BIODIVERSITY ASSESSMENT: MARITZBURG QUARRY, PIETERMARITZBURG

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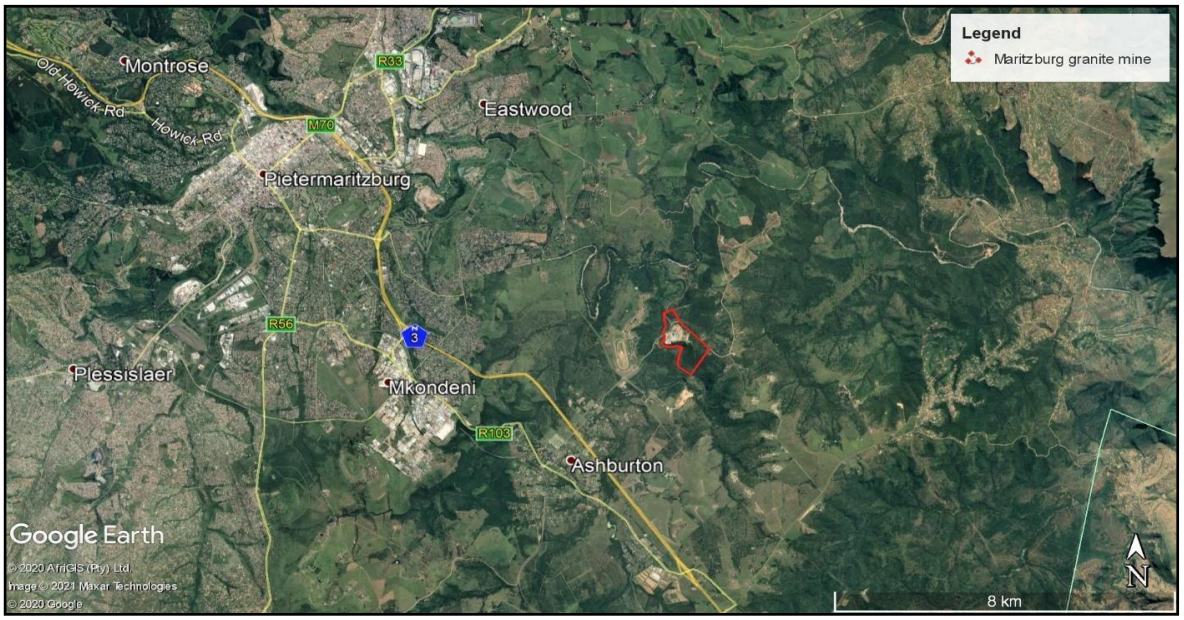
1 INTRODUCTION

This report investigates the biodiversity aspects of the Maritzburg Quarry site (±84 ha), an Afrimat mine located 8 km southeast of Pietermaritzburg near Ashburton (see Map 1). The mine is bordered on the eastern side by the Mpushini Protected Environment (a stewardship site) and on the western side by the Mpushini River. The site includes one large open cast mining area, a crushing area, stockpile areas, overburden stockpile areas and an office near the entrance (see Map 2). The biodiversity survey was prompted by the need to update the current environmental management plan (EMP) for mining activities on the property. Intact good quality vegetation was found around the mining area, especially on the southern side. Alien infestation seems to be minimal. According to the 2018 SA Vegetation Map, the mine is located inside Eastern Valley Bushveld with KwaZulu-Natal Hinterland Thornveld approaching from the east.



Map 1 Satellite photo showing the position of mining site (outlined in red) southeast of Pietermaritzburg.

