trying to define ambient sound levels using the result of one 10-minute measurement can be inaccurate (very low confidence level in the results) for the reasons mentioned above. The more measurements that can be collected at a location the higher the confidence levels in the ambient sound level determined. The more complex the sound environment, the longer the required measurement. When singular measurements are used, a precautious stance must be adopted.
- Ambient sound levels are dependent not only on time of day and meteorological conditions but also change due to seasonal differences. Ambient sound levels are generally higher in summer months when faunal activity is higher and lower during the winter due to reduced faunal activity. Winter months unfortunately also coincide with lower temperatures and very stable atmospheric conditions, ideal conditions for propagation of noise. Many faunal species are more active during warmer periods than colder periods. Certain cicada species can generate noise levels up to 120 dB for mating or distress purposes, sometimes singing in synchronisation magnifying noise levels they produce from their tymbals.
- It is assumed that the measurement locations represent other residential dwellings in the area (similar environment), yet, in practice, this can be highly erroneous as there are numerous factors that can impact on ambient sound levels, including:
    - the distance to closest trees, number and type of trees as well as the height of trees;
    - available habitat and food for birds and other animals;
    - distance to residential dwelling, type of equipment used at dwelling (compressors, air-con);
    - general maintenance condition of house (especially during windy conditions); and
    - number and type of animals kept in the vicinity of the measurement locations (typical land use taking place around the dwelling).
- Measurements over wind speeds of 3 -5 m/s could provide data influenced by wind-induced noises;
- Ambient sound levels recorded near rivers, streams, wetlands, trees and bushy areas can be high due to faunal activity, which can dominate the sound levels around the measurement point (specifically during summertime, rainfall event or during the dawn chorus of bird songs). This generally is still considered naturally quiet and accepted as features of the natural baseline, and in various cases sought after and pleasing;
- Considering one or more sound descriptor or equivalent can improve an acoustical assessment. Parameters such as $L_{AMin}$, $L_{Aeq}$, $L_{AMax}$, $L_{A10}$, $L_{A90}$ and spectral analysis forms part of the many variables that can be considered. However, South African legislation requires consideration of the impulse-weighted $L_{Aeq}$ setting that will be considered when measuring ambient sound levels;
- It is technically difficult and time-consuming to improve the measurement of spectral distribution of large equipment in an industrial setting. This is due to the many correction factors that need to be considered (e.g. other noise sources active in the area, adequacy of average time setting, surrounding field non-uniformity etc. as per SANS 9614-3:2005);
- Exact location of a sound level meter in an area in relation to structures, infrastructure, vegetation, wetlands and external noise sources will influence measurements. It may determine whether you are measuring anthropogenic sounds from a receptor dwelling, or measuring

environmental ambient baseline contributors of significance (faunal, roads traffic, railway traffic movement etc.); and

- As a residential area develops, the presence of people will result in increased dwelling-related sounds. These are generally a combination of traffic noises, voices, animals and equipment (including TVs and radios). The result is that ambient sound levels will increase as an area matures.

#### *10.2.3.2 Calculating noise emissions – Adequacy of predictive methods*

Limitations due to the calculations of the noise emissions into the environment include the following:

- Many sound propagations models do not consider sound characteristics as calculations are based on an equivalent level (with the appropriate correction implemented e.g. tone or impulse). These other characteristics include intrusive sounds or amplitude modulation;
- Most sound propagation models do not consider refraction through the various temperature layers (specifically relevant during the night-times);
- Most sound propagation models do not consider the low frequency range (third octave 16 Hz – 31.5 Hz). This would be relevant to facilities with a potentially low frequency issue;
- Many environmental models consider sound to propagate in hemi-spherical way. Certain noise sources (e.g. speakers, exhausts, fans) emit sound power levels in a directional manner;
- The impact of atmospheric absorption is simplified and very uniform meteorological conditions are considered. This is an over-simplification and the effect of this in terms of sound propagation modelling is difficult to quantify;
- Many environmental models are not highly suited for close proximity calculations; and
- Acoustical characteristics of the ground are over-simplified, with ground conditions accepted as uniform. Ground conditions will not be considered in this assessment.

Due to these assumptions, modelling generally could be out with as much as +10 dBA, although realistic values ranging from 3 dBA to less than 5 dBA are more common in practice.

#### *10.2.3.3 Adequacy of Underlying Assumptions*

- Noise experienced at a certain location is the cumulative result of innumerable sounds emitted and generated both far and close, each in a different time domain, each having a different spectral character at a different sound level. Each of these sounds is also impacted differently by surrounding vegetation, structures and meteorological conditions that result in a total cumulative noise level represented by a few numbers on a sound level meter.
- As previously mentioned, it is not the purpose of noise modelling to accurately determine a likely noise level at a certain receptor but to calculate a noise rating level that is used to identify potential issues of concern.

#### *10.2.3.4 Uncertainties associated with mitigation measures*

- Any noise impact can be mitigated to have a low significance; however, the cost of mitigating this impact may be prohibitive, or the measure may not be socially acceptable (such as the relocation of an NSD). These mitigation measures may be engineered, technological or due to management commitment.
- For the purpose of the determination of the significance of the noise impact mitigation measures were selected that is feasible, mainly focussing on management of noise impacts using rules, policy and require a management commitment. This, however, does not mean that noise levels cannot be reduced further, only that to reduce the noise levels further may require significant additional costs (whether engineered, technological or management).

It was assumed the mitigation measures proposed for the construction phase will be implemented and continued during the operational phase.

#### *10.2.3.5 Uncertainties of Information Provided*

While it is difficult to define the character of a measured noise in terms of numbers (third octave sound

power levels), it is difficult to accurately model noise levels at a receptor from any operation. The projected noise levels are the output of a numerical model with the accuracy depending on the assumptions made during the setup of the model. The assumptions include the following:

- That octave sound power levels selected for processes and equipment accurately represent the sound character and power levels of these processes and equipment. The determination of octave sound power levels in itself is subject to errors, limitations and assumptions with any potential errors carried over to any model making use of these results;
- Sound power emission levels from processes and equipment changes depending on the load the process and equipment are subject to. While the octave sound power level is the average (equivalent) result of a number of measurements, this measurement relates to a period that the process or equipment was subject to a certain load (work required from the engine or motor to perform action). Normally these measurements are collected when the process or equipment is under high load. The result is that measurements generally represent a worst-case scenario;
- As it is unknown which processes and equipment will be operational (when and for how long), modelling considers a scenario where processes and equipment are under full load for a set time period. Modelling assumptions comply with the precautionary principle and operational time periods are frequently overestimated. The result is that projected noise levels would likely be over-estimated;
- Modelling cannot capture the potential impulsive character of a noise that can increase the potential nuisance factor;
- The XYZ topographical information is derived from the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Global DEM data, a product of Japan's Ministry of Economy, Trade, and Industry (METI) and the National Aeronautical and Space Administration (NASA). There are known inaccuracies and artefacts in the data set, yet this is still one of the most accurate data sets to obtain 3D-topographical information;
- The impact of atmospheric absorption is simplified and very uniform meteorological conditions are considered. This is an over-simplification and the effect of this in terms of sound propagation modelling is difficult to quantify; and
- Acoustical characteristics of the ground are over-simplified with ground conditions accepted as uniform. Fifty per cent (50%) soft ground conditions will be modelled as the area where the construction activities are proposed is well vegetated and sufficiently uneven to allow the consideration of soft ground conditions matures.

### 10.2.4 Soil

- For the impact assessment, the assumption was made that the impacts will remain within the boundaries of the proposed mining area (approximately 30 ha) that was provided by the client.
- It was also assumed that when operations continue at the existing infrastructure, proper soil management will be followed at these areas to avoid major cumulative soil impacts.
- Soil profiles were observed using a 1.5 m hand-held soil auger. A description of the soil characteristics deeper than 1.5 m cannot be given.
- No analysis of the current soil microbiology was conducted to determine whether there are any unique soil microorganisms associated with the landscape that may support the unique vegetation of the area. These studies are still more of an academic nature and not freely available at commercial soil laboratories.
- The study does not include a land contamination assessment to determine pre-construction soil pollution levels (should there be any present).

### 10.2.5 Archaeology

- Although all efforts are made to locate, identify and record all possible cultural heritage sites and features (including archaeological remains) there is always a possibility that some might have been missed as a result of grass cover and other factors. Limitations such as restricted

access due to a variety of factors (including illegal mining activities and the related security risks) also played a role here.

### 10.2.6 Hydrogeology

The modelling was done within the limitations of the scope of work of this study and the amount of data available. Although all efforts have been made to base the model on sound assumptions and has been calibrated to observed data, the results obtained from this exercise should be considered in accordance with the assumptions made. Especially the assumption that a fractured aquifer will behave as a homogeneous porous medium can lead to error. However, on a large enough scale (bigger than the REV, Representative Elemental Volume) this assumption should hold reasonably well.

Other assumptions relating to calculations and models were made throughout the report and has been noted below.

The Groundwater Decision Tool (GDT) was used to quantify the vulnerability of the aquifer underlying the site using the below assumptions:

- Depth to groundwater below the site was estimated from water levels measured and inferred to be at mean of ~10.11 mbcl;
- Groundwater recharge of ~873.6 mm/a (6 % recharge);
- Bushveld vadose zone; and
- Gradient of 5.8% were assumed and used in the estimation.

Constructing a groundwater flow model with all the detail is close to impossible; however, assumptions are made based on data gathered in the field and used to simulate different scenarios to conclude with management protocol.

Although the most relevant aquifer parameters are optimised by the calibration of the model, many parameters are calculated and/or judged by conventional means. The following fixed assumptions and input parameters were used for the numerical model of this area:

- Recharge = 35 mm/a ≈ 0.00004 m/d. This value was calculated using the RECHARGE program7. This value relates to a recharge percentage of 4%. Please note that this is not effective recharge, as evapotranspiration was also modelled as discussed below. The result will thus be higher recharge in high topographical areas and lower recharge where the water table is shallow, similar to the conditions in nature;
- Maximum Evapotranspiration = 2 205 mm/a ≈ 0.006 m/d. This value is based on the S-pan evaporation data for this area5. Note that this rate of evapotranspiration is used by the modelling software only if the groundwater should rise to the surface. For the groundwater level between the surface and the extinction depth, the evapotranspiration is calculated proportionally;
- Evapotranspiration Extinction Depth = 10 m. This depth relates to the expected average root depth of plants in this area, with the thorn trees known to have a very deep root system;
- The specific storage over the area was taken as 0.000001. This is a typical value for fractured bedrock;
- Horizontal Hydraulic Permeability of the bedrock = 0.1 m/d as an initial value, declining with depth by an order of magnitude with depth due to decreasing weathering of the bedrock and increased pressure that tend to close fractures;
- Vertical Hydraulic Anisotropy (KH/KV) of the bedrock = 10. By nature of the pronounced horizontal layering, this value is commonly used in the Bushveld;
- The effective porosity value of the bedrock was taken as 0.3, declining gradually to 0.03 at a depth of 150 metres. This value could not be determined directly and was taken as typical of the fractured bedrock;

- Longitudinal dispersion was taken as 50 metres, which is about 10% of expected plume dimensions, as recommended in various modelling guidelines;
- Transverse and vertical dispersion was taken as 5 metres and 0.5 metre respectively as recommended in various textbooks, being about 10% of the expected plume dimensions;
- Open pits were simulated as drains, with a conductance of 0.001 $m^2$/day/$m^2$; and
- The underground mine was simulated as a drain with a conductance of 0.00001 $m^2$/day/$m^2$; and
- The leachate plume emanating from the mine is calculated to affect the local south draining non-perennial stream in about 50 years after mine closure. However, it should be noted that the concentration increase is likely to be negligible and the groundwater is likely to remain within potable quality with regards to sulphate when compared with the SANS water quality standards.

When assumptions were made or reference values used, a conservative approach was followed. Please also refer to Section 10.3.2.5.

### 10.2.7 Air Quality

- It has been assumed that the information provided to Eco Elementum (Pty) Ltd is correct and as such the accuracy of the conclusions made are reliant on the accuracy and completeness of the data supplied. Gaussian-plume models are best used for near-field applications where the steady-state meteorology assumption is most likely to apply. The most widely used Gaussian plume model is the US.EPA AERMOD model.
- Some assumptions were made with regards to the modelling parameters as indicated in the report.
- It was assumed that the decommissioning activities will only take place during daylight hours.

### 10.2.8 Socio Economic Assessment

The information was sourced from the 2016 report and local conditions may have changed in the past three years. This was not taken into consideration and available documented information was used.

### 10.2.9 Closure and Rehabilitation

- All costs referred to excludes Value Added Tax;
- The closure period will commence once the last ton of ore has been extracted although concurrent rehabilitation will take place (Roll-over mining);
- All runoff and process water will be recycled;
- It is assumed that all dumped material not properly rehabilitated during operation will be reshaped to a 1:3 slope to be sustainable in the long term; It was further assumed that berms and/or storm water retention dams will be required for storm water management during operations as well as to minimize the risk associated with inadvertent access to the pit.
- No engineering and/or specific closure designs were done as part of the closure liability determination process; and
- The financial provision required was calculated according to the criteria as set out in the official Mine Closure Quantum Guideline document (DME, 2005). As per the Mine Closure Quantum Guideline, specific weighing factors have been taken into account in these calculations.

## 10.3 THE POSITIVE AND NEGATIVE IMPACT THAT THE PROPOSED ACTIVITY (IN TERMS OF THE INITIAL SITE LAYOUT) AND ALTERNATIVES WILL HAVE ON THE ENVIRONMENT AND THE COMMUNITY THAT MAY BE AFFECTED

(Provide a discussion in terms of advantages and disadvantages of the initial site layout compared to alternative layout options to accommodate concerns raised by affected parties)

Please refer to Section 6 for the discussion regarding alternatives. Due to the fact that the mineral resource location is fixed no site alternative is applicable. As far as possible alternatives were taken

into consideration and included.

The significance assessment of the various impacts is outlined in Table 11-1.

### 10.3.1 CONSTRUCTION PHASE

#### *10.3.1.1 Surface water*

- **Diversion of drainage lines:** Alteration of drainage lines by impacting their natural course. Impact on catchment yield by capturing runoff and diverting the drainage systems. Degradation of stream channels through long-term reduced runoff and periodic discharge of high volumes.
- **Earth works, land clearance or removal of topsoil**: Exposed surfaces could result in increased erosion and associated runoff which in turn may result in increased siltation of surface streams.
- **Earth works, land clearance or removal of topsoil**: Exposed surfaces together with increased traffic on-site could result in increased siltation of surface water streams by excessive dust generation.
- **Erection of ablution facilities**: Inadequate maintenance of mobile sanitary facilities could result in spillage of sewage waste which could contaminate runoff to drainage lines.
- **Increase in traffic**: An increase in traffic and the additional logistics may result in hydrocarbon spillages which could in turn result in contaminated runoff reaching drainage lines.
- **Increase in personnel to the site:** Solid waste could reach drainage lines if not correctly disposed of.

#### *10.3.1.2 Flora*

- Most of the impacts on plant species will occur during the construction phase of the opencast and associated infrastructure, as most of the land clearing activities will take place during this phase.
- As a result of the construction activities fragmentation, degradation or compression may occur if heavy construction vehicles are not kept to the demarcated roads. Roads may also lead to an increase in erosion especially on the edges.
- Storing of construction material, mixing of concrete or collection and delivering could result in pollution.
- Invasive and/or exotic species could become established in the area. These species may also compete with indigenous species and will degrade the veld condition by making it unfeasible for other land-uses such as cattle grazing and wilderness.
- Species of conservation concern such as *Jamesbrittenia macrantha, Lydenburgia cassinoides, Sclerocarya birrea, Searsia sekhukhuniensis* and *Vachellia ormocarpoides*, were observed in the study area during the assessment. With the implementation of mitigation measures the impact significance of the loss of important species may be reduced, as edge effects will be suitably managed and these specific species will be relocated out of the disturbance zone.

#### *10.3.1.3 Fauna*

- As a result of the onset of construction activities, the sudden increase in activities, humans, noise and vehicles, possible fragmentation, degradation or compression may occur, especially if vehicles are not kept to the demarcated roads. Roads may also lead to an increase in erosion especially on the edges. Storing of construction materials, mixing of concrete or collection and delivering could result in pollution.
- Fragmentation of habitat areas due to possible fencing and activity will fragment ranges that certain animals may need to sustain adequate foraging area and breeding grounds.
- Anthropogenic influence stemming from workers that infiltrate/penetrate the natural veld areas will damage and impact on species communities within certain areas.

- Vegetation clearance in areas where the UG1 opencast is proposed may destroy habitats and lead to possible invasive and/or exotic species establishing in the area. This will cause the migration of sensitive species from the site to a more favourable habitat. It is important to note that the footprints mostly fall on already impacted areas associated with illegal mining, which constitutes a transformed habitat.
- Impacts on sensitive terrain associated with Koppie and rocky habitats may have devastating results on the specialized niches and species that require these areas to sustain life. These species usually have decreased adaptability capability and this may lead to forced migration and/or sensitive species diminishing.
- Koppies and rocky terrain usually constitute highly sensitive habitat, however, the sensitivity is reduced since the footprint has already been altered with minimal natural habitat or vegetation remaining within this stretch across the mountain.

#### *10.3.1.4 Soil*

- **Earthworks**: The disturbance of original soil profiles and horizon sequences of these profiles during earthworks is considered to be a measurable deterioration.
- **Vehicle movement**: Soil chemical pollution as a result of potential oil and fuel spillages from vehicles, is considered to be a moderate deterioration of the soil resource.
- **Earth works and vehicle movement**: Soil compaction will be a measurable deterioration that will occur as a result of the heavy vehicles commuting on the existing roads as well as any new haul roads constructed for this project.
- **Vegetation:** Soil erosion is also anticipated due to vegetation clearance.
- **Earth works:** In areas of permanent changes such as road upgrades, the sinking of open pits and the erection of infrastructure and stockpiles, the current land capability and land use will be lost temporarily

#### *10.3.1.5 Groundwater/Hydrogeology*

- **Groundwater quantity:** This phase is not expected to influence the groundwater levels. With the exception of lesser oil and diesel spills, there are also no activities expected that could impact on regional groundwater quality.
- **Groundwater Quality:** This phase should thus cause very little additional impacts in the groundwater quality. It is expected that the current status quo will be maintained.

#### *10.3.1.6 Noise*

##### *10.3.1.6.1 Conceptual Scenario - Existing Noise Levels*

This section calculates and illustrates the conceptual existing noise-generating activities as considering the conceptual noise-generating activities depicted Figure 10-1, using the sound power emission characteristics defined within the Nosie Assessment Report. Daytime noise rating level contours are illustrated in Figure 10-2 for the noise sources as conceptualized in Figure 10-1, with the night-time noise rating levels illustrated in Figure 10-3. The noise levels are also defined in Table 10-5.

A worst-case scenario was investigated, assuming that:

- all equipment (excluding the crusher) would be operating under full load (generate the most noise) at a number of locations both night and day;
- the crusher will be under full load 25% of the time (both night and day);
- atmospheric conditions would be ideal for sound propagation (10$^{o}$C air temperature, 70% humidity);
- equipment and activities take place at locations close to the identified NSD;
- waste and ROM is hauled using heavy vehicles, travelling at 40 km/h (5 vehicles per hour);
- equipment is operating at surface level without the benefit of the berms, stockpiles or an overburden dump to attenuate noise levels.

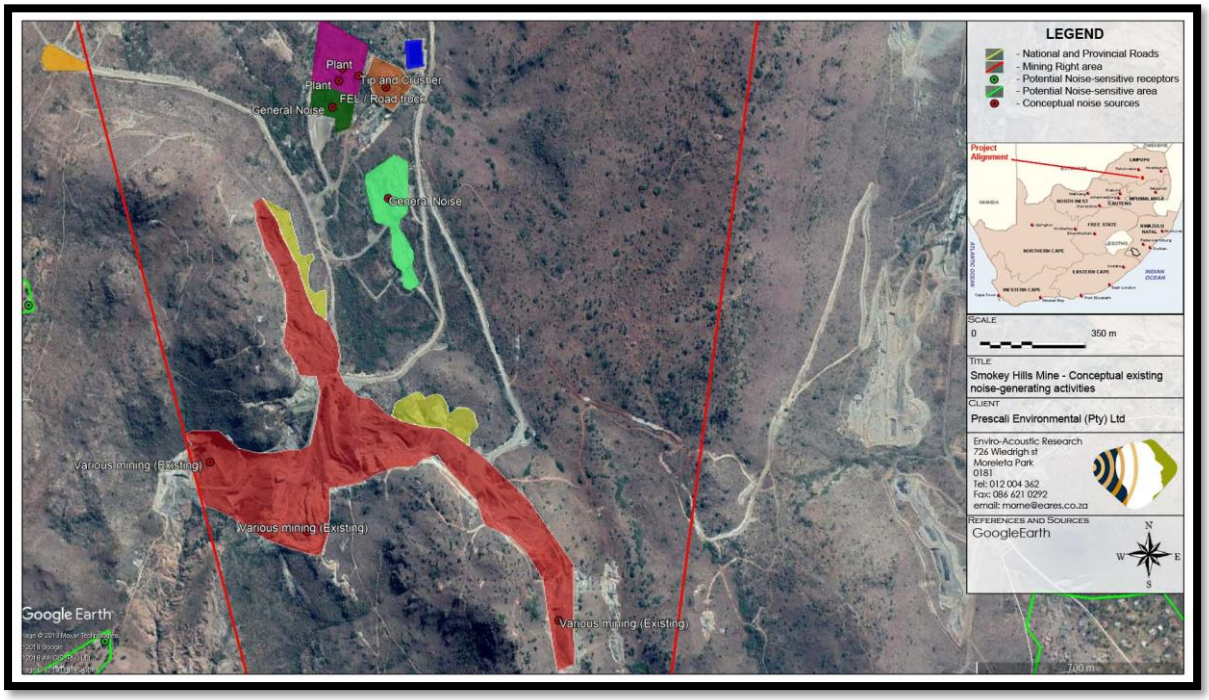


**Figure 10-1: Conceptual existing noise sources (worse-case scenario)**

**Table 10-5: Projected noise levels due to existing mining activities and construction phase of the proposed opencast**

| NSD | Projected existing noise rating levels (dBA) | | Projected change in ambient sound levels (dBA, 40 dBA day and 38 dBA night-time) | |
|---|---|---|---|---|
| | Day | Night | Day | Night |
| 1 | 40 | 40 | 0 | 2 |
| 2 | 39 | 39 | 0 | 1 |
| 3 | 41.8 | 41.8 | 1.8 | 3.8 |
| 4 | 23.5 | 23.5 | 0 | 0 |
| 5 | 21 | 21 | 0 | 0 |
| 6 | 42.3 | 42.3 | 2.3 | 4.3 |
| 7 | 37 | 37 | 0 | 0 |
| 8 | < 20 | < 20 | 0 | 0 |
| 9 | < 20 | < 20 | 0 | 0 |
| 10 | < 20 | < 20 | 0 | 0 |
| 11 | < 20 | < 20 | 0 | 0 |
| 12 | < 20 | < 20 | 0 | 0 |
| 13 | < 20 | < 20 | 0 | 0 |
| 14 | < 20 | < 20 | 0 | 0 |
| 15 | < 20 | < 20 | 0 | 0 |

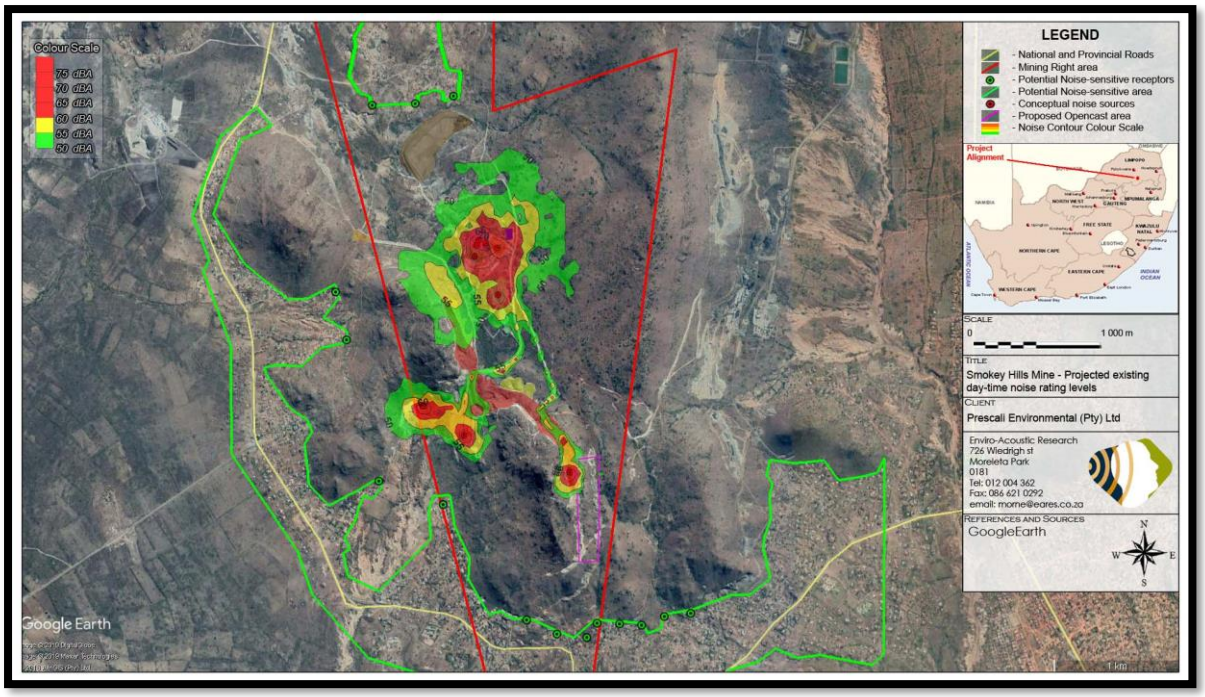


**Figure 10-2: Projected conceptual daytime noise rating levels – existing mining activities**

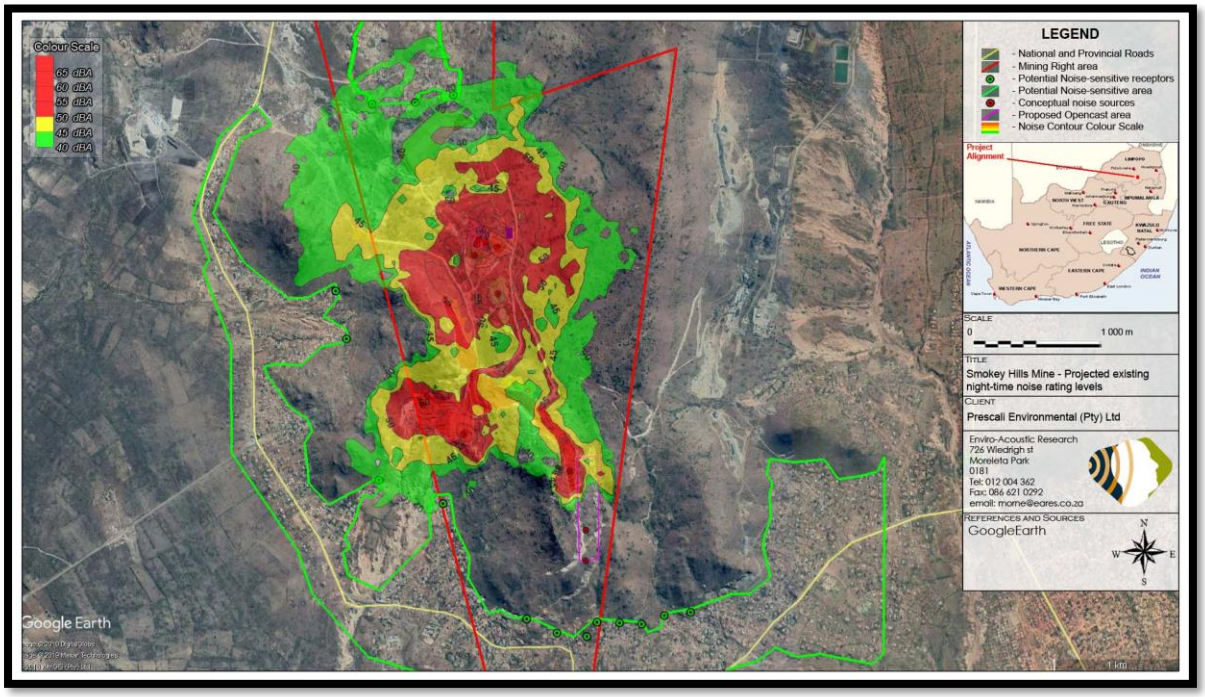


**Figure 10-3: Projected conceptual night-time noise rating levels – existing mining activities**

#### *10.3.1.7 Air Quality*

- **Site Clearance, removal of topsoil and vegetation:** During this activity, a number of operations take place such as land clearing, topsoil removal, loading of material, hauling, grading, stockpiling, bulldozing and compaction. Initially, topsoil and subsoil will be removed with large scrapers. The topsoil will be stockpiled for rehabilitation in the infrastructure area. It is anticipated that each of the above-mentioned operations will have its own duration and potential for dust generation. Fugitive dust (containing TSP (total suspended particulate, will

give rise to nuisance impacts as fallout dust), as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns giving rise to health impacts).

- **Construction of surface infrastructure:** During this phase, it is anticipated there will be construction of infrastructure. This will include, access roads, pipes, storm water diversion berms, change houses, admin blocks, drilling, blasting and development of box cut for mining, etc. Activities of vehicles on access roads, levelling and compacting of surfaces, as well localised drilling and blasting will have implications on ambient air quality. The above-mentioned activities will result in fugitive dust emissions containing TSP (total suspended particulate, giving rise to nuisance impacts as fallout dust). Topsoil and overburden need to be removed and stockpiled separately by means of truck and shovel methods (front end loaders, excavators and haul trucks.
- **General transportation, hauling and vehicle movement:** Transportation of the workers and materials in and out of mine site will be a constant feature during the construction phase. This will however result in the production of fugitive dust (containing TSP, as well as PM10 and PM2.5) due to suspension of friable materials from earth roads.

#### *10.3.1.8 Heritage sites*

No impacts were identified.

#### *10.3.1.9 Socio-economic impact*

Additional Employment opportunities will be created in an area with high unemployment figures. This is a positive effect.

### 10.3.2 OPERATIONAL PHASE

#### *10.3.2.1 Surface Water*

- **Diversion of drainage lines:** Alteration of drainage lines by impacting their natural course. Impact on catchment yield by capturing runoff and diverting the drainage systems. Degradation of stream channels through long-term reduced runoff and periodic discharge of high volumes.
- **Increase in traffic**: An increase in traffic and the additional logistics may result in hydrocarbon spillages which could in turn result in contaminated runoff reaching drainage lines.
- **Increase in personnel to the site:** Solid waste could reach drainage lines if not correctly disposed of.

**Temporary or long-term stockpiling of material:** Seepage and runoff from stockpile areas are moderately contaminated and could impact on surface water quality.
From the groundwater assessment study, it was determined that the impact of the mine on streams in the area can be estimated qualitatively from the model in so far as the groundwater component (base flow) of the stream is concerned. Such an impact assessment will not include possible surface runoff influences caused by mining, but merely addresses the base flow component due to gaining (or losing) of groundwater by the stream. It can be deduced from the calculated figures that the cumulative groundwater drawdown (Figure 10-5: Core depression during mining) at the streams/wetlands close to the mine will not have an impact.

#### *10.3.2.2 Flora*

- Once in operation the surface mining may have an increase of traffic in the area.
- Exotic/invasive species may become established and be distributed. The category invaders that are currently within the area may be distributed to other areas as well. If not managed and eradicated before they are distributed, these species will become a serious problem in the future. Unfortunately, if left unmanaged the costs and financial implications of eradication will be immense in the closure phase. Closure of the mine will, however, not be provided if these invasive species have become established.
- Staff will access remaining natural areas if not prohibited.

#### *10.3.2.3 Fauna*

- Long-term activity and movement associated with mining and hauling (during operational phase) may further impact on the faunal communities within the area. Associated noise, waste, the smell of humans, physical penetration into sensitive zones and natural areas are problematic and may lead to ever declining populations (where the disturbance of habitat has caused habitat remaining to become unfavourable).

#### *10.3.2.4 Soil*

- The disturbance of original soil profiles and horizon sequences of these profiles is considered to be a measurable deterioration.
- Soil chemical pollution as a result of spills of fuel and lubricants by vehicles and machinery as wells as the accumulation of domestic waste, is considered to be a moderate deterioration of the soil resource.
- Soil compaction will be a measurable deterioration that will occur as a result of the weight of the topsoil and overburden stockpiles stored on the soil surface as well as the movement of vehicles on the soil surfaces (including access and haul roads).
- During the operational phase, topsoil stockpiles as well as roads running down slopes will still be susceptible to erosion.
- The current land capability and land use of areas with active mining will be lost temporarily. However, the land capability and land use of areas where infrastructure will be decommissioned can be restored through mined land rehabilitation techniques.

#### *10.3.2.5 Groundwater*

##### *10.3.2.5.1 Impact on Groundwater quantity*

During the operational phase, it is expected that the main impact on the groundwater environment will be de-watering of the surrounding aquifer. Water entering the mining areas will have to be pumped out to enable mining activities. This will cause a lowering in the groundwater table in- and adjacent to the mine.

The dewatering of the aquifer has been calculated for the mine using the calibrated numerical model as described in the geohydrological report (Appendix 7). A worst-case scenario has been modelled, assuming that all opencast cuts would be dewatered simultaneously. This will obviously not be the case, and the actual drawdown could thus be less. However, as the recovery of groundwater is expected to be very slow, it could well be that the first opencast is still in an early stage of recovery. Thus, the worst-case scenario could also be close to the actual scenario.

The calculated drawdown of the worst-case scenario is depicted in Figure 10-5, as contours of drawdown for whole opencast. It follows from the figure that the groundwater drawdown is minimal, 5 meters at most, due to the deep groundwater levels in the area. Due to evaporation from the sidewalls of the mine, the mine will most likely be experienced as a dry mine.

Despite the modelled predictions, it must again be stressed that structures of preferred groundwater flow have not been modelled. It is known by experience that dolerite will most likely transgress the area, but details are limited and not adequate to model this structure(s). If such a structure is dewatered, any boreholes drilled into the structure might be seriously affected. These effects cannot be predicted with the current knowledge, and can only be established through continuous groundwater level monitoring.

The computed total inflow into each mine, assuming that all areas in the mine are dewatered simultaneously, was calculated and is indicated below.

- Mining Area UG1 Opencast
- Area (ha) 14

- Maximum Drawdown (m) 5
- Cone of depression from edge of pit (m) 200
- Estimated Inflow for the Total Area ($m^3$/day) Less than 100
- Evaporation ($m^3$/day) 700
- Potential Impacted Receptor Southern tributary
- Expected Water Level Decline (m) 2

However, these figures are overestimations and probably reflect worst-case scenarios. The actual inflow will depend on the area being mined at any one moment in time. However, at the last box cut, the inflow from the backfilled portion of the mine could be substantial and the above inflows can be approached.

It is important to view these numbers for the water make of the mine in relation to natural evaporation, as listed above. Illustrative volumes are included as if the evaporation will take place over the whole opencast, for comparative purposes. As the whole opencast will not be open at any one time, this is obviously an overestimate. Nevertheless, it is illustrative that evaporation can contribute considerably to the removal of groundwater seepage into the opencast.

Furthermore, it should be realised that evaporation is a seasonal effect. Direct recharge from rainfall will in turn add to these volumes. The amount of direct recharge will depend on the season as well as the mining layout and storm water management. It is suggested that this is calculated as part of the surface water study.

It must be cautioned that these calculations have been performed using simplified assumptions of homogeneous aquifer conditions. The reality could deviate substantially from this and the model should thus be updated as more information becomes available.

*10.3.2.5.2 Impacts on groundwater quality*

As some facilities will be present on the mine (waste rock dump specifically), outflow from these facilities could be contaminated as a result of mine drainage. Sulphate is normally a significant solute in drainage from mines. However, a previous groundwater study found that the waste material at the site is non-acid forming and mostly inert. The report states that while some contaminants might build up in PCDs due to recycling of water, waste rock is largely inert. It is thus assumed that no contamination will result at the opencast during mining.

