# TERRESTRIAL BIODIVERSITY STUDIES: PROPOSED MINING RIGHT TO MINE CHROME ORE, IRON ORE AND VANADIUM ORE ON THE FARM LOCATIE VAN M'PHATLELE 457KS WITHIN THE MAGISTERIAL DISTRICT OF LEPELLE-NKUMPI, LIMPOPO PROVINCE

## DOCUMENT CONTROL

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|---|---|
| **Project title** | TERRESTRIAL BIODIVERSITY STUDIES: PROPOSED MINING RIGHT TO MINE CHROME ORE, IRON ORE AND VANADIUM ORE ON THE FARM LOCATIE VAN M'PHATLELE 457KS WITHIN THE MAGISTERIAL DISTRICT OF LEPELLE-NKUMPI, LIMPOPO PROVINCE. |
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| **Document prepared for** | MNB Holdings (Pty) Ltd |
| **Document prepared by** | MORA Ecological Services (Pty) Ltd |
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# EXECUTIVE SUMMARY

## Project Background

MNB Holdings (Pty) Ltd has been appointed by Bakgaga Ba Mphahlele Traditional Authority (Mphahlele Community Development Trust) and Dithabeng Mining Pty Ltd to conduct an Environmental Impact Assessment for the proposed mining right to mine chrome ore, iron ore and vanadium ore on the Farm Locatie van M'PHATLELE 457KS within the Magisterial District of Lepelle-Nkumpi, Limpopo Province

MORA Ecological Services (Pty) Ltd was then appointed by MNB Holdings (Pty) Ltd to conduct a terrestrial biodiversity impact assessment. The ecological diversity information from the desktop study and that which was collected on site will be used to inform the Government's review during the application process of the proposed mining rights.

Flora: The site falls within Savanna biome, and the regional vegetation type is Sekhukhune Plains Bushveld, which is an Endangered ecosystem. However, the continuous subsistence crop farming in the area has transformed this vegetation type.

Fauna: The site is surrounded by over six villages and furthermore the habitats have been heavily transformed. The only faunal species observed on site were the birds due to their mobility.

No other alternative sites were identified on the affected property. The current study site is referred to as the preferred site. Limited sensitive features occur on the site. The size of the site makes provision for the exclusion of any sensitive environmental features that may arise through the Environmental Impact Assessment process to enable the appropriate construction.

It is the opinion of the specialist that this application be considered, provided that all recommendations and mitigations are strictly adhered to.

## DECLARATION BY THE SPECIALIST

I, Mokgatla Jerry Molepo declare that:

• I act as the independent specialist in this application.

• I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant.

• I declare that there are no circumstances that may compromise my objectivity in performing such work.

• I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity.

• I will comply with the Act, Regulations, and all other applicable legislation.

• I have no, and will not engage in, conflicting interests in the undertaking of the activity.

• I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan, or document to be prepared by myself for submission to the competent authority.

• all the particulars furnished by me in this form are true and correct; and

• I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

MORA Ecological Services (Pty) Ltd

Name of Company

20/11/2024

Date

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# INTRODUCTION

MNB Holdings (Pty) Ltd has been appointed to conduct an Environmental Impact Assessment for the proposed mining right to mine chrome ore, iron ore and vanadium ore on the Farm Locatie van M'PHATLELE 457KS within the Magisterial District of Lepelle-Nkumpi, Limpopo Province. As part of the application process, MORA Ecological Services (Pty) Ltd was appointed by MNB Holdings (Pty) Ltd to conduct a terrestrial biodiversity impact assessment on the site.

Biodiversity plays a pivotal role in South Africa's development, encompassing economic, socio-economic, and sustainable livelihood dimensions. The preservation of species, ecosystems, and ecological processes is imperative for the long-term sustainable utilization of the country's ecological resources. Effective governance in the biodiversity sector is essential to ensure these resources remain available for future generations. Wangari Maathai, emphasized the intrinsic connection between biodiversity and the economy. Her statement underscores the significance of maintaining biodiversity for human survival and well-being. While biodiversity conservation was traditionally the purview of government and non-governmental organizations, there is increasing recognition that all sectors of society must collaborate to manage biodiversity sustainably. This paradigm shift aligns with the Convention on Biological Diversity's (2012) emphasis on collective responsibility and engagement in biodiversity management.

To effectively prioritize and manage biodiversity in South Africa, the following actions should be considered:
1. Develop comprehensive policies that integrate biodiversity conservation into economic planning and development strategies.

2. Foster cross-sector collaboration between government, NGOs, businesses, and local communities in biodiversity management initiatives.

3. Implement education and awareness programs to promote understanding of biodiversity's importance across all societal levels.

4. Establish robust monitoring and evaluation systems to assess the effectiveness of biodiversity conservation efforts and inform adaptive management strategies.

5. Invest in research to enhance understanding of the complex relationships between biodiversity, ecosystem services, and human well-being in the South African context.

6. Create incentives for sustainable practices that support biodiversity conservation in various sectors, including agriculture, forestry, and urban development.

7. Strengthen legal frameworks and enforcement mechanisms to protect critical habitats and species.

8. Promote sustainable use of biological resources to support local livelihoods while maintaining ecosystem integrity.

Mining can have significant impacts on ecosystems in various ways. These include direct vegetation

clearance, introduction of alien plants, alteration of microhabitats, soil erosion and compaction. Although mining is essential for the country's economy, mining expansion require careful consideration of environmental impacts on ecosystems.

The ecological diversity information from the desktop study and that which was collected on site, as part of our investigations will be used to inform the Government's review for the application process of the proposed mining application.

## SITE DESCRIPTION OF THE AFFECTED ENVIRONMENT

The proposed project area is located outside Lebowakgomo Town, and it can be accessed via R37 and R518. The area is surrounded by several villages belonging to Ga Mphahlele within the Magisterial District of Lepelle-Nkumpi, Limpopo Province

## TERMS OF REFERENCE

The critical objective of this specialist study is to determine the site sensitivity of the biodiversity of the site based on a desktop and field assessment, as well as mapping using the national vegetation classification system.

The main objective of the assessment was to include every species with the slightest chance of occurring within the site in the species list. The following tasks were undertaken by MORA Ecological Services (Pty) Ltd to achieve the assessment objective:

- A visual inspection of the study area was done before surveys were conducted.
- The site was surveyed on foot and by vehicle to determine the floristic composition.
- A plotless, random sampling method was used to record data.
- Walk transects were conducted to identify faunal species.
- Species identification was done following reputable checklists and field guides.
- Where necessary, plant material was collected and/or photographs taken of specimens for identification purposes.