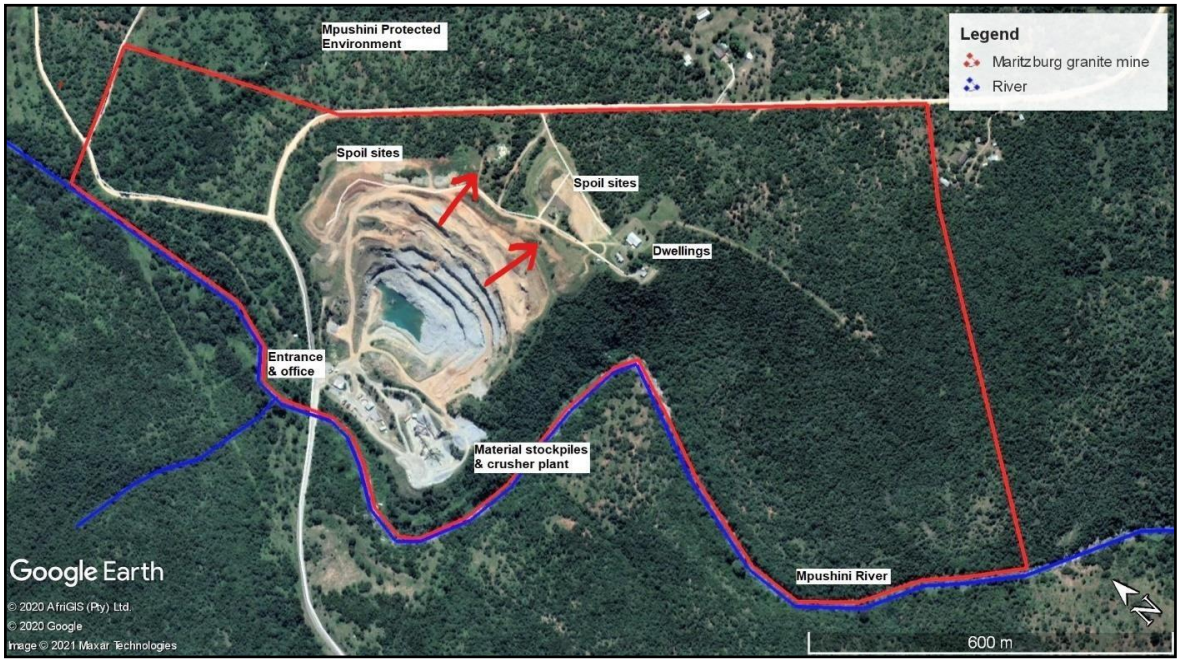
2 DESCRIPTION OF CURRENT & FUTURE MINING ACTIVITIES

Afrimat Aggregates (KZN) Pty Ltd is proposing to update the EMP for Maritzburg Quarry, which is situated in the Pietermaritzburg magisterial district. Stone aggregate (from dolerite) in being mined, which is used in the building/construction industry. The direction of mining is shown to be in an eastern direction towards the north-eastern boundary of the site as shown on Map 2.

The quarrying process currently involves:

- Drill and blast the hard rock after the topsoil of the area has been stripped and stockpiled;

- ❖ Load and haul the material out of the excavation to the crushing and screening plants;
- ❖ Rush and screen the recovered material at the crusher plant in order to reduce it to various size aggregate; and
- ❖ Stockpile the aggregate at a stockpile area until it is collected by clients.



Map 2 Satelite photo illustrating mining activities on the site. The red arrows indicate the direction of future mining towards the north-eastern boundary of mining rights area.

3 TERMS OF REFERENCE

- ➢ Identify and describe biodiversity patterns at a community and ecosystem level (main vegetation type, plant communities and threatened/vulnerable ecosystems), at species level (Species of Conservation Concern, protected species, presence of alien species) and in terms of significant landscape features;
- ➢ Describe the sensitivity of the site and its immediate surroundings;
- ➢ Map or describe the presence of invasive alien plants;
- ➢ Review the relevant biodiversity plans compiled in terms of the National Environmental Management Biodiversity Act (Act 10 of 2004); and
- ➢ Make recommendations with regards to the protection/management of biodiversity.

4 METHODOLOGY

A botanical survey of the site was undertaken on 14 December 2020 by Mark Berry (see CV attached). A qualitative assessment of the type and condition of affected vegetation on site, disturbance and presence of alien species, Species of Conservation Concern and

protected tree species was carried out. Plant species not identified in the field, were collected and/or photographed and identified at the office and Compton (Kirstenbosch) Herbarium. The 2018 South African Vegetation Map and the latest floristic taxonomic literature and reference books were used for the purpose of this specialist study. Any plants classified as rare or endangered in the Red List of South African Plants online database are highlighted. The assessment follows the relevant national guidelines for biodiversity assessments as listed in the Government Gazette No. 43110 on 20 March 2020.

The following information was recorded during the site visit:

1. The condition of the vegetation. Is the vegetation either disturbed or degraded? A disturbed or degraded area could range from agricultural fields (fallow land), or areas previously disturbed by mining activities, to an area that has been severely eroded or degraded as a result of bad land management or alien infestation.
2. The species diversity. This refers to the numbers of different indigenous plant species occurring on site. Indigenous fauna observed was also noted.
3. Species of Conservation Concern (SCC), as well as protected tree species occurring on site. This would include rare, vulnerable, endangered or critically endangered species.
4. Identification of the vegetation type(s) and communities (if discernible) on the site. This would include trying to establish the known range of a vegetation type and whether or not this vegetation type is vulnerable (VU), endangered (EN) or critically endangered (CR).

5 LIMITATIONS TO THE STUDY

Fieldwork was carried out in the summer season, which is the main rainfall and flower season for the area. However, flowering plants that flower later in the season (e.g. January to March) or at other times of the year, such as certain bulbs (Iridaceae and Orchidaceae), may have been missed. The overall confidence in the completeness and accuracy of the botanical findings is however considered to be moderate to good. No follow-up survey is deemed necessary.

6 LOCALITY & SITE DESCRIPTION

General location and topography

The site (84 ha) is located in a hilly area in the KwaZulu-Natal midlands. The general topography is undulating with fairly deep and narrow river valleys (see Photo 1). The area

around the mine itself is moderately sloped, with a steep slope above the Mpushini River. The topography is significantly influenced by resistance to weathering of the base rocks. The mine overlooks the Mpushini River to the west and is backed by the Mpushini Protected Environment on eastern side.

Photo 1 View across the mine showing the general topography of the area, with the Mpushini River valley just beyond the mining site.

Climate

The site lies in the summer-rainfall region, with a mean annual rainfall estimated at between 650 and 1000 mm for KwaZulu-Natal Hinterland Thornveld (Mucina & Rutherford 2006). Mean annual rainfall for Pietermaritzburg is 897 mm[1]. Frost is infrequent (Mucina & Rutherford 2006). Mean monthly maximum and minimum temperatures for Pietermaritzburg are 37.2°C and -1.8°C for January and June, respectively (Mucina & Rutherford 2006). Pietermaritzburg's climate is classified as warm and temperate. Its Köppen-Geiger climate classification is Cwa.