- Mining area UG1 Opencast
- Area (ha) 14
- Potential impacted receptor South Flowing local Stream
- Estimated increase in concentrations during operation (mg/ℓ) 0 mg/l

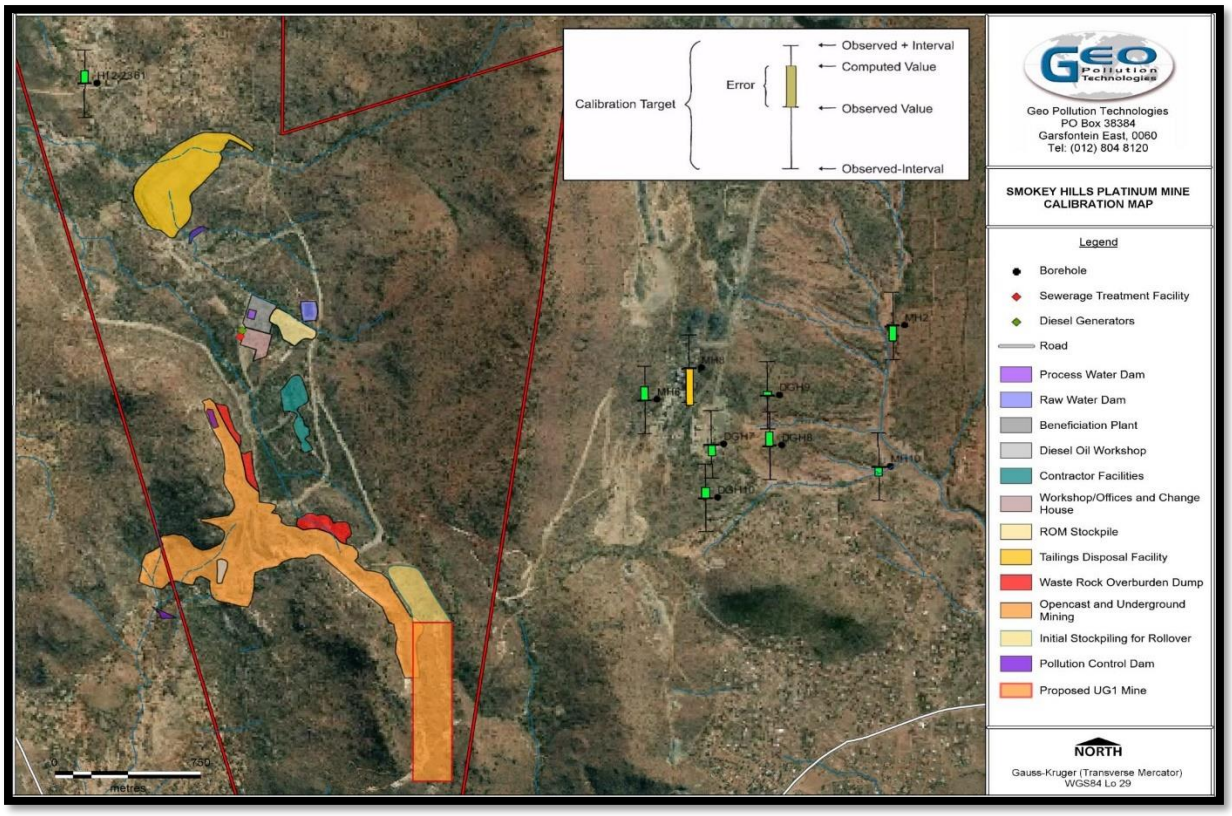


**Figure 10-4: Calibration of the numerical model**

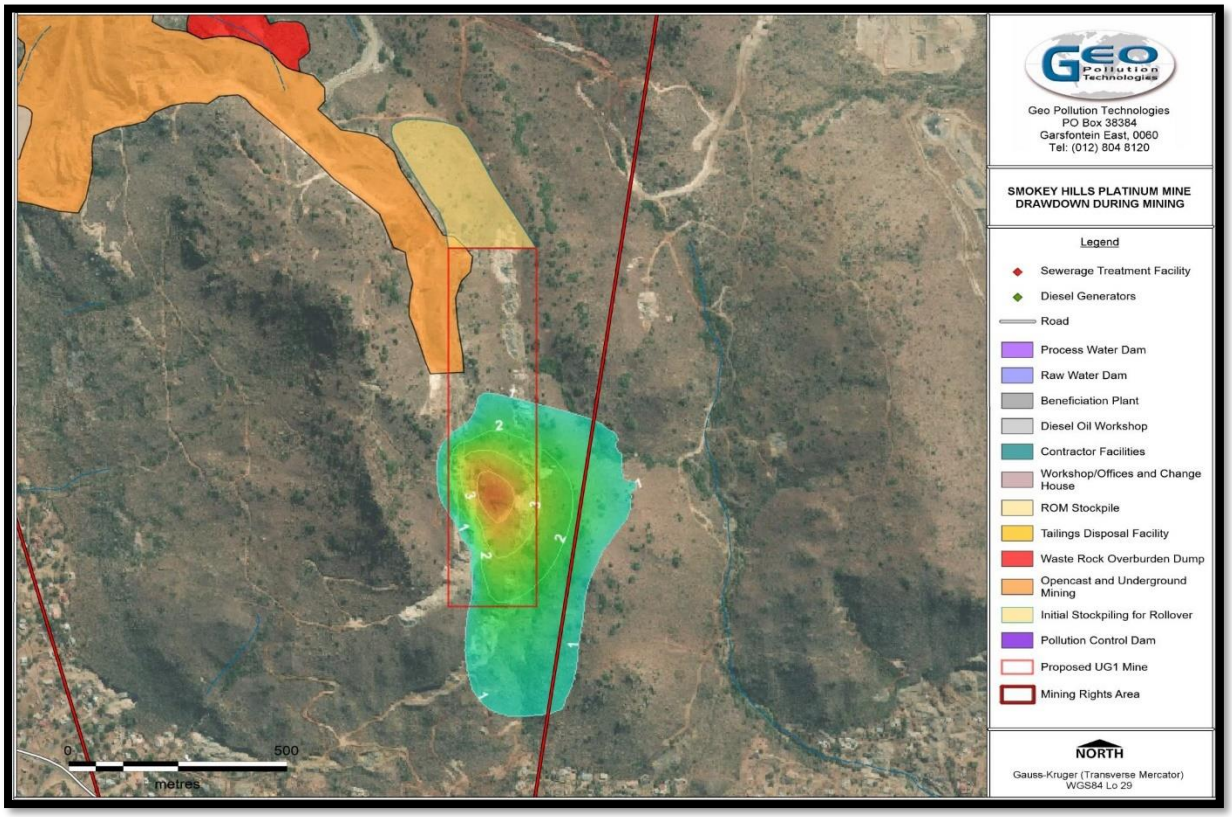


**Figure 10-5: Core depression during mining**

#### *10.3.2.6 Noise*

A conceptual noise model was developed considering the UG1 scenarios. A worst-case scenario was investigated, assuming that:

- all equipment used in Section 10.3.1.6.1 continue to operate; and
- various mining activities take place at two locations at the proposed opencast area as depicted in Figure 10-6. This includes an excavator and truck operating simultaneously under full load;
- 5 trucks travelling to the Black Chrome Mine processing plant via an existing haul road.

Daytime future noise rating level contours are illustrated in Figure 10-7 for the noise sources as conceptualized in Figure 10-6 with the night-time future noise rating level contours illustrated in Figure 10-8.

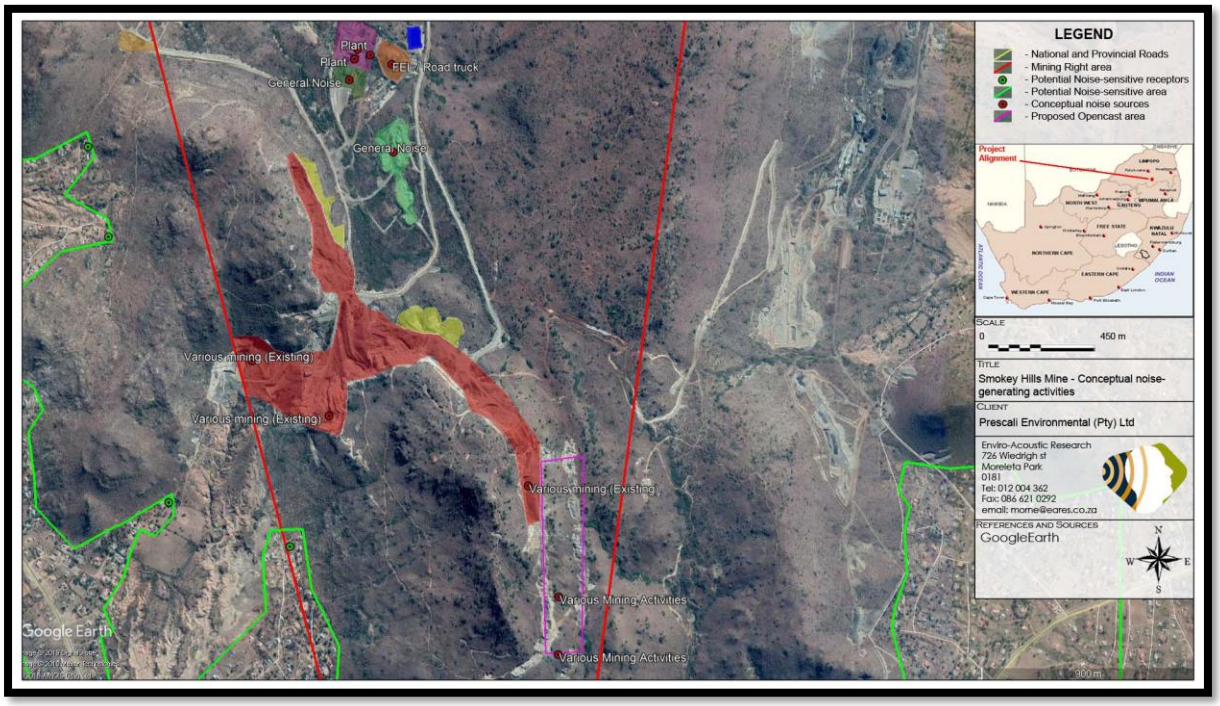


**Figure 10-6: Conceptual proposed future noise sources (worse-case scenario)**

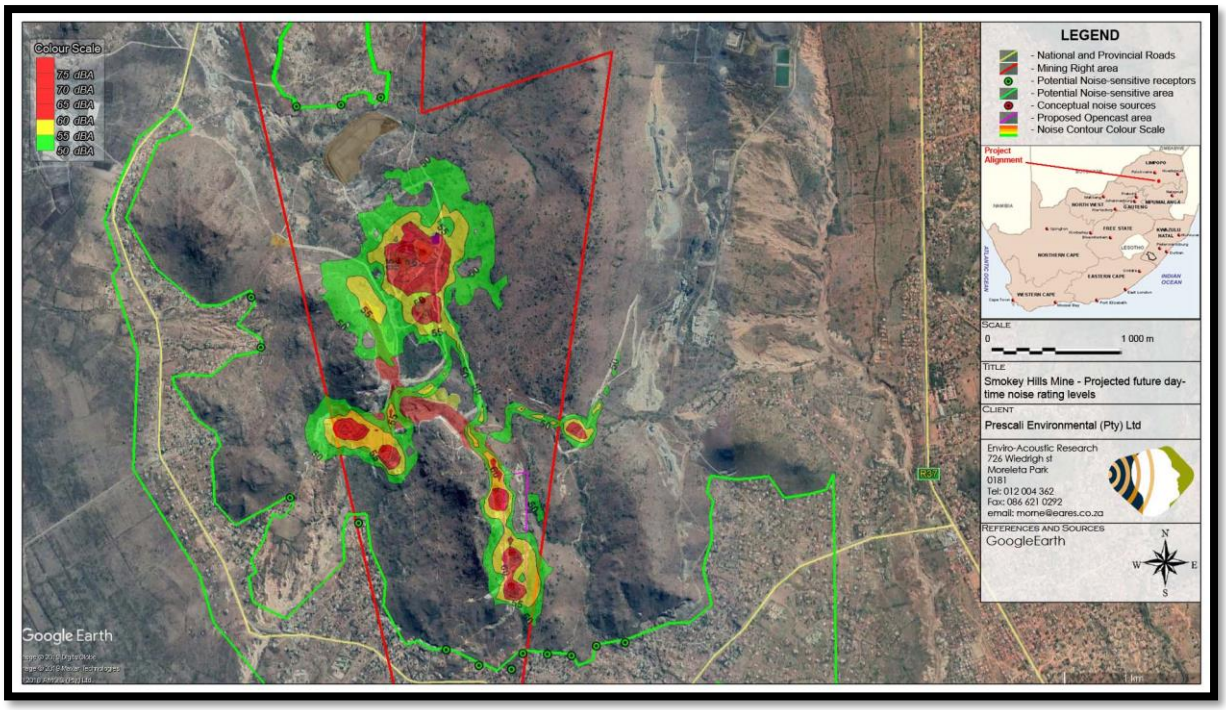


**Figure 10-7: Projected conceptual future daytime operational noise rating levels**

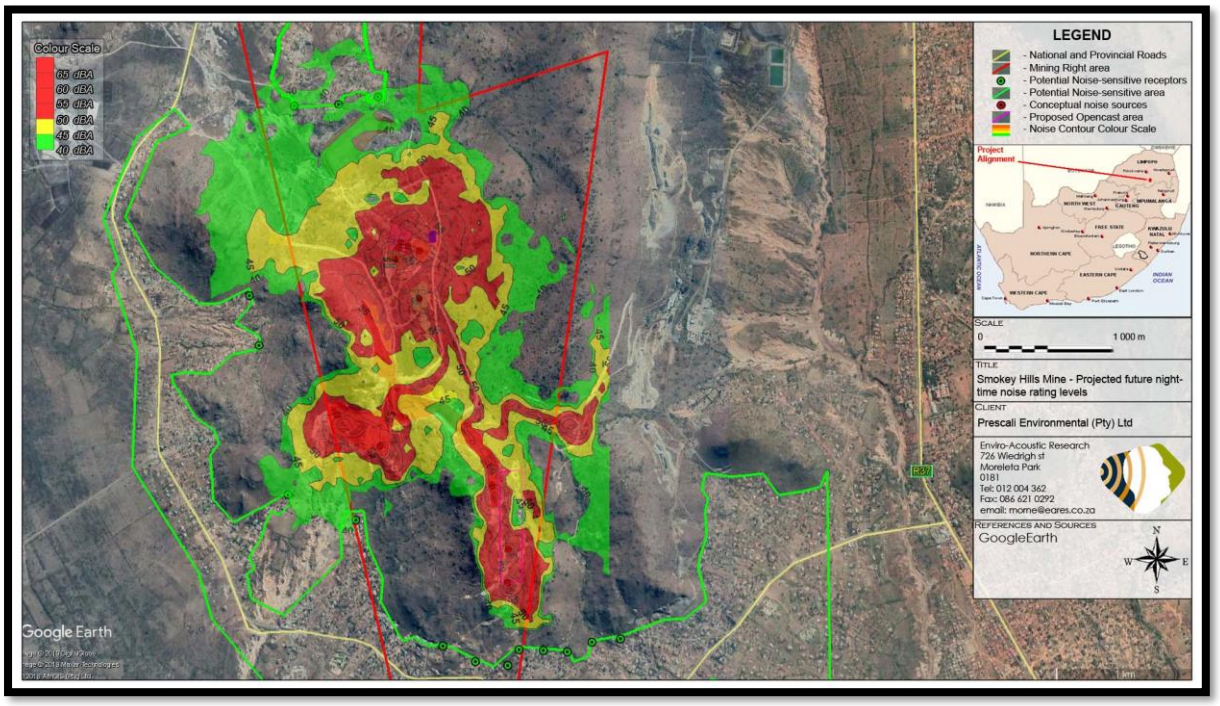


**Figure 10-8: Projected conceptual future night-time operational noise rating levels**

**Table 10-6: Projected noise rating levels due to operational activities**

| NSD | Projected existing noise rating levels (dBA) | | Projected change in ambient sound levels (dBA, 40 dBA day and 38 dBA night-time) | |
|---|---|---|---|---|
| | Day | Night | Day | Night |
| 1 | 40.1 | 40.1 | 0.1 | 2.1 |
| 2 | 39 | 39 | 0 | 1 |
| 3 | 41.8 | 41.8 | 1.8 | 3.8 |

| NSD | Projected existing noise rating levels (dBA) | | Projected change in ambient sound levels (dBA, 40 dBA day and 38 dBA night-time) | |
|---|---|---|---|---|
| 4 | 23.5 | 23.5 | 0 | 0 |
| 5 | 21.1 | 21.1 | 0 | 0 |
| 6 | 42.3 | 42.3 | 2.3 | 4.3 |
| 7 | 37 | 37 | 0 | 0 |
| 8 | 23.7 | 23.7 | 0 | 0 |
| 9 | 30.7 | 30.7 | 0 | 0 |
| 10 | 32.2 | 32.2 | 0 | 0 |
| 11 | 27.7 | 27.7 | 0 | 0 |
| 12 | 30.7 | 30.7 | 0 | 0 |
| 13 | 26.3 | 26.3 | 0 | 0 |
| 14 | 21.8 | 21.8 | 0 | 0 |
| 15 | 25.4 | 25.4 | 0 | 0 |

#### *10.3.2.7 Air Quality*

- The Impact assessment indicated that the following will have an impact on the surrounding air quality: Drilling and blasting:
- Dust from material handling: inside the pit area;
- Haul road for transporting ROM; and
- Wind erosion from stockpile.

The impacts were assessed for the various aspects as discussed below.

##### *10.3.2.7.1 $PM_{10}$*

For the unmitigated Daily $PM_{10}$ concentrations it was predicted to be higher than the 75 µm/m$^3$ limit at 12 of the sensitive receptors. It should however be noted that the predicted levels are the highest levels predicted for one year.

When comparing the Daily Mitigated $PM_{10}$ modelled concentrations, the sensitive receptors exceeding the 75 µg/m$^3$ limit drops to a total of 0 sensitive receptors.

None of the sensitive receptors are predicted to exceed the annual average $PM_{10}$ limit of 40 µg/m$^3$ for the mitigated and unmitigated scenarios.