## ASSUMPTIONS, LIMITATIONS, UNCERTAINITIES AND GAP ANALYSIS

- The observations, findings, conclusions, and recommendations provided in this report are based on the results of this survey, the available information regarding the impacts of the development of the mine prospecting, on the vegetation composition and the author's best scientific and professional knowledge.
- The assessment of impacts was based on the current state of the primary environment.
- MORA Ecological Services (Pty) Ltd relied on the client to supply correct information on the site locality and extent, as well as project details which were assumed to be correct.

- It was assumed that the information contained in existing databases, reports and publications is correct.

MORA reserves the right to amend this report, recommendations and/or conclusions at any stage should any additional or otherwise significant information come to light.

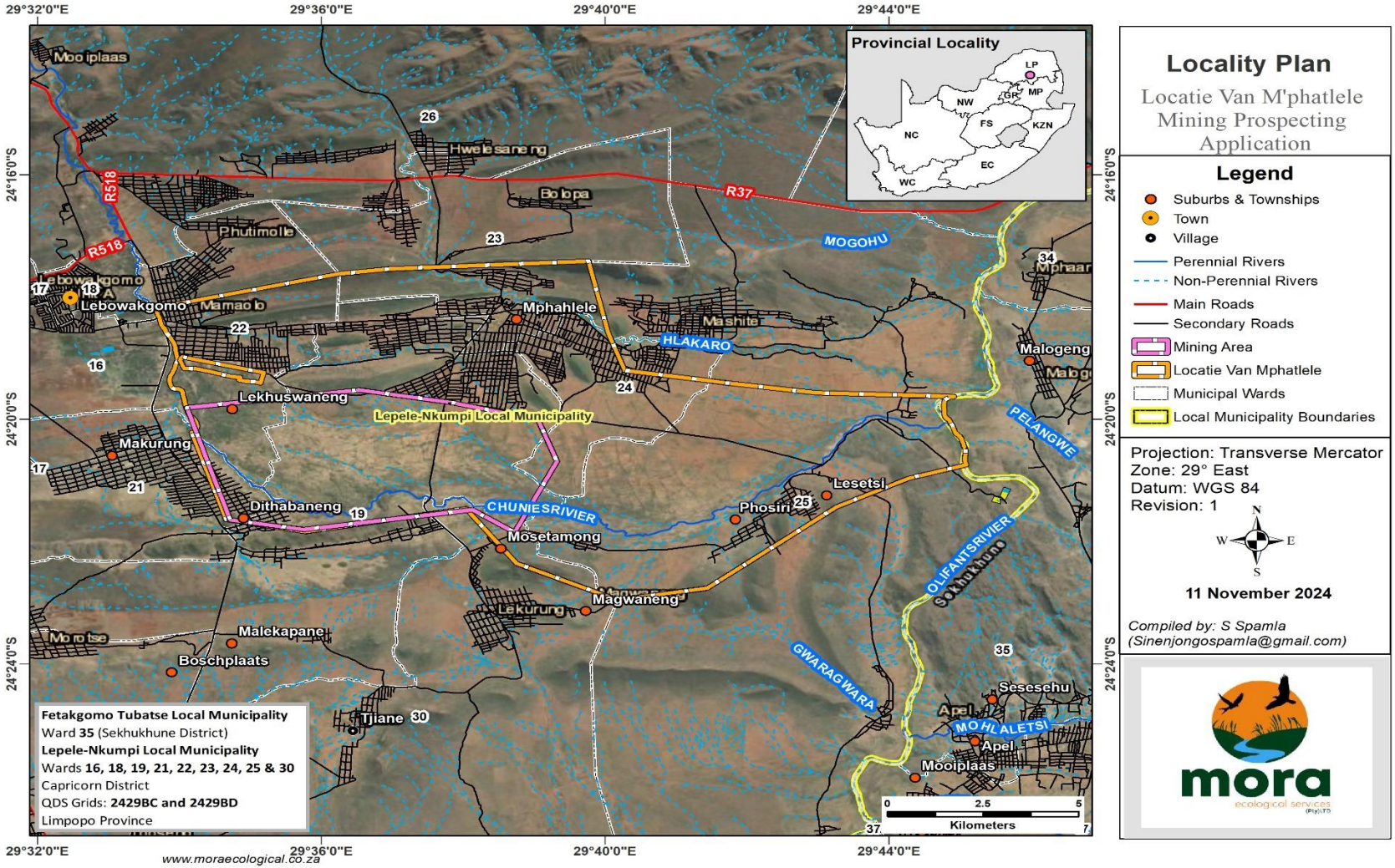



Figure 1. Locality Map of the proposed mining right on Farm Locatie van M'PHATLELE 457KS within the Magisterial District of Lepelle-Nkumpi

# BIOME AND BIOREGION

## Savanna Biome

The geographic region of the proposed borrow pits and upgrade of the road D 19 development is within the Savanna Biome (Figure **2**) below. This Biome is the largest in southern Africa, occupying 46% of its area, and over one-third the area of South Africa. It is well developed over the lowveld and Kalahari region of South Africa and is also the dominant vegetation in Botswana, Namibia, and Zimbabwe. It is characterized by a grassy ground layer and a distinct upper layer of woody plants. A vegetation that consists of an upper layer hat is closest to the ground is referred to as Shrubveld, when the upper layer is dense it is called a Woodland, and a Bushveld is one with intermediate upper layer.

The environmental factors delimiting the biome are complex: altitude ranges from sea level to 2 000 m; rainfall varies from 235 to 1 000 mm per year; frost may occur from 0 to 120 days per year; and almost every major geological and soil type occurs within the biome. A major factor delimiting the biome is the lack of sufficient rainfall which prevents the upper layer from dominating, coupled with fires and grazing, which keep the grass layer dominant. Summer rainfall is essential for the grass dominance, which, with its fine material, fuels near-annual fires. In fact, almost all species are adapted to survive fires, usually with less than 10% of plants, both in the grass and tree layer, killed by fire. Even with severe burning, most species can resprout from the stem bases.

The grass layer is dominated by C 4-type grasses, which are at an advantage where the growing season is hot, but where rainfall has a stronger winter component, C 3-type grasses dominate. The shrub-tree layer may vary from 1 to 20 m in height, but in Bushveld typically varies from 3 to 7m. The shrub-tree element may come to dominate the vegetation in areas which are being overgrazed (Low & Rebelo, 1996). The vegetation type found within the study site is Sekhukhune plains Bushveld (**Error! Reference source not found.**), and they are described below.