Hydrology

The Mpushini River forms the western boundary of the mining site (see Photo 2), with two

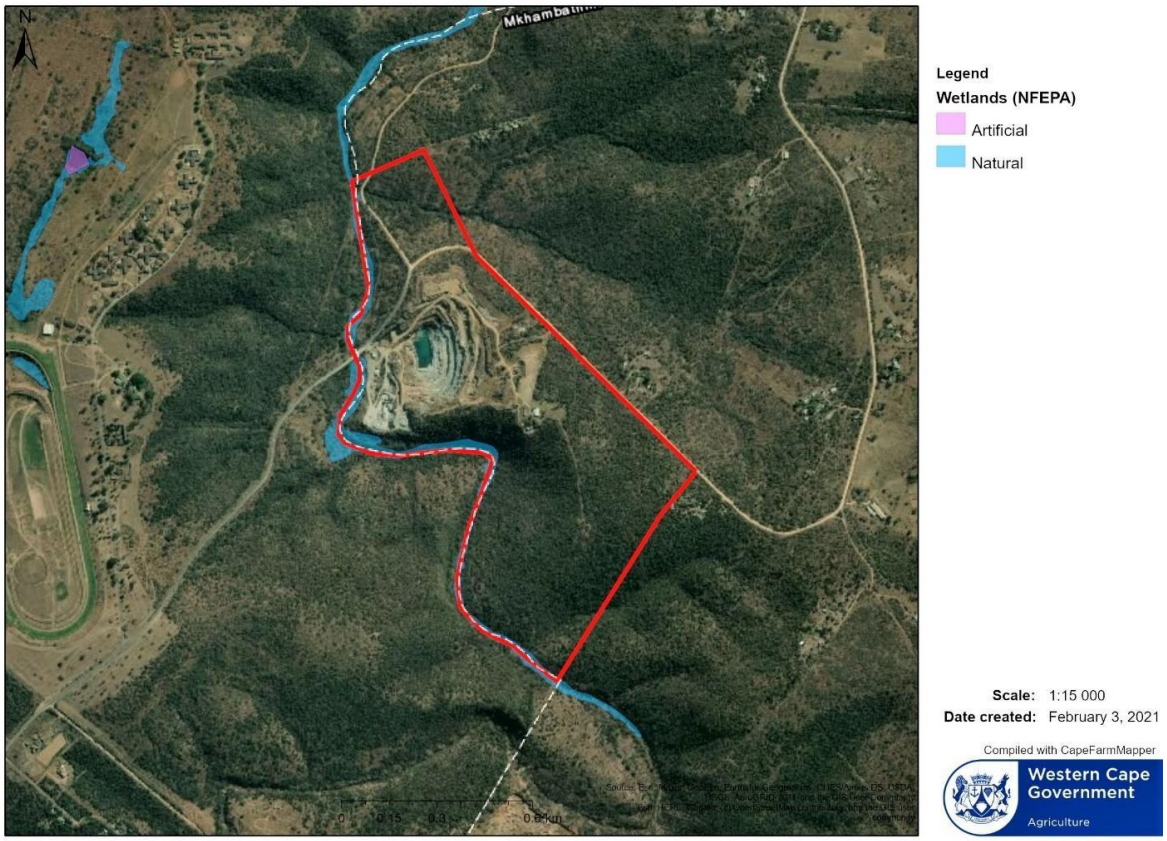
[1] https://en.climate-data.org/africa/south-africa/kwazulu-natal/pietermaritzburg-634/

minor drainage lines crossing the northern and southern tips of the site. Associated with the river is a NFEPA wetland, fringing the river channel (see Map 3). The latter is covered by *Typha capensis*, *Phragmites australis* and other tall grasses and herbaceous species. The National Freshwater Ecosystem Priority Areas (NFEPA) project provides strategic spatial priorities for conserving South Africa's freshwater ecosystems and supports sustainable use of water resources. These priority areas are commonly referred to as NFEPA's. A stormwater cut-off trench was also noted behind the mine on southern side, which was created to divert runoff away from the excavation area (see Photo 3).