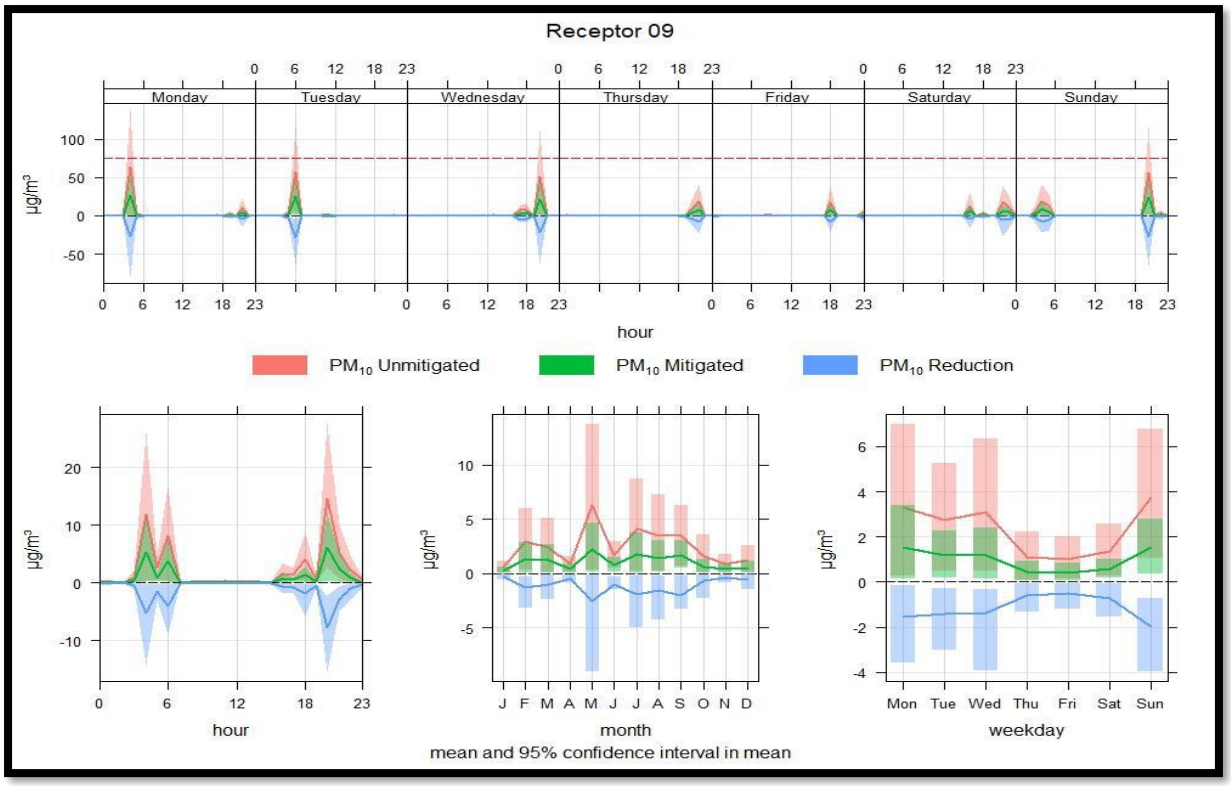


**Figure 10-9: Receptor 09 graphs**

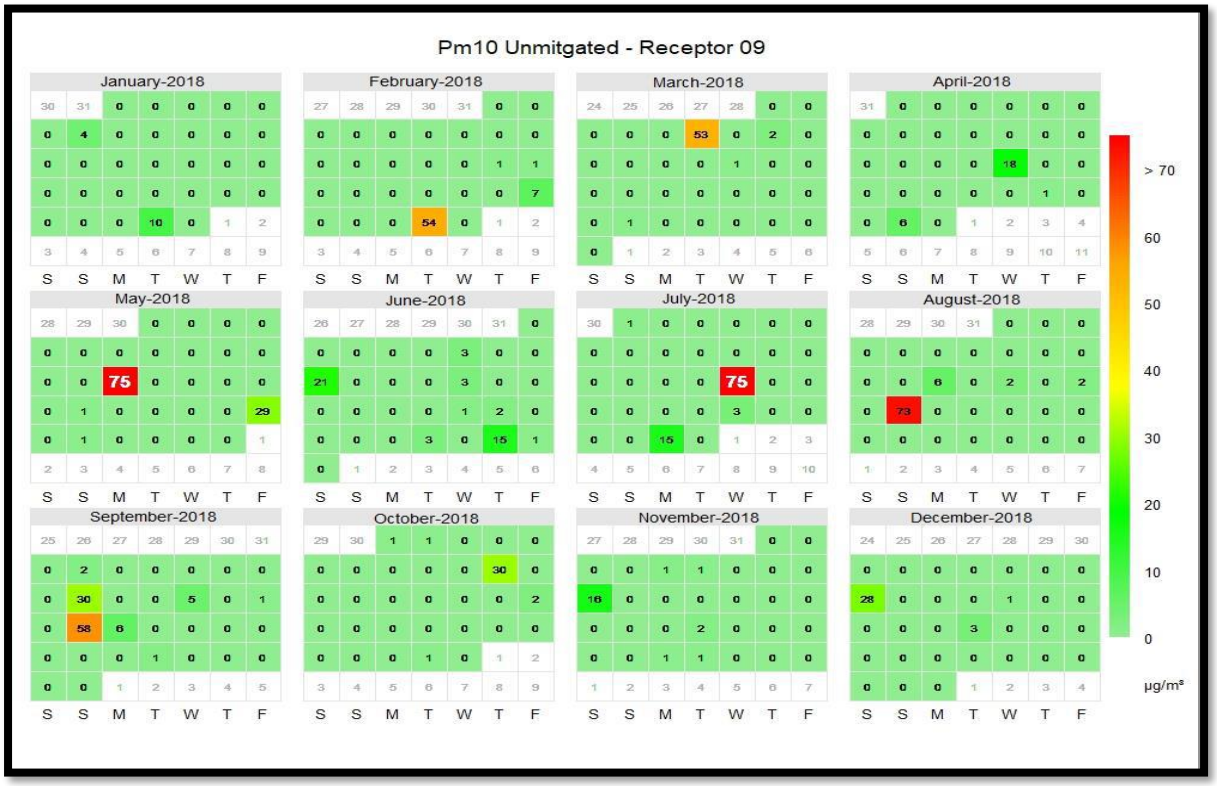


**Figure 10-10: Detailed analysis of receptor 09**

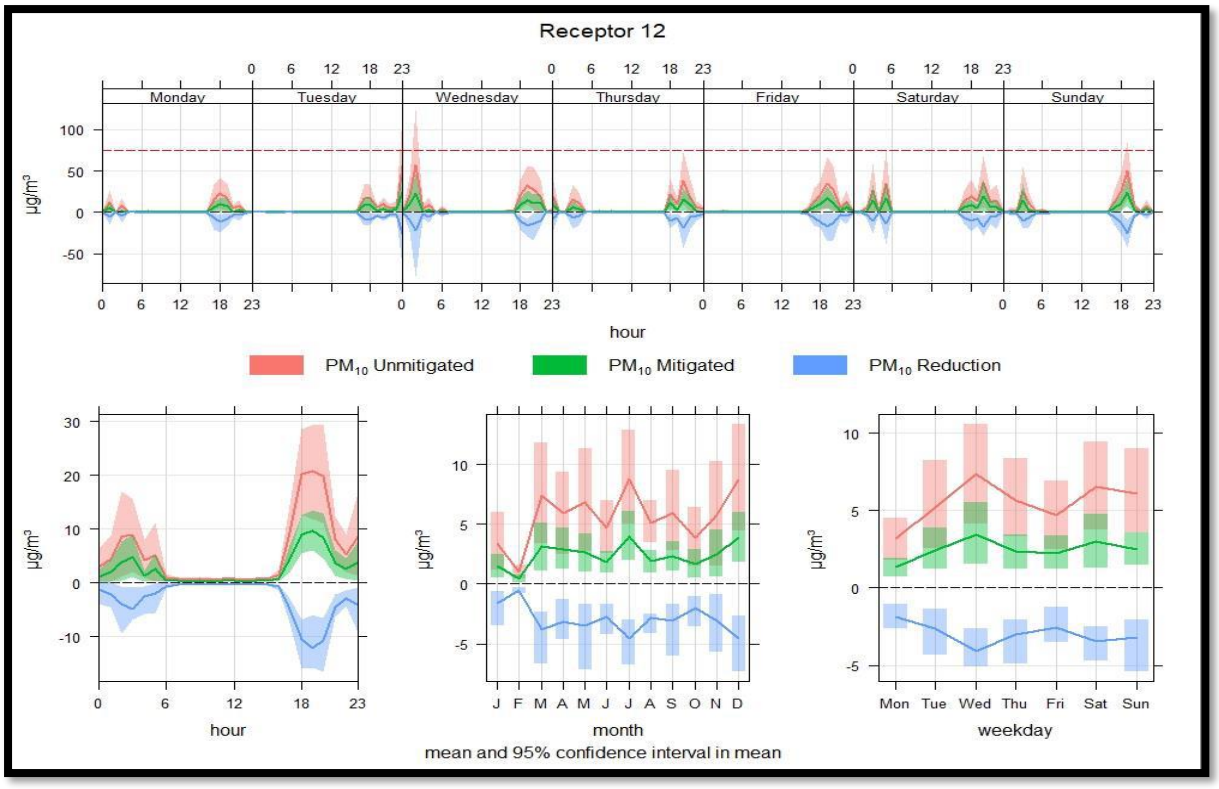


**Figure 10-11: Receptor 12**

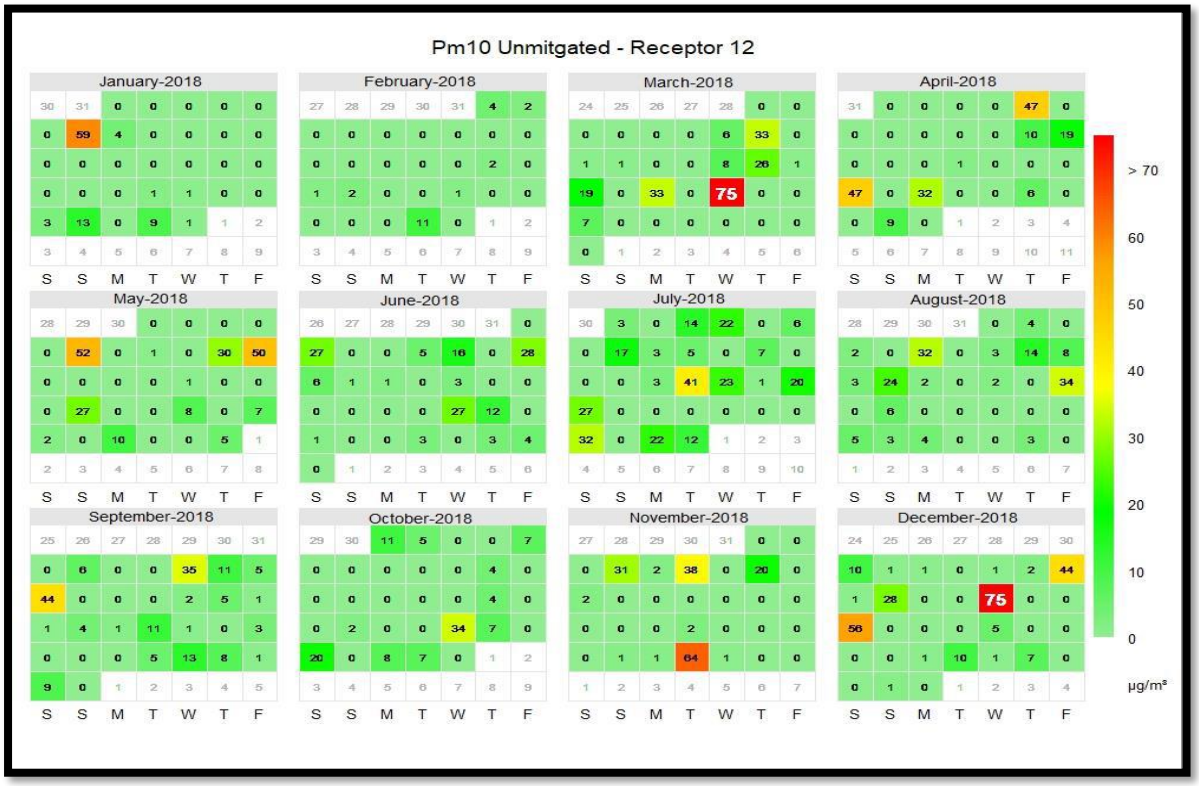


**Figure 10-12: Detailed analysis of receptor 12**

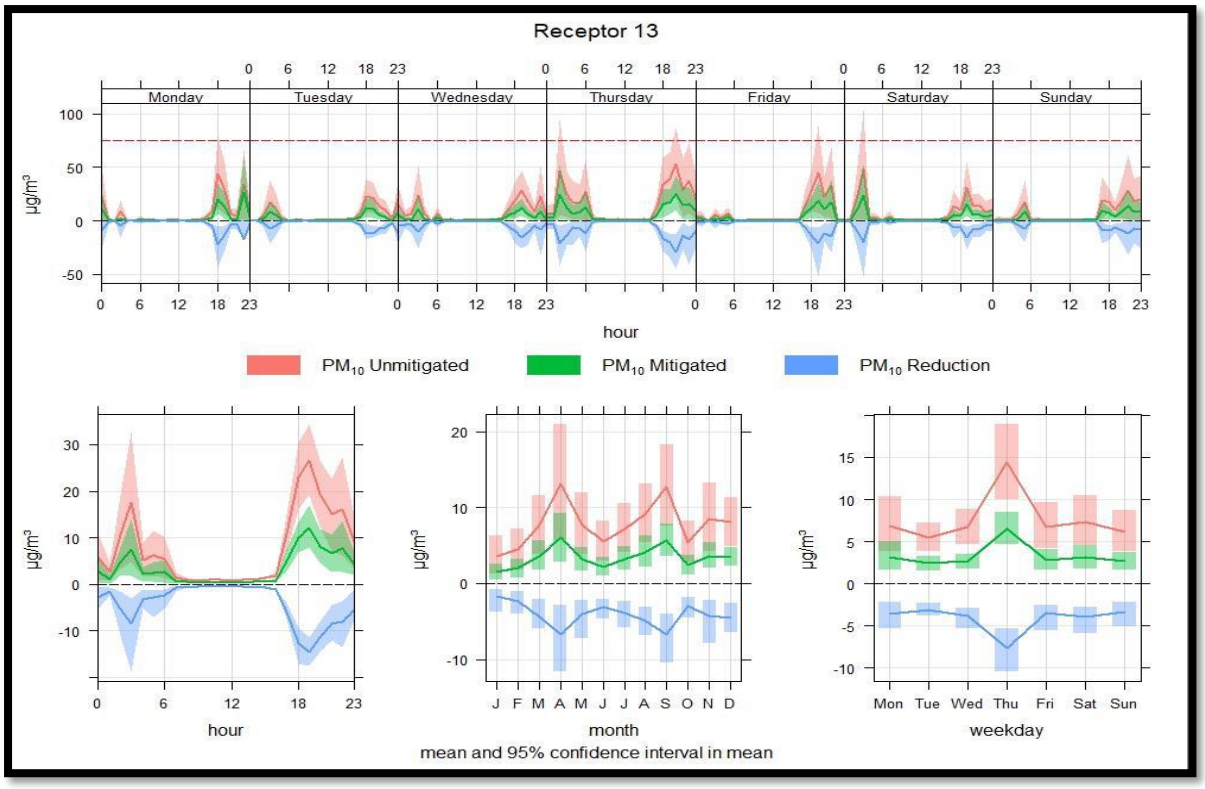


**Figure 10-13: Receptor 13**

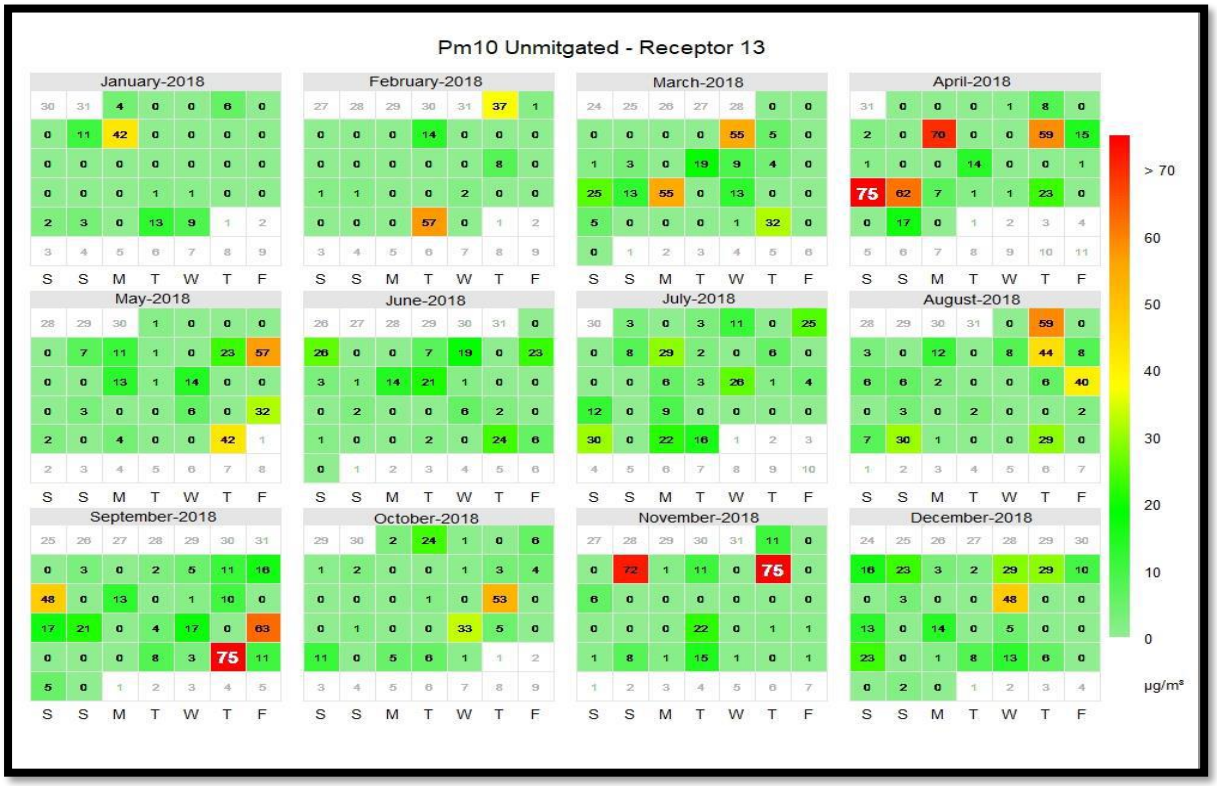


**Figure 10-14: Detailed analysis of receptor 13**

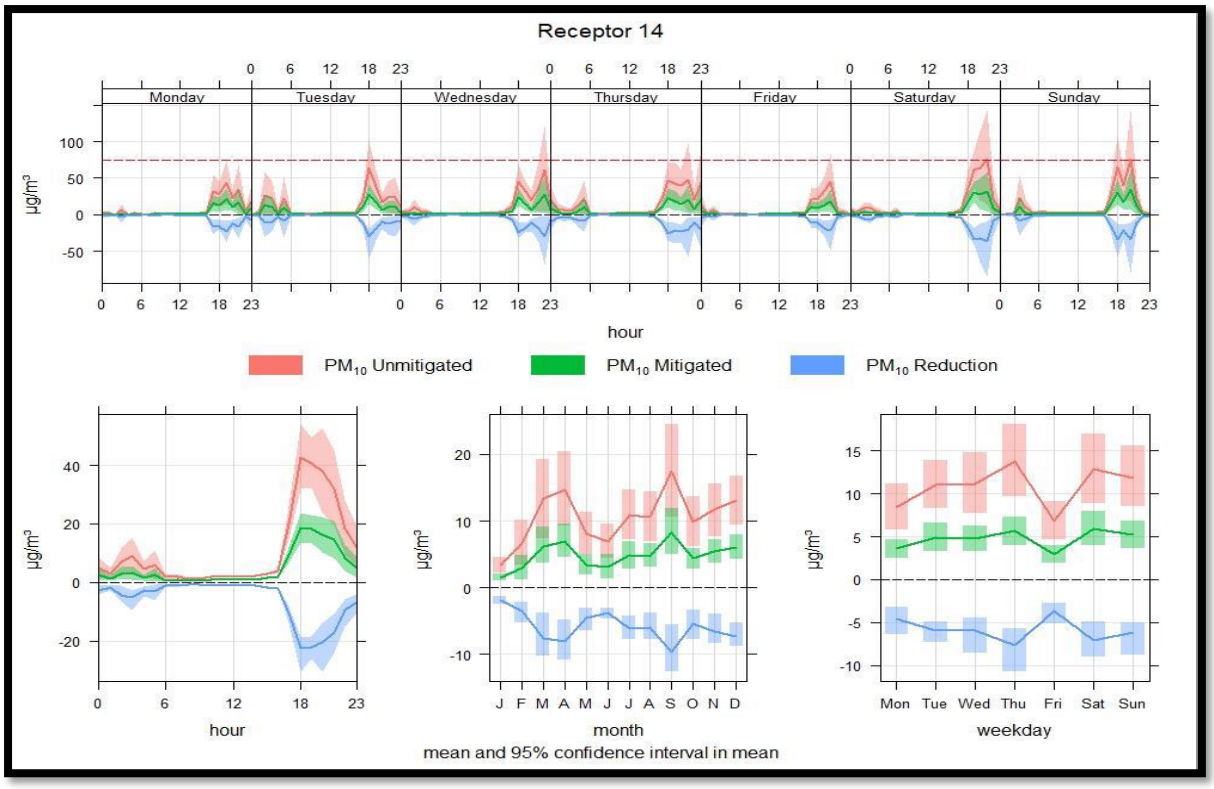


**Figure 10-15: Receptor 14**

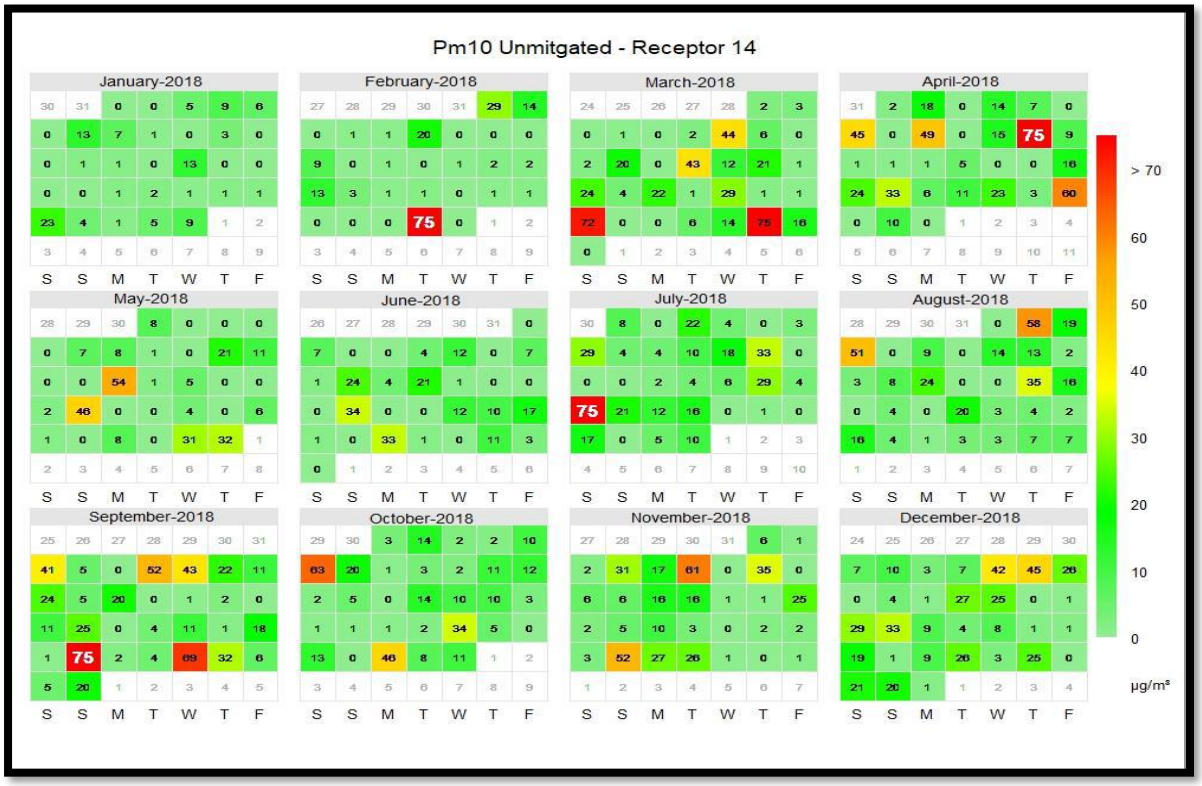


**Figure 10-16:Detailed analysis of receptor 14**

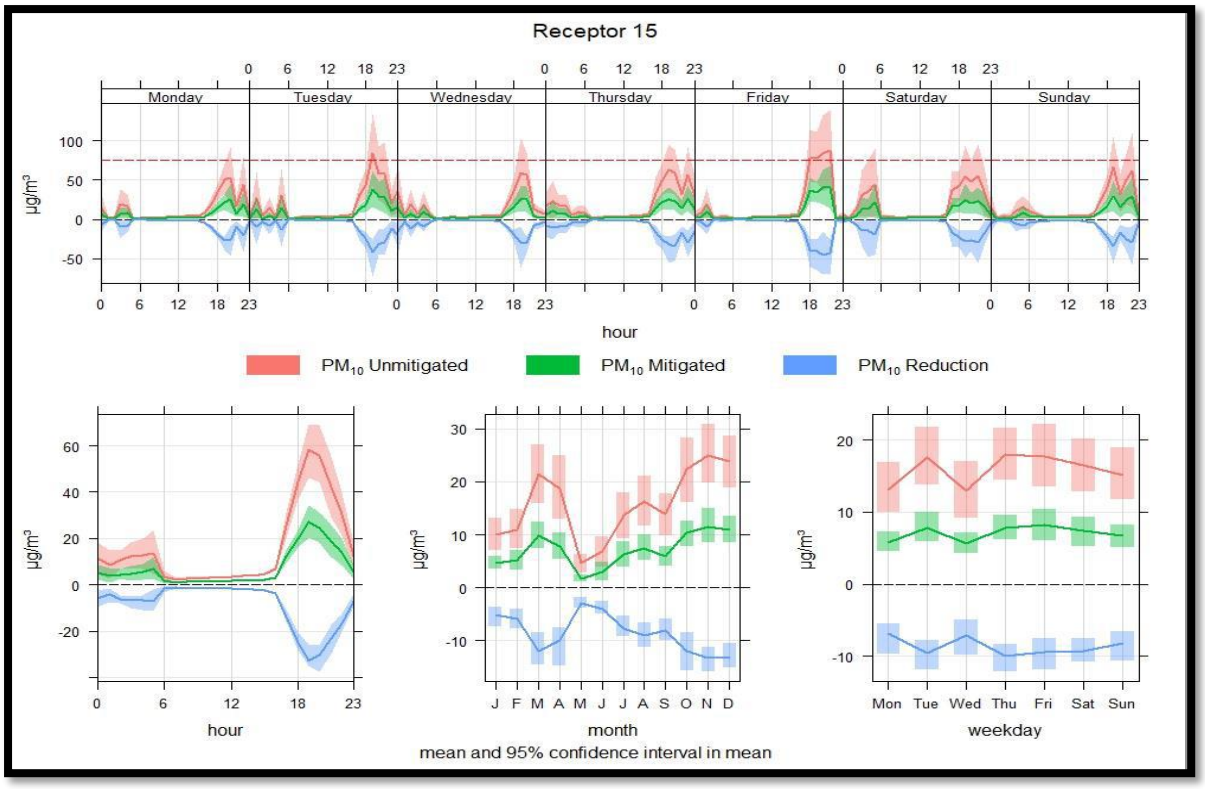


**Figure 10-17: Receptor 15**

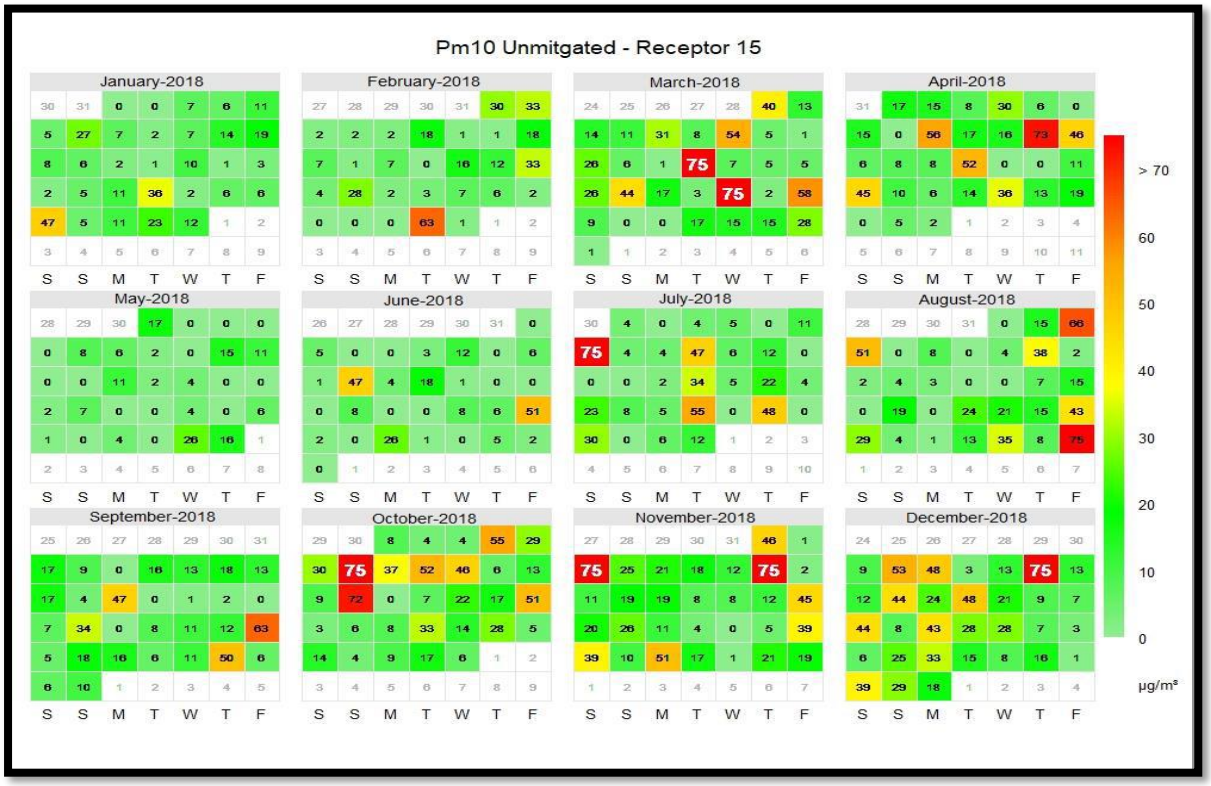


**Figure 10-18: Detailed analysis of receptor 15**

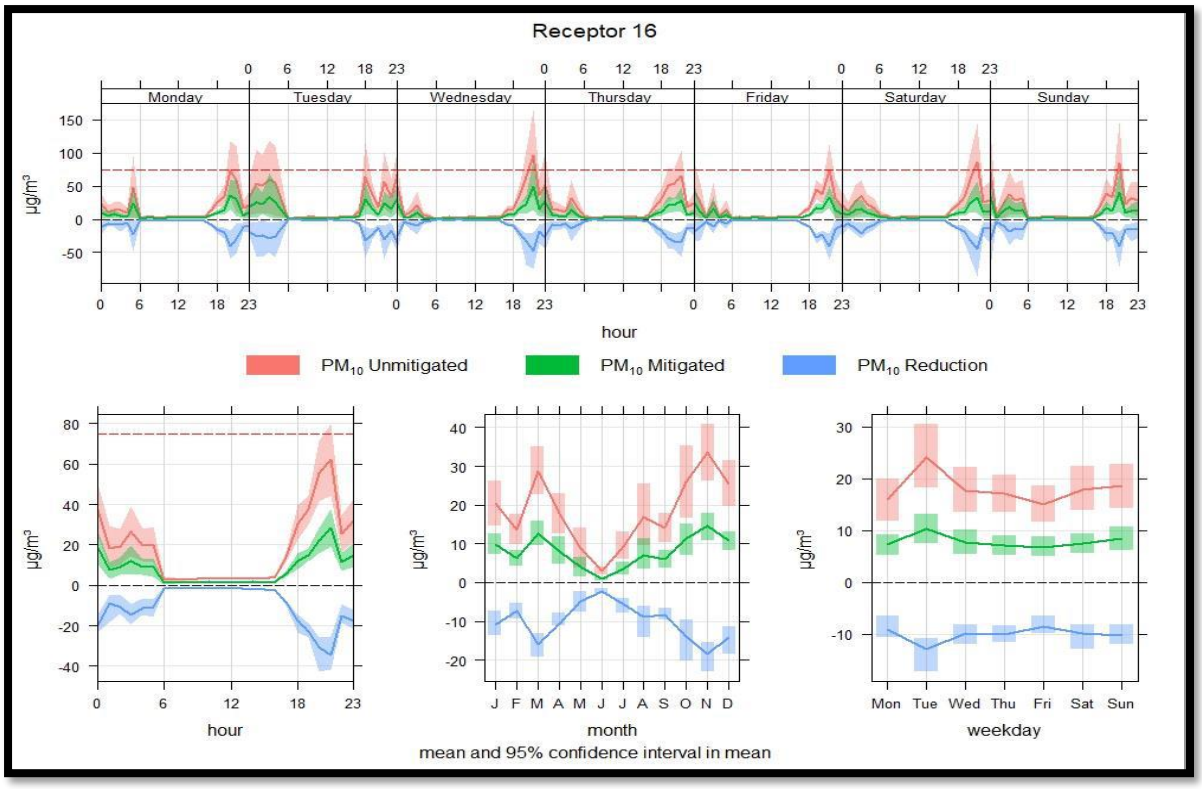


**Figure 10-19: Receptor 16**

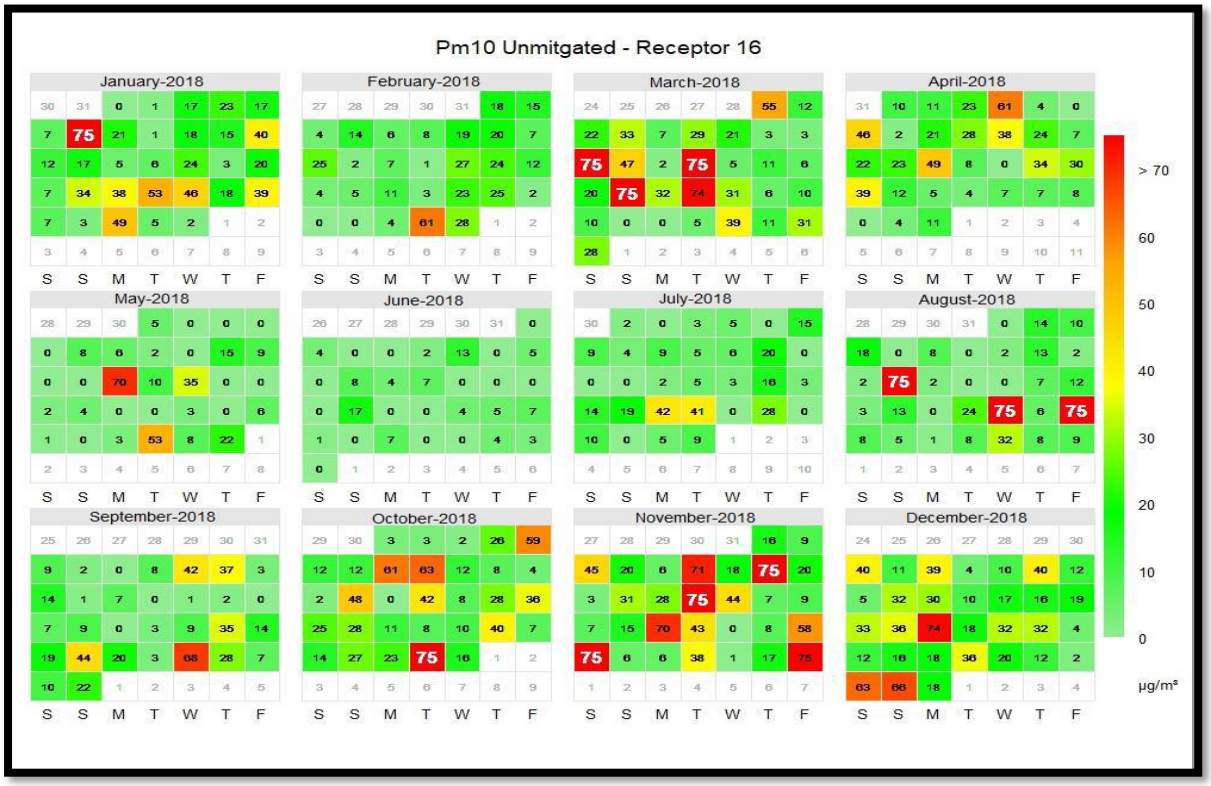


**Figure 10-20: Detailed analysis of receptor 16**

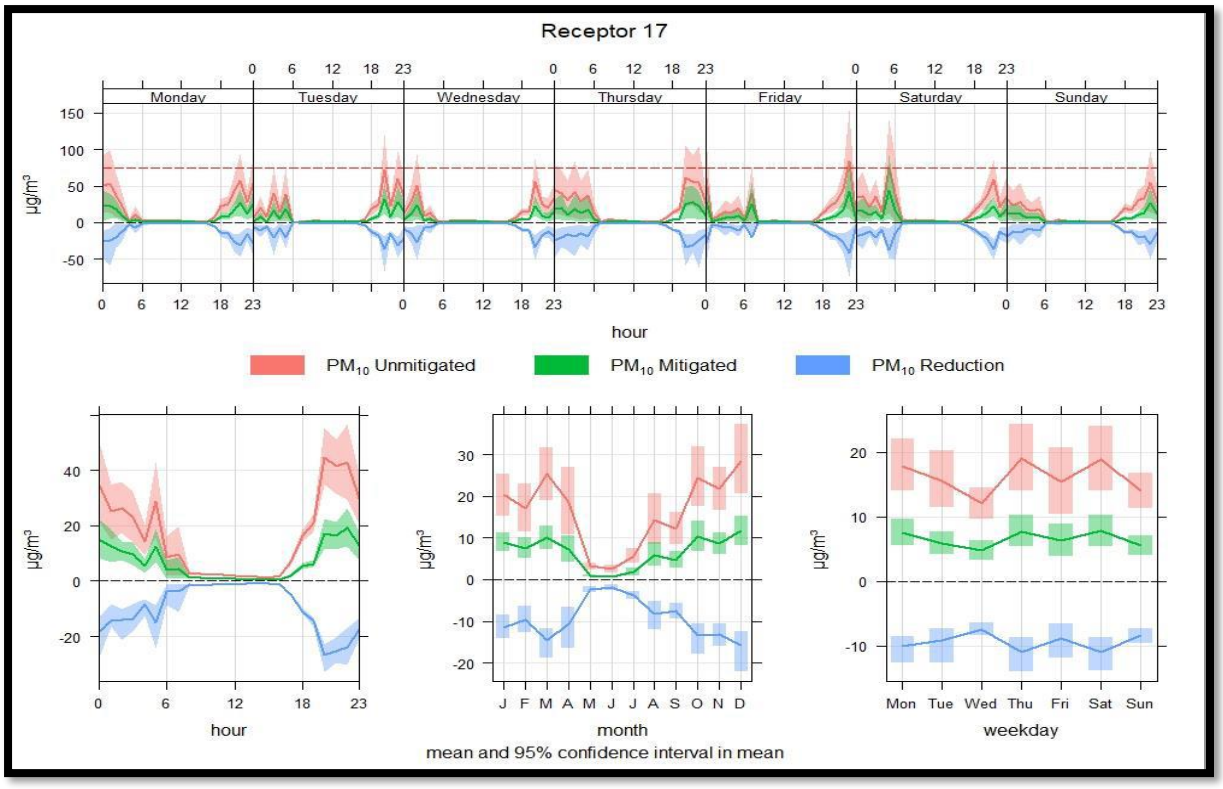


**Figure 10-21: Receptor 17**

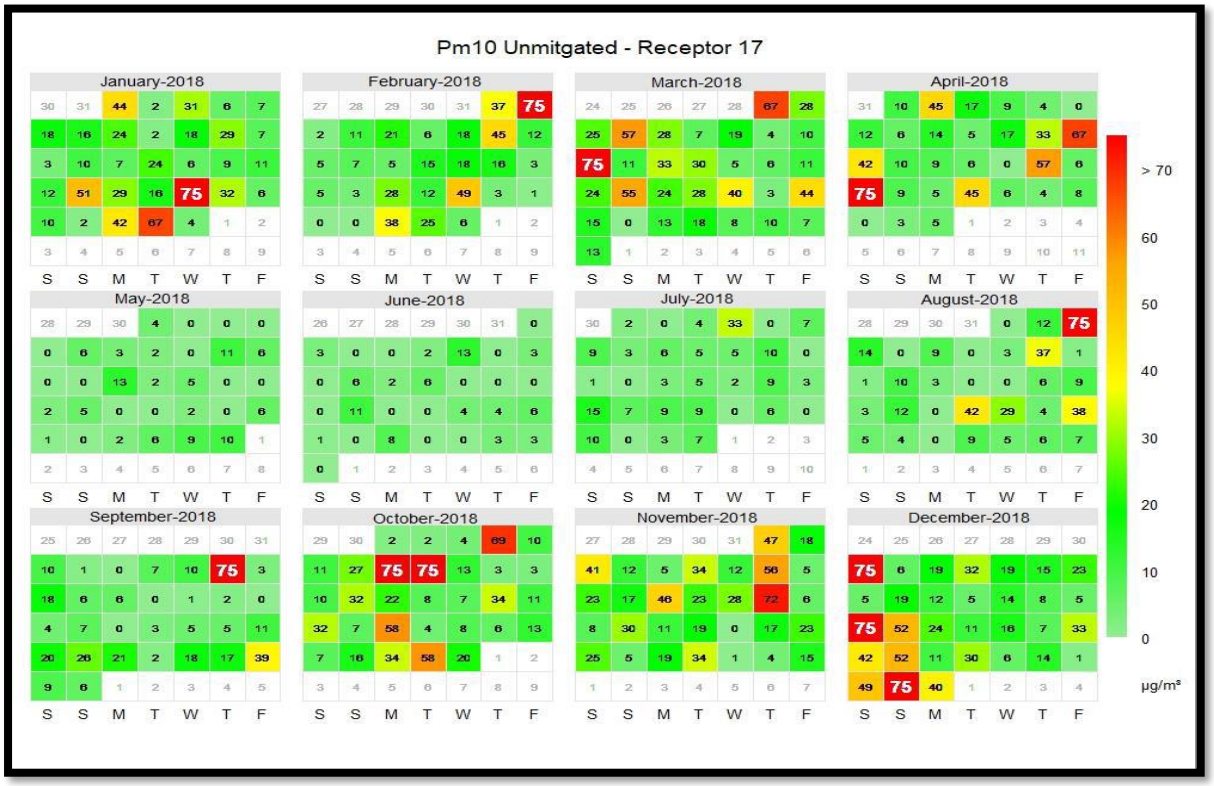


**Figure 10-22: Detailed analysis of receptor 17**

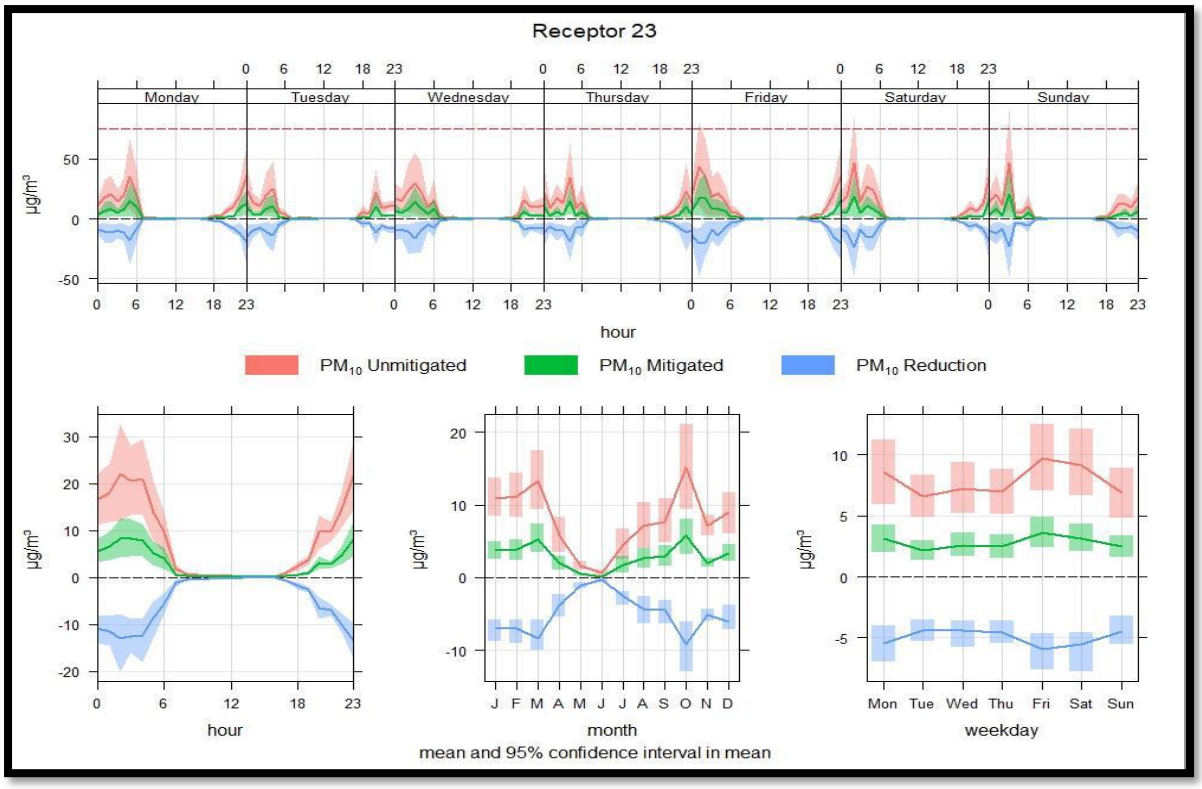


**Figure 10-23: Receptor 23**

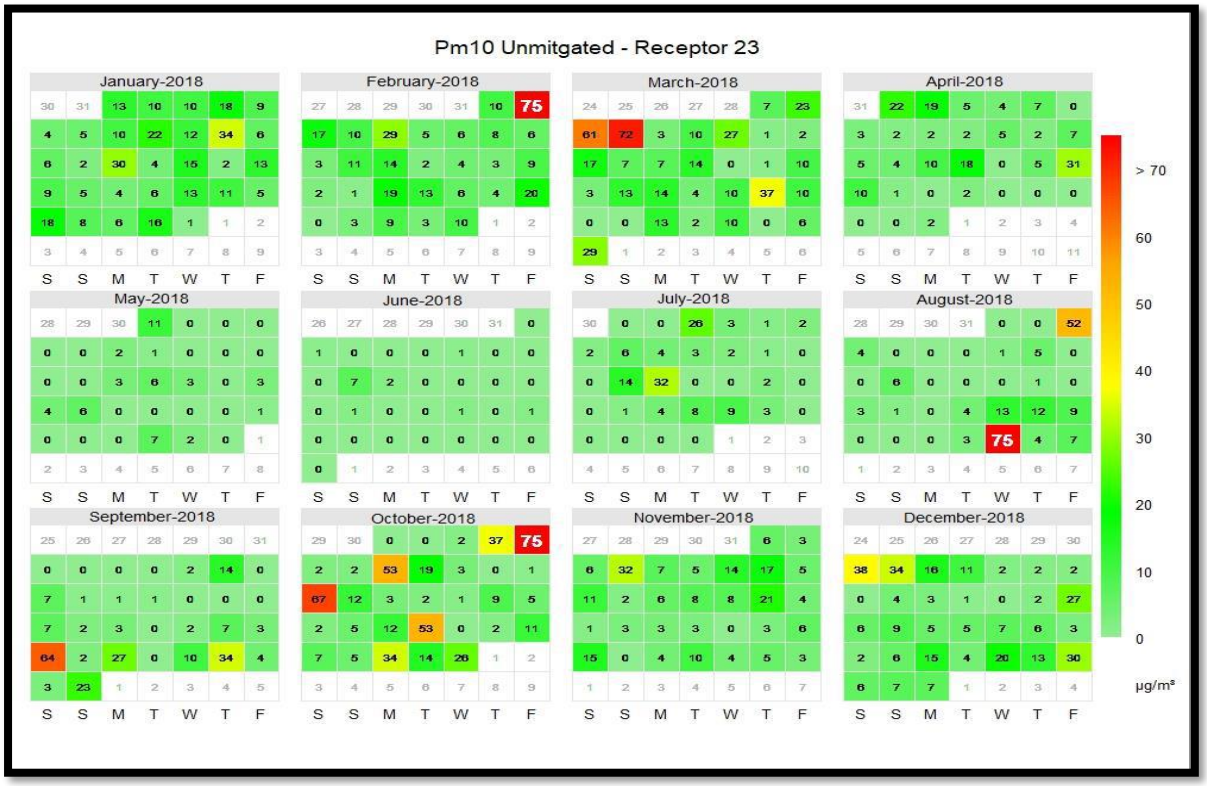


**Figure 10-24:Detailed analysis of receptor 23**

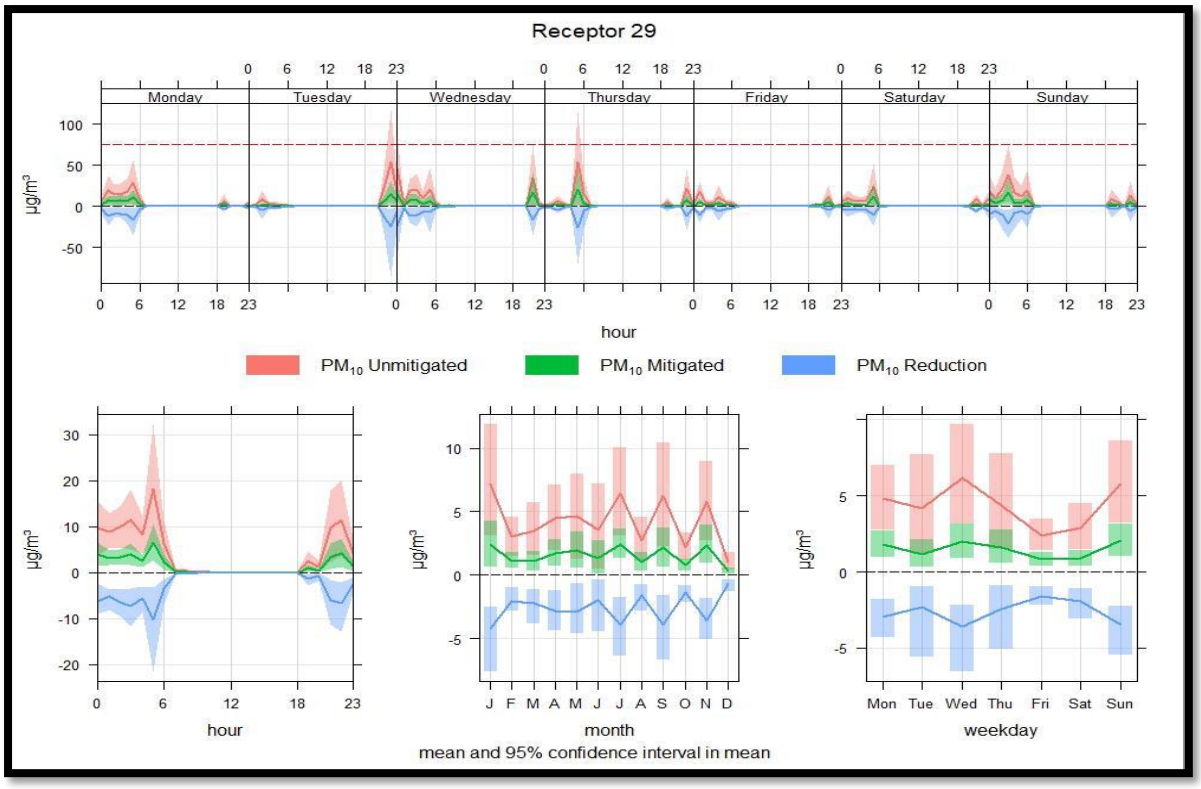


**Figure 10-25:Receptor 29**

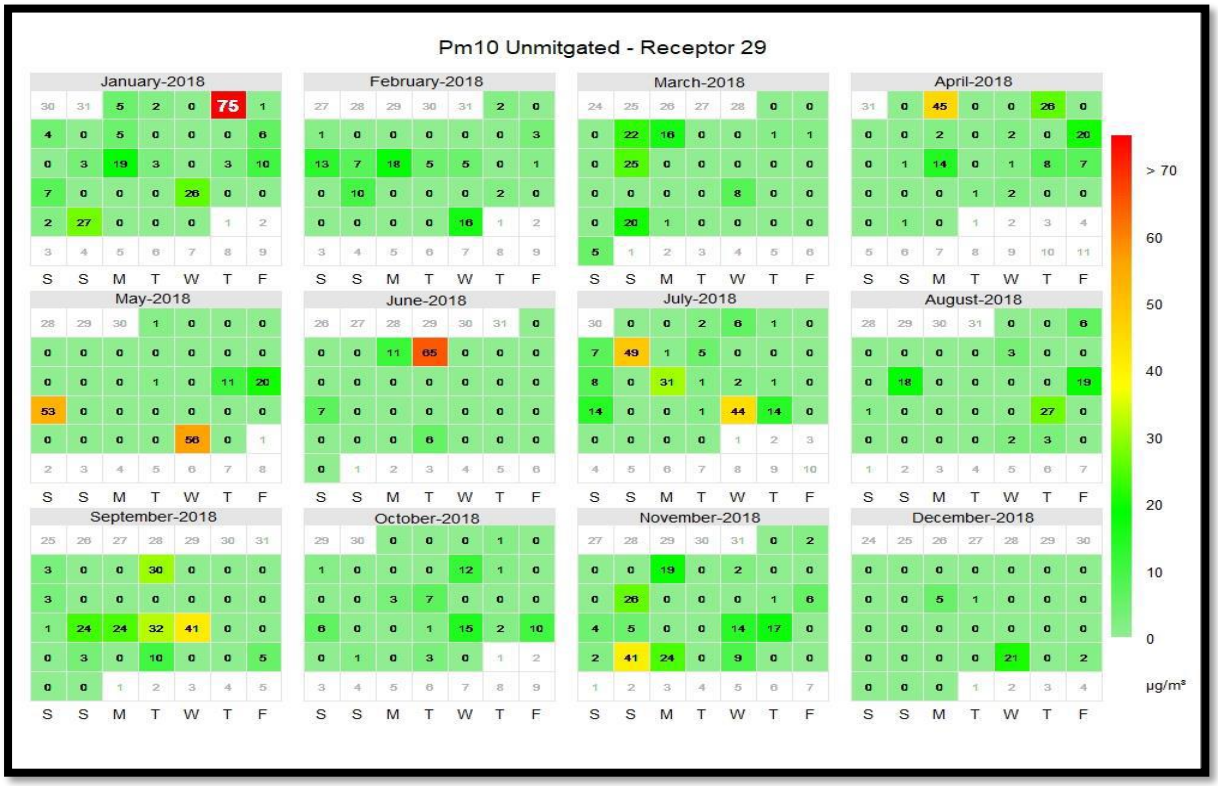


**Figure 10-26: Detailed analysis of receptor 29**

*10.3.2.7.2 Dust Fallout*

For both the unmitigated and mitigated scenarios it is predicted that none of the sensitive receptors will

exceed the monthly dust fallout residential limit of 600 mg/m$^2$/day.

| Receptor | TSP Highest Monthly (mg/m$^2$/day) | | TSP Annual Average (mg/m$^2$/day) | |
|---|---|---|---|---|
| | Unmitigated | Mitigated | Unmitigated | Mitigated |
| 1 | 2 | 1 | 1 | 0 |
| 2 | 2 | 1 | 1 | 0 |
| 3 | 1 | 1 | 0 | 0 |
| 4 | 1 | 0 | 0 | 0 |
| 5 | 1 | 0 | 0 | 0 |
| 6 | 0 | 0 | 0 | 0 |
| 7 | 0 | 0 | 0 | 0 |
| 8 | 0 | 0 | 0 | 0 |
| 9 | 0 | 0 | 0 | 0 |
| 10 | 1 | 0 | 0 | 0 |
| 11 | 1 | 0 | 0 | 0 |
| 12 | 1 | 1 | 1 | 0 |
| 13 | 2 | 1 | 1 | 0 |
| 14 | 4 | 2 | 2 | 1 |
| 15 | 7 | 3 | 4 | 2 |
| 16 | 7 | 3 | 4 | 2 |
| 17 | 6 | 2 | 4 | 1 |
| 18 | 3 | 1 | 2 | 1 |
| 19 | 2 | 1 | 1 | 0 |
| 20 | 2 | 1 | 1 | 0 |
| 21 | 2 | 0 | 1 | 0 |
| 22 | 2 | 1 | 1 | 0 |
| 23 | 2 | 1 | 1 | 0 |
| 24 | 1 | 0 | 1 | 0 |
| 25 | 0 | 0 | 0 | 0 |
| 26 | 0 | 0 | 0 | 0 |
| 27 | 0 | 0 | 0 | 0 |
| 28 | 0 | 0 | 0 | 0 |
| 29 | 0 | 0 | 0 | 0 |
| 30 | 0 | 0 | 0 | 0 |
| 31 | 0 | 0 | 0 | 0 |
| 32 | 0 | 0 | 0 | 0 |
| 33 | 0 | 0 | 0 | 0 |
| 34 | 0 | 0 | 0 | 0 |
| 35 | 1 | 0 | 0 | 0 |
| 36 | 1 | 0 | 0 | 0 |
| 37 | 1 | 0 | 0 | 0 |

#### *10.3.2.8 Heritage sites*

No impacts were identified.

#### *10.3.2.9 Socio-economic impact*

Additional Employment opportunities will be created in an area with high unemployment figures. This is a positive effect.

### 10.3.3 DECOMMISSIONING PHASE

#### *10.3.3.1 Surface Water*

- **Diversion of drainage lines:** Alteration of drainage lines by impacting their natural course. Impact on catchment yield by capturing runoff and diverting the drainage systems. Degradation of stream channels through long-term reduced runoff and periodic discharge of high volumes.
- **Earth works, land clearance or removal of topsoil**: Exposed surfaces could result in increased erosion and associated runoff which in turn may result in increased siltation of surface streams.
- **Earth works, land clearance or removal of topsoil**: Exposed surfaces together with increased traffic on-site could result in increased siltation of surface water streams by excessive dust generation.
- **Erection of ablution facilities**: Inadequate maintenance of mobile sanitary facilities could result in spillage of sewage waste which could contaminate runoff to drainage lines.
- **Increase in traffic**: An increase in traffic and the additional logistics may result in hydrocarbon spillages which could in turn result in contaminated runoff reaching drainage lines.

#### *10.3.3.2 Flora*

- Increased activity and traffic within a shorter timeframe (closure phase) may degrade the area. The possibility exists for rehabilitation to be ineffective if measures are not appropriately complied to or rehabilitation is not planned well in advance. Rehabilitation plans should be planned long before the closure phase is due. Continuous rehabilitation should also take place during the operational phase.
- Without mitigation the alien invasive species will increase and result in a degraded veld condition making the property less useful for post-closure land use activities such as grazing and agriculture. Alien invasive plant species should be eradicated on all parts of the mining permit area where the mine will be located before the closure certificate will be provided. It is the mine's responsibility according to the NEMBA that they mitigate all invasive or exotic species with the appropriate measures. This is a continuous process and will continue after the operational activities of the mine have ceased.

#### *10.3.3.3 Fauna*

- Most of the impacts on faunal species will occur during the construction- and operational phases. The possibility exists for rehabilitation to be ineffective if measures are not appropriately complied to or rehabilitation is not planned well in advance. Rehabilitation plans should be planned long before the closure phase is due to reduce the risk that rehabilitation might be unsuccessful.
- The UG1 open pit should be remediated concurrently and immediately as to prevent dangerous excavations and or additional soil loss, habitat loss and alien vegetation establishment associated with bare impacted areas. These could constitute a death trap for animal species if not rehabilitated immediately and properly during closure.