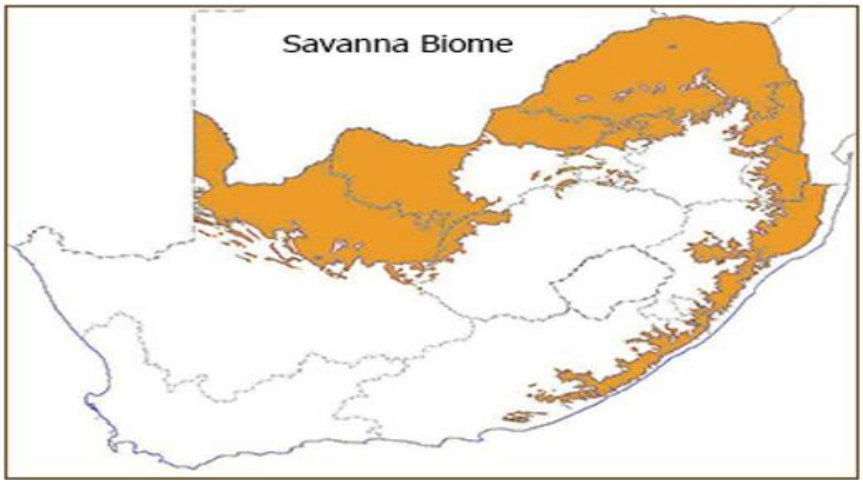



Figure 2. Location map of the Savanna Biome within South Africa (Low & Rebelo, 1996).

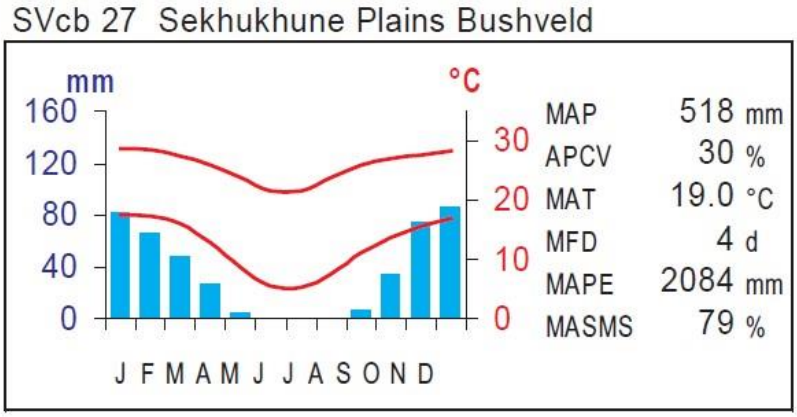
## Sekhukhune Plains Bushveld

### Distribution

This vegetation is found in Limpopo and Mpumalanga Provinces: Lowland area from Burgersfort and the lower basin of the Steelpoort River in the south, northwards through the plains of the Motse River basin to Jobskop and Legwareng (south of the Strydpoort Mountains). Continues up the basin of the Olifants River to around Tswaing and the valleys of the Lepellane and Mohlaletsi Rivers. Altitude mostly about 700–1 100 m.

### Climate

Summer rainfall with very dry winters. MAP about 400–600 mm, but at the lower end of this range on the central plains increasing to about 500 mm on the plains east of the Leolo Mountains. Frost very infrequent. Mean monthly maximum and minimum temperatures for Tswelopele 37.3°C and –0.9°C for January and June, respectively. Daily temperatures vary considerably at different localities, with higher temperatures on the western plains and lower temperatures on higher-lying plateaus. See also climate diagram for SVcb 27 Sekhukhune Plains Bushveld




### Conservation

According to the 2022 Threatened Ecosystems, this vegetation type is Endangered. Nearly 2% is statutorily conserved in Potlake, Bewaarkloof and Wolkberg Caves Nature Reserves. Approximately 25% of this area has been transformed and is mainly under dry-land subsistence cultivation. A small area is under pressure from chrome and platinum mining activities and the associated urbanisation. Depending on commodities, this threat could increase in the future. There is a high level of degradation of much of the remaining vegetation by unsustainable harvesting and utilisation. Erosion widespread at usually high to very high levels with donga formation. Alien *Agave* species, *Caesalpinia decapetala*, *Lantana camara*, *Melia azedarach*, *Nicotiana glauca*, *Opuntia* species, *Verbesina encelioides* and *Xanthium strumarium* are widespread but scattered

### Vegetation and Landscape Features

Mainly semi-arid plains and open valleys between chains of hills and small mountains running parallel to the escarpment. Predominantly short, open to closed thornveld with an abundance of *Aloe* species and other succulents. Heavily degraded in places and overexploited by man for cultivation, mining and

urbanisation. Both man-made and natural erosion dongas occur in areas containing clays rich in heavy metals. Encroachment by indigenous microphyllous trees and invasion by alien species is common throughout the area.

**Geology and soils**

Complex geology, with rocks mainly mafic and ultramafic intrusive rocks of the main to lower zones of the Rustenberg Layered Suite on the eastern lobe of the Bushveld Igneous Complex (Vaalian). The zones (subsuites) are dominated by concentric belts of norite, gabbro, anorthosite and pyroxenite, with localised protrusions of magnetite, chromatite, serpentinised harzburgite, olivine diorite, shale, dolomite and quartzite. Most of the area consists of red apedal soils. Deep, loamy Valsrivier soils are characteristic of the plains and shallow Glenrosa soils are found on the lowlying, rocky hills. Patches of erodable black, melanic structured horizons are common around small mountains. Some Steendal soils are underlain by gypsum. Land types mainly Ae, Ib, Ea and Ia.