Photo 2 Mpushini River

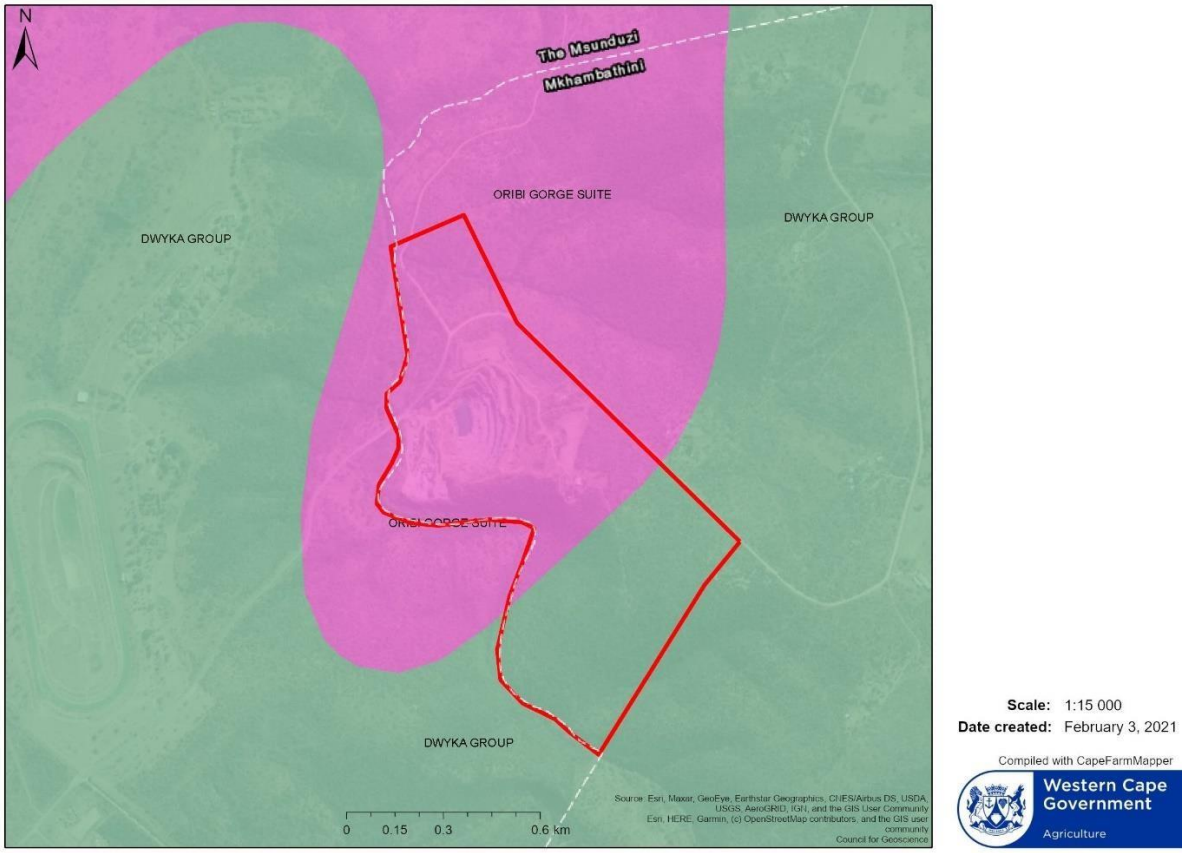
Geology

According to CapeFarmMapper online database, the site is underlain by Oribi Gorge Suite granite and Dwyka Group sediments (see Map 4). The former, which is the source of mining activities on site, comprise pyroxene granulite and garnet-bearing granulite. The Dwyka Group, which is of glacial origin, is the lowest unit in the Karoo Supergroup sequence (Norman & Whitfield 2006). It comprises diamictite, shale, siltstone, mudstone, fluvioglacial gravel and sandstone.



Map 3 Wetland features found in the vicinity of the mining site (outlined in red).

Photo 3 Overgrown stormwater cut-off trench on southern side of mine. The red arrow indicates the direction of flow.



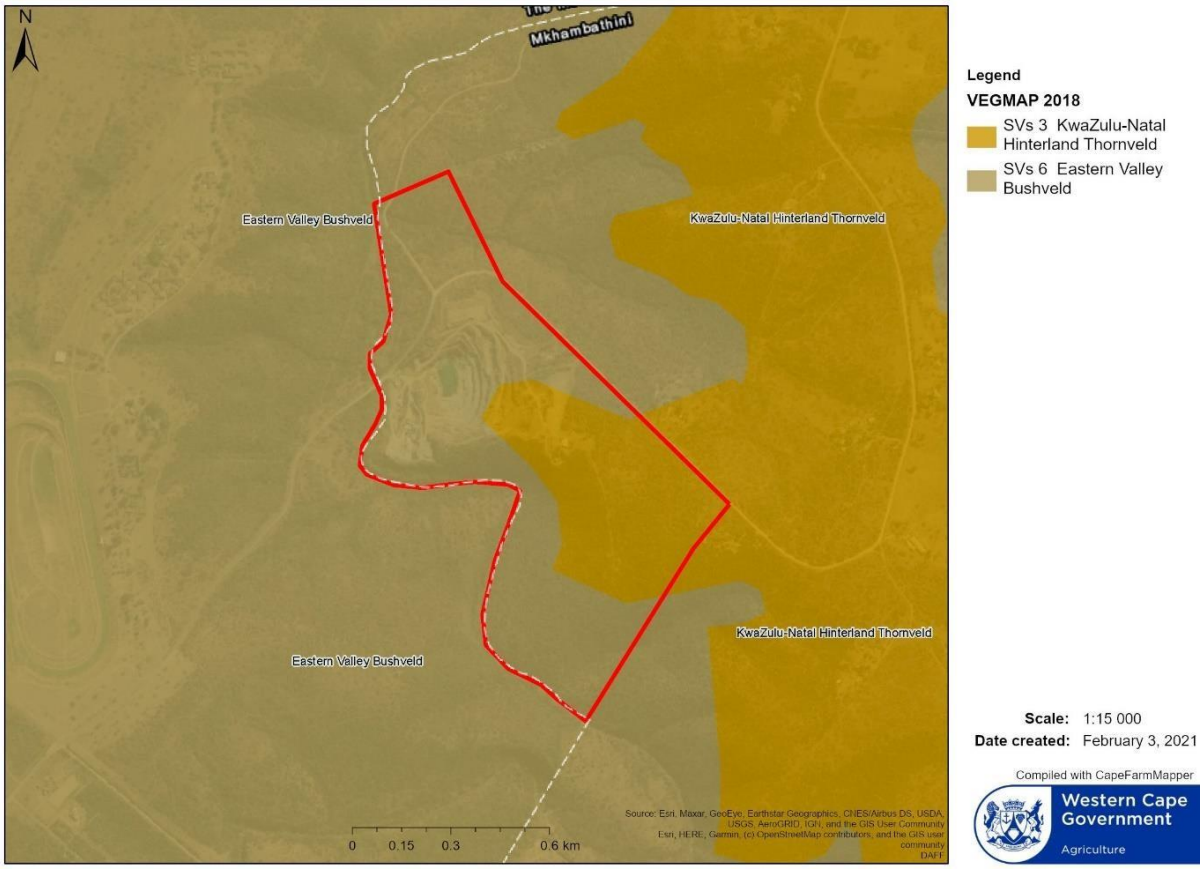
Map 4 Geology map.