#### *10.3.3.4 Soil*

- Transport of materials away from site.
- Earthworks will include redistribution of inert waste materials to fill the open pits as well as topsoil to add to the soil surface.
- Soil surfaces are in the process of being replanted with indigenous vegetation and until vegetation cover has established successfully, all surfaces are still susceptible to potential soil erosion.
- Soil are the handling and storage of materials and different kinds of waste generated as well as accidental spills and leaks with decommissioning and rehabilitation activities.
- Soil chemical pollution as a result of potential oil and fuel spillages from vehicle, is considered to be a medium deterioration of the soil resource.

- Soil compaction will be a measurable deterioration that will occur as a result of the heavy vehicles.
- Successful re-vegetation of all denuded areas with indigenous vegetation can reduce the significance of erosion to very low.

#### *10.3.3.5 Archaeology*

No impacts are expected.

#### *10.3.3.6 Groundwater*

During this phase it is assumed that dewatering of the mine will be ceased, and it will be allowed to flood. The groundwater regime will return to a state of equilibrium once mining has stopped and the removal of water from the mining void has been discontinued.

The rise in groundwater level is predicted to be relatively fast. The fast recovery is ascribed to the little water that will be encountered in the opencast, as well as the position of the mine within the topography.

The following possible impacts were identified at this stage:

- Following closure of the mine, the groundwater level will rise to an equilibrium that will differ from the pre-mining level due to the disturbance of the bedrock. However, this change is likely to be minimal due to the depth of mining and no drawdown anticipated close to surface.
- Groundwater within the mined areas is expected to deteriorate due to chemical interactions between the geological material and the groundwater. The resulting groundwater pollution plume is expected to commence with downstream movement.

*10.3.3.6.1 mpacts on groundwater quantity*

After closure, the water table will rise in the mine to reinstate equilibrium with the surrounding groundwater systems. However, the mined areas will have a large hydraulic conductivity compared to the pre-mining situation.

**Rebound and Potential Decant**

Following the closure of the opencasts and the cessation of the dewatering it is assumed to lead to groundwater rebound. This estimated rebound time for groundwater levels to recover to pre-mining levels in years is expected to be in the order of 10 years.

After rebound has reached equilibrium or water in the pit equal to surrounding host rock, decant has the potential to occur due to excessive rainfall and surface water run-off water entering the pit. Predicted groundwater levels indicate that a rise in groundwater will occur but that no decant will occur in so far as daylighting to surface is concerned, due to the deep groundwater levels in the area.

*10.3.3.6.2 Impacts on groundwater quality*

Once the normal groundwater flow conditions have been re-instated, polluted water could potentially migrate away from the mining areas.

**Spread of pollution**

- As some discards and exposed reactive mineral surfaces will remain in the mine, this outflow could be contaminated as a result of mine drainage. As sulphate is normally a solute in drainage from mines, sulphate concentration from the mine has been modelled as a conservative (non-reacting) indicator of mine drainage pollution. A starting concentration of 700 mg/litre has been assumed as a worst-case scenario based on the leach testing performed for the area in a previous study. The migration of contaminated water from the mining area has been modelled as described, and the results are presented in Figure 10-27 in terms of the extent of the pollution plume 10, 25, 50 and 100 years after the operations have ceased.

- As stated previously, the results must be viewed with caution as a homogeneous aquifer has been assumed. Heterogeneities in the aquifer are unknown and the effect of this cannot be predicted. Furthermore, no chemical interaction of the leachate with the minerals in the surrounding bedrock has been assumed. As there must be some interaction and retardation of the plume, this calculation will represent a worst-case scenario.

Within the limitations of the abovementioned assumptions, it can be estimated from these figures that:

- The leachate plume emanating from the mine is calculated to affect the local south draining non-perennial stream in about 50 years after mine closure. However, it should be noted that the concentration increase is likely to be negligible and the groundwater is likely to remain within potable quality with regards to sulphate when compared with the SANS water quality standards.

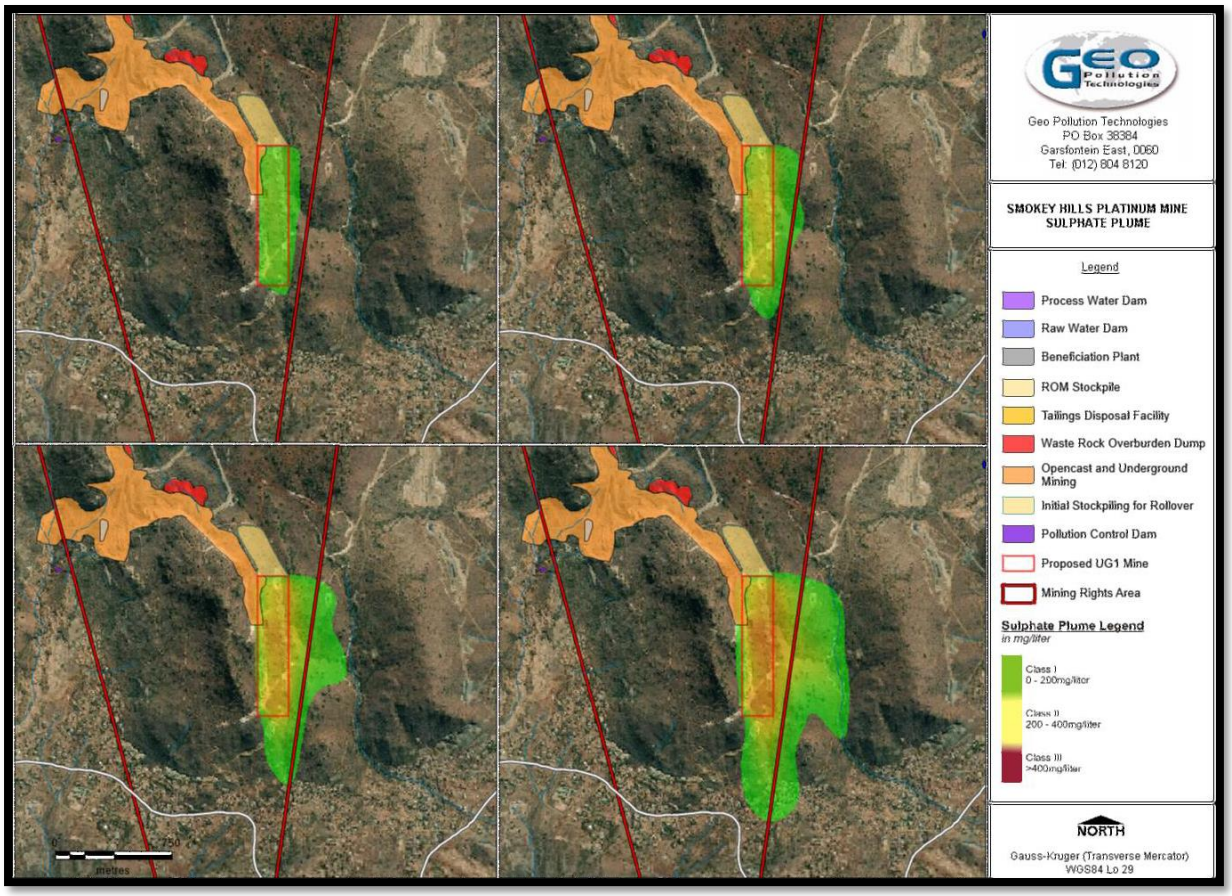


**Figure 10-27: Spread of pollution caused by mining activities**

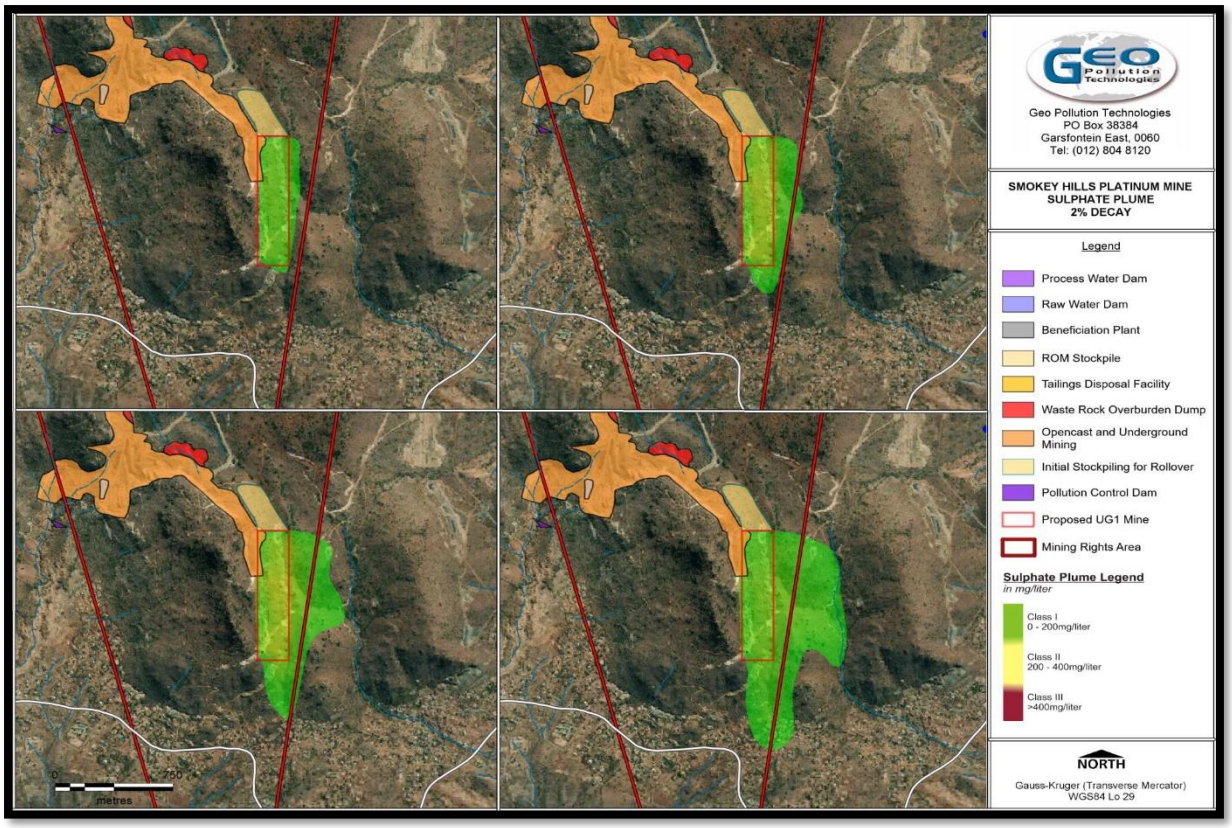


**Figure 10-28: Pollution plume assuming 2% decay**

#### *10.3.3.7 Noise*

The potential for a noise impact to occur during the decommissioning and closure phase will be much lower than that of the operational phases and noise from these phases was not investigated further.

#### *10.3.3.8 Air Quality*

It is assumed that the decommissioning activities will only take place during daylight hours. The following activities during the Decommissioning and Closure phase are identified as possible air impacting sources and may impact on the ambient air quality at the relevant sensitive receivers:

- **Demolition & Removal of all infrastructure (Including transportation off site):** During this activity, there is demolition of buildings and foundation and subsequent removal of rubbles generated. There is cleaning-up of workshops, fuels and reagents, removal of power and water supply, removal of haul and access roads. Potential for impacts during this phase will depend on the extent of demolition and rehabilitation efforts during closure as well as features which will remain.
    - The impacts on the atmospheric environment during the decommissioning phase will be similar to the impacts during the construction phase. The process includes dismantling and demolition of existing infrastructure, transporting and handling of topsoil on unpaved roads in order to bring the site to its initial/rehabilitated state. Demolition and removal of all infrastructures will cause fugitive dust emissions. The impacts will be short-term and localised. Any implication or implications this phase will have on ambient air quality will seize once the activities are finalised.
- **Rehabilitation (Spreading of soil, revegetation & profiling/contouring):** During this activity, there is the reshaping and restructuring of the landscape. Since this is an opencast operation mainly, the area to be reconstructed will be limited to the opencast areas. Topsoil can be imported to reconstruct the soil structure. There is less transfer of soil from one area to other

therefore negligible chances of dust through wind erosion. Profiling of dumps and waste rock dump to enhance vegetation cover and reduce wind erosion from such surfaces post mining.

#### *10.3.3.9 Socio – economic impacts*

Negative impacts with regards to increased unemployment in the area is associated with the closure of the mine.

### 10.3.4 CUMULATIVE IMPACTS

A cumulative impact may result from an additive impact i.e. where it adds to the impact which is caused by other similar impacts or an interactive impact i.e. where a cumulative impact is caused by different impacts that combine to form a new kind of impact. Interactive impacts may either be countervailing (net adverse cumulative impact is less than the sum of the individual impacts) or synergistic (net adverse cumulative impact is greater than the sum of the individual impacts).

The assessment of cumulative impacts on a study area is complex; especially if many of the impacts occur on a much wider scale than the site being assessed and evaluated. It is often difficult to determine at which point the accumulation of many small impacts reaches the point of an undesired or unintended cumulative impact that should be avoided or mitigated. There are often factors which are uncertain when potential cumulative impacts are identified.

The anticipated impacts resulting from the development of the UG1 opencast excavation could potentially result in cumulative effects in the following areas:

- Cumulative impacts on loss and damage to natural habitats when the vegetation is cleared for development.
- Impacts on soils including further topsoil degradation and erosion, compaction, sedimentation, soil pollution and loss of land capability.
- The disturbance of the area could lead to an increase in the growth of alien vegetation.
- Additional risk of soil and water pollution during the construction phase, but during the operational phase it will significantly lower the risk soil and water pollution at the mine site.
- Cumulative noise impacts: There exists other noise generating sources within the study area e.g. transportation networks. These sources were not investigated in the designed modelled scenario as:
    - Designed scenarios will be a worst-case investigation. The scenarios investigated/designed is applicable at a time at maximum capacity and should mask any other baseline noise contributors within close proximity to the project; and
    - It should be noted that measured and selected Rating Level will represent the baseline noise contributors, which already is a cumulation of noise in the vicinity.
- Regarding surface water environment, the assessment of cumulative impacts from adjacent mines with the implementation of appropriate management measures to ensure sensitive downstream water users are not detrimentally impacted was recommended as a general management feature to prevent surface water cumulative impacts.
- The groundwater report stated the following regarding cumulative impacts: “The cumulative pollution impacts of all current and historic mining in addition to the proposed new underground and open pits could not be calculated as any data on surrounding mines is not available. However, it is highly recommended that a regional study be undertaken to quantify impacts on at least a quaternary scale or a data sharing agreement should be reached with neighbouring mines.”
- The Soil report stated the following regarding cumulative impact: The larger area around the proposed Smokey Hill UG1 project have seen the development of several mining projects and processing plants for minerals over the past fifteen years. The development of the mining industry in this region has also led to the development of housing and business infrastructure

to support the growing communities and influx of people from other regions of the country in pursuit of Employment opportunities. The Smokey Hill development has a small surface footprint when compared to some other developments in the area. However, the removal of vegetation and the disturbance of in situ soil profiles will still have cumulative impacts. These cumulative impacts include:

- Increased risk of soil erosion;
- Increased risk of chemical soil pollution;
- Increased areas that experience soil compaction; and
- Increased loss of soil ecosystem services that supports natural vegetation and result in the current pre-mining land capabilities.

- Cumulative air quality impacts:
  - Project site localised cumulative impacts include the cumulative effects from operations that are close enough to potentially cause additive effects on the environment or sensitive receivers. These include mainly dust deposition. From this air impact assessment conducted for the proposed UG1 opencast project, the modelling indicates the cumulative pollution plume emanating from this site as a combination of activities and shows that the impacts will be mainly localised around and in the vicinity of the operations.
  - The mining sector in South Africa is growing steadily and therefore this project will also contribute to the larger regional impact that will be experienced.
  - The only impact from the project that is potentially global is the generation of potential greenhouse gas emissions. However, the level of emissions from the project represents a very minor and insignificant contribution at this scale.

# 11 IMPACTS AND RISKS IDENTIFIED INCLUDING THE NATURE, SIGNIFICANCE, CONSEQUENCE, EXTENT, DURATION AND PROBABILITY OF THE IMPACTS, INCLUDING THE DEGREE TO WHICH THESE IMPACTS

(Provide a list of the potential impacts identified of the activities described in the initial site layout that will be undertaken, as informed by both the typical known impacts of such activities, and as informed by the consultations with affected parties together with the significance, probability, and duration of the impacts. Please indicate the extent to which they can be reversed, the extent to which they may cause irreplaceable loss of resources, and can be avoided, managed or mitigated)

Please refer to Section 10.3 for discussions on identified impacts as well as Table 11-1 and Table 11-2.

## 11.1 ASSESSMENT OF EACH IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK

(This section of the report must consider all the known typical impacts of each of the activities (including those that could or should have been identified by knowledgeable persons) and not only those that were raised by registered interested and affected parties).

Please refer to Section 10.3 for discussions on identified impacts as well as Table 11-1 and Table 11-2.

**Table 11-1: Impact Assessment Table (SWM: Significance with Mitigation)**

| Aspect | Potential Impact | Activity | Phase | Scale | Duration | Intensity | Probability | Weighting factor | Significance | Mitigation efficiency | SWM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Geology | Impact on the overall geology of the area | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Site | Permanent | High | Definite | Medium to High | Medium to High | N/A | Medium to High |
| Geology | Sterilisation of mineral deposits | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Local | Short to Medium | High | Likely | Medium to Low | Low to Medium | N/A | Low to Medium |
| Topography | Hazardous excavations | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Regional | Permanent | High | Highly Likely | High | High | High | Low |
| Fauna and Flora | Topsoil & subsoil stripping, exposure of soils, ore and rock to wind and rain during construction causing erosion and sedimentation | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Site | Long term | High | Highly Likely | Medium | Medium | High | Low |

| Aspect | Potential Impact | Activity | Phase | Scale | Duration | Intensity | Probability | Weighting factor | Significance | Mitigation efficiency | SWM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Flora | Vegetation clearance will impact on protected tree species and medicinal plants | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Site | Long term | Medium | Highly Likely | Medium to High | Medium | Medium to high | Low to Medium |
| Fauna | Disturbance of fauna through noise, light and dust pollution and hunting, trapping and killing of fauna. | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Regional | Medium term | Medium | Possible | Low to Medium | Low to Medium | Low to medium | Low |
| Flora | Spreading of alien and invasive species | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Regional | Medium term | Medium | Likely | Medium | Low to Medium | Medium to High | Low |
| Soil | Loss of soil resource | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Site | Medium term | Medium | Highly Likely | Medium | Low to Medium | Medium to high | Low |
| Soil | Erosion and disturbance of original soil profiles due to vegetation clearance | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Regional | Long Term | High | Highly Likely | Medium to High | Medium to High | Medium | Medium |
| Soil | Soil contamination and compaction of access roads and mining area | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Regional | Medium term | Low | Likely | Medium | Low to Medium | Medium to high | Low |
| Land capability | Loss of grazing | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Local | Long term | Low | Likely | Medium | Low to Medium | High | Low |
| Land use | Road disturbance due to increased traffic | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Regional | Medium term | Medium | Highly Likely | Medium | Low to Medium | Medium to high | Low |
| Land use | Failure of mine residue deposit | Surface Mining: Opencast, dump and haul road operation | Operational | Local | Short to Medium | Low | Possible | Low to Medium | Low | High | Low |
| Surface water | Flooding of open pit and other infrastructure from rainfall and groundwater seepage. Seepage and runoff from stockpile areas are moderately contaminated and | Surface Mining: Opencast, dump and haul road operations | Operation | Local | Short term | Medium | Likely | Medium | Low to Medium | Medium to high | Low |

| Aspect | Potential Impact | Activity | Phase | Scale | Duration | Intensity | Probability | Weighting factor | Significance | Mitigation efficiency | SWM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | could impact on surface water quality | | | | | | | | | | |
| Stormwater | Exposed surfaces could result in increased erosion and associated runoff which in turn may result in increased siltation of surface streams. | Earth works, land clearance or removal of topsoil during construction and rehabilitation during closure. | Construction; Decommissioning | Regional | Long term | Medium | Likely | Medium to High | Medium | Medium to high | Low to Medium |
| Surface water | Surface water quality deterioration from possible mixing of clean and dirty water, hydrocarbon spillage, and solid waste that could reach drainage lines if not correctly disposed. | Surface Mining: Opencast, dump and haul road operations | Construction and Operation | Regional | Medium term | Medium | Highly Probable | Medium | Low to Medium | Medium to high | Low |
| Stormwater | Solid waste could reach drainage lines if not correctly disposed of. | Surface Mining: Opencast, dump and haul road operations | Construction; Operational; Decommissioning | Regional | Long term | Medium | Likely | Medium | Low to Medium | Medium to high | Low |
| Stormwater | Alteration of drainage lines by impacting their natural course. Impact on catchment yield by capturing runoff and diverting the drainage systems. Degradation of stream channels through long-term reduced runoff and periodic discharge of high volumes. | Surface Mining: Opencast, dump and haul road operations, Clean water diversion channels and storm water management | Construction; Operational; Decommissioning | Regional | Long term | High | Highly Probable | Medium to High | Medium to High | Medium | Low to Medium |
| Groundwater | Lowering of groundwater levels due to mine dewatering- effect on base flow | Surface Mining: Opencast, dump and haul road operations | Operational | Regional | Medium term | Medium | Likely | Medium to High | Medium | Medium | Low to Medium |
| Groundwater | Lowering of groundwater levels due to mine dewatering- effect on surrounding | Surface Mining: Opencast, dump and haul road operations | Operation | Regional | Long term | High | Highly likely | Medium to High | Medium to High | Medium to high | Low to Medium |

| Aspect | Potential Impact | Activity | Phase | Scale | Duration | Intensity | Probability | Weighting factor | Significance | Mitigation efficiency | SWM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | groundwater users | | | | | | | | | | |
| Groundwater | Deterioration of water quality as a result of seepage during the operational phase | Opencast mining, decommissioning, post closure | Operational | Regional | Long term | High | Highly Likely | Medium to High | Medium to High | Medium | Low to Medium |
| Groundwater | Deterioration of water quality as a result of seepage at the end of life of mine | Opencast mining, decommissioning, post closure | Decommissioning and Closure | Regional | Long term | High | Highly Likely | Medium to High | Medium to High | Medium | Low to Medium |
| Dust | Emissions such as dust and hydrocarbons from site clearance and infrastructure development | Surface Mining: Opencast, dump and haul road operations | Construction; Operational; Decommissioning | Regional | Short to Medium | Medium | Highly Likely | Low to Medium | Low to Medium | medium to high | Low |
| Ambient air quality | Blasting, construction of access roads, pipes and development of box cut will impact on the ambient air quality | Surface Mining: Opencast, dump and haul road operations | Construction; Operational; Decommissioning | Site | Short to Medium | Low | Likely | Low to Medium | Low | High | Low |
| Dust | Demolition and Removal of all infrastructure. | Surface Mining: Opencast, dump and haul road operations | Decommissioning | Local | Short term | Low | Likely | Low to Medium | Low | | Low |
| Noise | Elevated noise levels caused by movement of vehicles during site clearance | Surface Mining: Opencast, dump and haul road operations | Construction | Regional | Medium term | Low | Likely | Medium to high | Medium | Medium to high | Low |
| Noise | Elevated noise levels caused by mining operation, and blasting activities on residents close to the mine during day time and night time | Surface Mining: Opencast, dump and haul road operations | Operational | Regional | Medium term | Medium | Highly Likely | Medium to High | Medium | Medium to high | Low to Medium |
| Noise | Disturbing noise during demolition and dismantling of infrastructure. | Surface Mining: Opencast, dump and haul road operations | Decommissioning | Site | Medium term | Low | Likely | Low to Medium | Low to Medium | Medium to high | Low |
| Visual | Decrease in landscape character and sense of place as operations will be taking place at the top of a mountain, the site is already degraded | Site clearing, including the removal of topsoil and vegetation. | Construction; Operational; Decommissioning | Regional | Permanent | High | Highly Likely | Medium | Medium | Medium | Low to Medium |

| Aspect | Potential Impact | Activity | Phase | Scale | Duration | Intensity | Probability | Weighting factor | Significance | Mitigation efficiency | SWM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | as there is existing mining taking place. | | | | | | | | | | |
| Visual | Impacts due to Night Time lighting | Exterior lighting around open cast mining areas, Potential lighting at night from potential vehicles | Construction; Operational; Decommissioning | Regional | Medium term | Medium | Likely | Low to Medium | Low to Medium | High | Low |
| Socio-Economic | Positive impacts from temporary employment opportunities | N/A | Construction; Operational; Decommissioning | Regional | Long term | High | Highly Likely | Medium to high | Medium to High | N/A | Medium to High |
| Socio-Economic | Negative impact from closure | N/A | Decommissioning | Regional | Long term | High | Highly Likely | Medium | Medium | Low | Low to Medium |
| Socio-Economic | Negative cumulative impacts | N/A | Construction; Operational; Decommissioning | Regional | Long term | High | Highly Likely | Medium to High | Medium | Low to medium | Low to Medium |
| Heritage Resources | Potential loss of heritage, palaeontological and cultural resources due to surface disturbances | Opencast mining activities, including transport of the resource and creation of temporary stockpiles | Construction; Operational; Decommissioning | Site | Short term | Medium | Possible | Low to Medium | Low | High | Low |

## 11.2 THE POSSIBLE MITIGATION MEASURES THAT COULD BE APPLIED AND THE LEVEL OF RISK

(With regard to the issues and concerns raised by affected parties provide a list of the issues raised and an assessment/ discussion of the mitigations or site layout alternatives available to accommodate or address their concerns, together with an assessment of the impacts or risks associated with the mitigation or alternatives considered).

**Table 11-2: Possible Mitigation Measures (SWM: Significance with Mitigation)**

| Aspect | Potential Impact | Activity | Phase | Significance | SWM | Mitigation type |
|---|---|---|---|---|---|---|
| Geology | Impact on the overall geology of the area | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Medium to High | Medium to High | None |
| Geology | Sterilisation of mineral deposits | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Low to Medium | Low to Medium | Process Implementation |
| Topography | Hazardous excavations | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | High | Low | Management Rehabilitation |
| Fauna and Flora | Topsoil & subsoil stripping, exposure of soils, ore and rock to wind and rain during construction causing erosion and sedimentation | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Medium | Low | Management Rehabilitation |
| Flora | Vegetation clearance will impact on protected tree species and medicinal plants | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Medium | Low to Medium | Management; Infrastructure design |
| Fauna | Disturbance of fauna through noise, light and dust pollution and hunting, trapping and killing of fauna. | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Low to Medium | Low | Protection; Management; Rehabilitation |
| Flora | Spreading of alien and invasive species | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Low to Medium | Low | Management, Infrastructure, Rehabilitation |
| Soil | Loss of soil resource | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Low to Medium | Low | Management Rehabilitation |
| Soil | Erosion and disturbance of original soil profiles due to vegetation clearance | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Medium to High | Medium | Management Rehabilitation |
| Soil | Soil contamination and compaction of access roads and mining area | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Low to Medium | Low | Remedy through rehabilitation, Infrastructure design, and management |
| Land capability | Loss of grazing land within footprint | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Low to Medium | Low | Remedy through rehabilitation, infrastructure design, and management |
| Land capability | Loss of grazing land in greenfield site | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Low to Medium | Low | Remedy through rehabilitation, infrastructure design, and management |
| Land use | Road disturbance due to increased | Surface Mining: | Construction; | Low to Medium | Low | Modify through management |

| Aspect | Potential Impact | Activity | Phase | Significance | SWM | Mitigation type |
|---|---|---|---|---|---|---|
| | traffic | Opencast, dump and haul road operation | Operational; Decommissioning | | | |
| Land use | Failure of mine residue deposit | Surface Mining: Opencast, dump and haul road operation | Operational | Low | Low | Management Rehabilitation |
| Surface water | Flooding of open pit and other infrastructure from rainfall and groundwater seepage. Seepage and runoff from stockpile areas are moderately contaminated and could impact on surface water quality | Surface Mining: Opencast, dump and haul road operations | Operation | Low to Medium | Low | Infrastructure design, Management, Monitoring, Rehabilitation |
| Stormwater | Exposed surfaces could result in increased erosion and associated runoff which in turn may result in increased siltation of surface streams. | Surface Mining: Opencast, dump and haul road operations | Construction; Operational; Decommissioning | Medium | Low to Medium | Infrastructure design, Management, Monitoring, Rehabilitation |
| Surface water | Surface water quality deterioration from possible mixing of clean and dirty water, hydrocarbon spillage, and solid waste that could reach drainage lines if not correctly disposed. | Surface Mining: Opencast, dump and haul road operations | Construction and Operation | Low to Medium | Low | Infrastructure design, Management, Monitoring, Rehabilitation |
| Stormwater | Solid waste could reach drainage lines if not correctly disposed of. | Surface Mining: Opencast, dump and haul road operations | Construction; Operational; Decommissioning | Low to Medium | Low | Infrastructure design, Management, Monitoring, Rehabilitation |
| Stormwater | Alteration of drainage lines by impacting their natural course. Impact on catchment yield by capturing runoff and diverting the drainage systems. Degradation of stream channels through long-term reduced runoff and periodic discharge of high volumes. | Surface Mining: Opencast, dump and haul road operations | Construction; Operational; Decommissioning | Medium to High | Low to Medium | Infrastructure design, Management, Monitoring, Rehabilitation |
| Groundwater | Deterioration of water quality and quantity as a result of seepage during operational phase | Surface Mining: Opencast, dump and haul road operations | Operational | Low to Medium | Low | Infrastructure design, Management, Monitoring, Rehabilitation |
| Groundwater | Deterioration of water quality as a result of seepage at the end of life of mine | Opencast mining, decommissioning, post closure | Decommissioning and Closure | Medium to High | Low to Medium | Infrastructure design, Management, Monitoring, Rehabilitation |
| Groundwater | Lowering of groundwater levels due to mine dewatering- effect on base flow | Surface Mining: Opencast, dump and haul road operations | Operational | Medium | Low to Medium | Monitoring; Compensation |

| Aspect | Potential Impact | Activity | Phase | Significance | SWM | Mitigation type |
|---|---|---|---|---|---|---|
| Groundwater | Lowering of groundwater levels due to mine dewatering- effect on surrounding groundwater users | Surface Mining: Opencast, dump and haul road operations | Operation | Medium to High | Low to Medium | Monitoring; Compensation |
| Dust | Emissions such as dust and hydrocarbons from site clearance and infrastructure development | Surface Mining: Opencast, dump and haul road operations | Construction; Operational; Decommissioning | Low to Medium | Low | Infrastructure design, Management, Monitoring, Rehabilitation |
| Ambient air quality | Blasting, construction of access roads, pipes and development of box cut will impact on the ambient air quality | Surface Mining: Opencast, dump and haul road operations | Construction; Operational; Decommissioning | Low | Low | Infrastructure design, Management, Monitoring, Rehabilitation |
| Dust | Demolition and Removal of all infrastructure. | Surface Mining: Opencast, dump and haul road operations | Decommissioning | Low | Low | Infrastructure design, Management, Monitoring, Rehabilitation |
| Noise | Elevated noise levels caused by movement of vehicles during site clearance | Surface Mining: Opencast, dump and haul road operations | Construction | Medium | Low | Infrastructure design, Management, Monitoring, Rehabilitation |
| Noise | Elevated noise levels caused by mining operation, and blasting activities on residents close to the mine during day time and night time | Surface Mining: Opencast, dump and haul road operations | Operational | Medium | Low to Medium | Infrastructure design, Management, Monitoring, Rehabilitation |
| Noise | Disturbing noise during demolition and dismantling of infrastructure. | Surface Mining: Opencast, dump and haul road operations | Decommissioning | Low to Medium | Low | Infrastructure design, Management, Monitoring, Rehabilitation |
| Visual | Decrease in landscape character and sense of place as operations will be taking place at the top of a mountain, the site is already degraded as there is existing mining taking place. | Site clearing, including the removal of topsoil and vegetation. | Construction; Operational; Decommissioning | Medium | Low to Medium | Infrastructure design, Management, Monitoring, Rehabilitation |
| Visual | Impacts due to Night Time lighting | Exterior lighting around open cast mining areas, Potential lighting at night from potential vehicles | Construction; Operational; Decommissioning | Low to Medium | Low | Infrastructure design, Management, Monitoring, Rehabilitation |
| Socio-Economic | Positive impacts from temporary employment opportunities | N/A | Construction; Operational; Decommissioning | Medium to High | Medium to High | Management Rehabilitation |
| Socio-Economic | Negative impact from closure | N/A | Decommissioning | Medium | Low to Medium | Management; communication; Strategy implementation. |
| Socio-Economic | Negative cumulative impacts | N/A | Construction; Operational; | Medium | Low to Medium | Management; communication; Strategy |

| Aspect | Potential Impact | Activity | Phase | Significance | SWM | Mitigation type |
|---|---|---|---|---|---|---|
| | | | Decommissioning | | | implementation. |
| Heritage Resources | Potential loss of heritage, palaeontological and cultural resources due to surface disturbances | Opencast mining activities, including transport of the resource and creation of temporary stockpiles | Construction; Operational; Decommissioning | Low | Low | Management; Conservation; Permitting |

## SUMMARY OF SPECIALIST REPORTS

(This summary must be completed if any specialist reports informed the impact assessment and final site layout process and must be in the following tabular form):

**Table 11-3: Specialist Recommendations**

| LIST OF STUDIES UNDERTAKEN | RECOMMENDATIONS OF SPECIALIST REPORTS | SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable) | REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS/MITIGATION MEASURES HAVE BEEN INCLUDED |
|---|---|---|---|
| Surface Water | An Integrated Water and Waste Management Plan (IWWMP) needs to be compiled as a technical supporting document for the water use authorisation process. The Environmental Management Plan (EMPR) for the proposed expansion should address good waste management practices, guidelines for the storage, handling, use and disposal of waste, etc. It is important that the project aim to limit impacts on the aquatic resources as far as possible in order to maintain its current basic ecosystem functions.<br><br>All mitigation measures that were provided within this report should be implemented and included in the relevant management plans. If all mitigation is adhered to, the combined impact could be rated as low. | X | Impact Assessment and Mitigation measures in Section 11 of this report and also refer to Appendix 7.1 Surface Water Report. |
| Fauna and Flora | **Pre-Construction Phase**<br>• The footprints of all developments should be planned to keep to the already altered sections of the terrain;<br>• Relevant Authorisation needed for all protected species, in | X | Impact Assessment and Mitigation measures in Section 11 |

| | | | |
|---|---|---|---|
| | terms of NEMBA (TOPS List) and the National Forests Act, 1998 (Act No. 84 of 1998), will be necessary if any species neem to be relocated during any phase of the development.<br>• Planning and infrastructure layout plans will need to be adapted to avoid sensitive zones and species encountered.<br><br>**Construction and Operational Phases**<br>Flora Mitigation and Management measures<br>• Appoint an ECO to oversee the activities and ensure that ecological aspects are kept in mind;<br>• Continuous (concurrent) rehabilitation (inclusive of re-vegetation practices after topsoil has been restored) and clean-up of the area should be implemented during the both the construction and operational phase;<br>• Limit activities (transport etc.) to the smallest area possible. This is to prevent fragmentation that may have irreversible changes to floral communities. It also increases the invasion of alien/foreign species;<br>• A management plan for the control of invasive and exotic plant species needs to be implemented;<br>• Restrict movement to the footprint. A control of access should be implemented for all other natural areas (and prescribed 30 m buffer zone) to prevent unnecessary destruction of habitats or disturbance of species. Human and vehicles movement should stay out of the natural areas not delineated for activity. It is also vital that no additional fragmentation occur and that all roads are clearly demarcated and kept to a minimum without any exceptions.<br>• It is vital that if any endemic, rare or vulnerable species occurs on the proposed site that these species should be protected and/or left undisturbed. Only as an exception can these species be relocated to favourable sites with the use of a specialist prior to vegetation and habitat removal. | | |

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| | Threatened species are not allowed to be disturbed in any way. • No foraging, food and wood collecting within the veld should be allowed.<br>• The vegetation removal should be controlled and should be very specific.<br><br>Fauna Mitigation and Management measures<br>• To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his Employees, his Sub-Contractors or his Sub-Contractors' Employees;<br>• Activities on site must comply with the regulations of the Animal Protection Act, 1962 (Act No. 71 of 1962). Workers should also be advised on the penalties associated with the needless destruction of wildlife, as set out in this act;<br>• Appoint an ECO to oversee the activities and ensure that ecological aspects are kept in mind;<br>• Priority species, specifically nests if encountered, should be identified first and a management plan should be established for each of the priority species;<br>• Continuous rehabilitation and clean-up of the area should be implemented during the both the construction and operational phase;<br>• Limit activities (transport etc.) to the smallest area possible. This is to prevent fragmentation that may have irreversible changes to faunal communities;<br>• A management plan for the control of invasive and exotic plant species needs to be implemented;<br>• Restrict movement to the footprint. A control of access should be implemented for all other natural areas (and prescribed 30 m buffer zone) to prevent unnecessary destruction of habitats or disturbance of species. Human | | |

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| | and vehicles movement should stay out of the natural areas not delineated for activity. It is also vital that no additional fragmentation occur and that all roads are clearly demarcated and kept to a minimum without any exceptions;<br>• It is vital that if any endemic, rare or vulnerable species occurs on the proposed site that these species should be protected and/or left undisturbed. Only as an exception can these species be relocated to favourable sites with the use of a specialist prior to vegetation and habitat removal. Threatened species are not allowed to be disturbed in any way. Allow animals to escape areas of activity freely and do not hinder their movement;<br>• All injured animals sighted during the development should be protected and moved to receive rehabilitation at a pre-identified centre and should not be handled by the Employees under any circumstance. Clear protocol should be developed on the matter;<br>• Have a policy in place to prohibit hunting (rifles, snares, dogs) by the workers or Employees of the site. These conditions should be written into contractors' agreements with strict penalty clauses. Employees engaging in any of these activities should be faced with disciplinary action. No hunting activities will be allowed on site.<br>• No foraging, food and wood collecting within the veld should be allowed;<br>• All noisy equipment should be mitigated to lessen the sound levels as well as vibration levels should be controlled to limit impact on biodiversity and sensitive species by an accredited vibration specialist;<br>• Avoid night-time movement or activities. Restrict movement in sensitive terrain such as the rocky areas during the day-time hours to avoid impacts on nocturnal animals and to prevent 24-hour human activity; | | |