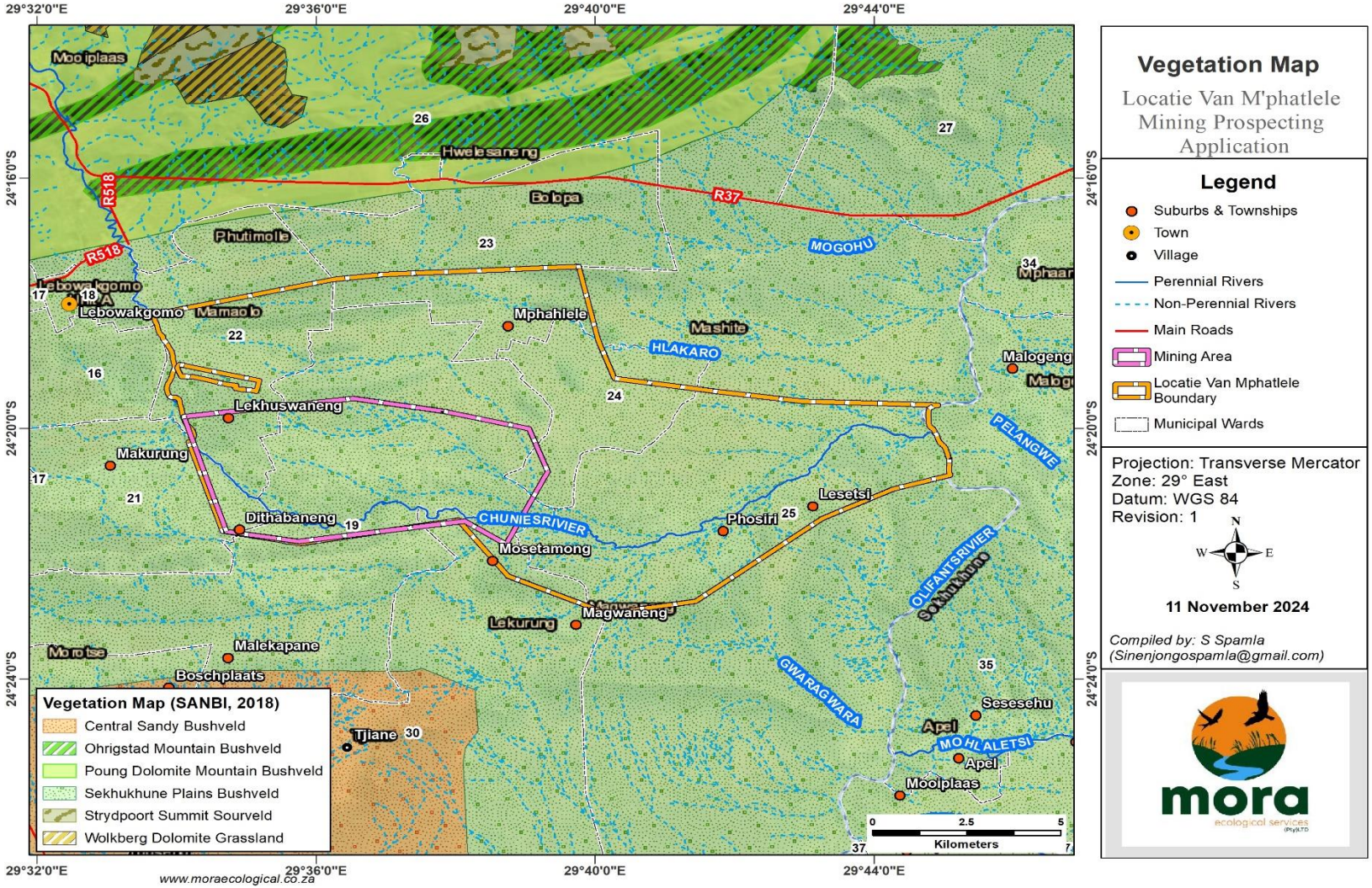



Figure 3. Vegetation Map of the proposed mining right on Farm Locatie van M'PHATLELE 457KS within the Magisterial District of Lepelle-Nkumpi.

## Limpopo Conservation Plan

Limpopo Conservation Plan was initiated by Limpopo Department of Economic Development, Environment and Tourism. This Conservation Plan v3.3 delineates on a map, commonly known as a Critical Biodiversity Areas (CBA), biodiversity priority areas called Critical Biodiversity Areas, Ecological Support Areas, and Protected Areas. These areas are the portfolio of sites that are required to meet the region's biodiversity targets and need to be maintained in the appropriate condition for their category. It is highly recommended that this Conservation Plan be a primary biodiversity consideration in Environmental Impact Assessments.

Critical Biodiversity Areas (CBAs) are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses.

Ecological Support Areas (ESAs) are terrestrial and aquatic areas that are not essential for meeting biodiversity representation targets (thresholds), but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree or extent of restriction on land use and resource use in these areas may be lower than that recommended for CBAs. According to LCP, the site falls within ESA 1 & 2 (Figure **4**). Although there are disturbed habitats within the site, there are also protected trees which warrant conservation.

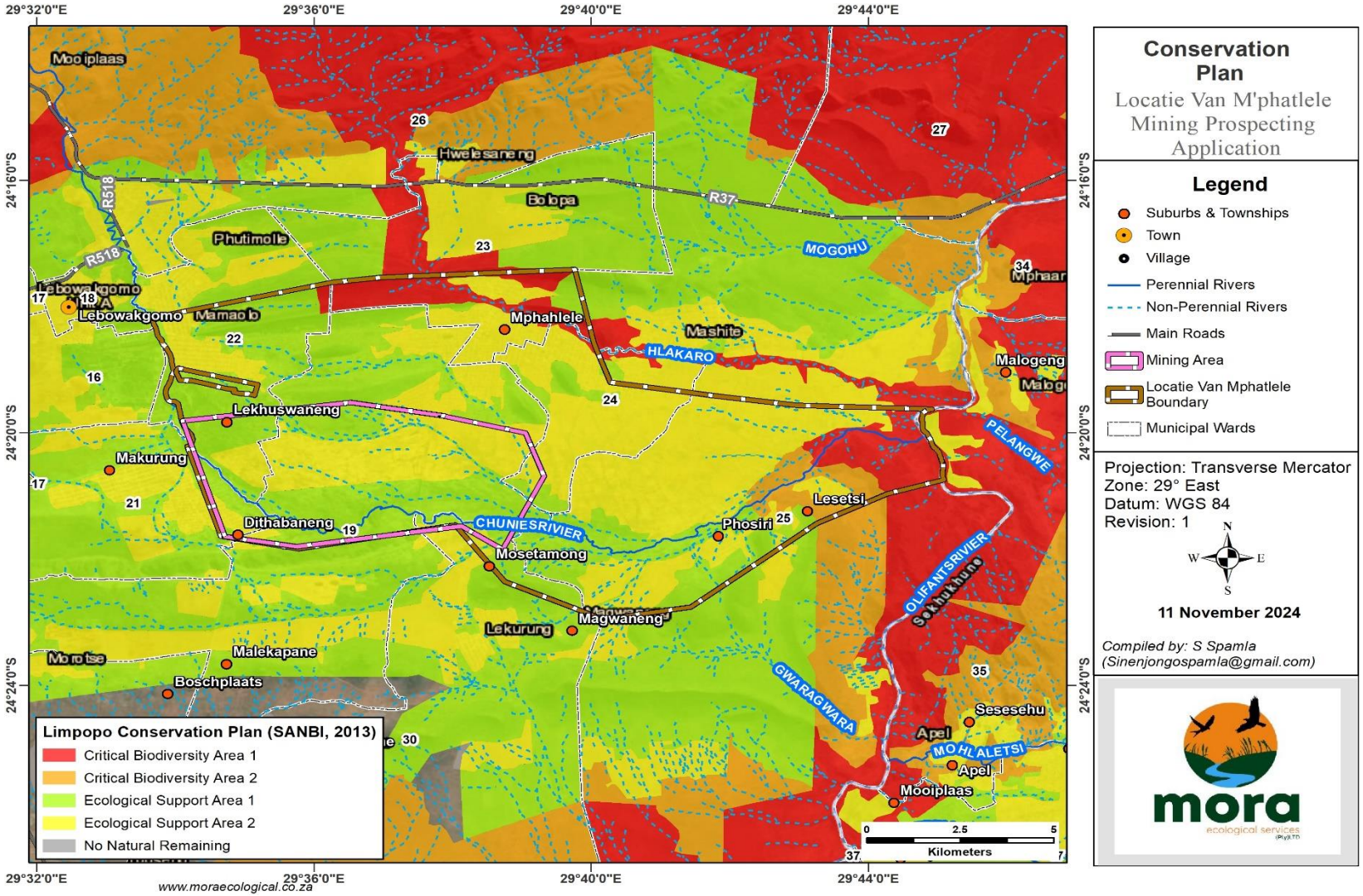



Figure 4. Limpopo Biodiversity Conservation Plan Map of the proposed mining right on Farm Locatie van M'PHATLELE 457KS within the Magisterial District of Lepelle-Nkumpi.