7 BIOGEOGRAPHICAL CONTEXT

Being located on the eastern edge of the KwaZulu-Natal midlands, the site lies in a typical savanna biome environment. Biogeographically, it is positioned between the grassland biome and the Indian Ocean Coastal Belt. This is evidenced by the presence of a "herbaceous layer dominated by grasses and a discontinuous to very open tree layer" (Mucina & Rutherford 2006). According to the 2018 SA Vegetation Map, the site and its surrounding area have been mapped as Eastern Valley Bushveld and KwaZulu-Natal Hinterland Thornveld (see Map 5). Both are savanna vegetation types. The distinction on site between the two vegetation types is very difficult and may relate to steepness of the slopes and dominance of thorny acacias.

KwaZulu-Natal Hinterland Thornveld is an open thornveld dominated by *Acacia* species on undulating plains found on upper margins of river valleys (Mucina & Rutherford 2006). It is restricted to KwaZulu-Natal and occurs in patches immediately above Eastern Valley Bushveld in river valley of mainly the Mpisi, Mvoti, Umgeni, Mlazi and Lufafa (Mucina & Rutherford 2006). Trees such as *Acacia natalitia, Ziziphus mucronata, Cussonia spicata* and

Euphorbia ingens, and shrubs such as *Calpurnia aurea, Coddia rudis* and *Gymnosporia buxifolia* are typical (Mucina & Rutherford 2006). The vegetation type is underlain by Natal Group sandstones, Dwyka diamictites and Oribi Gorge Suite granite.



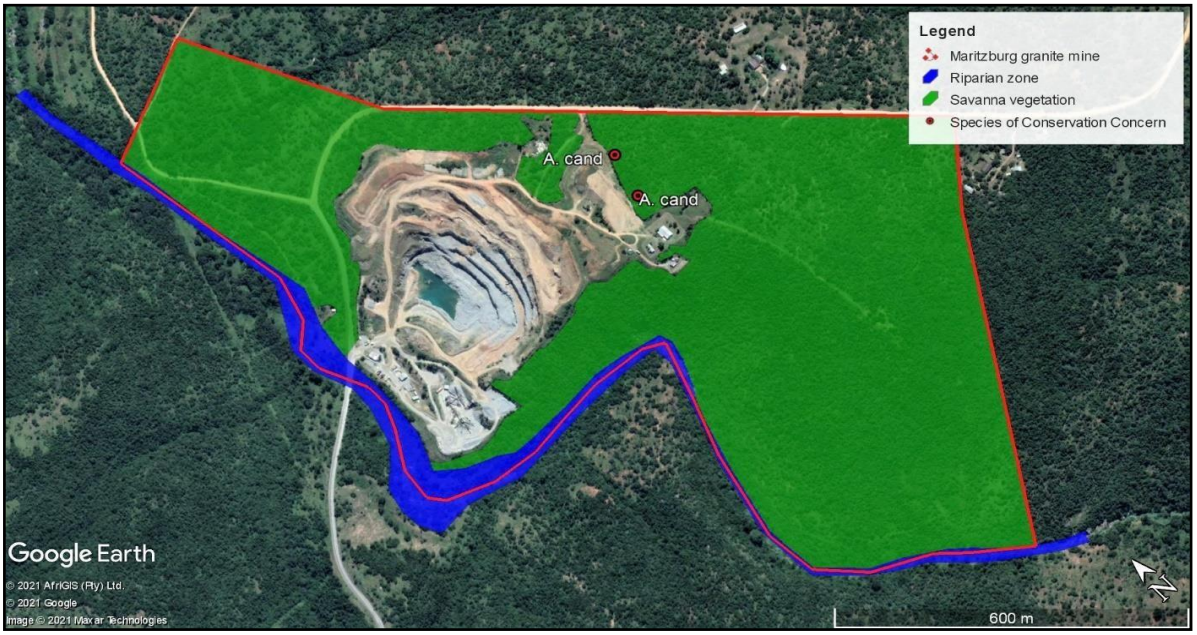
Map 5 Extract of the 2018 SA Vegetation Map, showing the position of the site (outlined in red) inside Eastern Valley Bushveld and KwaZulu-Natal Hinterland Thornveld.

Eastern Valley Bushveld occurs in the KwaZulu-Natal and the Eastern Cape Provinces. It is found in deeply incised river valleys, including the lower reaches of the Thukela, Mvoti, Mgeni, Mlazi and others (Mucina & Rutherford 2006). It is described as semideciduous savanna woodlands in a mosaic with thickets, often succulent and dominated by species of *Euphorbia* and *Aloe* (Mucina & Rutherford 2006). The steep north-facing slopes are sheltered from the rain and also receive greater amounts of insolation adding to xerophilous conditions on the slopes (Mucina & Rutherford 2006). The area is underlain by sediments of the Karoo Supergroup, in this instance, the Dwyka Group. Important taxa are similar to that of KwaZulu-Natal Hinterland Thornveld.

8 VEGETATION & FLORA

As noted above, the natural vegetation on site comprises Eastern Valley Bushveld and

KwaZulu-Natal Hinterland Thornveld, or rather a transitional form between the two (see Map 6). It is not possible to draw a line between the two, but Map 5 above presents an approximation. KwaZulu-Natal Hinterland Thornveld is expected on the flatter eastern part of the site, spreading eastwards. The vegetation comprises a 4-6 m tall tree layer, with a prominent grass understorey (see Photos 4 & 5). Structurally it can be described as a short, closed woodland following Edward's (1983) classification.



Map 6 Aerial photograph showing the biodiversity attributes of the study site.

The areas covered with savanna vegetation as shown on Map 6 seem to be in a fair to good condition with little disturbance. Botha (2005), however, noted that the mining site and surrounding areas have been disturbed by past agricultural activities. The scenery around the mining site was lush and green during the site visit. However, the dry winter situation may paint a different picture. As expected, some disturbances were noted on the edges of the mining area, such as localised erosion events, vehicular activities, spoiling of overburden and alien infestation (see Photo 6). Of a total of 49 species recorded, 15 (31%) were alien.