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| | • The vegetation removal (and associated fauna) should be controlled and should be very specific; and<br>• Opencast areas should be barricaded by suitable methods as to prevent hazardous excavations before rehabilitation and backfill has been completed.<br><br>**Decommissioning and Closure**<br>Fauna and Flora Mitigation and Management Measures<br>• A management plan for control of invasive/exotic plant species needs to be implemented as part of the flora management plan. This will be ongoing until the end of the closure phase;<br>• A rehabilitation plan should be implemented as part of the flora management plan. This includes the return of the topsoil and the process of replanting the vegetation for areas that was subjected to mining activities. The focus of the rehabilitation plan would be to deliver the best overall environmental, economic and social outcomes;<br>• Since the area is already impacted, the land use should be either restored to that as per final approved landform (to prevent barren ground and invasive establishment), or alternatively, the land use is to be restored and rehabilitated to that of wilderness and grazing, which will enable a movement towards natural habitat and encourage plant and habitat diversity, which will in return also stimulate animal diversity;<br>• Close monitoring of faunal communities to ensure that ecology is restored and self-sustaining. A formal report should be written and stored to be made available and should be available at all times;<br>• Ensure awareness amongst all staff, contractors and visitors to the site to not needlessly damage flora;<br>• Re-vegetation of all degraded areas and bare patches is | | |

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| | advised to speed recovery to natural, self-sustaining state as soon as possible;<br>• Ensure awareness amongst all staff, contractors and visitors to the site to not needlessly harm or hinder animals; and<br>• General management in terms of dust and traffic control will ensure low hindrance to the fauna communities and should be adequate. These measures are discussed below in the following section.<br><br>**General Mitigation and Management**<br>General<br>• Protect and preserve all surrounding areas unaffected by the operation.<br>Traffic<br>• Ensure trucks and vehicles remain on roads and areas designated as a construction site to limit disturbance to areas unaffected by construction;<br>• Ensure drivers are informed that off-road travelling is prohibited except where otherwise not practically feasible; and<br>• Ensure speed limits are set on all roads and enforce speed limits. Ensure all drivers at the site are informed about speed limits.<br>Spills<br>• Regularly maintain equipment to reduce risk of hydrocarbon leaks and have communication channels set up to report incidences and action plans in place to address issues immediately.<br>• Report all incidences immediately and have action plans in place to deal with any issues arising immediately.<br>Dust<br>• Have dust suppression mechanisms in place such as water | | |

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| | sprays.<br>Noise<br>• Consider enclosing point sources of noise to reduce noise levels;<br>• Consider use of silencers and other noise muffling devices on equipment and vehicles; and<br>• Consider screening areas of high noise off from sensitive areas.<br>Housekeeping<br>• Ensure adequate domestic waste bins are supplied and that domestic waste is removed by a reputable contractor. Adhere to the waste management plan;<br>• Erect posters to educate staff about the dangers of littering and dangers of damaging sensitive and endemic fauna and flora species they may encounter.<br>Monitoring<br>• Monitoring of the ecological aspects should be done on a continual basis to assess whether there are any concerns regarding the flora and to assess whether the rehabilitation is successful.<br>• Monitoring of the flora should start as soon as the construction phase of the development commences. Monitoring should be undertaken annually;<br><br>The monitoring of biodiversity should include the following:<br>• Seasonal visual assessment of areas to determine if vegetation in undisturbed areas is being impacted;<br>• Annual biodiversity monitoring of areas both affected and unaffected by activities should be initiated to determine the annual fluctuation in species numbers and, if necessary, relate this to activities on site;<br>• Continue with alien invasive monitoring, eradication and control programme; and | | |

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| | • Implement an Observe and Report approach which will enable Employees to report any disturbance of fauna or degradation that they encounter during the operational phase. | | |
| Soil and land use | • To minimise compaction associated with stockpile creation, it is recommended that the height of stockpiles be restricted between of 4 – 5 metres maximum. For extra stability and erosion protection, the stockpiles may be benched;<br>• It is recommended that vegetation removed during land clearance be composted (after seed was harvested to serve as a seed bank for the indigenous vegetation present) during the operational phase and that this compost be used as a soil ameliorant for soil rehabilitation purposes.<br><br>All above soil management measures explained under the Construction Phase should be maintained for similar activities during the Operational Phase. In addition to this, the following Soil Management Measures are recommended:<br>• The vegetative (grass) cover on the soil stockpiles (berms) must be continually monitored in order to maintain a high basal cover. Such maintenance will limit soil erosion by both the mediums of water (runoff) and wind (dust).<br>• Drains and intercept drains must be maintained so that they continue to redirect clean water away from the operating areas, and to convey any potentially polluted water to pollution control dams.<br>• Routine monitoring will be required in and around the sites.<br>• In addition to this, it is recommended that the baseline soil metal levels be determined prior to mining activities and that a follow-up soil metal- and pollutant assessment be conducted once every five years. | X | Impact Assessment and Mitigation measures in Section 11 |
| Archaeology | Although all efforts were made to locate, identify and record all possible cultural heritage sites and features (including | X | Impact Assessment and Mitigation measures in Section 11 |

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| | archaeological remains) there is always a possibility that some might have been missed as a result of grass cover and other factors.<br><br>The subterranean nature of these resources (including low stone-packed or unmarked graves) should also be taken into consideration. Should any previously unknown or invisible sites, features or material be uncovered during any development actions then an expert should be contacted to investigate and provide recommendations on the way forward.<br><br>From a cultural heritage point of view the development should be allowed to continue taking cognizance of the above recommendations | | |
| Groundwater | The following actions are recommended:<br>• Update the numerical model against monitored data during operations.<br>• Water quantity and quality data should be collected on a regular, ongoing basis during mine operations. These data will be used to recalibrate and update the mine water management model, to prepare monitoring and audit reports, to report to the regulatory authorities against the requirements of the IWMP and other authorisations and as feedback to stakeholders in the catchment, perhaps via the CMA.<br>• The three newly proposed monitoring boreholes should be drilled prior to the start of the opencast pit<br>• The monitoring as recommended in the report should be established prior to operation.<br>• The hydrocensus and risk assessment should at least be repeated once before closure to evaluate any impacts. | X | Impact Assessment and Mitigation measures in Section 11 |
| Noise | Conceptual scenarios were developed for the existing and future proposed operational phase with the output of the modelling exercise indicating a low-medium risk of a noise impact (night-time | X | Impact Assessment and Mitigation measures in Section 11 |

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| | mining activities). No critical mitigation is required as the projected noise levels is low and unlikely to significantly change the existing ambient sound levels, yet, it is recommended that the mine develop and implement a noise monitoring programme. This is because the proposed opencast will be developed within 1 000 m from the closest NSD and mining activities could be taking place closer than 450m from the closest NSD (worst-case scenario as evaluated).<br><br>This may pose a risk of increased noises if these activities take place at night and it is recommended that:<br>• the mine uses the topsoil and overburden to develop a berm between the proposed opencast and the closest receptors. This berm should be as high as practical. This berm should be developed during the daytime period only.<br>• if possible, the mine should plan to only operate during the daytime hours when mining activities need to take place closer than 500m from the closest NSD.<br><br>It is concluded that, if the mine considers the recommendations in this report (incorporated in the Environmental Management Plan), that the increases in noise levels do not constitute a fatal flaw. It is, therefore, the recommendation that the development of the proposed opencast at Smokey Hills mine be authorized (from a noise impact perspective). Apart from the recommended noise monitoring, no further investigations are recommended. | | |
| Air Quality | • It is recommended that ambient air quality monitoring be established to get a baseline condition prior to the onset of the operations and in order to establish the level at which the proposed operations are noted to impact on the ambient air quality.<br>• Fallout monitoring should be continued for the life of mine to better assess the level of nuisance dust associated with both mining and process related operations. Sampling of | X | Impact Assessment and Mitigation measures in Section 11 |

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| | fallout should be undertaken within the neighbouring areas as well as on-site.<br>• $PM_{10}$ and $PM_{2.}5$ dust monitoring must also be undertaken at the same sites as mentioned under the previous bullet but also in and around potential fugitive emission sources to determine mitigation measures and focus management efforts.<br>• Further mitigation measures that should be applied, if it is found that dust and $PM_{10}$ levels are measured to be exceeding the limits are:<br>○ Reducing the speed of the Haul Trucks on the Haul road.<br>○ Fully sealed Pit Haul Road achieve 100% mitigation on these roads.<br><br>The impacts from dust fallout and Particulate matter can be reduced by implementing dust control measures. The highest intensity of the construction work should be carried out during the summer months and not over the harsh winter months as can result in increased dispersion of fugitive dust. The mine should ensure that unpaved roads are continuously watered and treated with dust binding additive products to reduce the volume of fugitive dust emitted from unpaved roads.<br><br>The mitigation and management measures for mining operation and discussed in this report should be sufficient to ensure the mining operation can be conducted with minimal impact on the receiving environment and therefore not have a detrimental effect. | | |
| Socio - economic | No assessment was done for the UG1 project, it is recommended that the recommendations in the currently approved EIA/EMPR be adhered too. | X | |

## 11.3 ENVIRONMENTAL IMPACT STATEMENT

### 11.3.1 Summary of the key findings of the environmental impact assessment;

The findings of the specialist studies undertaken within this EIA&EMPR provide an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed project. The findings conclude that, provided that the recommended mitigation and management measures are implemented, there are no environmental fatal flaws that should prevent the proposed project from proceeding.

In order to achieve appropriate environmental management standards and ensure that the findings of the environmental studies are implemented through practical measures, the recommendations from this EIA&EMPR will form part of the contract with the contractors appointed to construct and maintain the proposed mine and associated infrastructure. The EIA&EMPR would be used to ensure compliance with environmental specifications and management measures. The implementation of this EIA&EMPR for key cycle phases (i.e. construction, operation and closure/decommissioning) of the proposed project is considered to be fundamental in achieving the appropriate environmental management standards as detailed for this project.

#### *11.3.1.1 Surface water*

The impact on the surface water area could be seen as moderate to high without the implementation of mitigation measures. With the implementation of mitigation management measures the impact of the development on the surface water environment is ranked as a low significance.

All mitigation measures that were provided within the specialist report should be implemented and included in the relevant management plans. If all mitigation is adhered to, the combined impact could be rated as low.

#### *11.3.1.2 Groundwater*

In general, the groundwater qualities at the Smokey Hills site are good compared to the SANS 241 and WUL limits with rare exceedances over time. One element and especially one of its compounds is however of concern when using the SANS 241 standards and that element is nitrogen (N) from its compound $NO_3$.

#### *11.3.1.3 Fauna and flora*

Locally, in terms of the Limpopo Conservation Plan, the UG1 outcrop development is located within areas classified as Ecological Support Areas 1 (ESA1). The impacts of the proposed project to the biodiversity of the affected area were rated as medium to high without the implementation of mitigation measure and medium to low once mitigation measures have been considered.

#### *11.3.1.4 Air quality*

The mitigation and management measures for mining operation and discussed in the specialist report should be sufficient to ensure the mining operation can be conducted with minimal impact on the receiving environment and therefore not have a detrimental effect.

#### *11.3.1.5 Noise*

If the mine considers the recommendations in the specialist report and incorporate it into the Environmental Management Plan the increases in noise levels do not constitute a fatal flaw. It is, therefore, the recommendation that the development of the proposed opencast at Smokey Hills mine be authorized (from a noise impact perspective). Apart from the recommended noise monitoring, no further investigations are recommended.

### 11.3.2 Heritage

From a cultural heritage point of view the development should be allowed to continue taking cognizance

of the recommendations as made in the specialist report.

## 11.4 FINAL SITE MAP

Provide a map at an appropriate scale which superimposes the proposed overall activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers. Attach as Appendix.

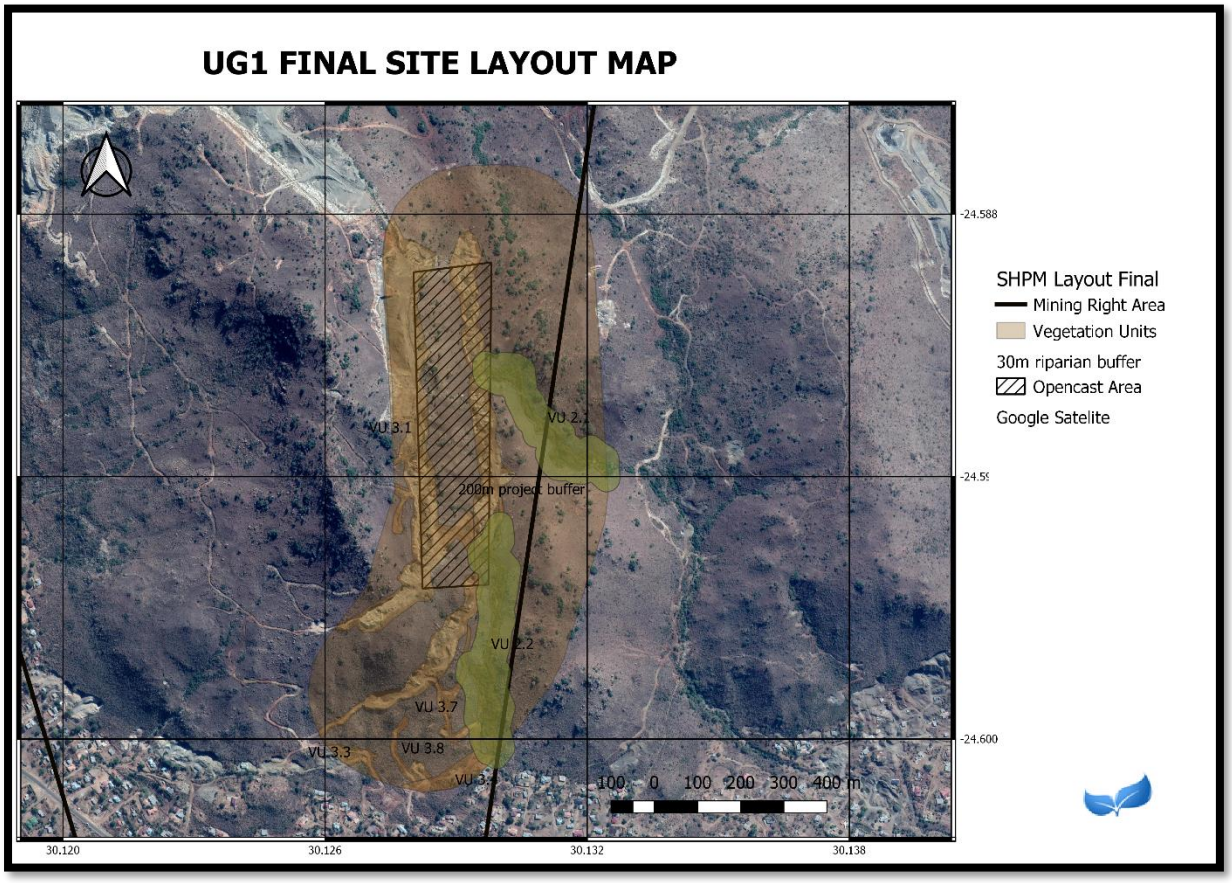


**Figure 11-1: Final site map showing proposed UG1 Opencast area, riparian buffer zone, and the Vegetation Units within the proposed mining area.**

Please refer to Appendix 5 for a larger map.

### 11.4.1 Summary of the positive and negative implications and risks of the proposed activity and identified alternatives

Also refer to Table 11-1 and Section 10.3.

The positive aspects of the proposed and existing activities are:

- Provision of Employment to a large number of people during the construction and operational phases. The numbers of jobs created are significant to the local and regional economy.
- A large capital investment and substantial offshore revenue generation.
- A large amount of money paid out locally in the form of the company payroll.
- Significant amounts of money paid to the government in the form of local, regional and national taxes and levies.

- Economic multiplier effects linked to the creation and support of service-sector jobs, the procurement of large quantities of consumables annually and the outsourcing of service provision to local service providers.
- The illegal mining activities footprint will be used and existing infrastructures will be used at the SHPM area as far as possible. This area is already impacted and degraded and this containing the proposed infrastructure within this footprint will limit environmental damage to other natural areas in the vicinity.
- All the remaining ore will be removed.

The negative aspects of the proposed and existing activities are:

- Impact on geology;
- Soil compaction, topsoil loss, alteration of possible drainage lines, change of land use;
- Soil erosion;
- Sterilisation of soil resource of footprint;
- Loss of soil resource, possible contamination and nutrient pool;
- Loss of land capability;
- Blasting damage and hazards;
- Loss of vegetation, ecological functioning and biodiversity;
- Loss of animal life, ecological functioning and biodiversity;
- Impact on grazing animals and domestic animals;
- Deterioration of surface water quality;
- Deterioration of surface water quantity;
- Impacts in the event of a discharge of the PCD;
- Lowering of groundwater levels due to mine dewatering;
- Deterioration of ground water quality due to seepage in operational phase;
- Emissions impacting on air quality;
- Noise impacts (Day and Nigh time noise);
- Visual impacts on land users;
- Disturbances of heritage sites (not likely); and
- Socio-Economic impacts.

## 11.5 PROPOSED IMPACT MANAGEMENT OBJECTIVES AND THE IMPACT MANAGEMENT OUTCOMES FOR INCLUSION IN THE EMPR

Based on the assessment and where applicable the recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPR as well as for inclusion as conditions of authorization

Specialist recommendations which could be included as conditions have been discussed in Table 11-3. Specialist management measures as well as the significance of the impacts prior and post mitigation are provided in Table 11-1, Table 11-2, and contained in the respective studies.

**Table 11-4: Proposed impact management objectives and the impact management outcomes for inclusion in the EMPR**

| Aspect | Management Objectives | Management Outcomes |
|---|---|---|
| Geology | To prevent the sterilization of minerals. | None. |
| Geology | To prevent the sterilization. | As much of possible of the mineral resource will be recovered |
| Topography | To ensure that humans and large animals do not fall into excavations. | Fenced / bermed / notification of hazardous excavations. Continuous |

| Aspect | Management Objectives | Management Outcomes |
|---|---|---|
| | | rehabilitation. |
| Fauna and Flora | To minimise area of disturbance. | Protection of environment. |
| Flora | Minimise area of disturbance.<br>To rehabilitate disturbed land to a stable physical state and prevent proliferation of invasive plants.<br>To remove, protect and conserve any red data species, as well as any other species with conservation value. | Reducing footprint on which activities occur. Planning and preparation, specifically along natural areas such as the access road should avoid damage to the natural plant life of the area. |
| Fauna | To prevent unnecessary disturbance of animal habitats. | Protection of environment. |
| Flora | To rehabilitate disturbed land to a stable physical state and prevent proliferation of invasive plants. | Protection of environment. Eliminating or reducing alien invasive plant species in the area. |
| Soil | To conserve soil resources disturbed by the development of the mine and to ensure that the pre-mining land capability can be restored.<br>To prevent erosion. | Storing of topsoil in berms that are covered with vegetation. Improved rehabilitation of the disturbed area. |
| Soil | To prevent Erosion. | Prevention of erosion. Protection of downstream surface water areas. |
| Soil | To conserve soil resources disturbed by the development of the mine and to ensure that the pre-mining land capability can be restored.<br>To prevent erosion. | Implementation and compliance with the soil conservation procedure. Improved rehabilitation of the disturbed area. |
| Land Capability | Prevention of the loss of grazing land within footprint. | After rehabilitation the area can be used for grazing purposes. The operational area will be kept as to the minimum area required. Sensitive areas will not be impacted. |
| Land use | Restore disturbed land to grazing potential. | After rehabilitation the area can be used for grazing purposes. |
| Land use | Restore disturbed land to grazing potential | Reducing footprint on which activities occur.<br>Prevention of erosion and conservation of soil resource. |
| Surface water | To prevent animals and personnel from drowning.<br>To increase production time. | Compliance with legislation.<br>Prevention of loss of life. |
| Stormwater | Minimize the impacts on the environment (ecological, economic, social) due to the alteration of drainage channels. | Compliance with legislation. Protection of sensitive surface water areas. |
| Surface water | To prevent discharges of contaminated water to the environment.<br>To prevent pollution of water resources in the vicinity of the project. | Prevent soil erosion. Compliance with legislation. Prevent impacts on surface water quality. |
| Stormwater | To mitigate the impacts on the environment (ecological, economic, social) due to the alteration of drainage channels | Compliance with legislation. Protection of sensitive surface water areas |
| Stormwater | Minimize the impacts on the environment (ecological, economic, social) due to the alteration of drainage | Prevent soil erosion. Compliance with legislation. |

| Aspect | Management Objectives | Management Outcomes |
|---|---|---|
| | patterns in the project area. | Prevent impacts on surface water quality. |
| Groundwater | To prevent water shortages for future mining activities and consumption by surrounding communities. | Compliance with legislation. Water conservation and demand management. |
| Groundwater | To prevent water shortages for future mining activities | Compliance with legislation. Water conservation and demand management. |
| Groundwater | To limit the impact of infiltration of potentially contaminated leachate to the underlying aquifers. | Compliance with legislation. Prevention of impacts on groundwater levels. |
| Groundwater | To limit the impact of infiltration of potentially contaminated leachate to the underlying aquifers. | Identification of impacts on groundwater quality. Protection of the aquifer water quality. |
| Dust | To limit public exposure to unacceptable health risks. | Low exposures to unacceptable health risks |
| Ambient air quality | To limit public exposure to unacceptable health risks. | Low exposures to unacceptable health risks |
| Dust | To limit public exposure to unacceptable health risks. | Management of dust emissions |
| Noise | To prevent public exposure to disturbing noise in excess of 7 dBA increases above ambient noise levels during construction, operation, decommissioning and during the day. | Reducing disturbing noise from SHPM to outside SHPM boundaries. Berm. |
| Noise | To prevent public exposure to disturbing noise in excess of 7 dBA increases above ambient noise levels during construction, operation, decommissioning and during the day. | Reducing disturbing noise from SHPM to outside SHPM boundaries. Berm. |
| Noise | To prevent public exposure to disturbing noise in excess of 7 dBA increases above ambient noise levels during construction, operation, decommissioning and during the day. | Reducing disturbing noise from SHPM to outside SHPM boundaries. Berm. |
| Visual | To limit the visual impact of the project on both the surrounding landowners and the Natural Area | Reduction of the visual impact of the project. |
| Visual | To limit the visual impact of the project on both the surrounding landowners and the Natural Area | Reduction of the visual impact of the project. |
| Socio-Economic | To enhance the socio-economic benefits of the project. | Employment at a local level. |
| Socio-Economic | To mitigate the negative social impacts of the project. | Communication with IAPs and upliftment of the community. Increased security and reduced crime |
| Socio-Economic | To mitigate the negative social impacts of the project. | Communication with IAPs and upliftment of the community. Increased security and reduced crime |
| Heritage Resources | To avoid disturbing sites of archaeological and cultural interest. Where disturbance of sites of archaeological and cultural interest, is unavoidable, the objective is to ensure that adequate measures are taken to conserve the information held within the sites. This must be done in accordance with legal requirements. | No sites will be impacted |

## 11.6 FINAL PROPOSED ALTERNATIVES

(Provide an explanation for the final layout of the infrastructure and activities on the overall site as shown on the final site map together with the reasons why they are the final proposed alternatives which

respond to the impact management measures, avoidance, and mitigation measures identified through the assessment)

Refer to Section 6.

## 12 ASPECTS FOR INCLUSION AS CONDITIONS OF AUTHORIZATION

Refer to Table 11-2 and Table 11-3 for conditions which could possibly be included in the Environmental Authorisation.

In addition to the above, as per the request of the LDEDET an Offset strategy needs to be submitted to the Department for approval as the UG1 opencast mine is located in an ecological support area.

The management and rehabilitation measures for the whole mining area as approved in the EIA/EMPR and the PCD EIA/EMPR must be adhered too at all times.

## 13 DESCRIPTION OF ANY ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE.

(Which relate to the assessment and mitigation measures proposed?)

All the data and information supplied to Prescali is assumed to be accurate and reflective of the current condition of the affected area. It is assumed that the baseline information scrutinised and used to explain the environmental profile is accurate.

SHPM will comply with all legislation pertaining to the activities of this proposed project and that all permits and licenses that may be required will be identified and applied for prior to commencement of construction activities.

The public involvement process has been sufficiently effective in identifying the critical issued needing to be addressed in the EIA / EMPR by the EAP. The public involvement process has sought to involve key stakeholders and individual landowners.

Wherever possible the information requested and comments raised by I&APs during the initiation phase and Scoping Report review periods, has been sufficiently addressed and incorporated into the EIA and EMPR for perusal and comment. These requests and any further comments will be tracked and recorded in the Comments and Response Report.

Prescali assumes that SHPM will implement the measures contained in the EMPR, and will adhere to any monitoring procedures. A monitoring and evaluation system, including auditing, will be established and operationalized to track the implementation of the EMPR ensuring that management measures are effective to avoid, minimize and mitigate impacts and that corrective action is being undertaken to address shortcomings and / or non-conformances.

Please Refer to Section 10.2 for assumptions and limitations within the specialist reports

# 14 REASONED OPINION AS TO WHETHER THE PROPOSED ACTIVITY SHOULD OR SHOULD NOT BE AUTHORIZED

## 14.1 Reasons why the Activity should be authorized or not.

Mining and its associated impacts have already commenced on the proposed project site and the area has been disturbed by adjacent mining activities, illegal mining activities, the nearby local community, agricultural activities and intensive grazing practices. Taking the aforementioned into account as well as the relatively low nature of the potential impacts (with the implementation of management measures), as discussed throughout this document, it is clear that the UG1 opencast, as proposed by the applicant, will be the most suitable future land use for the site in terms of environmental and economic cost-benefit.

Please refer to Section 11.3 for the impact statements. The findings of the specialist studies undertaken within this EIA/EMPR provide an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed project. The findings conclude that, provided that the recommended mitigation and management measures are implemented, there are no environmental fatal flaws that post the provided mitigation, should prevent the proposed project from proceeding.

## 14.2 Conditions that must be included in the authorization

### 14.2.1 Specific conditions to be included into the compilation and approval of the EMPR

Please Refer to Table 11-3 and Section 12.

### 14.2.2 Rehabilitation requirements

For the UG1 mining operations, the following closure objectives and goals are proposed:

- To rehabilitate all disturbed land to a state that is suitable for its post closure use;
- To ensure that affected areas are safe and secure for both human and animal activities;
- The physical and chemical stability of the remaining structures should be such that risk to the environment through naturally occurring forces is eliminated;
- To rehabilitate all disturbed land to a state where limited or preferably no post closure management is required;
- To rehabilitate all disturbed land to a state that facilitates compliance with current environmental quality objectives (air and water quality); and
- To limit the impact on personnel whose positions may become redundant on decommissioning of the mine.

With regards to the stockpiling of the tailings at the existing ROM site the rehabilitation for the overall mining area as per the current approved EIA/EMP should be implemented. Similarly, the objectives for the PCD's as outlined in the 2019 approved EIA/EMP for the storm water infrastructure should be implemented.

## 14.3 Period for which the Environmental Authorization is Required.

The proposed UG1 opencast Life of Mine is expected to be for 24 months once the mine comes out of care and maintenance.

The operational PCDs and stockpiling of tailings at the existing ROM area will be for the life of mine and is expected to be for more than 20 years.

## 14.4 UNDERTAKING

Confirm that the undertaking required to meet the requirements of this section is provided at the end of

the EMPR and is applicable to both the Environmental Impact Assessment Report and the Environmental Management Programme report.

The signed undertaking is included in Section 25 of Part B.

# 15 FINANCIAL PROVISION

Environmental management infrastructure that is required at the outset will be financed out of the project capital. On-going environmental management and rehabilitation as identified in this document and as set out in the EMPR will be funded from working costs during the life of the project

**Table 15-1: Financial Quantum Calculated for UG1 Opencast**

**CALCULATION OF THE QUANTUM**

| Applicant: | Phokathaba Platinum Mine | Location | Burgersfort/Steelpoort |
|---|---|---|---|
| EAP | Prescali Environmental Consultants (Pty) Ltd | Date: | Aug-19 |

| 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 | 0 | 16 | 1 | 1 | 0 |
| 2 (A) | Demolition of steel buildings and structures | m2 | 0 | 228 | 1 | 1 | 0 |
| 2(B) | Demolition of reinforced concrete buildings and structures | m2 | 0 | 336 | 1 | 1 | 0 |
| 3 | Rehabilitation of access roads | m2 | 1 500,00 | 41 | 1 | 1 | 61500 |
| 4 (A) | Demolition and rehabilitation of electrified railway lines | m | 0 | 395 | 1 | 1 | 0 |
| 4 (A) | Demolition and rehabilitation of non-electrified railway lines | m | 0 | 216 | 1 | 1 | 0 |
| 5 | Demolition of housing and/or administration facilities | m2 | 0 | 455 | 1 | 1 | 0 |
| 6 | Opencast rehabilitation including final voids and ramps | ha | 13,5 | 238697 | 1 | 1 | 3222409,5 |
| 7 | Sealing of shafts adits and inclines | m3 | 0 | 122 | 1 | 1 | 0 |
| 8 (A) | Rehabilitation of overburden and spoils | ha | 0 | 159131 | 1 | 1 | 0 |
| 8 (B) | Rehabilitation of processing waste deposits and evaporation ponds (non-polluting potential) | ha | 0 | 198195 | 1 | 1 | 0 |
| 8 ( C ) | Rehabilitation of processing waste deposits and evaporation ponds (polluting potential) | ha | 0 | 575653 | 1 | 1 | 0 |
| 9 | Rehabilitation of subsided areas | ha | 0 | 133249 | 1 | 1 | 0 |
| 10 | General surface rehabilitation | ha | 0 | 126059 | 1 | 1 | 0 |
| 11 | River diversions | ha | 0 | 126059 | 1 | 1 | 0 |
| 12 | Fencing | m | 0 | 144 | 1 | 1 | 0 |
| 13 | Water management | ha | 0 | 47931 | 1 | 1 | 0 |
| 14 | 2 to 3 years of maintenance and aftercare | ha | 0 | 16776 | 1 | 1 | 0 |
| 15 (A) | Specialist study | Sum | 0 | | | 1 | 0 |
| 15 (B) | Specialist study | Sum | 0 | | | 1 | 0 |
| | | | | | Sub Total 1 | | 3283909,5 |
| 1 | Preliminary and General | | 394069,14 | | weighting factor 2 1 | | 394069,14 |
| 2 | Contingencies | | 328390,95 | | | | 328390,95 |
| | | | | | Subtotal 2 | | 4006369,59 |
| | | | | | VAT (15%) | | 600955,44 |
| | | | | | **Grand Total** | | **4607325** |

## 15.1 Describe the Closure objectives and the extent to which they have been aligned to the baseline environment described under regulation 22(2) (D) as described in 2.4 herein.

The post closure land use proposed for the project area is to return the area to wilderness/natural area or area suitable for game and or grazing land. This excludes the portions of the pits which will only be partially backfilled.

The Soils, Agricultural Potential and Land Capability report (TerraAfrica, 2019, Appendix 7) conducted for the project area state that the project area receives an annual rainfall between 400 mm and 500 mm which is considered low and unsuitable for crop cultivation under arable conditions.

Soils in the area are generally shallow with exposed bedrock outcrops and those that are somewhat

suitable for agriculture are used for subsistence agriculture only. The Agricultural potential is thus classified as moderate to low. The limited soil on site can be used for rehabilitation post-mining if adequately managed. The closure objectives have been determined taking this into account.

The following closure objectives and goals are proposed:

- To rehabilitate all disturbed land to a state that is suitable for its post closure use;
- To ensure that affected areas are safe and secure for both human and animal activities;
- The physical and chemical stability of the remaining structures should be such that risk to the environment through naturally occurring forces is eliminated;
- To rehabilitate all disturbed land to a state where limited or preferably no post closure management is required;
- To rehabilitate all disturbed land to state that facilitates compliance with current environmental quality objectives (air and water quality); and
- To limit the impact on personnel whose positions may become redundant on decommissioning of the mine.

## 15.2 Confirm specifically that the environmental objectives in relation to the closure have been consulted with landowner and interested and affected parties.

The environmental objective in relation to closure was reported in the Draft EIA which was made available to all registered I&AP's for comment for a period of 30 days. All comments received and the relevant meeting minutes are appended to this report (Appendix 8). The closure end land-use will stay unchanged from that approved in the mine`s 2019 EIA/EMP for the PCDs and co-operation activities with BCM.

## 15.3 Provide a rehabilitation plan that describes and shows the scale and areal extent of the main mining activities, including the anticipated mining area at the time of closure.

Please refer to Appendix 5 and Figure 15-1 for the final site map for the UG1 area.

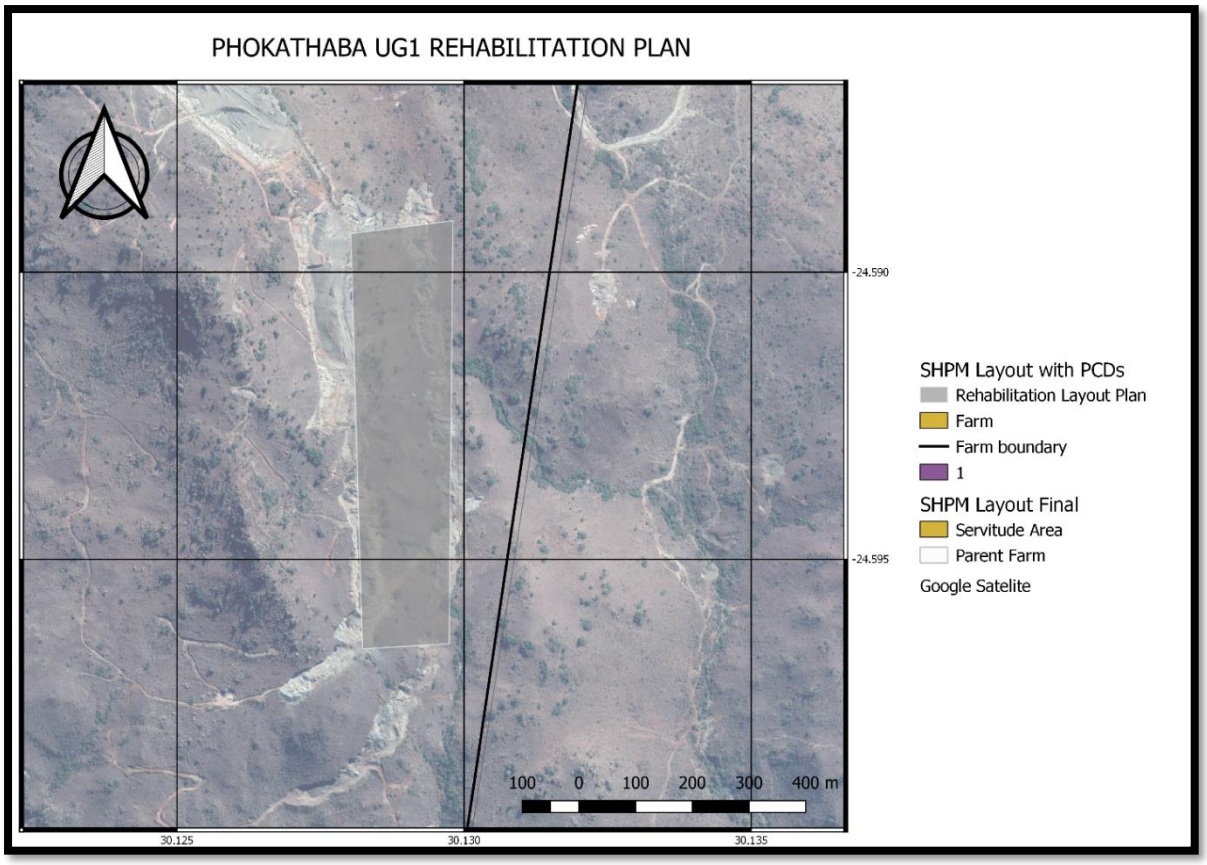


**Figure 15-1: Extend of UG 1 Rehabilitation area (no infrastructure other than backfilled area will be on site after rehabilitation)**

## 15.4 Explain Why it can be confirmed that the rehabilitation plan is compatible with closure objectives.

The rehabilitation plan has been compiled in accordance with the closure objectives and goals and is deemed to be satisfactory according to the Mine and Petroleum Resources Development Act, 2002 (Act No.28 of 2002) as amended and GNR 1147 of the National Environmental Management Act, 1988 (Act No. 107 of 1998).

## 15.5 Calculate and state the Quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline

Please refer to Table 15-1.

## 15.6 Confirm that the financial provision will be provided as determined

Phokathaba Platinum (Pty) Ltd. has a dedicated rehabilitation and closure fund and a deposited sum with the DMR. The additional provision as required for the UG1 operations will be provided should there be a shortfall.

# 16 DEVIATION FROM THE APPROVED SCOPING REPORT AND PLAN OF STUDY

## 16.1 Deviation from the methodology used in determining the significance of potential environmental impacts and risks

Provide a list of activities in respect of which the approved scoping report was deviated from, the reference in this report identifying where the deviation was made, and a brief description of the extent of the deviation

No deviations were made to the methodology used and as outlined in Section 9.1.

### 16.1.1 Motivation for the deviation

Not applicable.

# 17 OTHER INFORMATION REQUESTED BY THE COMPETENT AUTHORITY

The Competent Authority (LDEDET) has requested a biodiversity offset strategy to be included in the list of specialist studies. This is still in process. SHPM will appoint a specialist to assist in this regard. It is proposed that this becomes a condition of the Environmental Authorisation.

## 17.1 Compliance with the provisions of sections 24(4)(a) and (b) read with section 24 (3) (a) and (7) of the national environmental management act (act 107 of 1998) the eia report must include the:

### 17.1.1 Impact on the socio-economic conditions of any directly affected person

The project involves the UG1 opencast operation which will involve recommissioning of SHPM mine for a period of 24 months. The following impacts are anticipated"

- Temporary Employment benefits to the local communities;
- Tension with communities regarding implementation of the Social and Labour Plan;
- Tension with community member involved in illegal mining activities in the property; and
- The proposed UG1 opencast will also bring negative impacts during the closure of the project as it may lead to retrenchments of staff.

For the whole of the SHPM operations (currently under care and maintenance) the impacts as identified in the 2016 assessment (Appendix 7: Specialist ) is still in effect.