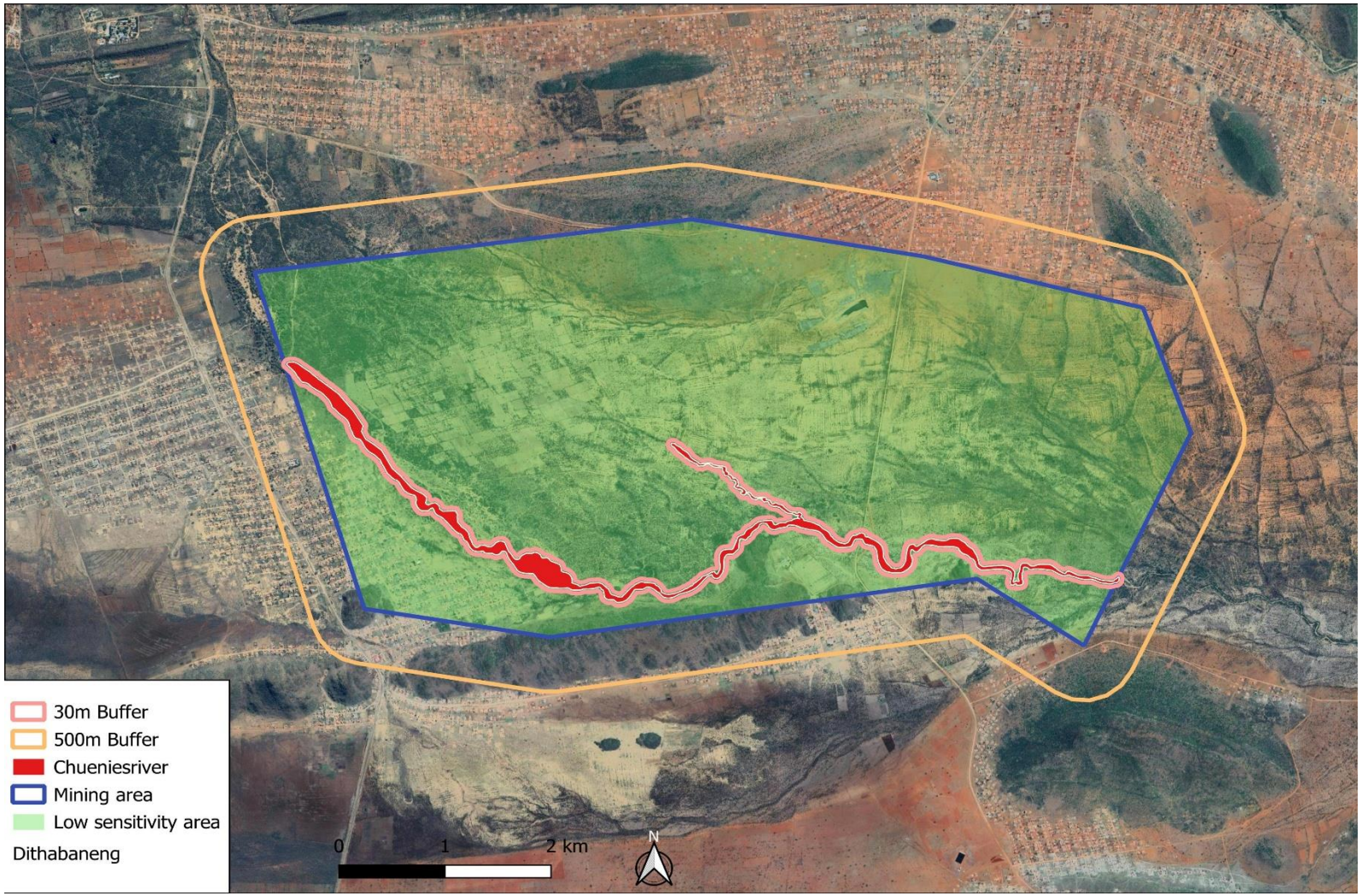



Figure 5. Site Sensitivity Map of the proposed mining right on Farm Locatie van M'PHATLELE 457KS within the Magisterial District of Lepelle-Nkumpi.

## Site Sensitivity Assessment

The DFFE screening tool was consulted for the proposed area of the vegetation clearance for the proposed mining. The DFFE screening tool outputs (Figure 6, 7 & 8) highlighted the site as having medium plant sensitivity, medium animal, and very high terrestrial biodiversity sensitivity. The study's on-site assessment revealed low sensitivity for both the animal and plant species.

Table 1. Site sensitivity ratings to species data in the screening tool.

| Sensitivity Rating | Description of Sensitivity Rating |
|---|---|
| Very high | Habitat for species that are endemic to South Africa, where all the known occurrences of that species are within an area of 10 $km^2$ is considered critical habitat, as all remaining habitat is irreplaceable. Typically, these include species that qualify under the CR, EN, or VU criteria of the IUCN or species listed as Critically/Extremely Rare under South Africa's National Red List Criteria. For each species reliant on a critical habitat, all remaining suitable habitat has been manually mapped at a fine scale. |
| High | Recent occurrence records for all threatened (CR, EN, VU) and/or Rare endemic species are included in the high sensitivity level. Spatial polygons of suitable habitat have been produced for each species by intersecting recently collected occurrence records (those collected since the year 2002) that have a spatial confidence level of less than 250 m with segments of remaining natural habitat. For birds, species distribution models (SDMs) and SABAP2 data (http://sabap2.birdmap.africa/) were combined to delineate the 'high' sensitivity areas |
| Medium | Medium Model-derived suitable habitat areas for threatened and/or rare species are included in the medium sensitivity level. Two types of spatial models have been included. The first is a simple rule-based habitat suitability model where habitat attributes such as vegetation type and altitude are selected for all areas where a species has been recorded to occur. The second is a species distribution model which uses species occurrence records combined with multiple environmental variables to quantify and predict areas of suitable habitat. The models provide a probability-based distribution indicating a continuous range of habitat suitability across areas that have not been previously surveyed. A probability threshold of 75% for suitable habitat has been used to convert the modelled probability surface and reduce it into a single spatial area which defines areas that fall within the medium sensitivity level. |
| Low | Low Areas where no species of conservation concern (SCC) are known or expected to occur. |