Prominent tree and tall shrub species recorded include *Gymnosporia buxifolia, Vachellia natalitia, V. karroo, V. nilotica, Senegalia ataxacantha, Dalbergia obovata, Ziziphus mucronata, Ehretia rigida, Zanthoxylum capense, Brachylaena discolor, Croton sylvaticus, Spirostachys africana, Searsia pentheri, Grewia occidentalis* and *Cussonia spicata* (see Photo 7). Tall (tree like) succulents include *Aloe cf candelabrum* and *Euphorbia ingens*.

Photo 4 Good quality savanna vegetation on the eastern side of mining site. The tall aloe in the foreground is *Aloe cf candelabrum*.

Photo 5 Savanna vegetation with a lush grass understorey.

Photo 6 New overburden spoil site (terraced) on north-eastern side of mine.

Smaller shrubs and succulents recorded include *Capparis* sp, *Azima tetracantha, Asparagus africanus, Euryops chrysanthemoides, Tecomaria capensis, Calpurnia aurea, Coddia rudis, Lantana rugosa, Aloiampelos tenuior* and *Sansevieria hyacinthoides*. Creepers and herbaceous species recorded include *Cyphostemma cirrhosum, Senecio inaequidens, S. deltoideus, Priva flabelliformis* and *Commelina* sp. Hemicryptophytes recorded, include *Typha capensis, Cyperus esculentus, Phragmites australis* and a variety of grasses. Botha (2005) lists a few more species recorded on site, including *Buddleja saligna, Searsia gueinzii, Diospyros lycioides, Euclea crispa*, etc.

A fair number of exotic species were also recorded including *Phytolacca dioica, Yucca gloriosa, Opuntia ficus-indica, Ricinus communis, Tecoma stans, Argemone ochroleuca, A. mexicana, Tagetes minuta, Datura ferox, Malvastrum coromandelianum, Verbena brasiliensis, Solanum mauritianum, Manihot grahamii, Melilotus albus* and *Glandularia aristigera* (see Photo 8). The majority of these are listed as Category 1b invaders in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) Alien and Invasive Species List (2016). Some of the species, such as *Tecoma stans*, have the ability to form dense stands that completely eliminate indigenous vegetation (Bromilow 2010).

Photo 7 A few indigenous species recorded, with *Vachellia karroo* (top left), *Euphorbia ingens* (top right), *Senegalia ataxacantha* (bottom left) and *Searsia pentheri* (bottom right).

Aloe cf candelabrum is the only Species of Conservation Concern (SCC) and regional endemic recorded on site (see Map 6). It is currently listed as near threatened and has a restricted distribution range from Pietermaritzburg southwards to the Umtamvuna River[2]. About 50-56% of A. candelabrum's habitat is already transformed, mainly through loss to sugarcane cultivation, timber plantations and urban development around Pietermaritzburg and Durban. Other SCC known from the general area and vegetation types include *Aloe pruinosa* (Vul), *Brachystelma franksiae* (Vul), *Cineraria atriplicifolia* (Vul), *Drimia echinostachya* (Vul), *Hermannia sandersonii* (Vul) and *Woodia verruculosa* (Vul).

The previous EIA report for the mine made mention of *Encephalartos cerinus* (Criticallly Endangered), but no observation was made on site by the author (Botha 2005). It is known from Thukela Valley Bushveld much further away to the north. All the other recorded species seem to be widespread and common. None of the recorded tree species are protected in terms of the National Forests Act (Act 84 of 1998).

[2] Threatened Species Programme | SANBI Red List of South African Plants

Photo 8 A few alien species recorded, with *Glandularia aristigera* (top left), *Opuntia ficus-indica* (top right), *Solanum mauritianum* (bottom left) and *Ricinus communis* (bottom right).

9 OBSERVED FAUNA

According to the previous EIA report by Botha (2005), a fair number of mammal species are known (or expected) from the larger area, including black-backed jackal (*Canis mesomelas*), clawless otter (*Aonyx capensis*), African striped weasel (*Poecilogale albinucha*), striped polecat (*Ictonyx striatus*), large-spotted genet (*Genetta tigrina*, a common and widely distributed carnivore), slender mongoose (*Galerella sanguinea*), white-tailed mongoose (*Ichneumia albicauda*), water mongoose (*Atilax paludinosus*), aardwolf (*Proteles cristatus*), and possibly even leopard (*Panthera pardus*). During the site survey evidence of common duiker (*Sylvicapra grimmia*) was found (see Photo 10). They prefer the presence of bush, which give shelter and shade, as well as leaves and twigs for food (Skinner & Smithers 1990).

The mine manager also sent me photographs of kudu (*Tragelaphus strepsiceros*), nyala (*Tragelaphus angasii*), impala (*Aepyceros melampus*), Burchell's zebra (*Equus quagga* ssp. *burchelli*) and vervet monkeys (*Cercopithecus aethiops*), all of which were observed on or

around the mining site (see Photo 11). Most of these are savanna woodland inhabitants and were probably introduced to the neighbouring conservation area.