### 17.1.2 Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act

(Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any national estate referred to in section 3(2) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) with the exception of the national estate contemplated in section 3(2)(i)(vi) and (vii) of that Act, attach the investigation report as Appendix and confirm that the applicable mitigation is reflected in 2.5.3; 2.11.6.and 2.12.herein).

Previous studies conducted in the Steelpoort region suggest a rich and diverse archaeological landscape but the surroundings of the proposed UG1 Opencast Project areas have been transformed by mining, prospecting and related developments. Cognisance should nonetheless be taken of

archaeological material that might be present in surface in surface and sub-surface deposits along drainage lines and in pristine areas.

No heritage resources were documented within the proposed Smokey Hills UG1 Opencast project footprints. It is the opinion of the author of the Archaeological Impact Assessment Report (Appendix 7: Specialist ) that the proposed Smokey Hills UG1 Opencast may proceed from a culture resources management perspective, provided that no previously undetected heritage remains are found at any point in construction and operational phases.

**Archaeology**

The study did not identify any archaeological receptors which will be directly impacted by the proposed project. Maandagshoek is situated in a rich archaeological landscape with Stone Age and Iron Age remnants occurring throughout. However, no impact on archaeological sites or features is anticipated.

**Built Environment**

The study has not identified any buildings which will be directly impacted by the proposed project. In terms of the larger mining property, the general landscape has low significance in terms of the built environment as there are no apparent old buildings, structures, or features, old equipment, public memorial or monuments present. No impact on the built environment is therefore anticipated.

**Cultural Landscape**

Even though the larger Steelpoort area comprises a rich cultural landscape, the landscape surrounding the proposed project areas has been transformed by mining, human settlement and agriculture. Further away from the project area, the landscape is typical of Sekhukhune, with large areas of undulating hills, large mountains to the south and north and flatter plains in-between. This landscape stretches over many kilometres and the proposed project is unlikely to result in a significant impact on the landscape.

**Graves / Human Burials Sites**

No human burials were identified during the study. In the rural areas of the Limpopo Province graves and cemeteries often occur within settlements or around homesteads but they are also randomly scattered around archaeological and historical settlements. The probability of additional and informal human burials encountered during development should thus not be excluded. In addition, human remains and burials are commonly found close to archaeological sites; they may be found in "lost" graveyards, or occur sporadically anywhere as a result of prehistoric activity, victims of conflict or crime. It is often difficult to detect the presence of archaeological human remains on the landscape as these burials, in most cases, are not marked at the surface. Human remains are usually observed when they are exposed through erosion. In some instances, packed stones or rocks may indicate the presence of informal pre-colonial burials. If any human bones are found during the course of construction work, then they should be reported to an archaeologist and work in the immediate vicinity should cease until the appropriate actions have been carried out by the archaeologist. Where human remains are part of a burial, they would need to be exhumed under a permit from either SAHRA (for pre-colonial burials as well as burials later than about AD 1500). Should any unmarked human burials/remains be found during the course of construction, work in the immediate vicinity should cease and the find must immediately be reported to the archaeologist, or the South African Heritage Resources Agency (SAHRA). Under no circumstances may burials be disturbed or removed until such time as necessary statutory procedures have been followed and approved.

**The Archaeology Study conducted on UG1 Opencast**

No sites of any cultural heritage (archaeological and/or historical) origin or significance were identified in the impact areas that had to be surveyed by APAC (Pelser, 2019). However, the subterranean nature of these resources (including low stone-packed or unmarked graves) should also be taken into consideration. Should any previously unknown or invisible sites, features or material be uncovered

during any development actions then an expert should be contacted to investigate and provide recommendations on the way forward.

## 17.2 Other matters required in terms of sections 24(4)(a) and (b) of the act.

(the EAP managing the application must provide the competent authority with detailed, written proof of an investigation as required by section 24(4)(b)(i) of the Act and motivation if no reasonable or feasible alternatives, as contemplated in sub-regulation 22(2)(h), exist.).

Please refer to Section 6.

# PART B

# ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

## 18 DETAILS OF THE EAP:

(Confirm that the requirement for the provision of the details and expertise of the EAP are already included in PART A, section 1(a) herein as required).

The information can be found Section 1.

## 19 DESCRIPTION OF THE ASPECTS OF THE ACTIVITY

(Confirm that the requirement to describe the aspects of the activity that are covered by the draft environmental management programme is already included in PART A, section (1)(h) herein as required).

Please refer to Section 3 above. Key aspects that were assessed by specialist studies as part of this EIA include:

- Surface Water (2019 assessment);
- Ecology (Fauna and Flora (2019 assessment);
- Geohydrology (groundwater) (2019 assessment);
- Noise (2019 assessment);
- Air Quality (2019 assessment);
- Soil and Land capability (2019 assessment); and
- Archaeology (2019 assessment);

Reference is also made to the 2016 Socio-economic assessment report.

### 19.1 COMPOSITE MAP

(Provide a map (Attached as an Appendix) at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers)

Refer to Appendix 4: Layout Maps.

### 19.2 DESCRIPTION OF CLOSURE OBJECTIVES

(ensure that the closure objectives are informed by the type of environment described in 2.4 herein)

- To rehabilitate all disturbed land to a state that is suitable for its post closure use;
- To ensure that affected areas are safe and secure for both human and animal activities;
- The physical and chemical stability of the remaining opencast pit (if applicable) and the backfilled area should be such that risk to the environment through naturally occurring forces is eliminated;
- To rehabilitate all disturbed land to a state where limited or preferably no post closure management is required;

- To rehabilitate all disturbed land to a state that facilitates compliance with current environmental quality objectives (air and water quality); and
- To limit the impact on personnel whose positions may become redundant on decommissioning of the mine.

## 19.3 THE PROCESS FOR MANAGING ANY ENVIRONMENTAL DAMAGE, POLLUTION, PUMPING AND TREATMENT OF EXTRANEOUS WATER OR ECOLOGICAL DEGRADATION AS A RESULT OF UNDERTAKING A LISTED ACTIVITY

Refer to Table 11-2 for the proposed mitigation measures.

Any activity that results in damage or pollution to the environment will be rated and signed a value to determine the risk. An environmental emergency is defined as an unplanned situation or event resulting in potential pollution of the environment. A pollution incident means an incident or set of circumstances during or as a consequence of which there is or is likely to be a leak, spill or other escape or deposit of a substance, as a result of which pollution has occurred, is occurring or is likely to occur.

### 19.3.1 Roles and Responsibilities

All Employees and its contractors working for the mine are responsible for reporting any accident/emergency to their supervisor immediately, and if required notifying the emergency response teams. Personnel must be nominated as response team members and must receive appropriate training to manage emergencies. All other personnel must be made aware of potential emergencies and trained in emergency response. Management must be aware of their responsibilities in case of emergency.

### 19.3.2 Response to Emergencies

#### *19.3.2.1 Emergency Plan*

An emergency plan must be developed for each potential environmental emergency situation. The emergency plan must give information on:

- Description of the emergency;
- Reference to relevant material safety data sheets;
- Responsibilities for management of emergencies;
- Contact telephone numbers (on-site & off-site);
- Equipment required (including locations); and
- Site plan where applicable.

#### *19.3.2.2 Classification of emergencies*

The following incidents will be classified as an emergency:

- Natural Disasters;
- Damage to radiological/nuclear sources equipment;
- Strikes, protest or unrest;
- Information Management System Failure (plc systems);
- Health and Disease Outbreaks;
- Serious Incident or Fatality;
- High Potential Risk Incidents (Fatality, serious environmental pollution); and
- Other emergencies.

#### *19.3.2.3 Reporting Emergencies*

SHPM must establish procedures to identify the potential for, and response to, incidents and emergency situations and for preventing and mitigating the illness, injury or environmental hazard that may be associated with them. SHPM will review its emergency preparedness and response plans and procedures, in particular, after the occurrence of incidents or emergency situations. The mine shall also

periodically test such procedures where and when practicable.

In the event of a serious incident or fatality occurring it is of the utmost importance to not only ensure the Health and Safety of every person involved but also to ensure that certain evidence is protected and gathered for use by the SHPM mine, with the aim of the prevention of a similar incident/accident occurring in the future.

A "No Blame Fixing" approach to incident investigation will be implemented and it must be stressed that the gathering of information must be seen as preventative action and not as blame fixing. In light of the above, and in addition to the emergency procedure that is relevant to the specific area where the incident/accident occurred, and in relation to the notifying of person and first aid treatment/safety of any person involved, the following steps must be taken immediately after an incident/accident classified above has occurred.

In the event of a reportable/major environmental incident that could lead to danger to the public or the environment (death or sustaining impact on the environment) the appointee of that specific section, in consultation with SHEQ Manager, is responsible for communicating with and drafting an external report (in terms of Section 30 of National Environmental Management Act, 1998 (Act No. 108 of 1998) and Sections 19 and 20 of the National Water Act, 1998 (Act No. 36 of 1998) to the national and provincial department and the municipality containing the:

- Nature of the incident;
- Substances and quantities and accurate effect on persons and environment;
- Initial measures to minimise impacts;
- Causes of the incident;
- Accordance measures;
- When an environmental incident occurs, the following should be adhered to:
    - Report incident as per Incident Reporting Flow Diagram;
    - Measures to clean up any spillage/pollution must be taken as per Emergency Procedure.
    - It is important to ensure that no secondary pollution is caused by incorrect handling of an environmental incident, e.g. incorrect disposal of absorbent material use to clean up a spill; and
- For high potential risk incident (HPRI) / reportable environmental incidents, the SHEQ Manager will conduct a closeout investigation prior to closure of the incident. This will be done one month after all actions has been completed to verify the effectiveness of the actions.

#### *19.3.2.4 Formalize Policies*

***Objectives:*** To formalize and sign off on company policies
***Actions:*** Compile Health and Safety Policy; and Compile Environmental Policy.
***When:*** Before construction starts for the new activities applied with the UG1 Opencast project.

The notification process has six main steps in managing an emergency, from the identification of the situation to final close off. These are as follows:

- Find and identify;
- Ensure human safety;
- Reporting;
- Containment and clean-up;
- Corrective action; and
- Monitoring.

#### *19.3.2.5 Environmental Emergency Incidents*

The SHEQ Manager must, within 14 days of the incident, report information on the incident to enable

initial evaluation to the following"

- Director-General of DEAT / LEDET;
- Provincial Head of Department (DMR);
- Provincial Head of Department (DWS); and
- Local Municipality.

It is advised that the Fire Department and Local Police also be informed.

The report must include:

- Nature of the incident;
- Substance involved and an estimation of quantity released and their possible acute effects on persons and the environment;
- Initial measures taken to minimise impacts;
- Cause of incident, whether direct or indirect; and
- Measures taken to avoid recurrence of such incident.

#### *19.3.2.6 Water pollution Emergency Incidents*

Water Pollution Emergency Incident is any accident /incident in which a substance pollutes or has the potential to pollute a water resource or a substance that has or is likely to have a detrimental effect on a water resource.

The responsible person who was in control of the substance involved in the incident at the time or responsible for the section the incident occurred will immediately inform the superior of the area where the incident occurred.

The information with regard to the incident is communicated to the Business Manager, SHEQ Manager and Security Personnel immediately by the superior of the area. The SHEQ Manager and the General Manager must, as soon as reasonably practicable after obtaining the knowledge of the incident, (i.e. within 14 days) report to:

- DWS (Regional Manager);
- South African Police Services or relevant fire department; and
- The Catchment Management Agency.

The SHEQ Manager and crisis management team must

- Take all reasonable measures to contain and minimise the effects of the incident;
- Undertake clean-up procedures;
- Remedy the effects of the incidents; and
- Sample the water together with the responsible person of the area.

#### *19.3.2.7 Pollution Emergency Incidents*

- Non-compliance with the air quality registration certificate condition and requirements;
- Record of any non-compliance is kept;
- The non-compliance with the certificate conditions will be reported telephonically, by fax or by email to the Chief Air Pollution Control Officer as soon as possible but not later than 24 hours after violation will start to occur. The particulars of such violation, including details of measure is put in place to prevent it happening in the future, will be included respective or in the weekly or monthly report;
- If the utilisation and/or efficiency of air pollution control fail to meet requirements as specified in the certificate then the process is managed under emergency procedures until such time as it will be possible to operate in compliance with the conditions of this certificate; and
- Record is kept of periods of upset and abnormal emissions, e.g. off-gas vented directly to the atmosphere or excess thereof due to the faults or limited capacity of air pollution control

equipment or limits for process parameters being exceeded, etc. and the Chief Air Pollution Control Officer is notified immediately should it occur.

#### *19.3.2.8 Environmental Impact Register*

All non-conformances pertaining to safety, health, environmental, quality of project activities and employees shall be documented as identified by the relevant documented procedures. SHPM will make provision for recording and reviewing the nature and extent of any non-conformance that may be encountered during the Project Execution phase.

The Project Steering Committee in conjunction with the identifier shall decide on the impact of poor performance and the actions that would be necessary to prevent further deterioration or occurrence.

#### *19.3.2.9 Records*

Records must be kept of all environmental emergencies and non-conformances.

# 20 ACID MINE DRAINAGE (AMD)

## 20.1 Potential risk of Acid Mine Drainage

A 2019 approved SHPM EIA/EMPR reported on 8 Eight geochemical samples that were submitted to UIS Analytical Services laboratory for selected geochemical analyses. Six of the samples were taken from different representative locations on the tailings storage facility (TSF). Two samples were taken at representative waste rock deposit locations. Applicable to this report is the two waste rock samples which were composited into one to conduct the following analyses:

- XRD whole rock analysis for mineral composition;
- Aqua regia leach with analysis of the following constituents: Ca, Mg, Na, K, Al, Si, V, Cr(total), Cr(VI), B, Ba, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Sb, Mo, Cd, Pb, U, Th, Hg, F, CN (total);
- Distilled water leach with analysis of the following constituents: o pH, TDS, EC, total alkalinity, bicarbonate alkalinity, Ca, Mg, Na, K, Al, Si, V, Cr(total), Cr(VI), Ba, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Sb, Mo, Cd, Te, Pb, U, Th, Hg, CN (total), B, SO4, $NO_3$, $NH_4$, $NO_2$, $PO_4$, Cl, F; and
- ICP-MS: Quantitative analysis of above-mentioned constituents for each of the leach tests.

The macro-chemical leachate (LCT) analysis indicated that the leachate is close to neutral with a pH of 7.17 for the waste rock material. Leachate of TDS (73 mg/L), $SO_4$ (12 mg/L), and small quantities of $NO_3$-N (3 mg/L) shows that the waste rock material does not generate any notable leachate (Table 20-1). The low nitrate levels are due to the fact that the mine is in care and maintenance and does not generate nitrate. The residual nitrate decayed due to denitrification. The nitrate does not originate from the waste rock material and does not occur in mineral form in the XRD analyses as it is from ammonia nitrate-based explosives used during mining.

The samples concluded that there is no risk for acid mine drainage (AMD) as the sulphide content is insignificantly low with very low sulphide generating potential.

**Table 20-1: Smokey Hills Mine Residue facilities-chemical and distilled water leach test results-macro-parameters**

| Analyses | TSF/COMP/OSITE/GH/1172/ Water/Leach/ | TSF/COMP/OSITE/GH/1171/ Water/Leach/1 |
|---|---|---|
| Sample number | 491205 | 491206 |
| TCLP/Acid Rain/Distilled Water/$H_2O_2$ | Distilled water | Distilled water |
| Dry Mass Used (g) | 50 | 50 |
| Volume used (ml) | 1000 | 1000 |

| Analyses | TSF/COMP/OSITE/GH/1172/ Water/Leach/ | TSF/COMP/OSITE/GH/1171/ Water/Leach/1 |
|---|---|---|
| pH Value | 7.75 | 7.17 |
| Electrical Conductivity in mS/m at 25◦C | 6.08 | 9.46 |
| Inorganic Anions | Mg/l | Mg/l |
| Total Dissolved Solids by sum | 52 | 73 |
| Total dissolved solids by EC | 43 | 66 |
| Phenolphthalein Alkalinity as CaCO3 | <0.6 | <0.6 |
| Chloride as Cl | <0.25 | <0.96 |
| Sulphate as SO4 | 2.79 | 12.3 |
| Nitrate as N | 1.34 | 2.96 |
| Nitrite as N | <0.2 | <0.2 |
| Fluoride as F | <0.1 | 0.19 |
| NH4 | <0.01 | <0.01 |
| Phosphate | <0.8 | <0.8 |
| Hexavalent Chromium as Cr6+ | <0.05 | <0.05 |
| Total Cyanide as CN | <0.01 | <0.01 |

## 20.2 POTENTIAL OF LEACHING FROM WASTE ROCK

(Indicate whether or not the mining can result in acid mine drainage)

The geohydrological assessment (2019) indicates the potential impact as a result of the leachable concentrations general geology taking into consideration a 2% decay rate. Please refer to Figure 10-28.

### 20.2.1 Steps Taken to Investigate, Assess, and Evaluate the Impact of Acid Mine Drainage

The material is not considered to be acid forming, please refer to Section 20.1.

### 20.2.2 Engineering or Mine Design Solutions to Be Implemented to Avoid or Remedy Acid Mine Drainage

As the material will be backfilled into the pit there is no solution that can be implemented as the backfilling is an integral part of the rehabilitation process to meet the closure objectives.

### 20.2.3 Measures That Will Be Put in Place to Remedy Any Residual or Cumulative Impact That May Result from Acid Mine Drainage

Acid mine drainage is not anticipated.

# 21 WATER

## 21.1 Volumes and rate of water use required for the mining, trenching or bulk sampling operations

An Integrated Water Use Licence Application Amendment has been submitted to the Department of Water and Sanitation (DWS)in 2018. SHPM along with BCM will undergo updates to the Water Use licenses during the updating of their various authorizations to accommodate all the new activities and combined services as a result of the pipeline developments over the mountain, which is submitted as a separate application for to the DMR.

As the SHPM is currently under care and maintenance the approved water volumes as licenced for abstraction will not be exceeded.

### 21.2 Has a Water use licence been applied for?

A new application must be submitted to register the backfilling of the opencast areas and should the activities take place within 100 m from the identified watercourses. However, as the 2018 application is still being processed by the DWS this application could not be submitted as yet.

## 22 IMPACTS TO BE MITIGATED IN THEIR RESPECTIVE PHASES

Measures to rehabilitate the environment affected by the undertaking of any listed activity

**Table 22-1: Mitigation measures**

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
|---|---|---|---|---|---|---|
| Geology | Opencast mining; Blasting; Waste rock stockpiling; ROM stockpiling; temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Tailings drying facility; Tailings stockpile; Road construction. | Construction; Operational; Decommissioning | 14 ha | Mining will be conducted strictly according to the mine plan; and | N/A | N/A |
| | | | | Optimally exploit this resource in terms of tonnage of rock mined and cost as provided for in the mine plan. | N/A | N/A |
| Geology | Opencast mining; Blasting; Waste rock stockpiling; ROM stockpiling; temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Tailings drying facility; Tailings stockpile; Road construction. | Construction; Operational; Decommissioning | 29 ha | Implement future reclamation process of the tailing's material generated by the processing of the Run of Mine to extract minerals contained therein. | N/A | N/A |
| Topography | Opencast mining; Blasting; Road construction; Storm water management structures, pipelines, berms and water resources diversions. | Construction; Operational; Decommissioning | 29 ha | Proposed open pit will be backfilled progressively during mining and until permanent closure, barriers such as fencing or berms will be used to ensure that no humans or animals fall into the pit. | N/A | Continuous |
| Ecology | Opencast mining; Blasting; Road construction; Storm water management | Construction; Operational; Decommissioning | 29 ha | Continuous (concurrent) rehabilitation (inclusive of re-vegetation practices after topsoil has been restored) and clean-up of the area should be implemented during both the | NEMBA, NEMA LEMA | As needed as pit progress |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
|---|---|---|---|---|---|---|
| | structures, pipelines, berms and water resources diversions. | | | construction and operational phases. | | |
| | | | | Limit activities (transport etc.) to the smallest area possible. | NEMBA, NEMA LEMA | Continuous |
| | | | | It is vital that if any endemic, rare or vulnerable species occurs on the proposed site that these species should be protected and/or left undisturbed. | NEMBA, NEMA LEMA NFA, 1998[2] | As encountered |
| | | | | Only as an exception can these species be relocated to favourable sites with the use of a specialist prior to vegetation and habitat removal. | NEMBA, NEMA NFA LEMA | As needed |
| | | | | Threatened species are not allowed to be disturbed in any way. | NEMBA, NEMA NFA LEMA | Continuous |
| Flora | Opencast mining; Blasting; Road construction; Storm water management structures, pipelines, berms and water resources diversions. | Construction; Operational; Decommissioning | 29 ha | It is vital that if any endemic, rare or vulnerable species occurs on the proposed site that these species should be protected and/or left undisturbed. | NEMBA, NEMA NFA LEMA | As encountered |
| | | | | Only as an exception can these species be relocated to favourable sites with the use of a specialist prior to vegetation and habitat removal. | NEMBA, NEMA NFA LEMA | As needed |
| | | | | Threatened species are not allowed to be disturbed in any way. | NEMBA, NEMA NFA LEMA | Continuous |
| | | | | No foraging, food and wood collecting within the veld | NEMBA, NEMA | Continuous |

[2] National Forest Act, 1998 (Act No. 84 of 1998)

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
|---|---|---|---|---|---|---|
| | | | | | NFA<br>LEMA | |
| | | | | The vegetation removal should be controlled and should be very specific should be allowed. | NEMBA,<br>NEMA<br>NFA<br>LEMA | As needed per approved mining plan |
| | | | | Ensure awareness amongst all staff, contractors and visitors to the site to not needlessly damage flora | NEMBA,<br>NEMA<br>NFA<br>LEMA | Continuous, Part of induction |
| Fauna | Opencast mining; Blasting; Road construction; Storm water management structures, pipelines, berms and water resources diversions. | Construction; Operational; Decommissioning | 29 ha | To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his Employees, his Sub-Contractors or his Sub-Contractors' Employees. | NEMBA,<br>NEMA<br>NFA<br>LEMA | Continuous |
| | | | | Priority species, specifically nests if encountered, should be identified first and a management plan should be established for each of the priority species. | NEMBA,<br>NEMA<br>NFA<br>LEMA | As needed |
| | | | | All injured animals sighted during the development should be protected and moved to receive rehabilitation at a pre-identified centre and should not be handled by the Employees under any circumstance. | NEMBA,<br>NEMA<br>NFA<br>LEMA | As needed |
| | | | | implement an AIP Management Plan during the life of the development, to maintain and restore the ecological integrity of the remaining natural vegetation. | NEMBA,<br>NEMA<br>NFA<br>LEMA | Continuous |
| Alien Invasive plant species | Opencast mining; Blasting; Road construction; Storm | Construction; Operational; Decommissioning | 29 ha | A management plan for control of invasive/exotic plant species needs to be implemented as part of the flora management | NEMBA,<br>NEMA<br>NFA | Before operations commence and implemented as per |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
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| | water management structures, pipelines, berms and water resources diversions. | | | plan. This will be ongoing until the end of the closure phase. | LEMA | the approved plan |
| | | | | Appoint an ECO to oversee the activities and ensure that ecological aspects are kept in mind, | NEMBA, NEMA NFA LEMA | Continuous and inspections as per EMPr |
| Soil resources | Opencast mining; Blasting; Waste rock stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Placement of fences; Removal of indigenous vegetation; Backfilling of opencast areas | Construction; Operational; Decommissioning | 29 ha | The soil that has been removed within the area needs to be replaced and rehabilitated to its previous natural state as far as possible. | NEMA, NEMWA, CARA | As needed during rehabilitation |
| | | | | The activities of construction contractors or Employees will be restricted to the planned areas; | NEMA, NEMWA, CARA | Continuous |
| | | | | Instructions must be included in contracts that will restrict construction work and construction workers to the clearly defined limits of the construction site; | NEMA, NEMWA, CARA | When contracts are drafted and signed |
| | | | | Locate all topsoil stockpiles in areas where they will not have to be relocated prior to replacement for final rehabilitation; | NEMA, NEMWA, CARA | Continuous |
| | | | | The mine will implement a soil conservation procedure which includes the protection of soil from compaction, protection of topsoil, prevention of erosion and loss, re-vegetation of disturbed areas and monitoring. | NEMA, NEMWA, CARA | During planning, construction, operational phases |
| | | | | Ensure all topsoil stockpiles are clearly and permanently demarcated and located in defined no-go areas; | NEMA, NEMWA, CARA | Continuous |
| | | | | Map all stockpile locations; and Topsoil should never be used as a filling material for roads; and | NEMA, NEMWA, CARA | Continuous |
| | | | | The mine will implement a soil conservation procedure which includes the protection of soil from compaction, protection of topsoil, | NEMA, NEMWA, CARA | As per approved procedure |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
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| | | | | prevention of erosion and loss, re-vegetation | | |
| Soil erosion | Opencast mining; Blasting; Waste rock stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Placement of fences; Removal of indigenous vegetation; Backfilling of opencast areas | Construction; Operational; Decommissioning | 29 ha | Existing established roads should be used wherever possible; | NEMA, NEMWA, CARA | Continuous |
| | | | | Access roads should be designed with a camber to avoid ponding and to encourage drainage to side drains; where necessary, culverts should be installed to permit free drainage of existing water courses; | NEMA, NEMWA, CARA | During planning and construction phase |
| | | | | The side drains of the roads can be protected with sediment traps and/or gabions to reduce the erosive velocity of water during storm events and where necessary geo-membrane lining can be used; | NEMA, NEMWA, CARA | As needed |
| | | | | Losses of fuel and lubricants from the oil sumps and steering racks of vehicles and equipment should be contained; | NEMA, NEMWA, CARA | As needed |
| | | | | Using biodegradable drilling fluids, using lined sumps for collection of drilling fluids, recovering drilling muds and treating them off-site, and securely storing dried waste mud by burying it in a purpose-built containment area; | NEMA, NEMWA, CARA | As needed |
| | | | | Vegetate disturbed areas during the rainy season; Where disturbed areas cannot be re-vegetated during the life of the mine appropriate measures will be taken to control erosion. These may include: contours; berms; runoff diversion canals; energy dissipaters; and application of straw mulches or soil binders to exposed soils. | NEMA, NEMWA, CARA | Rainy Season annually Continuous |
| | | | | Avoiding waste disposal at the site wherever possible, by segregating, trucking out, and recycling waste. The mine will observe the requirements of the Department of Agriculture | NEMA, NEMWA, CARA Department | Continuous |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
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| | | | | in the design of effective erosion control measures on bare soils. The movement of soil should be prevented. These requirements are as follows: erosion control measures are required in all areas where slope gradients exceed 2%; engineered erosion control measures are required where slope gradients exceed 7º (15%). | of Agriculture | |
| Soil Contamination | Opencast mining; Blasting; Waste rock stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Placement of fences; Removal of indigenous vegetation; Backfilling of opencast areas | Construction; Operational; Decommissioning | 29 ha | All soils compacted as a result of the pre-construction activities falling outside the infrastructure footprint areas should be ripped and profiled; | NEMA, NEMWA, CARA | As needed |
| | | | | The mine will ensure that erosion controls are included in the designs of the opencast sections within the Koppie areas, which has increased risk for easy mobility downslope. | NEMA, NEMWA, CARA | During planning and construction phase |
| | | | | Adequate sanitary facilities will be provided at construction sites and areas that is located away from the mine ablution blocks | NEMA, NEMWA, CARA | Life of mine |
| | | | | Storage areas and vehicle maintenance areas will be surfaced and will have appropriate runoff containment measures, such as oil traps, bunds and canals, will be in place; | NEMA, NEMWA, CARA | Life of mine |
| | | | | Vehicles will be regularly serviced according to a pre-planned maintenance programme; | NEMA, NEMWA, CARA | As per planned maintenance programme |
| | | | | All chemical, fuel and lubricant storage areas will be underlain by impermeable substrates; Drums containing chemicals will be stored upright in a secure, bunded area with an impermeable surface; | NEMA, NEMWA, CARA | Continuous |
| | | | | If necessary, the polluted soils will be classified as wastes and will be discarded at an appropriate permitted waste site. After | NEMA, NEMWA, CARA | as needed |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
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| | | | | removal of the contaminated soils, the affected areas will be landscaped and rehabilitated. | | |
| Grazing land | Opencast mining; Blasting; Waste rock stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Placement of fences; Removal of indigenous vegetation; Backfilling of opencast areas | Construction; Operational; Decommissioning | 14 ha | The new infrastructure will be developed as much as possible on the existing disturbed sites, or on the management areas with the lowest agricultural potential; The mine will conserve soil and control erosion (as discussed above). | NEMA, NEMWA, CARA | During planning phase and life of mine |
| | | | | Land capability and land use will be loss as a result of the UG1 expansion. This cannot be mitigated further; | NEMA, NEMWA, CARA | Life of mine |
| | | | | Grazing and natural land along the servitude will need to remain as the main land activity to match the rest of the mountain and to not cause any unnecessary fragmentation of the larger landscape | NEMA, NEMWA, CARA | Life of mine |
| Land use | Opencast mining; Blasting; Waste rock stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Placement of fences; Removal of indigenous vegetation; Backfilling of opencast areas | Construction; Operational; Decommissioning | 29 ha | As the increase in production and the new infrastructure will increase the amount of trucks and vehicles utilising the road, new roads will need to take cognisance of this and aim to improve congestion and safety on the roads. | NEMA, NEMWA, CARA | Continuously |
| | | | | Travel speeds on the mine roads will be limited to less than 40 km/h. Travel speeds on the access roads will be limited to between 60 m/h and 80 km/h and whichever the speed limit may be as per the signs on the access roads outside of the mine boundary. | NEMA, NEMWA, CARA | Continuously |
| Land use | Waste rock stockpiling; ROM stockpiling; | Construction; Operational; Decommissioning | 14 ha | The residue deposits have been sited and planned and will be designed and operated in terms of the relevant SABS Code of Practice | NWA, NEMA, NEMWA, | During planning and life of mine |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
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| | Temporary topsoil storage/and removal; Overburden stockpiles; Tailings drying facility; Tailings stockpile. Waste rock stockpiling; ROM stockpiling; Temporary topsoil storage/and removal; | | | for mine residue deposits, under the supervision of suitably qualified professional engineers; | CARA | |
| | | | | Professional engineers will undertake monitoring of the residue deposits at the frequency deemed appropriate by these engineers; | NWA, NEMA, NEMWA, CARA | During planning and life of mine and as per the engineer's report |
| | | | | Monitoring of the stability of the residue deposits will continue through the decommissioning phase and until the time when a suitably qualified professional engineer has attested to its long-term stability. | NWA, NEMA, NEMWA, CARA | During planning life of mine |
| Surface water quality | Opencast mining; Blasting; Waste rock stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Placement of fences; Removal of indigenous vegetation; | Construction; Operational; Decommissioning | 14 ha | Mobile sanitary facilities must be inspected regularly and adequately maintained by an approved contractor to prevent any spills/leaks from occurring. Mobile sanitary facilities must be located outside the applicable buffer zones. Ensure that an adequate number of mobile toilets are available for workers on site. | NEMA, NWA, NEMWA | as needed |
| Flooding of open pit and other infrastructure from rainfall and groundwater seepage. Seepage and runoff from stockpile areas are moderately contaminated and could | Opencast mining; Blasting; Waste rock stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling | Operational; decommissioning | 14 ha | Storm water runoff generated at the pit should be directed to and contained within the lined Storm water Control Dams | GN704 | Life of mine |
| | | | | Appropriate management measures should be implemented to drain any seepage to the lined dams | GN704 | Life of mine |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
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| impact on surface water quality | and transporting; Road construction; Placement of fences; Removal of indigenous vegetation; Storm water management structures, pipelines, berms and water resources diversions | | | Dirty water should be re-used wherever practical. | NWA | Continuous |
| surface water quality | Opencast mining; Blasting; Waste rock stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Placement of fences; Removal of indigenous vegetation; Storm water management structures, pipelines, berms and water resources diversions | Construction; Operational; Decommissioning | 29 ha | Spills resulting from vehicle maintenance or as result of the storage of hydrocarbon materials must immediately be cleaned and properly disposed of. Petroleum (and other hazardous materials) storage areas should be effectively bunded and applicable safety standards must be adhered to. Hazardous materials and chemicals must be stored on solid concrete surfaces. Storage containers must be inspected regularly for leaks and repaired as needed. Maintain parking areas and roads in good conditions for the duration of operations. No unauthorised washing of vehicles should be allowed on the premises | NEMA, NWA, NEMWA | Continuously |
| | | | | Design waste water containing structures according to applicable standards. Immediate action must be taken to contain spillage. The dams must be inspected regularly for early detection of leaks. Ensure that pipelines are of a hard-enough material to withstand damage | NEMA, NWA, NEMWA | During planning and life of mine |
| | | | | Uncontrolled disposal of waste near any construction site must be communicated to all contractors as unacceptable. All waste should be placed in a central collection point and | NEMA, NWA, NEMWA | Induction and Life of mine |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
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| | | | | removed from the site. Encourage and implement the separation and recycling of general waste. Place refuse bins on strategic places to encourage the disposal of litter to these bins. Erect notices to inspire the staff to keep their environment clean and hazardous free. Inspect all on-site disposal sites regularly to ensure adherence to all legal requirements. Inspect all contractors and disposal agents, premises and sites regularly to ensure that all environmental and legal requirements are adhered to. | | |
| | | | | An annual report on the project water balance will be submitted to DWS. This will provide information on the status of the water balance in the wet season and the dry season and under conditions of extreme rainfall. | NEMA, NWA, NEMWA | Annual during life of mine |
| Surface water | Opencast mining; Blasting; Waste rock stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Placement of fences; Removal of indigenous vegetation; Storm water management structures, pipelines, berms and water resources diversions | Construction; Operational; Decommissioning | 29 ha | Silt screens/sandbags could be Employed on exposed areas. The construction contractor must monitor the formation of erosion channels and must repair these as required. All erosion channels which develop during construction should be backfilled and consolidated as required. Construction should take place during the dry season. Grass and vegetation removal should be limited to the footprint of the proposed project | NEMA, NWA, NEMWA | During planning and life of mine |
| | | | | Silt screens/sandbags could be Employed on exposed areas; | NEMA, NWA, NEMWA | Life of mine |
| | | | | The construction contractor must monitor the formation of erosion channels and must repair these as required; | NEMA, NWA, NEMWA | Weekly during Life of mine |
| | | | | All erosion channels which develop during | NEMA, | As needed |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
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| | | | | construction should be backfilled and consolidated as required; | NWA, NEMWA | |
| | | | | Construction should take place during the dry season. Grass and vegetation removal should be limited to the footprint of the proposed project; | NEMA, NWA, NEMWA | During planning and life of mine |
| | | | | Due to the location of the proposed opencast pit, it is not possible to place the overburden upstream of the pit, it is recommended that mining should commence at the most northern point and progress towards the south. Overburden (OB) from cut 1 can be stockpiled to the east of the cut, however subsequent cut's overburden needs to be placed in the previous cut which will need to be shaped to become free draining. | NEMA, NWA, NEMWA | During planning and life of mine |
| Surface water | Opencast mining; Blasting; Waste rock stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Placement of fences; Removal of indigenous vegetation; Storm water management structures, pipelines, berms and water resources diversions | Construction and operational | 29 ha | Uncontrolled disposal of waste near any construction site must be communicated to all contractors as unacceptable; | NEMA, NWA, NEMWA | Induction and continuously |
| | | | | All waste should be placed in a central collection point and removed from the site; | NEMA, NWA, NEMWA | Continuously |
| | | | | Encourage and implement the separation and recycling of general waste. Place refuse bins on strategic places to encourage the disposal of litter to these bins; | NEMA, NWA, NEMWA | Continuously |
| | | | | Erect notices to inspire the staff to keep their environment clean and hazardous free. Inspect all on-site disposal sites regularly to ensure adherence to all legal requirements; | NEMA, NWA, NEMWA | Continuously |
| | | | | Inspect all contractors and disposal agents, premises and sites regularly to ensure that all environmental and legal requirements are adhered to. | NEMA, NWA, NEMWA | Annually |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
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| Stormwater | Opencast mining; Blasting; Waste rock stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Placement of fences; Removal of indigenous vegetation; Storm water management structures, pipelines, berms and water resources diversions | Construction; Operational; Decommissioning | | Hazardous materials and chemicals must be stored on solid concrete surfaces. | | |
| | | | | Topsoil must not be placed on exotic plants that can propagate when the topsoil is replaced. The infrastructure must be placed into the excavation as soon as possible to avoid the trench becoming a death trap to small animals. Soil must be replaced in the order it was removed. The top soil must be compacted to prevent erosion, but only to pre-construction levels. Once rehabilitation is complete the site must be monitored to detect any areas where soil stabilising or settling has taken place. Areas where settling takes place must be filled to preconstruction level. | GN704 | Continuously |
| | | | | The water balance for the project will be refined on an ongoing basis during the life of the project. Flow meters will be installed in the mine water circuit to enable refinement of the water balance. The water balance will be used to check on an ongoing basis that the capacity of the dirty water holding facilities is adequate, taking the operational distribution and use of water into account. | GN704 | Annually |
| | | | | An annual report on the project water balance will be submitted to DWS. This will provide information on the status of the water balance in the wet season and | GN704 | Annually |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
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| | | | | the dry season and under conditions of extreme rainfall. | | |
| | | | | Keep the dirty area footprint as small as possible and capture all dirty storm water generated on site for potential re-use; | GN704 | Continuously |
| | | | | Define the runoff/flood characteristics of the study site and design storm water management facilities accordingly. | GN704 | Continuously |
| Surface water | Opencast mining; Blasting; Waste rock stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Placement of fences; Removal of indigenous vegetation; Storm water management structures, pipelines, berms and water resources diversions | Construction; Operational; Decommissioning | 29 ha | Define the runoff/flood characteristics of the study site and design storm water management facilities accordingly. This will ensure appropriate separation of clean and dirty storm water and will maximise the return of clean water to the downstream drainage system. Keep the dirty area footprint as small as possible and capture all dirty storm water generated on site for potential reuse. Adherence to the Storm Water Management Plan as compiled by an accredited engineer is crucial | NEMA, NWA, NEMWA | During planning phase for implementation during life of mine |
| Groundwater | Opencast mining; Storm water management structures, pipelines, berms and water resources diversions; Mining related infrastructure within a | Construction; Operational; Decommissioning; Closure | 29 ha | Clean and dirty water systems should be separated as planned. Ensure that the appropriate design facilities (berms, storm water channels etc.) are constructed to ensure clean and dirty water is separated at the ore handling facilities; | WUL (NWA), NEMWA | Continuously |
| | | | | Implement the EMPR's of other environmental related aspects, including pollution prevention | WUL (NWA), NEMA | Continuously |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
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| | watercourse or within 32 m of watercourses and diversion of watercourses. | | | and impact minimization; | | |
| | | | | Groundwater monitoring boreholes should be sited at designated positions based on infrastructure layout, to comply with the design requirements of a groundwater monitoring system, as recommended; | WUL (NWA) | Before mining commence and monitor as per monitoring plan |
| | | | | Monitor static groundwater levels on a quarterly basis in all boreholes within a zone of one kilometre surrounding the mines to ensure that any deviation of the groundwater flow from the idealized predictions is detected in time and can be re-acted on appropriately; | WUL (NWA) | Quarterly |
| | | | | If it can be proven that the mine is indeed affecting the quantity of groundwater available to certain users, the affected parties should be compensated; | WUL (NWA), NEMWA | As needed |
| | | | | This may be done through the installation of additional boreholes for water supply purposes, or an alternative water supply; | WUL (NWA), NEMWA | As needed |
| | | | | If surface water monitoring shows that the Moopetsi or its tributaries are affected by mine dewatering, discharge of clean water into the tributaries should be considered; | WUL (NWA), NEMWA | As needed |
| | | | | Timing and volumes should be determined by a surface water specialist; | WUL (NWA), NEMWA | As needed |
| | | | | This may be achieved through dewatering boreholes around the mine to extract clean water and ensure dry mining conditions; | WUL (NWA), NEMWA | As needed |
| | | | | Groundwater quality must be monitored on a quarterly basis; | WUL (NWA), NEMWA | Quarterly |
| | | | | The monitoring results must be interpreted annually by a qualified hydrogeologist and the monitoring network should be audited annually to ensure compliance with | WUL (NWA), NEMWA | Annually |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
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| | | | | regulations; | | |
| | | | | The numerical model should be updated during operation of the opencast by using the measured inflows, water levels and drilling and pump test information to re-calibrate and refine the impact prediction; | WUL (NWA), NEMWA | Annually |
| | | | | Water retention dams should be lined to prevent ingress of contamination; and | WUL (NWA), NEMWA | Continuous |
| | | | | Geochemical testing of the backfill material should be conducted to aid in the prediction of contaminant release and potential geochemical changes induced in the subsurface, by means of geochemical modelling. | WUL (NWA), NEMWA | Annual |
| Groundwater | Opencast mining; Waste rock stockpiling; ROM stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Dust suppression; Removal of indigenous vegetation; Backfilling of opencast areas; Wash plant; Crushing, screening and washing of ore; Tailings drying facility; Tailings stockpile | Operational | 29ha | All spillages will need to be cleaned up as soon as practically possible; | WUL (NWA), NEMWA | As needed |
| | | | | Proper management of stormwater drainage infrastructure should be ensured; | WUL (NWA), NEMWA | Continuous |
| | | | | Maintain construction vehicles and encourage contractors to report, react and manage all spills and leaks so that action can be taken to immediately minimise contamination to the groundwater; | WUL (NWA), NEMWA | Induction Continuously |
| | | | | Groundwater monitoring of boreholes should continue as per the WUL and approved monitoring programme; | WUL (NWA), NEMWA | Quarterly |
| | | | | Spill kits will be made available in areas of likely spillage; | WUL (NWA), NEMWA | Continuous |
| | | | | All hydrocarbon storage containers will be stored within a bunded areas which are water tight and able to contain 110% of the stored volume; and | WUL (NWA), NEMWA | Continuous |
| | | | | All equipment utilising hydrocarbons will be stored on a hard-standing surface. | WUL (NWA), NEMWA | Continuous |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
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| Groundwater | Opencast mining; Waste rock stockpiling; ROM stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Dust suppression; Removal of indigenous vegetation; Backfilling of opencast areas; Wash plant; Crushing, screening and washing of ore; Tailings drying facility; Tailings stockpile. | Operational | 29 ha | Surface hydrology design should include surface drainage and storm water diversion drains, to meet the requirements of the Water Act. This includes the separation of unpolluted from polluted surface water and the containment of polluted water on site in impoundments. Also, where leachate is generated, it must be contained separately from water which is only slightly polluted through contact with the waste. | WUL (NWA), NEMWA | Planning and Continuous |
| | | | | In the case of hazardous waste disposal sites, the design must make provision for containment of hazardous waste. This implies the complete separation of the waste body and any associated leachate from the surrounding soil or rock strata, by means of a liner and a leachate collection system. | WUL (NWA), NEMWA | Planning and Continuous |
| | | | | Leachate management is not necessary at mine sites, provided that they are properly designed and operated. However, if this is not the case, and significant leachate is generated as a result of poor drainage or the disposal of high moisture wastes, it must be detected as soon as possible. | WUL (NWA), NEMWA | As needed |
| | | | | Monitoring systems for surface and ground water pollution should be indicated. This will include the positions of both surface water sampling points and monitoring boreholes. Quarterly surface water and groundwater quality and quantity monitoring should be instituted as planned. | WUL (NWA), NEMWA | As per the monitoring plan |
| | | | | The Progressive Rehabilitation Plan should indicate when areas should reach their final level and how they will be progressively | WUL (NWA), NEMWA | Planning and life of mine |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
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| | | | | restored, by means of final cover or capping, top soiling and vegetating. The type of vegetation envisaged should also be described. Rehabilitation, where possible, should run concurrently with the mining programme as planned | | |
| | | | | Drains must divert or contain the peak design storm of 50-year return period for the particular catchment area. The system must effectively separate unpolluted water, that has not come into contact with waste, from polluted water. Upslope cut -off drains must divert clean storm water around the site and into the natural drainage system. • Polluted water, on the other hand, must be collected in toe drains, retained on the site and managed in accordance with the Department's directives. This may include controlled release, recycling and evaporation or treating with any leachate that has been collected; | WUL (NWA), NEMWA | Planning and life of mine |
| | | | | It is a minimum requirement that there always be an acceptable physical separation between the proposed waste body and the wet season high elevation of the ground water. This applies whether cover excavations take place on site or not. The minimum permissible separation is 2m; | WUL (NWA), NEMWA | Continuous |
| | | | | All mines have the potential to generate sporadic leachate. Therefore, the base must be so sloped that any leachate formed, even sporadic leachate, is directed to a control point. | WUL (NWA), NEMWA | Planning and construction |
| | | | | The leachate treatment system will depend on the leachate composition and on the most | WUL (NWA), NEMWA | as needed |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
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| | | | | appropriate method of treatment. This could be on-site chemical, physical or biological treatment, and/or off-site treatment where leachate is passed into a sewer or pipeline for treatment elsewhere; | | |
| | | | | All temporarily and permanently covered areas must be graded and maintained to promote runoff without excessive erosion and to eliminate ponding or standing water; | WUL (NWA), NEMWA | As needed |
| | | | | Clean, uncontaminated water, which has not been in contact with the waste, must be allowed to flow off the site into the natural drainage system, under controlled conditions. All drains must be maintained. This involves ensuring that they are not blocked by silt or vegetation; | WUL (NWA), NEMWA | Continuous |
| | | | | The progressive rehabilitation of mines by means of capping and the subsequent establishment of vegetation is a Minimum Requirement.; | WUL (NWA), NEMWA | Annually during rainy season |
| | | | | Domestic waste water should be temporarily stored on-site to be collected and disposed of offsite by an accredited contractor; | WUL (NWA), NEMWA | Continuous and as needed |
| | | | | The DWS requires a Water Quality Monitoring Plan as part of the permitting requirements. This involves background analyses, detection monitoring, investigative monitoring and post - closure monitoring. The Water Quality Monitoring Plan ensures that the water quality in the vicinity of a mine is regularly monitored and reported upon throughout its life, so that, where necessary, remedial action can be taken; | WUL (NWA), NEMWA | Planning phase and as per approved plan |
| | | | | Dewatering and groundwater abstraction for | WUL (NWA), | Daily |