MAP OF RELATIVE PLANT SPECIES THEME SENSITIVITY

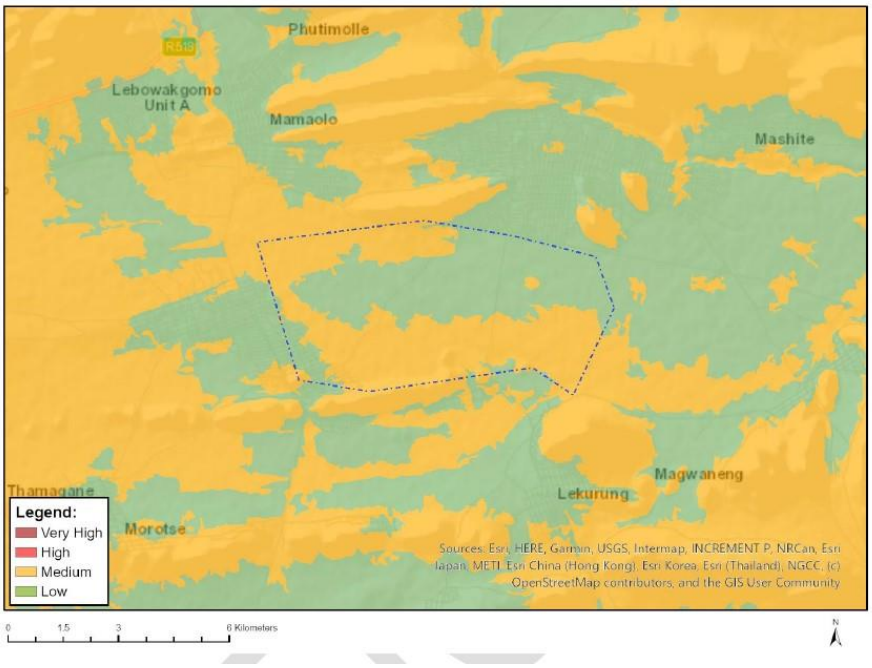



Figure 6. DFFE Screening Tool Output.

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY

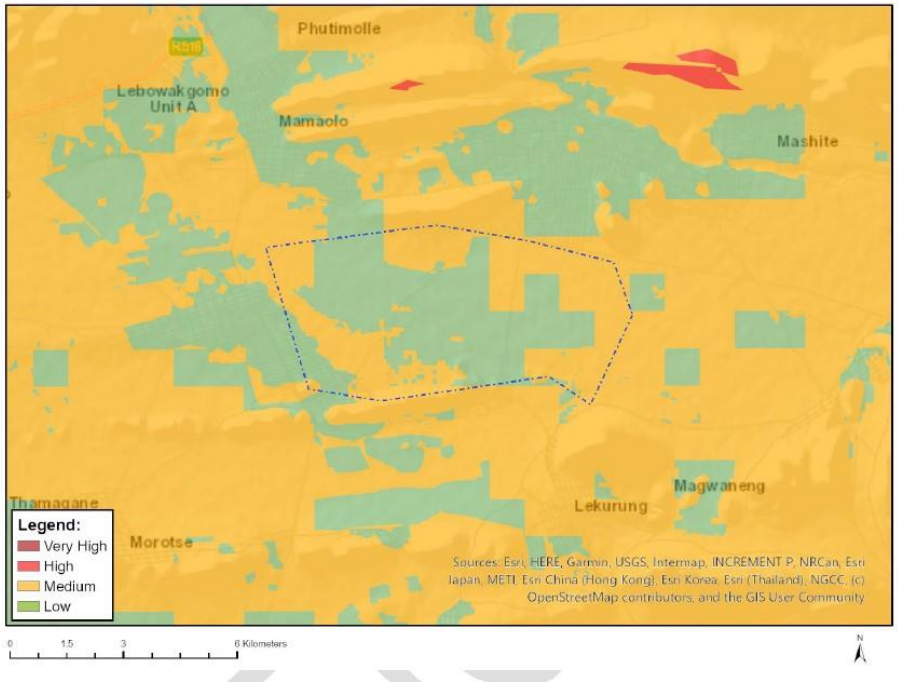



Figure 7. DFFE Screening Tool Output.

MAP OF RELATIVE TERRESTRIAL BIODIVERSITY THEME SENSITIVITY

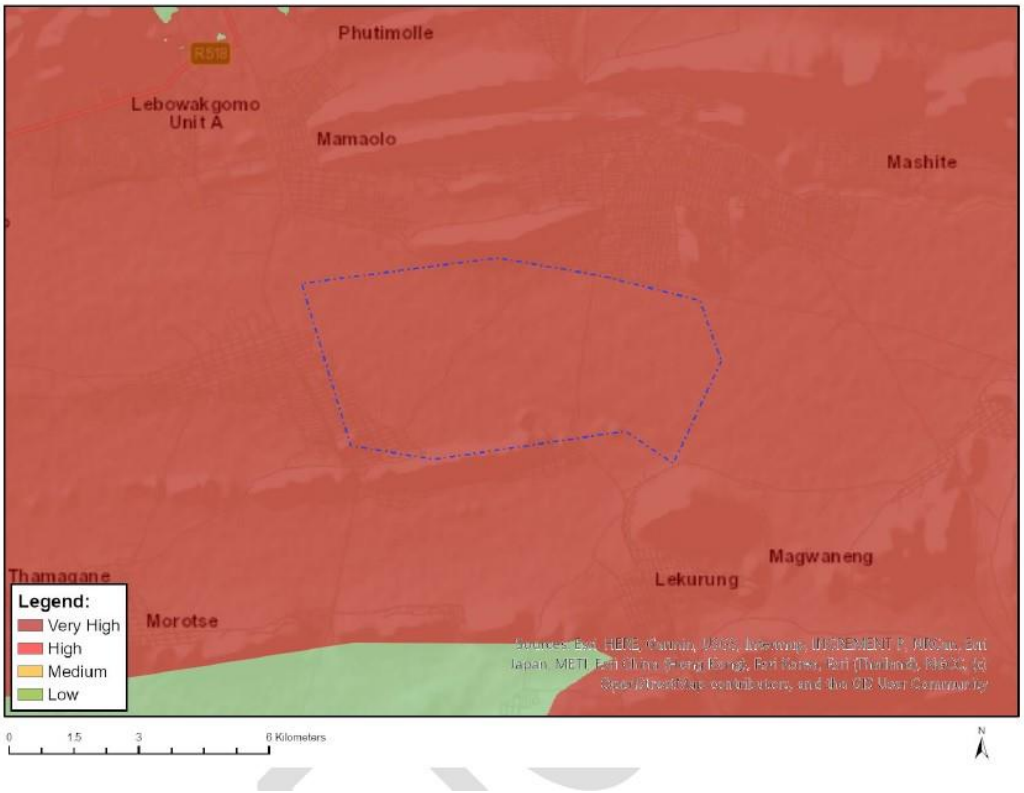



Figure 8. DFFE screening tool output.