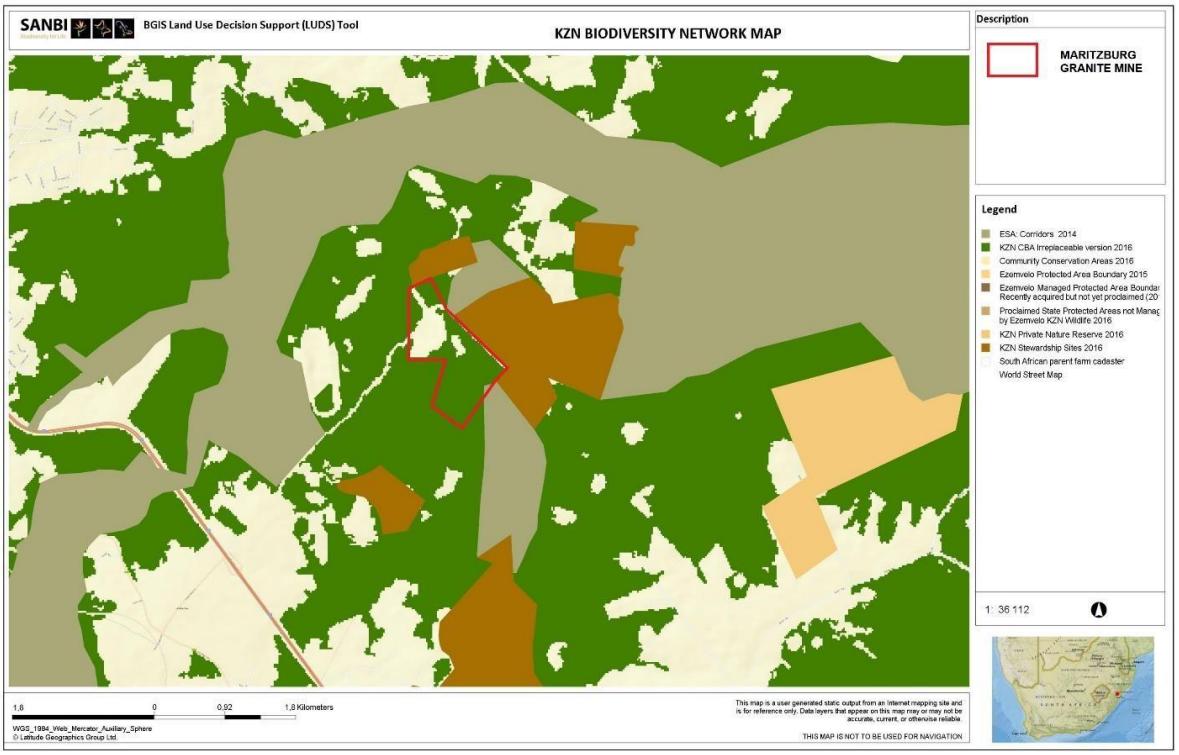
Photo 10 Common duiker spoor in damp sand nearby the overburden stockpiles.

Photo 11 Antelope species recorded on the mining site by the manager, with impala (left) and nyala (right).

10 CONSERVATION STATUS & THREATS

Eastern Valley Bushveld and KwaZulu-Natal Hinterland Thornveld are currently not listed

as threatened vegetation types in National Environmental Management: Biodiversity Act (Act 10 of 2004) (DEA 2011). The threat status of Least Concern is supported for both vegetation types in the recent 2018 National Biodiversity Assessment (Skowno *et al*. 2019). Around 69-70% of their original extent remains, which suggests that both are still well represented. Interestingly, it is indicated as not formally protected! Mucina & Rutherford (2006), however, stated that <1% of Eastern Valley Bushveld is conserved in the Luchaba Wildlife Reserve and a few small patches in the Oribi Gorge Nature Reserve. The Mpushini Protected Environment, a stewardship site next to the mine, protects some of the vegetation on a contractual basis with support from the provincial conservation authority. The main threats to the vegetation types are alien plant infestations and cultivation.



Map 7 Extract of the KZN biodiversity network map, with the site outlined in red.

The mining site falls inside the KZN biodiversity network (see Map 7 above). Apart from the active mining area and associated infrastructure which are already transformed, the site is mapped as a critical biodiversity area (CBA): irreplaceable. The mining site is strategically positioned amidst portions of the Mpushini Protected Environment. The CBA extends well beyond the boundary of the mining site towards the south and west. CBA's are defined as areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure (Skowno *et al*. 2019). Many of these areas support known occurrences of threatened plant species, and/or may be essential elements of designated ecological corridors. Loss of designated CBA's is therefore not

recommended.

11 IMPACT ASSESSMENT

Mining activities seem to be well contained and not spread-out throughout the mining rights area. The surrounding natural vegetation also seem to be in a good condition. Encroachment into the vegetation was noted around the stockpile areas, notable on the northern side of the overburden stockpiles and on the southern side of the material stockpile area above the Mpushini River. Further encroachment of stockpiling into the natural areas should be kept in check unless it is allowed for in terms of the mining plan. Associated with stockpiling is localised erosion and the washing of silt into the green areas (see Photo 12). This needs to be addressed by means of stabilisation of the stockpile slopes.

Photo 12 Localised erosion at one of the overburden stockpiles.

It was pointed out to the biodiversity specialist that the direction of mining is towards the north- eastern boundary of the site (see Map 2). This is the boundary shared with the Mpushini Protected Environment. It is strongly recommended that, in order to safeguard the integrity of the protected area, an undisturbed buffer of a suitable width (e.g. 30-50 m) be determined and maintained between the latter and mining activities. This will allow the

movement of fauna around the edges of the mine and prevent the undermining of conservation efforts next door.

It cannot be established at this point in time if any more natural vegetation will need to be cleared in the near future. Nevertheless, Eastern Valley Bushveld and KwaZulu-Natal Hinterland Thornveld are still well represented in the region and the impact on vegetation type *per se* is of a low to moderate concern. None of the vegetation types are listed as threatened. The impact on the biodiversity (CBA) network is another matter to which end all mining activities should be contained as far as possible. The south-eastern and northern (north of bypassing district road) parts of the mining rights area should be conserved.