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| | | | | mining purposes should be monitored so as to prevent negative impacts on the underlying aquifer. Sustainable abstraction rates should be determined and adhered to. | NEMWA | |
| Groundwater | Opencast mining; Waste rock stockpiling; ROM stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Dust suppression; Removal of indigenous vegetation; Backfilling of opencast areas; Tailings stockpile | Decommissioning and Closure | 29 ha | Surface hydrology design should include surface drainage and storm water diversion drains, to meet the requirements of the Water Act | WUL (NWA), NEMWA | Planning phase |
| | | | | This includes the separation of unpolluted from polluted surface water and the containment of polluted water on site in impoundments | WUL (NWA), NEMWA | Planning phase |
| | | | | Also, where leachate is generated, it must be contained separately from water which is only slightly polluted through contact with the waste. | WUL (NWA), NEMWA | Continuous |
| | | | | The DWS requires a Water Quality Monitoring Plan as part of the permitting requirements. This involves background analyses, detection monitoring, investigative monitoring and post - closure monitoring. | WUL (NWA), NEMWA | Planning phase |
| | | | | The Water Quality Monitoring Plan ensures that the water quality in the vicinity of a mine is regularly monitored and reported upon throughout its life, so that, where necessary, remedial action can be taken. Surface and groundwater quality and quality monitoring should be continued until steady state is reached | WUL (NWA), NEMWA | As per approved plan |
| | | | | A pollution control dam could be used to intercept polluted seepage water. An interception trench is an additional option to treat the contaminated discharge | WUL (NWA), NEMWA | Planning phase and life of mine |
| | | | | Implement as many closure measures during | WUL (NWA), | Continuous |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
|---|---|---|---|---|---|---|
| | | | | the operational phase, while conducting appropriate monitoring programmes to demonstrate actual performance of the various management actions during the life of mine. | NEMWA | |
| | | | | All mined areas should be flooded as soon as possible to minimise oxygen from reacting with the remaining pyrite. | WUL (NWA), NEMWA | AS soon as possible |
| | | | | The final backfilled opencast topography should be engineered such that runoff is directed away from the mining areas. | WUL (NWA), NEMWA | Quarterly |
| | | | | The final layer (just below the topsoil cover) should be as clayey as possible and compacted if feasible, to reduce recharge to the decommissioned mines. | WUL (NWA), NEMWA | Rehabilitation |
| | | | | Quarterly groundwater sampling must be conducted to establish a database of groundwater quality to assess plume movement trends. | WUL (NWA), NEMWA | Quarterly |
| | | | | Groundwater monitoring boreholes should be sited at designated positions based on infrastructure layout, to comply with the design requirements of a groundwater monitoring system, as recommended; | WUL (NWA), NEMWA | Before mining commence |
| | | | | Monitor static groundwater levels on a quarterly basis in all boreholes within a zone of one kilometre surrounding the mines to ensure that any deviation of the groundwater flow from the idealized predictions is detected in time and can be reacted on appropriately; | WUL (NWA), NEMWA | Quarterly |
| | | | | If it can be proven that the mine is indeed affecting the quantity of groundwater available to certain users, the affected parties should be compensated; and | WUL (NWA), NEMWA | as needed |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
|---|---|---|---|---|---|---|
| | | | | This may be done through the installation of additional boreholes for water supply purposes, or an alternative water supply. | WUL (NWA), NEMWA | As needed |
| Air quality | Opencast mining; Blasting; Waste rock stockpiling; ROM stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Dust suppression; Removal of indigenous vegetation; Backfilling of opencast areas; Crushing, screening and washing of ore; Tailings drying facility; Tailings stockpile. | Construction; Operational; Decommissioning | N/A | Topsoil should not be removed during windy months (August to January) due to associated wind erosion heightening dust levels in the atmosphere; | NEMAQA | Continuous |
| | | | | Area of disturbance to be kept to a minimum and no unnecessary clearing of vegetation to occur; | NEMAQA | Continuous |
| | | | | Topsoil should be re-vegetated to reduce exposure areas; | NEMAQA | Continuous |
| | | | | During the loading of topsoil onto trucks or stockpiles, the dropping heights should be minimised; | NEMAQA | Continuous |
| | | | | Water or binding agents such as (petroleum emulsions, polymers and adhesives) can be used for dust suppression on earth roads; | NEMAQA | Continuous |
| | | | | When using bulldozers and graders, minimise travel speed and distance and volume of traffic on the roads; | NEMAQA | Continuous |
| | | | | Stockpiles should not be left for prolonged periods as wind energy generates erosion and causes more dust to form; | NEMAQA | Continuous |
| | | | | Emissions generated by wind are dependent on the frequency of disturbance of erodible surfaces and by covering the stockpiles with vegetation would reduce the negative erosion effect; | NEMAQA | Continuous |
| | | | | Any crusting of the surface binds the erodible material; | NEMAQA | Continuous |
| Air quality | Opencast mining; Waste rock stockpiling; ROM | Construction, Operational | N/A | Hauling of materials and transportation of people should take place on roads which is being watered and/or sprayed with dust | NEMAQA | Continuous as needed |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
|---|---|---|---|---|---|---|
| | stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Backfilling of opencast areas. | | | suppressant; | | |
| | | | | To reduce the amount of dust being blown from the load bin in the haul roads, the material being transported can be watered or the back of the vehicles can be covered with plastic tarpaulin covers; | NEMAQA | Continuous |
| | | | | In order to mitigate the impacts of the activity, the speed limit should be kept to the low as more dust will be generated at higher wind speeds; | NEMAQA | Continuous |
| | | | | Speed limits need to be observed and adhered to; | NEMAQA | Continuous |
| | | | | Management should fit roads with speed humps to ensure adherence; | NEMAQA | Continuous |
| | | | | Application of wetting agents or application of dust suppressant to bind soil surfaces to avoid soil erosion; | NEMAQA | As needed |
| | | | | The drop heights should be minimised when depositing materials to the ground; | NEMAQA | Continuous |
| | | | | Encourage car-pool and bulk delivery of materials in order to reduce the number of trips generated daily. | NEMAQA | Continuous |
| | | | | Revegetation of exposed areas for long-term dust and water erosion control is commonly used and is the most cost-effective option; | NEMAQA | Continuous |
| | | | | Plants with roots that bind the soil, and vegetation cover should be used that breaks the impact of falling raindrops, thus preventing wind and water erosion; | NEMAQA | Continuous |
| | | | | Plants used for revegetation should be indigenous to the area, hardy, fast-growing, nitrogen-fixing, provide high plant cover, be adapted to growing on exposed and disturbed soil (pioneer plants) and should easily be | NEMAQA | Continuous |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
|---|---|---|---|---|---|---|
| | | | | propagated by seed or cuttings; | | |
| | | | | The area of disturbance must be kept to a minimum, as demolition should be done judiciously avoid the exposure of larger areas to wind erosion; | NEMAQA | Continuous |
| | | | | Spreading of soil must be performed on less windy days; | NEMAQA | Continuous |
| | | | | The bare soil will be prone to erosion and therefore there is need to reduce the velocity near the surface of the soil by re-vegetation. Leaving the surface of soil in a coarse condition reduces wind erosion and ultimately reduces dust levels | NEMAQA | Continuous |
| | | | | Additional mitigation measures include keeping soil moist using sprays or water tanks, using wind breaks; | NEMAQA | Continuous |
| | | | | The best time to re-vegetate the area must be linked to the distribution and reliability of rainfall; | NEMAQA | Continuous |
| | | | | Speed restrictions should be imposed and enforced; | NEMAQA | Continuous |
| | | | | Dust suppression of roads being used during rehabilitation should be enforced; and | NEMAQA | Continuous |
| | | | | It is recommended that the rehabilitation by vegetating should begin during the operational phase already as the objective is to minimise the erosion. | NEMAQA | Continuous |
| Dust | Demolition and Removal of all infrastructure. | Surface Mining: Opencast, dump and haul road operation | N/A | Revegetation of exposed areas for long-term dust and water erosion control is commonly used and is the most cost-effective option. | NEMAQA | End of mine |
| | | | | Plants with roots that bind the soil, and vegetation cover should be used that | NEMAQA | End of mine |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
|---|---|---|---|---|---|---|
| | | | | breaks the impact of falling raindrops, thus preventing wind and water erosion. | | |
| | | | | Plants used for revegetation should be indigenous to the area, hardy, fast growing, nitrogen-fixing, provide high plant cover, be adapted to growing on exposed and disturbed soil (pioneer plants) and should easily be propagated by seed or cuttings. | NEMAQA | End of mine |
| | | | | The area of disturbance must be kept to a minimum, as demolition should be done judiciously avoid the exposure of larger areas to wind erosion. | NEMAQA | End of mine |
| | | | | Spreading of soil must be performed on less windy days. | NEMAQA | End of mine |
| | | | | The bare soil will be prone to erosion and therefore there is need to reduce the velocity near the surface of the soil by re-vegetation. | NEMAQA | Continuous |
| | | | | Leaving the surface of the soil in a coarse condition reduces wind erosion and ultimately reduces the dust levels. | NEMAQA | Continuous |
| | | | | Additional mitigation measures include keeping the soil moist using sprays or water tanks, using wind breaks. | NEMAQA | Continuous |
| | | | | The best time to re-vegetate the area must be linked to the distribution and reliability of the rainfall. Demolition should not be performed during windy periods (August, September and October), as dust levels and the area affected by dust | NEMAQA | Continuous |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
|---|---|---|---|---|---|---|
| | | | | fallout will increase | | |
| | | | | Dust suppression of roads being used during rehabilitation should be enforced. | NEMAQA | Continuous |
| | | | | Hard surfaced haul roads or standing areas should be washed down and swept to remove accumulated dust. | NEMAQA | Continuous |
| | | | | Engine cooling fans of vehicles should be shrouded so that they do not raise dust. | NEMAQA | Continuous |
| | | | | Exhaust pipes of vehicles should be directed so that they do not raise dust. | NEMAQA | Continuous |
| | | | | Cabs of machines should be swept or vacuumed regularly to remove accumulated dust. | NEMAQA | Continuous |
| | | | | Speed restrictions should be imposed and enforced. | NEMAQA | Continuous |
| | | | | The area of disturbance must be kept to a minimum, as demolition should be done judiciously avoid the exposure of larger areas to wind erosion. | NEMAQA | Continuous |
| | | | | Revegetation of exposed areas for long-term dust and water erosion control is commonly used and is the most cost-effective option. | NEMAQA | Continuous |
| Noise | Opencast mining; Blasting; Waste rock stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; | Construction; operation; decommissioning | N/A | General mitigation measures that should be considered by the mine include the development of a good working relationship between the mining environmental representative and all potentially sensitive receptors; | ECA | Continuous |
| | | | | Communication channels should be established to ensure prior notice to the | ECA | Continuous |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
|---|---|---|---|---|---|---|
| | Road construction; Placement of fences; Dust suppression; Removal of indigenous vegetation; Backfilling of opencast areas; Storm water management | | | sensitive receptor if work is to take place close to them; | | |
| | | | | Information that should be provided to the potentially sensitive receptor(s) include: | ECA | Continuous |
| | | | | • Proposed working times; How long the activity is anticipated to take place; What is being done, or why the activity is taking place; and | ECA | Continuous |
| | | | | • Contact details of a responsible person where any complaints can be lodged should there be an issue of concern. | ECA | Continuous |
| Nosie | Opencast mining; Blasting; Waste rock stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Placement of fences; Dust suppression; Removal of indigenous vegetation; Backfilling of opencast areas; Storm water management | Operational | N/A | The mine should develop and implement a quarterly noise monitoring programme to confirm the noise levels at the closest NSD for the first year of operation; | ECA | Continuous |
| | | | | The noise monitoring programme can be reviewed after this first year of measurements; | ECA | Annually |
| | | | | The mine can use the topsoil and overburden to develop a berm between the proposed opencast and the closest receptors; | ECA | if needed |
| | | | | This berm should be as high as practical. This berm should be developed during the daytime; | ECA | Continuous |
| | | | | The mine should develop and implement a noise monitoring programme to confirm the noise levels at the closest NSD; and | ECA | as per the monitoring plan |
| | | | | If possible, the mine should plan to only operate during the daytime hours when mining activities need to take place closer than 500m from the closest NSD period only. | ECA | Continuous |
| Noise | Removal of all infrastructure: Waste rock stockpiling; ROM stockpiling; | Closure | N/A | General mitigation measures that should be considered by the mine include the development of a good working relationship between the mining environmental the noise | ECA | Continuous |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
|---|---|---|---|---|---|---|
| | Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Placement of fences; Dust suppression Backfilling of opencast areas; Tailings stockpile; Storm water management structures, pipelines, berms and water resources diversions; Mining related infrastructure within a watercourse or within 32 m of watercourses and diversion of watercourses. | | | monitoring programme can be reviewed after this first year of measurements; | | |
| | | | | Communication channels should be established to ensure prior notice to the sensitive receptor if work is to take place close to them; | ECA | Continuous |
| | | | | Information that should be provided to the potentially sensitive receptor(s) include: | ECA | Continuous |
| | | | | • To prevent public exposure to disturbing noise in excess of 7 dBA increases above ambient noise levels during construction, operation, decommissioning and during the day. | ECA | Continuous |
| | | | | If possible, the mine should plan to only operate during the daytime hours when mining activities need to take place closer than 500m from the closest NSD period only. | ECA | Continuous |
| Visual | Opencast mining; Blasting; Waste rock stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Placement of fences; Dust suppression; Removal of indigenous | Construction; operational | 29 ha | The relevant exposed construction site areas and access gravel roads will be irrigated on a regular basis, with just enough moisture to keep the dust down without creating undue runoff; | N/A | Continuous as needed |
| | | | | Natural vegetation, wherever practical, must be retained on and around the construction sites; | N/A | Continuous |
| | | | | All lights used for illumination (except for lighting associated with security) should be faced inwards and shielded to avoid light escaping above the horizon; | N/A | Continuous |
| | | | | Construction site will be screened from | N/A | Continuous as |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
|---|---|---|---|---|---|---|
| | vegetation; Backfilling of opencast areas; Storm water management | | | sensitive receptors and rubble removed from site on a daily basis; | | needed |
| | | | | Litter and dust management measures should be in place at all times; | N/A | Continuous |
| | | | | The sites should be kept neat and tidy at all times; and | N/A | Continuous |
| | | | | On site construction activities will be limited to be undertaken between 6am and 6pm. | N/A | Continuous |
| Visual | Opencast mining; Blasting; Waste rock stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Placement of fences; Dust suppression; Removal of indigenous vegetation; Backfilling of opencast areas; Storm water management | Construction; | 29 ha | All lights used for illumination (except for lighting associated with security) should be faced inwards and shielded to avoid light escaping above the horizon; | N/A | Continuous |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
|---|---|---|---|---|---|---|
| Socio Economic | Removal of all infrastructure: Waste rock stockpiling; ROM stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Placement of fences; Dust suppression; Backfilling of opencast areas; | Closure | 29 ha | Adequate communication with the surrounding communities during all phases of the development to ensure that an open policy regarding timelines is enforced during all stages of the development. | N/A | Continuous |
| Socio Economic | All activities: Opencast mining; Blasting; Waste rock stockpiling; ROM stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Placement of fences; Dust suppression; Removal of indigenous vegetation; Backfilling of opencast areas | Operational; Decommissioning; Closure | 29 ha | Where it is possible, hire/use local personnel; | N/A | Continuous |
| | | | | Identify opportunities for the Employment/procurement and training of people and contractors from the local area; | N/A | Continuous |
| | | | | Opportunities for local Employment may include activities related to site clearance, digging of trenches and building of the open Pit; | N/A | Continuous |
| | | | | Based on these opportunities, develop a recruitment and training strategy that the main construction contractors will have to adhere to; | N/A | Continuous |
| | | | | Monitor implementation of local recruitment and training strategies, including monitoring of corruption and nepotism; | N/A | Continuous |
| | | | | Employment and training of the youth and females where possible; | N/A | Continuous |
| | | | | Implementation of Employment and | N/A | Continuous |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
|---|---|---|---|---|---|---|
| | Tailings drying facility; Tailings stockpile; Storm water management structures, | | | procurement policy; and | | |
| | | | | Communication with locals regarding job opportunities and skills requirements to manage expectations. | N/A | Continuous |
| | | | | Non-core activities will be identified and prioritised for local service providers. Local service providers will be identified and requested to tender for the provision of the various services. | N/A | Continuous |
| Cumulative impacts | All activities: Opencast mining; Blasting; Waste rock stockpiling; ROM stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Placement of fences; Dust suppression; Removal of indigenous vegetation; Backfilling of opencast areas Tailings drying facility; Tailings stockpile; | Operational; Decommissioning; Closure | 26 ha | Ensure a grievances procedure is in place for local people to log grievances; | N/A | Continuous |
| | | | | Implement local recruitment and training strategies and policies, and clearly communicate these locally through relevant authorities and media; | N/A | Continuous |
| | | | | Do not recruit informally at the gate but follow a formal recruitment process; | N/A | Continuous |
| | | | | Make use of local accommodation for workers, as opposed to a construction camp; | N/A | Continuous |
| | | | | Inform SHPM Employees and neighbouring landowners and inhabitants about local recruitment strategies and policies, and give regular updates; | N/A | Continuous or as needed |
| | | | | Monitor the surrounding area for illegal informal settlement and develop a strategy to deal with illegal settlement; | N/A | Continuous |
| | | | | Ensure that all contractors and their Employees attend inception training, addressing SHPM standards and requirements, SHPM Safety Health and Environmental policies, relevant South African regulations, the environmental management plan, and recruitment strategies. | N/A | Induction and Continuous |
| Heritage | Opencast mining; | Construction; | 29 ha | If any palaeontological material is exposed | NHRA, | As needed |

| Aspect | Activity | Phase | Size and scale of disturbance | Mitigation measures | Compliance with standards | Time period for implementation |
|---|---|---|---|---|---|---|
| | Blasting; Waste rock stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Placement of fences; Dust suppression; Removal of indigenous vegetation; Backfilling of opencast areas; Storm water management | operational; decommissioning | | during digging, excavating, drilling or blasting, SAHRA must be notified. All development activities must be stopped and a palaeontologist should be called in to determine proper mitigation measures, especially for shallow caves. | LIHRA | |

**Table 22-2: Impact management Outcomes**

| Aspect | Potential Impact | Activity | Phase | Mitigation type | Standard to be achieved |
|---|---|---|---|---|---|
| Geology | Impact on the overall geology of the area | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | None | N/A |
| Geology | Sterilisation of mineral deposits | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Process Implementation | N/A |
| Topography | Hazardous excavations | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Management Rehabilitation | DMR Specifications |
| Fauna and Flora | Topsoil & subsoil stripping, exposure of soils, ore and rock to wind and rain during construction causing erosion and sedimentation | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Management Rehabilitation | N/A |
| Flora | Vegetation clearance will impact on protected tree species and medicinal plants | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Management; Infrastructure design | N/A |
| Fauna | Disturbance of fauna through noise, light and dust pollution and hunting, trapping and killing of fauna. | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Protection; Management; Rehabilitation | N/A |
| Flora | Spreading of alien and invasive species | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Management, Infrastructure, Rehabilitation | N/A |
| Soil | Loss of soil resource | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Management Rehabilitation | N/A |
| Soil | Erosion and disturbance of original soil profiles due to vegetation clearance | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Management Rehabilitation | N/A |
| Soil | Soil contamination and compaction of access roads and mining area | Surface Mining: Opencast, dump and | Construction; Operational; | Remedy through rehabilitation, infrastructure | N/A |

| Aspect | Potential Impact | Activity | Phase | Mitigation type | Standard to be achieved |
|---|---|---|---|---|---|
| | | haul road operation | Decommissioning | design, and management | |
| Soil | Loss of grazing land in greenfield site | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Remedy through rehabilitation, infrastructure design, and management | N/A |
| Land use | Road disturbance due to increased traffic | Surface Mining: Opencast, dump and haul road operation | | Modify through management | N/A |
| Land use | Failure of mine residue deposit | Surface Mining: Opencast, dump and haul road operation | Construction; Operational; Decommissioning | Management Rehabilitation | SABS Code for mine residue deposits |
| Surface water | Flooding of open pit and other infrastructure from rainfall and groundwater seepage. Seepage and runoff from stockpile areas are moderately contaminated and could impact on surface water quality | Surface Mining: Opencast, dump and haul road operations | Operation | Infrastructure design, Management, Monitoring, Rehabilitation | GN704 |
| Stormwater | Exposed surfaces could result in increased erosion and associated runoff which in turn may result in increased siltation of surface streams. | Surface Mining: Opencast, dump and haul road operations | Construction; Decommissioning | Infrastructure design, Management, Monitoring, Rehabilitation | GN704 |
| Surface water | Surface water quality deterioration from possible mixing of clean and dirty water, hydrocarbon spillage, and solid waste that could reach drainage lines if not correctly disposed. | Surface Mining: Opencast, dump and haul road operations | Construction and Operation | Infrastructure design, Management, Monitoring, Rehabilitation | GN704 |
| Stormwater | Solid waste could reach drainage lines if not correctly disposed of. | Surface Mining: Opencast, dump and haul road operations | Construction; Operational; Decommissioning | Infrastructure design, Management, Monitoring, Rehabilitation | GN704 |

| Aspect | Potential Impact | Activity | Phase | Mitigation type | Standard to be achieved |
|---|---|---|---|---|---|
| Stormwater | Alteration of drainage lines by impacting their natural course. Impact on catchment yield by capturing runoff and diverting the drainage systems. Degradation of stream channels through long-term reduced runoff and periodic discharge of high volumes. | Surface Mining: Opencast, dump and haul road operations | Construction; Operational; Decommissioning | Infrastructure design, Management, Monitoring, Rehabilitation | GN704 |
| Groundwater | Dewatering of aquifer as a result of mining, resulting in drying up of boreholes and springs | Surface Mining: Opencast, dump and haul road operations | Operational | Monitoring; Compensation | N/A |
| Groundwater | Deterioration of water quality and quantity as a result of seepage during operational phase | Surface Mining: Opencast, dump and haul road operations | Operational | Infrastructure design, Management, Monitoring, Rehabilitation | N/A |
| Groundwater | Deterioration of water quality as a result of seepage at the end of life of mine | Opencast mining, decommissioning, post closure | Decommissioning and Closure | Infrastructure design, Management, Monitoring, Rehabilitation | N/A |
| Groundwater | Lowering of groundwater levels due to mine dewatering- effect on base flow | Surface Mining: Opencast, dump and haul road operations | Operational | Monitoring; Compensation | N/A |
| Groundwater | Lowering of groundwater levels due to mine dewatering- effect on surrounding groundwater users | Surface Mining: Opencast, dump and haul road operations | Operation | Monitoring; Compensation | N/A |
| Dust | Emissions such as dust and hydrocarbons from site clearance and infrastructure development | Surface Mining: Opencast, dump and haul road operations | Construction; Operational; Decommissioning | Infrastructure design, Management, Monitoring, Rehabilitation | N/A |
| Ambient air quality | Blasting, construction of access roads, pipes and development of box cut will impact on the ambient air quality | Surface Mining: Opencast, dump and haul road operations | Construction; Operational; Decommissioning | Infrastructure design, Management, Monitoring, Rehabilitation | N/A |
| Dust | Demolition and Removal of all | Surface Mining: | Decommissioning | Infrastructure design, | N/A |

| Aspect | Potential Impact | Activity | Phase | Mitigation type | Standard to be achieved |
|---|---|---|---|---|---|
| | infrastructure. | Opencast, dump and haul road operations | | Management, Monitoring, Rehabilitation | |
| Noise | Elevated noise levels caused by movement of vehicles during site clearance | N/A | Construction | Infrastructure design, Management, Monitoring, Rehabilitation | SANS 10103:2008 |
| Noise | Elevated noise levels caused by mining operation, and blasting activities on residents close to the mine during day time and night time | N/A | Operational | Infrastructure design, Management, Monitoring, Rehabilitation | SANS 10103:2008 |
| Noise | Disturbing noise during demolition and dismantling of infrastructure. | N/A | Decommissioning | Infrastructure design, Management, Monitoring, Rehabilitation | SANS 10103:2008 |
| Visual | Decrease in landscape character and sense of place as operations will be taking place at the top of a mountain, the site is already degraded as there is existing mining taking place. | Site clearing, including the removal of topsoil and vegetation. | Construction; Operational; Decommissioning | Infrastructure design, Management, Monitoring, Rehabilitation | N/A |
| Visual | Impacts due to Night Time lighting | Exterior lighting around open cast mining areas, Potential lighting at night from potential vehicles | Construction; Operational; Decommissioning | Infrastructure design, Management, Monitoring, Rehabilitation | N/A |
| Socio-Economic | Positive impacts from temporary employment opportunities | Opencast mining activities, including transport of the resource and creation of temporary stockpiles | Construction; Operational; Decommissioning | Management Rehabilitation | N/A |
| Socio-Economic | Negative impact from closure | Opencast mining activities, including transport of the | Decommissioning | Management; communication; Strategy implementation. | N/A |

| Aspect | Potential Impact | Activity | Phase | Mitigation type | Standard to be achieved |
|---|---|---|---|---|---|
| | | resource and creation of temporary stockpiles | | | |
| Socio-Economic | Negative cumulative impacts | Opencast mining activities, including transport of the resource and creation of temporary stockpiles | Construction; Operational; Decommissioning | Management; communication; Strategy implementation. | N/A |
| Heritage Resources | Potential loss of heritage, palaeontological and cultural resources due to surface disturbances | Opencast mining activities, including transport of the resource and creation of temporary stockpiles | Construction; Operational; Decommissioning | Management; Conservation; Permitting | N/A |

# 23 FINANCIAL PROVISION

## 23.1 DETERMINATION OF THE AMOUNT OF FINANCIAL PROVISION

**23.1.1 Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under Regulation 22 (2) (d) as described in 2.4 herein.**

Refer to Section 15.

**23.1.2 Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties.**

Refer to Section 15.2.

**23.1.3 Provide a rehabilitation plan that describes and shows the scale and aerial extent of the main mining activities, including the anticipated mining area at the time of closure.**

Refer to Section 15.415.3.

**23.1.4 EXPLAIN WHY IT CAN BE CONFIRMED THAT THE REHABILITATION PLAN IS COMPATIBLE WITH THE CLOSURE OBJECTIVES.**

Please refer to Section 15.4.

**23.1.5 CONFIRM THAT THIS AMOUNT CAN BE PROVIDED FOR FROM OPERATING EXPENDITURE**

(Confirm that the amount, is anticipated to be an operating cost and is provided for as such in the Mining work programme, Financial and Technical Competence Report or Prospecting Work Programme as the case may be).

The above-mentioned amount is obtained from the submitted EIA for Smokey Hill Platinum Mine, any additional funds will be made provision for as needed.

# 24 MECHANISM FOR MONITORING COMPLIANCE WITH AND PERFORMANCE ASSESSMENT AGAINST THE ENVIRONMENTAL MANAGEMENT PROGRAMME AND REPORTING THEREON

Including:

a) Monitoring of impact Management Actions
b) Monitoring and reporting frequency
c) Responsible persons
d) Time period for implementing impact management action
e) Mechanism for monitoring compliance

**Table 24-1: Mechanism for monitoring**

| Aspect | Time Period for implementation | Functional Requirements for monitoring | Roles and Responsibility | Monitoring and Reporting frequency | Time Period for implementation Impact Management Options |
|---|---|---|---|---|---|
| Geology | N/A | Tons ore removed and total area mined. | Geologist/Mining Manager | Quarterly | Continuous |
| Geology | Continuous | Tons ore removed and total area mined. | Geologist/Mine Manager | Quarterly | Continuous |
| Topography | Continuous | Management, Rehabilitation | N/A | Quarterly | Geologist/Mining Engineer |
| Ecology | Continuous | Demarcated Area | ECO/Contractor | As needed | Continuous |
| Ecology | Immediately, before construction begins | Vegetation inspection | SHEQ | As per biomonitoring plan | Continuous |
| Ecology | Continuous | Demarcated Area | ECO/Contractor | As needed | Continuous |
| Ecology | Continuous | Vegetation inspection | ECO/Contractor | Monthly | Continuous |
| Soil, Land use and Land capability | Continuous | Conduct inspections to determine sites prone to erosion. Implement management measures to reduce potential for erosion | SHEQ | Annually | Continuous |
| Soil, Land use and Land capability | Weekly during the rainy season. Monthly during the dry season. | Conduct inspections to determine sites prone to erosion. Implement management measures to reduce potential for erosion | SHEQ | Annually | Continuous |
| Soil, Land use and Land capability | Continuous | Conduct inspections to determine sites prone to erosion. Implement management measures to reduce potential for erosion | SHEQ | Annually | Continuous |
| Land Capability | Continuous | Landscape management | SHEQ | Annually | Continuous |
| Land use | Continuous | Modify through management | SHEQ | Annually | Continuous |
| Land use | Continuous | Control though correct handling and stockpiling of topsoil | Mine engineer | Annually | Continuous |
| Surface water | Continuous | WUL monitoring related to surface water and groundwater samples (Water quality) | SHEQ | As per Wul requirement | Continuous |
| Surface water | Continuous | Report on waste generated and removed from | SHEQ | Daily/annually | Continuous |

| Aspect | Time Period for implementation | Functional Requirements for monitoring | Roles and Responsibility | Monitoring and Reporting frequency | Time Period for implementation Impact Management Options |
|---|---|---|---|---|---|
| | | site | | | |
| Surface water | Continuous | Measure and record water meter readings. Update water balance | Metallurgical engineers | Daily/annually | Continuous |
| Surface water | Continuous | Volume of water discharged | SHEQ | Daily/annually | Continuous |
| Surface water | Continuous | Confirm clean up done correctly, soil disposed of correctly and inspect rehabilitated area. | SHEQ | As needed | Continuous |
| Ground water | Continuous | Monitor boreholes for quality and water levels | SHEQ | Quarterly | Continuous |
| Ground water | Continuous | Monitor boreholes for quality and water levels | SHEQ | Quarterly | Continuous |
| Ground water | Continuous | Monitor boreholes for quality and water levels | SHEQ | Quarterly | Continuous |
| Ground water | Continuous | Monitor boreholes for quality and water levels | SHEQ | Quarterly | Continuous |
| Air Quality | Continuous | Conduct air quality monitoring. | SHEQ | Monthly | Continuous |
| Air Quality | Continuous | Conduct air quality monitoring. | SHEQ | Monthly | Continuous |
| Noise | Continuous | Conduct Noise monitoring, maintenance | SHEQ Manager/ On-site ECO | Annually | Continuous |
| Noise | Continuous | Conduct Noise monitoring, maintenance | SHEQ Manager/ On-site ECO | Annually | Continuous |
| Noise | Continuous | Conduct Noise monitoring, maintenance | SHEQ Manager/ On-site ECO | Annually | Continuous |
| Visual | Continuous | Appointment landscape architect to assist in reducing visual impacts and implement | SHEQ | Annually | Continuous |
| Visual | Continuous | Appointment landscape architect to assist in reducing visual impacts and implement | SHEQ | Annually | Continuous |
| Socio Economic | Continuous | Keep records of service providers and where they are from | Procumbent | Annually | Continuous |
| Socio Economic | Continuous | Ensure regular communication and good relationship with SAPS of the region | Human Resources | Annually | Continuous |
| Socio Economic | Continuous | Compliance with policy principles / vision | Human Resources | Annually | Continuous |
| Heritage | Continuous | Record occurrences of sites and artefacts if | SHEQ | As needed | Continuous |

| Aspect | Time Period for implementation | Functional Requirements for monitoring | Roles and Responsibility | Monitoring and Reporting frequency | Time Period for implementation Impact Management Options |
|---|---|---|---|---|---|
| | | found | | | |

## 24.1 NOISE MONITORING PROGRAMME

Environmental Noise Monitoring can be divided into two distinct categories, namely:

- Passive monitoring – the registering of any complaints (reasonable and valid) regarding noise; and
- Active monitoring – the measurement of noise levels at identified locations.