# LEGAL FRAMEWORK RELATING TO FLORA SPECIES AND PROPOSED DEVELOPMENT

## International Law and Conventions

The importance of sustainable development and the protection of environmental resources have globally become a driving factor in the construction of new legislation governing industrial practices and their impact on the environment. South Africa has signed and ratified several global treaties, protocols, and conventions, agreeing to implement the policies, which endorse sustainable development and promote a positive environmental legacy for future generations. A considerable international convention to which South Africa agrees with in signatory is namely the Convention on Biological Diversity (CBD). The CBD is notably the key international convention for sustainable development. The CBD has three main objectives which lead and encourage a sustainable future. These are:

- The conservation of biological diversity.
- The sustainable use of its components; and
- The fair and equitable sharing of the benefits from the use of genetic resources.

The convention covers all possible domains that are directly or indirectly related to biodiversity and its role in development, ranging from science, politics and education to agriculture, business, and culture.

## South African Constitution

The foundation of South Africans Environmental law is set in the Constitution of the Republic of South Africa (1996), specifically “Chapter 2- The Bill of Rights: section 24”. This has allowed for the rapid development of environmentally based legislations which guard, enforce, and guide all parties to maintain the human rights granted in the Constitution. These rights include:

- 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 prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

## National Environmental Management Act (NEMA)

The National Environmental Management Act (NEMA), Act 107 of 1998 is the fundamental environmental legislation which aims to strengthen the rights granted in the South African Constitution. The NEMA Act is the foundation of environmental law in South Africa and has set the framework for additional legislation to build on. The Act establishes principles for decision-making on environmental matters, as well as providing motive for institutions which promote cooperative governance, and which can coordinate environmental action plans. Section 2(4) specifies that sustainable development requires the consideration of all relevant factors. In the regard to biodiversity and South Africa’s ecological integrity, development should not result in the disturbance of ecosystems and loss of biological diversity, if not possible, these effects must be minimised and remedied. A low-risk, cautious approach should always be applied, considering limits of current knowledge concerning consequences and actions. Always anticipate possible negative impacts on the environment and people's environmental rights, identified impacts should be prevented and where they

cannot be altogether prevented, are minimised, and mitigated. Outlined NEMA principles about biodiversity are to:

- Prevent pollution and ecological degradation.
- Promote conservation; and
- Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

## National Environmental Management of Biodiversity Act (NEMBA)

The National Environmental Management of Biodiversity Act (NEMBA) Act 10 of 2004 was designed to provide a management and conservation outline for biological diversity, as drafted under the NEMA. NEMBA focuses on the management and conservation of biodiversity, with its relevant components, which includes the use of indigenous biological resources in a sustainable manner, the fair and equitable sharing of benefits arising from bio-prospecting, cooperative governance in biodiversity management and conservation within the structures of NEMA. The Act, in protecting biodiversity, deals with the protection of threatened ecosystems and species, the control of alien invasive species, genetically modified organisms and regulates bio-prospecting. As with NEMA, NEMBA incorporates and gives effect to international agreements relating to biodiversity. The Act gives the Minister of Environmental Affairs, Forestry and Fisheries the power to categorise any process or activity in a listed ecosystem, as a threatening process, thereafter, be regarded as an activity contemplated in Section 24(2) (b) of NEMA which states that: Specified activities may not be commenced without prior authorisation from the Minister or MEC and specify such activities. NEMBA is the most prominent statute containing provisions directly aimed at the conservation of b with the Threatened or Protected Species Regulations, February 2007 (TOPS Regulations). The NEMBA Regulations on Threatened or Protected Species (TOPS, 2007) lists all the species that are threatened with extinction and therefore, nationally protected under an approach to sustainable use and development. Periodically, Red Data books are published, and the data used to update these lists of protected species.

Additionally, NEMBA regulates all invasive organisms in South Africa, including a wide range of fauna and flora. Chapter 5 of the Act relates to species and organisms posing a potential threat to biodiversity. The purpose of Chapter 5 is:

- To prevent the unauthorized introduction and spread of alien species and invasive species to ecosystems and habitats where they do not naturally occur.
- To manage and control alien species and invasive species to prevent or minimize harm to the environment and to biodiversity.
- To eradicate alien species and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats.

According to Section 65 of the Act, "Restricted activities involving alien species":

- A person may not carry out a restricted activity involving a specimen of an alien species without a permit issued in terms of Chapter 7.

Restricted activities include the following:

- Importing into the Republic, including introducing from the sea, any specimen of a listed invasive species.
- Having in possession or exercising physical control over any specimen of a listed invasive species.

- Growing, breeding or in any other way propagating any specimen of a listed invasive species or causing it to multiply.
- Conveying, moving, or otherwise translocating any specimen of a listed invasive species.
- Selling or otherwise trading in, buying, receiving, giving, donating, or accepting as a gift, or in any other way acquiring or disposing of any specimen of a listed invasive species.
- Spreading or allowing the spread of any specimen of a listed invasive species.
- Releasing any specimen of a listed invasive species.

## Conservation of Agricultural Resources Act (Act No. 43 of 1983)

In terms of the amendments to the regulations under this Act, landowners are legally responsible for the control of invasive alien plants on their properties. The schedules provide a list of declared weeds and invaders, which have been divided into three categories, as follows:

- Category 1 plants are prohibited and must be controlled.
- Category 2 plants (commercially used plants) may be grown in demarcated areas providing that there is a permit and that steps are taken to prevent their spread.
- Category 3 plants (ornamentally used plants) may no longer be planted; existing plants may remain, if all reasonable steps are taken to prevent the spreading there of, except within the flood line of watercourses and wetlands.

# METHODS

## Methodology

Prior to conducting field assessments, a comprehensive literature review, of available published and unpublished literature pertaining to the current use of the land and the potential environmental sensitivity was evaluated.

Part of desktop study included the retrieval of previously recorded plants in the area. This data was obtained from BRAHMS Online (SANBI). The species are listed under appendices.

The main objective of the flora assessment was to include every plant species with the slightest chance of occurring within the site in the species list. The following tasks were undertaken by MORA Ecological Services (Pty) Ltd to achieve the assessment objective:

**Flora**

- A visual inspection of the study area was done before surveys were conducted.
- During the process different homogenous vegetation units were identified and subsequently surveyed on foot and by vehicle to determine the floristic composition of each unit.
- A plotless sampling method was used to record data.
- Species identification was done following reputable checklists and field guides.
- Where necessary, plant material was collected and/or photographs taken of specimens for identification purposes.