As an indirect impact, soil disturbance caused by mining activities provides ideal conditions for the establishment of invasive alien species. The presence of aliens in the immediate area, such as *Phytolacca dioica, Opuntia ficus-indica, Ricinus communis* and *Solanum mauritianum*, will exacerbate this impact. Alien weeds have the potential to diminish the local biodiversity by outcompeting indigenous species. As an operational phase impact, alien control will be required as an ongoing management concern. The proliferation and spread of aliens into the adjacent protected area must be prevented.

12 SUMMARY & RECOMMENDATIONS

As noted earlier, the natural vegetation on site comprises Eastern Valley Bushveld and KwaZulu-Natal Hinterland Thornveld, or rather a transitional form between the two. They are currently not listed as threatened. Around 69-70% of their original extent remains, which suggests that both are still well represented in the region. The mining site falls inside the KZN biodiversity network. Apart from the active mining area and associated infrastructure which are already transformed, the site is mapped as a critical biodiversity area (CBA), and considered to be of high conservation value. Only one Species of Conservation Concern (SCC) was recorded, namely *Aloe cf candelabrum*.

Mining activities seem to be well contained and not spread-out throughout the mining rights area. The surrounding natural vegetation also seem to be in a good condition. Encroachment into the vegetation was, however, noted around the stockpile areas. Further encroachment of stockpiling into the natural areas should be kept in check unless it is allowed for in terms of the mining plan. At this point in time it is unsure if any more natural vegetation will need to be cleared to allow future expansion of mining activities.

Please consider the following mitigation measures with regards to future mining operations:

- As a matter of priority, the stockpile slopes must be stabilised to prevent erosion and the washing of silt into the green areas and the Mpushini River. This can be achieved by means of a variety of ways, such a log stabilisation, geo-netting, hydroseeding, etc.
- With regards to the future extension of the mining area towards the north-eastern boundary, which is shared with the Mpushini Protected Environment, it is strongly recommended that an undisturbed buffer of a suitable width (e.g. 30-50 m) be determined and maintained between the latter and mining activities. This will allow the movement of fauna around the edges of the mine and prevent the undermining of conservation efforts next door.
- In order to support the KZN biodiversity (CBA) network, the south-eastern and northern (north of bypassing public road) parts of the mining rights area should be conserved.
- The presence of a fair number of alien species on the mining site is a great concern. As an operational phase impact, alien control is required as an ongoing management concern. The proliferation and spread of aliens into the adjacent protected area must also be prevented. One-year old seedlings can be hand-pulled, preferably when soil is wet after a rainfall. If left to grow, removal becomes more difficult and costly. The use of heavy plant, such as bush cutters or D9 Caterpillar, for alien clearing is not recommended. Certain species, such as *Opuntia ficus-indica*, requires the removal and destruction of the entire plant. Please note that herbicides may only be effective for certain species.

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CONDENSED CV OF SPECIALIST

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PROFESSIONAL STATEMENT

Environmental assessment professional and biodiversity specialist with nearly 25 years of experience mainly in the Western Cape Province, but also in the Northern Cape and Eastern Cape. Experience in Environmental Impact Assessments (EIA's), biodiversity assessments, Environmental Management Programmes (EMPr's), Environmental Control Officer (ECO) duties and environmental due diligence investigations.

WORK EXPERIENCE

1989-1990 Nature Conservation Officer in the South African Air Force, based at Langebaan Road Air Force Base.

1997-2005 Employed as principal environmental specialist at Planning Partners, a multi-disciplinary consultancy specialising in town and regional planning, environmental planning and landscape architecture. Duties included the conducting of EIA's, compiling EMPr's, ECO duties, biodiversity surveys and status quo environmental assessments for spatial development frameworks.

2000-2006 Examiner for the Board of Control for Landscape Architects (BOCLA), responsible for the setting up and marking of the Environmental Planning Section of exam paper.

2005-current Started Mark Berry Environmental Consultants in June 2005. Responsibilities include office management, seeking tenders, conducting EIA's, compiling EMPr's, construction site environmental audits, biodiversity surveys, etc. A relationship is maintained with previous employer, and, among other, undertook land-use surveys and reporting for the Eskom's site safety reports for three proposed nuclear power plants in the Western and Eastern Cape Provinces.

QUALIFICATIONS

- BSc (1988) University of Stellenbosch
- BSc-Hons in Botany (1991) University of Stellenbosch
- MSc in Botany (1993) Nelson Mandela Metropolitan University
- PhD in Botany (2000) Nelson Mandela Metropolitan University.

PROFESSIONAL MEMBERSHIP

Professional member (reg. no. 400073/98) of the South African Council for Natural Scientific Professions (SACNASP).

REFERENCES

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DECLARATION OF INDEPENDENCE

I Mark Gerald Berry, as the appointed Specialist hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that I:

- in terms of the general requirement to be independent:
  - **other than fair remuneration for work performed in terms of this application, have no business, financial, personal or other interest in the development proposal or application and that there are no circumstances that may compromise my objectivity**; or
  - am not independent, but another specialist (the "Review Specialist") that meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);
- in terms of the remainder of the general requirements for a specialist, have throughout this EIA process met all of the requirements;
- have disclosed to the applicant, the EAP, the Review EAP (if applicable), the Department and I&APs all material information that has or may have the potential to influence the decision of the Department or the objectivity of any report, plan or document prepared or to be prepared as part of the application; and
- am aware that a false declaration is an offence in terms of Regulation 48 of the EIA Regulations, 2014 (as amended).

Signature of the Specialist:	
Name of Company:	Mark Berry Environmental Consultants
Date:	22 February 2021