Active environmental noise monitoring is recommended due to the proximity of mining to the closest NSD. In addition, should a valid complaint be registered, the mine must investigate this complaint as per the following sections. It is recommended that the noise investigation be done by an independent acoustic consultant.

While this section recommends a noise monitoring programme, it should be used as a guideline as site specific conditions may require that the monitoring locations, frequency or procedure be adapted.

### 24.1.1 Measurement Localities

Quarterly noise measurements are recommended at the closest NSD. In addition, noise measurements must be conducted at the location of the person that registered a valid and reasonable noise complaint. The measurement location should consider the direct surroundings to ensure that other sound sources cannot influence the reading. A second instrument can be deployed at the mine (close to the source of noise) during the measurement.

If any of these receptors are relocated the measurement locations should be replaced with a similar location. If there are no potential noise-sensitive receptors living within 1 000 m from any noise sources (associated with the mine) no noise measurements are required.

### 24.1.2 Measurement Frequencies

Noise measurements should be conducted on a quarterly basis at the measurement locations identified in the section above (or any additional measurement locations that can be motivated) using a defined measurement procedure as outlined below). Noise measurements should continue during the operational phase (quarterly) for the first year of operation when the noise monitoring plan can be reviewed (measurements increased, continued, reduced or stopped).

### 24.1.3 Measurement Procedures

Ambient sound measurements should be collected as defined in SANS 10103:2008. Due to the variability that naturally occurs in sound levels at most locations, it is recommended that semi-continuous measurements are conducted over a period of at least 24 hours, covering at least a full day-(06:00 – 22:00) and night-time (22:00 – 06:00) period. Measurements should be collected in 10-minute bins defining the 10-minute descriptors such as $L_{AIeq,10min}$ (National Noise Control Regulation requirement), $L_{A90,\,f}$ (background noise level as used internationally) and $L_{AFeq,10min}$ (Noise level used to compare with IFC noise limit). Spectral frequencies should also be measured to define the potential origin of noise. When a noise complaint is being investigated, measurements should be collected during a period or in conditions similar to when the receptor experienced the disturbing noise event.

### 24.1.4 Relevant Standard for Noise Measurements

Noise measurements must be conducted as required by the National Noise Control Regulations (GN R154 of 1992) and SANS 10103:2008. It should be noted that the SANS standard also refers to a number of other standards.

## 24.2 FAUNA AND FLORA MONITORING PROGRAM

Monitoring of the ecological aspects should be done on a continual basis to assess whether there are

any concerns regarding the flora and to assess whether the rehabilitation is successful. Monitoring of the flora should start as soon as the construction phase of the development commences. Monitoring should be undertaken annually.

The monitoring of biodiversity should include the following:

- Seasonal visual assessment of areas to determine if vegetation in undisturbed areas is being impacted.
- Annual biodiversity monitoring of areas both affected and unaffected by activities should be initiated to determine the annual fluctuation in species numbers and, if necessary, relate this to activities on site.
- Continue with alien invasive monitoring, eradication and control programme.
- Implement an Observe and Report approach which will enable Employees to report any disturbance of fauna or degradation that they encounter during the operational phase.

## 24.3 SURFACE WATER MONITORING

Due to the lack of surface water on site, a monthly/quarterly/annual monitoring plan is not feasible. As with the site survey conducted for the surface water assessment in 2019, a water sample should be obtained during the wet season when possible. This sample should be analysed for the parameters indicated in the table below and compared to the RWQO and sample results in this document.

**Table 24-2: Surface water variables to be analysed**

| Variable | Unit |
|---|---|
| pH | |
| Electrical Conductivity as EC | mS/m |
| Suspended solids as SS | mg/l |
| Total Dissolved Solids as TDS | mg/l |
| Sulphate as $SO_4$ | mg/l |
| Nitrate as $NO_3$ | mg/l |
| Sodium as Na | mg/l |
| Chloride as Cl | mg/l |
| Calcium as Ca | mg/l |
| Potassium as K | mg/l |
| Magnesium as Mg | mg/l |
| Total hardness as $CaCO_3$ | mg/l |
| Total alkalinity | mg/l |
| Fluoride as F | mg/l |
| Aluminium as Al | mg/l |
| Iron as Fe | mg/l |
| Manganese as Mn | mg/l |

In addition, monitoring of the water quality in the storm water control dams (i.e. PCDs) should be undertaken on a quarterly (October, January, April, July) basis and include the variables as specified in the table above. The water quality will be representative of:

- Seepage/run off from the mining areas;
- Seepage from waste rock dump;
- Dewatering of the open pit; and
- Potential impacts from upstream mining.

Since this was the first SASS 5 sampling event associated with the UG1 Outcrop development, no background information is available to compare or gain insight into the natural variation or changes over

time. A follow-up SASS study should be conducted in the wet season 2019/ early 2020 (preferably December/January) to compare results and continue with establishment of long-term trends.

Future additions to improve monitoring and associated impacts from the UG1 Outcrop should ideally include toxicology tests and/ or Diatom studies. Success in impact monitoring associated with mines have also been proven with South African Diatom Index (SADI). By assessing these indices, the overall ecological integrity may be more comprehensive and favourable to interpretation.

Also, recommendations made by Exigo (2017) stated that: “Regular ongoing biomonitoring of the trends in ecological integrity of the unnamed tributary of the Moopetsi River is not deemed essential since the system has a low sensitivity and low diversity of aquatic biota. It is recommended that regular toxicity testing of the water in this system replace the biomonitoring protocols in order to define the toxicological risk to the aquatic resources further downstream in the catchment and that biomonitoring take place on an annual basis”.

Therefore, fixed sampling points should be selected (such as described within this report for UG1), and these should be re-monitored on an annual basis, within the wet season. Monitoring within ephemeral streams should always be interpreted with caution and limitations in mind.

River systems and the applicable streams, that meet SASS5 requirements, need to be monitored and updated on a regular basis to ensure that any fluctuating results can be detected and reported to the applicable authorities.

Review of the success of biomonitoring implementation of the proposed biomonitoring points as specified within this report should be initiated after three years and revised if meaningful and measurable trends/results are not obtained due to the lack of water within these tributaries.

## 24.4 GROUNDWATER MONITORING SYSTEM

A groundwater monitoring system has to adhere to the criteria mentioned below. As a result, the system should be developed accordingly.

### 24.4.1 Source, plume, impact and background monitoring

A groundwater monitoring network should contain monitoring positions which can assess the groundwater status at certain areas. The boreholes can be grouped classification according to the following purposes:

- **Source monitoring:** Monitoring boreholes are placed close to or in the source of contamination to evaluate the impact thereof on the groundwater chemistry.
- **Plume monitoring:** Monitoring boreholes are placed in the primary groundwater plume’s migration path to evaluate the migration rates and chemical changes along the pathway
- **Impact monitoring:** Monitoring of possible impacts of contaminated groundwater on sensitive ecosystems or other receptors. These monitoring points are also installed as early warning systems for contamination break-through at areas of concern.
- **Background monitoring:** Background groundwater quality is essential to evaluate the impact of a specific action/pollution source on the groundwater chemistry.

### 24.4.2 System Response Monitoring Network

Groundwater levels: The response of water levels to abstraction is monitored. Static water levels are also used to determine the flow direction and hydraulic gradient within an aquifer. Where possible all of the above-mentioned borehole’s water levels need to be recorded during each monitoring event.

### 24.4.3 Monitoring Frequency

In the operational phase and closure phase, quarterly monitoring of groundwater quality and groundwater levels is recommended. Quality monitoring should take place before after and during the wet season, i.e. during September and March. It is important to note that a groundwater- monitoring network should also be dynamic. This means that the network should be extended over time to accommodate the migration of potential contaminants through the aquifer as well as the expansion of infrastructure and/or addition of possible pollution sources.

### 24.4.4 Monitoring Parameters

The identification of the monitoring parameters is crucial and depends on the chemistry of possible pollution sources. They comprise a set of physical and/or chemical parameters (e.g. groundwater levels and predetermined organic and inorganic chemical constituents). Once a pollution indicator has been identified it can be used as a substitute to full analysis and therefore save costs. The use of pollution indicators should be validated on a regular basis in the different sampling positions. The parameters should be revised after each sampling event; some metals may be added to the analyses during the operational phase, especially if the pH drops.

Abbreviated analysis (pollution indicators):

- Physical Parameters:
  - Groundwater levels
- Chemical Parameters:
  - Field measurements:
    - pH, EC
  - Laboratory analyses:
    - Major anions and cations (Ca, Na, Cl, SO4)
    - Other parameters (EC)

Full analysis:

- Physical Parameters:
  - Groundwater levels
- Chemical Parameters:
  - Field measurements:
    - pH, EC
  - Laboratory analyses:
    - Anions and cations (Ca, Mg, Na, K, NO3, Cl, SO4, F, Fe, Mn, Al, & Alkalinity)
    - Other parameters (pH, EC, TDS)
    - Petroleum hydrocarbon contaminants (where applicable, near workshops and petroleum handling facilities)
    - Sewage related contaminants (*E. Coli*, faecal coliforms) in borehole in proximity to septic tanks or sewage plants – not expected to be part of the UG1 operations.

### 24.4.5 Monitoring Boreholes

DWAF (1998) states that “A monitoring hole must be such that the section of the groundwater most likely to be polluted first, is suitably penetrated to ensure the most realistic monitoring result.”

Currently a monitoring network does exist for the mine. Additional monitoring boreholes are recommended as listed in Table 24-3 and the areas to site these monitoring boreholes are shown in Figure 24-1. These boreholes can be utilised for water level monitoring during operations, as well as groundwater quality monitoring after decommissioning of the site.

However, a monitoring network should be dynamic. This means that the network should be extended

over time to accommodate the migration of contaminants through the aquifer as well as the expansion of infrastructure and/or addition of possible pollution sources. An audit on the monitoring network should be conducted annually.

**Table 24-3: Proposed Monitoring Positions (New boreholes to be sited by geophysics)**

| ID | Latitude (South) | Longitude (East) | Owner | Borehole Depth (mbgl) | Reasoning | Requirement | Frequency | Existing/ New |
|---|---|---|---|---|---|---|---|---|
| SHM01 | -24.601853° | 30.129899° | Smokey Hills | 30 | Monitoring | Pathway Monitoring | Quarterly | New |
| SHM02 | -24.593700° | 30.134441° | Smokey Hills | 30 | Monitoring | Background Monitoring | Quarterly | New |
| SHM02 | -24.600831° | 30.136580° | Smokey Hills | 30 | Monitoring | Pathway Monitoring | Quarterly | New |

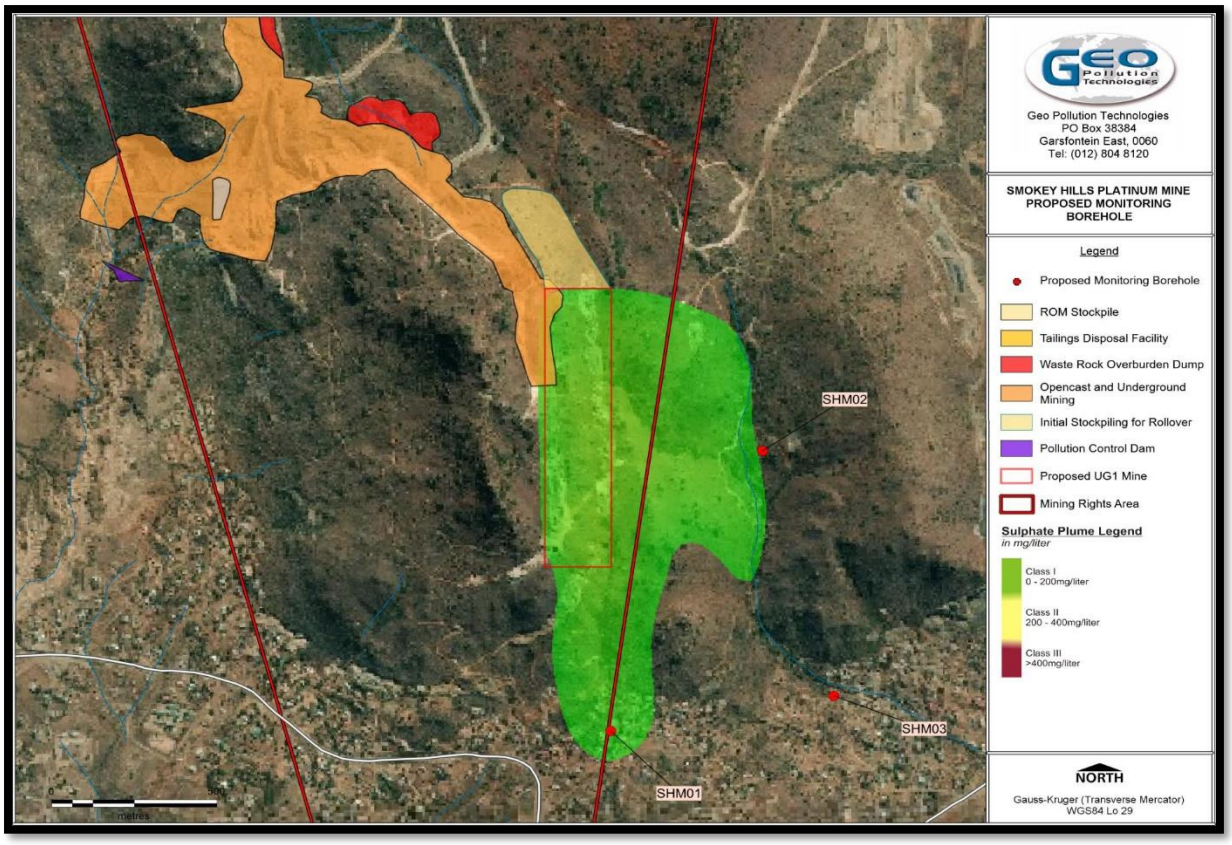


**Figure 24-1: Proposed Monitoring positions (new boreholes to be sited by geophysics)**

## 24.5 AIR QUALITY MONITORING PROGRAMME

Currently no monitoring campaign exists for the proposed Smokey Hills II project as it is under care and maintenance. It is highly recommended that a dust monitoring campaign be conducted prior to the proposed UG1 mining operations commencing and then continue for the life of mine in order to establish historical repository of data needed to fully understand/address fugitive and airborne dust emissions from the construction, operation and closure activities. Managing dust fallout effectively will result in the reduction of respiratory diseases that are as a result of air pollution, reduced risk of damage to property, improved visibility, and fewer disturbances to existing flora and fauna habitats.

### 24.5.1 GRAVIMETRICAL DUST FALLOUT – (MILLIGRAM/SQUARE METER/DAY) OR (MG/M$_2$/DAY) (MONTHLY 8 SAMPLES)

Site layout for sampling points must be carried out according to the eight main compass directions; the site layout and equipment placement must be done in accordance with the ASTM standard, D 1739 – 2010, thereafter relevant sampling reference numbers will be allocated to the receptors accordingly. At each gravimetric dust fallout gauge / receptor point there is a stand built according to specification containing the dust sample collection bucket. Samples will be collected after a 1 month running period (±30 day's exposure). After sample collection, the samples must be taken to a SANAS accredited laboratory as required. A visual site investigation is done where after correlations are drawn and findings are identified and reported on.

Dust buckets of a standard size and shape are prepared and set up at locations related to the eight main compass points on the borders of the property so that dust can settle in them for periods of 30±2 days. The dust buckets are then sealed and replaced with new empty ones and send away to the SANAS accredited laboratory for analysis. The masses of the water-soluble and –insoluble components

of the material collected are then determined and results are reported as mg/m$^2$/day. This methodology is described according to South African National Standards 1929:2004 and the American Society for Testing and Materials (ASTM) Designation: D 1739-98 (2010). The results for this method of testing are obtained by gravimetrical weighing. The apparatus required include open top buckets / containers not less than 150 mm in diameter with a height not less than twice its diameter. The buckets must be placed on a stand at a height of 2±0.2 m above the ground.

Taken into account the above site layout, predominant wind direction and modelling results, the site monitoring layout as shown in the figure below are recommended.

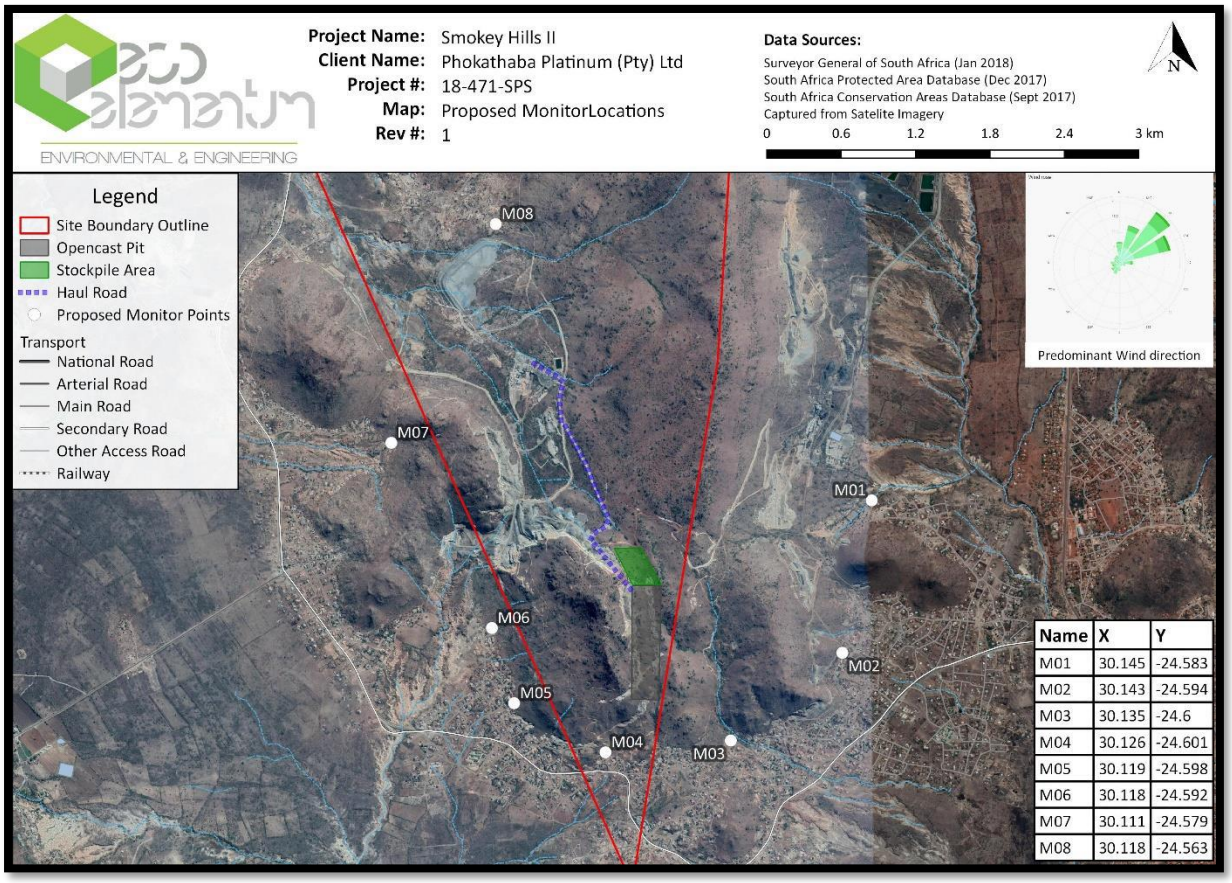


**Figure 24-2: Proposed dust monitoring locations**

### 24.5.2 PARTICULATE MATTER $PM_{10}$ (MONTHLY 8 SAMPLES)

As reported previously, no current monitoring campaign exists as the mine is under care and maintenance. The client should establish a fine particulate monitoring programme, which should include one particulate instrument to monitor $PM_{10}$ and preferably $PM_{2.5}$ from the mine operation. The $PM_{10}$ instrument that could be used can be similar to the one used during this investigation. The handheld sampling instrument not only allows for sampling in the 8 main wind directions, but also on-site sampling down-wind of potential dust sources to quantify and determine impacts that need to be managed. It is advised to conduct this sampling on a monthly basis but also when the need arises during periods of elevated dust concentrations being emanated from the site.

## 24.6 SOIL MONITORING PROGRAMME

The following monitoring strategies should be implemented:

- A proper soil quality audit should be conducted every second year that will measure soil quality parameters;
- The status of land degradation, including visual evidence where soil erosion has increased and if proper erosion management techniques are in place should be assessed;
- Any areas where bare soil surfaces are not covered by either vegetation or geotextiles to prevent future soil erosion incidences should be identified;
- Areas outside the planned mining footprint affected by mining activities that leads to increased compaction and soil layer inversion should be identified; and
- Soil chemical sampling of topsoil stockpiles as well as surrounding undisturbed areas to determine the soil fertility levels of the stockpiles for rehabilitation purposes should be done prior to rehabilitation.

In addition to this, it is recommended that the baseline soil metal levels be determined prior to mining activities and that a follow-up soil metal- and pollutant assessment be conducted once every five years.

## 24.7 ARCHAEOLOGICAL MONITORING PROGRAMME

No specific heritage/archaeological program was described within the specialist report, however should any heritage remains be discovered during any phase of the development, a specialist should be consulted

## 24.8 ENVIRONMENTAL MONITORING AND AUDITING

DEAT (2002) defines environmental auditing as “a process whereby an organisation’s environmental performance is tested against its environmental policies and objectives.” Monitoring and auditing are an essential environmental management tools which is used to assess, evaluate and manage environmental and sustainability issues:

- In order to ensure that the objectives of sustainable development and integrated environmental management are met and
- In order to obtain data which can inform continuous improvement of environmental practices at the site (adaptive management), monitoring and reporting will be an essential component of the proposed operations.

Monitoring and management actions associated with this project are contained in the Sections above and in Table 24-1.

## 24.9 GENERAL MONITORING AND MANAGEMENT

The appointment of a suitably qualified on-site Environmental Control Officer (ECO) is essential to the successful implementation of this project, although this role can be fulfilled by the SHE Representative. The ECO will be responsible for the implementation of the EMPR, applicable environmental legislation and any stipulations/conditions set by the relevant competent authorities (including but not limited to the DMR and DWS). The Environmental officer will conduct formal monthly site inspections and conduct an internal annual audit during the construction and operational phase.

An independent Environmental Control Officer (ECO) should also be appointed to conduct bi-annual (6 monthly) audits for the duration of the construction and operational phase. The Independent ECO should monitor the success and effective implementation of the environmental management measures stipulated by applicable legislation, the EIA&EMPR, and any conditions set by the competent authorities. Following each site visit, the ECO should submit a report to the DMR documenting the success/failure of the implementation of the management measures at the operations.

### 24.9.1 SPECIFIC MONITORING REQUIREMENTS

Monitoring of the proposed development (both on site and where appropriate in the surrounding environments) should be considered a high priority and should be conducted in accordance with the relevant specialist recommendations as summarised in the sections above.

### 24.9.2 MONITORING PROTOCOL

It is essential that during the construction and operational phase of the proposed development that the monitoring of certain elements is carried out to ensure compliance with regulatory bodies. A monitoring protocol for both the construction phase and the operational phase will be required. The monitoring only includes those activities identified in the EMPR and excludes any monitoring that should take place according to the water use license if and when it will be authorized. Please refer to the Sections above.

### 24.9.3 MONITORING REQUIREMENTS AND RECORD KEEPING

To ensure that the procedures outlined throughout the EMPR are implemented effectively it will be necessary to monitor the implementation of the EMPR and evaluate the success of achieving the objectives listed in the EMPR. To ensure that all personnel on site are aware of their obligation to protect the environment, induction training will also include environmental awareness.

The audit procedure will include a Compliance audit, conducted by the Environmental Control Officer. Where the objectives of the EMPR are not being met the reasons will be determined and remedial action or variation to the tasks will be recommended. Major residual effects shall be documented in a Non-Conformance Report, during the construction and operational phases. Follow-up audits will be conducted as per the audit protocol in the EMPR.

#### *24.9.3.1 CONSTRUCTION PHASE*

The following monitoring needs to be conducted:

- Monitoring must continue from the baseline monitoring already conducted, at least one year prior to construction so that seasonal variations are further accounted for over and above what is already known for the site.

#### *24.9.3.2 OPERATIONAL PHASE*

Please refer to the Sections above for the required monitoring.

#### *24.9.3.3 AUDIT PROTOCOL*

It is essential that during the construction and operational phases of the proposed development, the monitoring and auditing of certain elements are carried out to ensure compliance with regulatory bodies. An Audit Protocol for both the construction phase and the actual operational phase will be required. The auditing only includes those activities identified in the EIA&EMPR and excludes any auditing that should take place according to the water use license or any other legislative authorization process if and when they will be authorized.

***Construction Phase***

The following audits need to be completed (valid for this EMPR):

- EMPR compliance (on a weekly basis): to be checked by an on-site ECO, SHE representative or Environmental manager (EM)
- EMPR compliance (on a bi-annual basis – 6 monthly): to be checked by an independent ECO.

**Operational Phase**

The following audits must be completed:

- External environmental compliance audits (EA and EMPR annually during operations).

#### *24.9.3.4 Environmental Incidents*

An environmental incident is defined as any unplanned event that results in actual or potential damage to the environment, whether of a serious or non-serious nature. An incident may involve non-conformance with environmental legal requirements, the requirements of the EMPR, or contravention of written or verbal orders given by the ECO or relevant authority.

In the event of any incident, an Environmental Incident Log should be completed and these reports should be kept on file by the Environmental Manager. Such reports should provide the following details:

- Date of the Incident (and time if relevant);
- Description of the nature of the incident (what happened);
- Explanation for current conditions (why it happened), responsible person, supporting photographs etc.
- Description of corrective actions taken.

Corrective action to mitigate the impact (appropriate to the nature and scale of the incident) should be conducted immediately and affected parties notified. In case of serious incidents or emergencies, the incident report should be sent to the relevant authority as soon as possible after the incident has been recorded.

In case of any incident, an Environmental Incident log should be completed and these reports should be kept on the file by the Environmental Manager. Such reports should provide the following details:

- Date of the incident;
- Description of the incident;
- Explanation for current condition (why it happened), responsible person, supporting; photographs etc.; and
- Description of corrective actions taken.

Corrective actions to mitigate the impact (appropriate to the nature and scale of the incident) should be conducted immediately after the affected parties have been notified.

In the case of serious incidents or emergencies, the incident report should be sent to the relevant authority as soon as possible after the incident has been recorded.

##### *24.9.3.4.1 Water Pollution Emergency Incident*

Water Pollution Emergency Incident is any accident /incident in which a substance pollutes or has the potential to pollute a water resource or a substance that has or is likely to have a detrimental effect on a water resource.

The responsible person who was in control of the substance involved in the incident at the time or responsible for the section the incident occurred will immediately inform the superior of the area where the incident occurred.

The information with regard to the incident is communicated to the Business Manager, SHEQ Manager and Security Personnel immediately by the superior of the area.

The SHEQ Manager and the General Manager must, as soon as reasonably practicable after obtaining the knowledge of the incident, (i.e. within 14 days) report to:

- DWS (Regional Manager);
- South African Police Services or relevant fire department; and
- The Catchment Management Agency.

The SHEQ Manager and crisis management team must

- Take all reasonable measures to contain and minimise the effects of the incident;
- Undertake clean-up procedures;
- Remedy the effects of the incidents; and
- Sample the water together with the responsible person of the area

*24.9.3.4.2 Air Pollution Emergency Incidents*

- Non-compliance with the air quality registration certificate condition and requirements.
- Record of any non-compliance is kept;
- The non-compliance with the certificate conditions will be reported telephonically, by fax or by e-mail to the Chief Air Pollution Control Officer as soon as possible but not later than 24 hours after violation will start to occur. The particulars of such violation, including details of measure is put in place to prevent it happening in the future, will be included respective or in the weekly or monthly report;
- If the utilisation and/or efficiency of air pollution control fail to meet requirements as specified in the certificate, then the process is managed under emergency procedures until such time as it will be possible to operate in compliance with the conditions of this certificate; and
- Record is kept of periods of upset and abnormal emissions, e.g. off-gas vented directly to the atmosphere or excess thereof due to the faults or limited capacity of air pollution control equipment or limits for process parameters being exceeded, etc. as per requirements of Annexure II and Chief Air Pollution Control Officer is notified immediately should it occur.

#### *24.9.3.5 Penalties And Fines For Non-Compliance Or Misconduct*

This EMPR forms part of the contract agreement between the Client and the Principal contractor. As such, non-compliance with conditions of the EMPR will amount to a breach of contract. Penalties will be issued directly to the contractor by the applicant in the event of non-compliance to the EMPR specifications. The issuing of a penalty will be preceded by a verbal warning by the applicant, as well as strict instruction in at least one monthly ECO report to rectify the situation. The ECO and applicant will communicate with regards to realistic time-frames for possible rectification of the contravention, and possible consequences of continued non-compliance to the EMPR.

Penalties incurred do not preclude prosecution under any other law. Cost of rehabilitation and/or repair of environmental resources that were harmed by the actions of the contractor if such actions were in contravention of the specifications of the EMPR will be borne by the contractor himself. Penalties may be issued over and above such costs. The repair or rehabilitation of any environmental damage caused by non-compliance with the EMPR cannot be claimed in the Contract Bill, nor can any extension of time be claimed for such works. Penalty amounts shall be deducted from Certificate payments made to the Contractor.

The following categories of non-compliance are an indication of the severity of the contravention, and the fine or penalty amounts may be adjusted depending on the seriousness of the infringement.

- Category One: Acts of non-compliance that are unsightly, a nuisance or disruptive to adjacent landowners, existing communities, tourists or persons passing through the area;
- Category Two: Acts of non-compliance that cause minor environmental impact or localised disturbance;
- Category Three: Acts of non-compliance that affect significant environmental impact extending beyond point source;
- Category Four: Acts of non-compliance that result in major environmental impact affecting large areas, site character, protected species or conservation areas.

### 24.9.4 Environmental Awareness Plan

Environmental awareness training is critical for two primary reasons:

- The workforce must understand how they can play a role in achieving the objectives specified in the EMPR; and
- The workforce must understand their obligations in terms of the implementation of the EMPR and adherence to environmental-legislative requirements.

This environmental awareness plan is aimed at ensuring that Employees, contractors, subcontractors and other relevant parties are aware of and able to meet their environmental commitments. This plan is to be updated on a yearly basis during the construction and operational phases of the project in light of operational changes, learning experiences and identified training needs.

All full-time staff and contractors are required to attend an induction session when they start, which session should include environmental aspects.

It is therefore recommended that the ECO/Environmental Manager be involved in induction training. The induction sessions may be modified / adapted based on the audience attending the specific session, but it should ensure that all Employees gain a suitable understanding of:

- Environmental requirements of the project, and how these will be implemented and monitored;
- Including each Employee's responsibilities with respect to environmental issues;
- Contents and commitments of the EMPR, including no-go areas, Employee conduct, pollution prevention (prohibitions against littering, unauthorised fires, loud music, entry to adjacent properties, road conduct etc.);
- Environmentally sensitive areas on and around the proposed development sites, including why these are deemed important and how these are to be managed. Employees will also be made aware of protected species found on the site and how these are to be conserved, as well as alien invasive species potentially found on the site and how these should be managed; and
- Incident identification, remediation and reporting requirements: what constitutes an environmental incident (spillages, fire etc.) and how to react when such an incident occurs.

Environmental training will not be restricted to induction training sessions alone, but will be conducted on an on-going basis throughout the lifecycle of the project as and when required. Records are to be kept of the type of training given (matters discussed and by whom), date on which training was given and the attendees of each training session.

### 24.9.5 Indicate the frequency of the submission of the performance assessment report

It is recommended that the bi-annual external ECO report be submitted in addition to the annual performance assessment reports.

### 24.9.6 Manner in which risk will be dealt with in order to avoid pollution or degradation of the environment

Refer to Table 22-1for the recommended mitigation measures to limit environmental impacts.

#### *24.9.6.1 Objectives*

The following requirements of ISO14001 are relevant to the SHPM:

- The organisation shall establish, implement and maintain a procedure(s) to identify potential emergency situations and potential accidents that can have an impact(s) on the environment and how it will respond to them.
- The organisation shall respond to actual emergency situations and accidents and prevent or mitigate associated adverse environmental impacts.

- The organisation shall periodically review and, where necessary, revise its emergency preparedness and response procedures, in particular, after the occurrence of accidents or emergency situations.
- The organisation shall also periodically test such procedures where practicable.

#### *24.9.6.2 Identification Of Environmental Risks*

Environmental risks must be identified and procedures must be set in place by the SHPM to deal with potential environmental risks, which could include:

- Environmental emergency situations;
- Potential accidents that can have an impact on the environment; and
- General environmental ignorance that could lead to unnecessary pollution or disturbance to the environment.

Potential environmental risks identified on Smokey Hill Platinum Mine include:

- Petrochemical/chemical spillages;
- Hazardous material spillages;
- Uncontrolled emissions to the atmosphere;
- Fires;
- Untreated effluent spillages;
- Explosions and natural disasters;
- Disturbance of sensitive ecological environments;
- Disturbance to heritage and cultural resources;
- Uncontrolled erosion; and
- Dissatisfaction of local communities / outrage of communities.

#### *24.9.6.3 Risk Matrix*

**Risk Calculation**

Exposure X Probability X Result (Consequence) = Risk Rating

**Risk Reduction**

Exposure X Probability X Result (Consequence after mitigation steps are implemented) = Risk Rating after Mitigation

**Risk Level**

- 400 < = Very High risk, discontinuation considered immediate correction required
- 200 – 400 = High risk, immediate correction required
- 70 – 200 = Medium / Substantial risk, mitigation required
- 20 – 70 = Low / Possible risk, mitigate when required
- >20 = Tolerable risk, report to Supervisor when complete

| PROBABILITY OF EVENT OCCURRING | RISK | EXPOSURE TO EVENT | RISK |
|---|---|---|---|
| Almost Certain | 10 | Yearly | 0.5 |
| Has happened | 6 | Quarterly | 1 |
| Possible | 3 | Monthly | 2 |
| Heard of | 1 | Weekly | 3 |
| Unlikely | 0.5 | Daily | 6 |
| | | Continuous | 10 |
| **RESULT (CONSEQUENCE)** | | | **RISK RATING** |

| | |
|---|---|
| Catastrophic Environmental Impact Irreversible / regional degradation of the biophysical environment, biodiversity compromised on regional scale, formal complaints with clear expectations of corrective actions, impact on immediate and remote neighbours | 100 |
| Major Environmental Impact. Irreversible and localized degradation of the biophysical environment, biodiversity compromised on local scale, formal complaints with clear expectations of corrective actions, impact on immediate neighbours (level 3) | 40 |
| Very Serious Environmental Impact Irreversible and localized degradation of the biophysical environment, biodiversity compromised on local scale, formal complaints with clear expectations of corrective actions, impact on immediate neighbours (level 2) | 15 |
| Serious Environmental Impact Reversible and localized degradation of the biophysical environment, biodiversity not compromised, low-level complaints, no perceived expectations of corrective action (level 1) | 7 |
| Self-reversible impact within life of business. No reasonable cause for external complaints | 3 |
| Minor environmental incident. Very low impact on biophysical environment, No reasonable cause for external complaints | 1 |

## 24.10 SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

*(among others, confirm that the financial provision will be reviewed annually).*

The Immediate Closure Provision will be updated yearly as part of the annual liability assessment required by the MPRDA and GNR 1147 in terms of the NEMA, once operations commence.

The Off set strategy as requested by LDEDET will be completed and submitted for approval.

# 25 UNDERTAKINGS

The EAP, Prescali Environmental Consultants……., herewith confirms
a) The correctness of the information provided in the reports;
b) The inclusion of comments and inputs from stakeholders and I&APs;
c) The inclusion of inputs and recommendations from the specialist reports where relevant; and
d) The acceptability of the project in relation to the finding of the assessment and level of mitigation proposed;
Signed at.....on this..... day .....

Signature of applicant .....

Designation .....

**COMMITMENT/UNDERTAKING BY THE APPLICANT**

I, ……, the undersigned and duly authorised thereto by the Phokathaba Platinum Mine (Pty) Ltd/ Smokey Hills Platinum undertake to adhere to the requirements and to the conditions as set out in the EMPR submitted to the Director: Mineral Development and approved on.....
.....
Signed at.....on this..... day .....

Signature of applicant .....

Designation .....

# 26 REFERENCES

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# 27 APPENDICES

**Appendix 1: C.V of EAPs**
**Appendix 2: Qualifications of EAPs**
**Appendix 3: Locality Maps**
**Appendix 4: Layout Maps including sensitivity maps**
**Appendix 5: Final Site Map**
**Appendix 6: Summary Table of impacts and management aspects**
**Appendix 7: Specialist**
Appendix 7.1- Surface Water Report
Appendix 7.2- Flora and Fauna Report
Appendix 7.3- Soil Report
Appendix 7.4- Archaeology Report
Appendix 7.5- Groundwater Report
Appendix 7.6- Noise Report
Appendix 7.7- Air Quality Report
Appendix 7.8– 2016 Socio economic assessment report
Appendix 7.8- Rehab and Closure Plan
**Appendix 8: Public Participation**