**Fauna**

- Prior to the initial visit, satellite images (Google Earth) of the site were studied and the different habitat types identified (uniform features from an aerial perspective). The site was then verified upon arrival.
- Non-invasive walk transects were performed during the site assessment, documenting all animal sightings.
- Avifaunal surveys were conducted by means of walk transects and point count method. A 12-minute point count method on a 20 m radius was used (Macchi & Grau 2012).
- No formal consultation process was conducted as part of this faunal study as it was not deemed necessary at the time of the study.

The site visit was undertaken on the 20th of October 2024 to conduct necessary in-field procedures in assessing the vegetation and faunal composition and within the study area. The surveys were conducted by two senior fieldworkers. Surveys involved recording species encountered within the identified site.

# RESULTS OF THE ECOLOGICAL ASSESSMENT

Part of the study area has been mined and there are lot of stockpiles on site. Most area is disturbed by an existing mining, animal and stock farming. Land is used for crop farming, residential area and mining. There is an ongoing road construction close to site area and community dumping of rubbles in that area. There were alien trees observed on the terrestrial habitats and protected trees spotted on site, Shepherd tree &

Marula tree. Chueniesriver runs traverse the proposed mining area and should be protected during all phases.

Species recorded in the proposed development area are represented in Table 2.

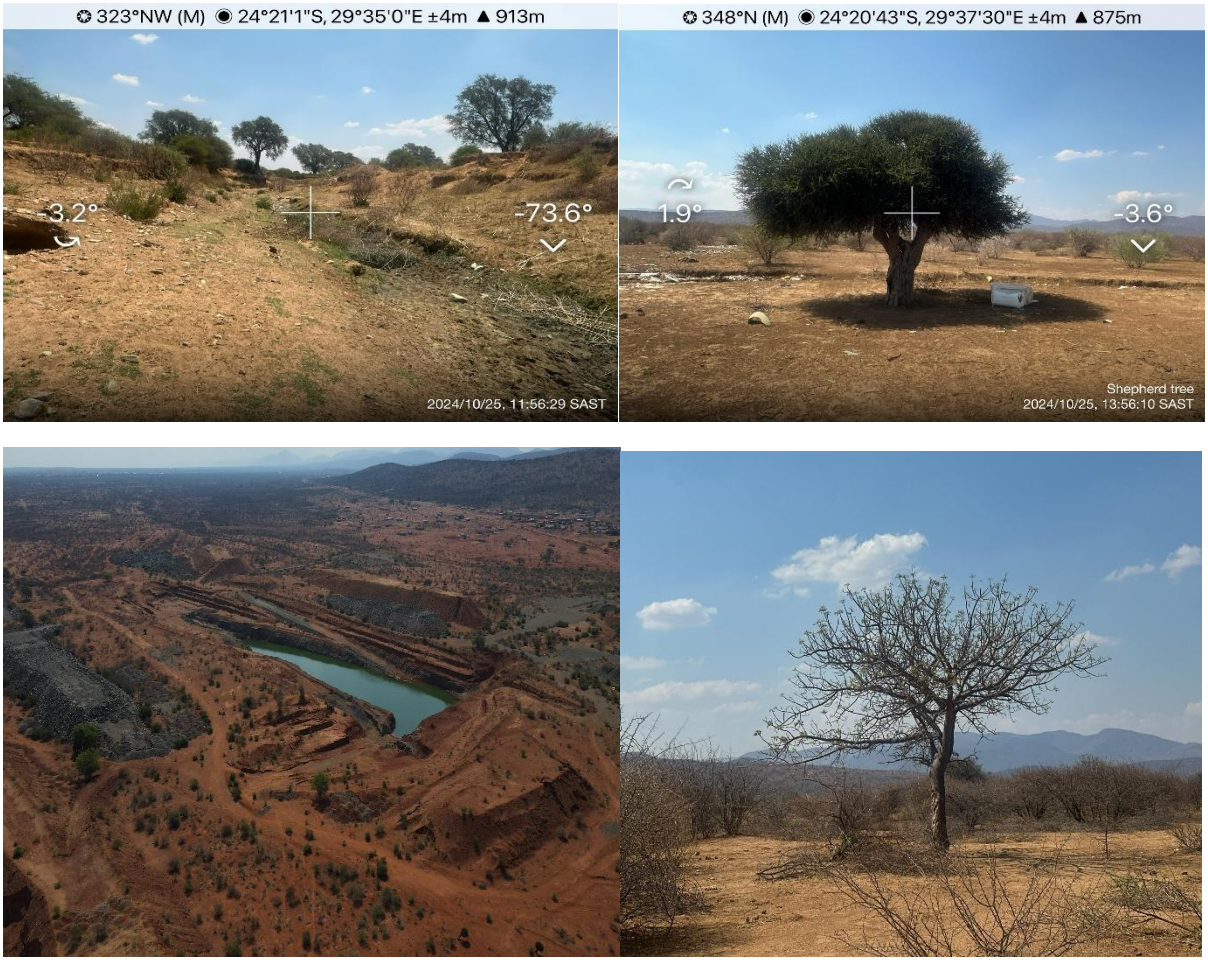



Figure 9. Photographic representation of the current site state.

**Invasive Alien Flora Species**

Invasive alien species are establishing and expanding in growing numbers globally. These invasions are often followed by major negative effects on ecosystems, the environment, and human health. Invasive alien species were encountered on site, the species is listed in Table 2 below gives a detailed description of the species.

Table 2. List of recorded invasive alien plants

| Common name | Scientific name | Growth form | NEMBA CATEGORY |
|---|---|---|---|
| Wild tobacco | *Nicotiana glauca* | Perennial shrub or small tree | Cat 1b |
| Blackjack | *Biden pilosa* | Perennial herb | Weed |
| Sweet prickly pear | *Opuntia ficus indica* | Succulent shrub | Cat 1b |

| | | | |
|---|---|---|---|
| Apple of sodom | *Solanum linnaeanum* | Shrub | Cat 1b |
| Pepper tree | *Schinus molle* | Medium to large evergreen tree | Cat 1b |
| Spiny cocklebur | *Xanthium spinosum* | Annual herb | Cat 1b |
| Mexican prickly poppy | *Argemone mexicana* | Herbaceous annual | Cat 1b |

Table 3. List of recorded indigenous trees

| Common name | Scientific name | Growth form | IUCN |
|---|---|---|---|
| Sweet thorn | *Acacia karoo* | Shrub to medium sized tree | LC |
| Smooth tinderwood | *Volkameria glabra* | Semi-deciduous small tree or shrub | LC |
| Shepherd tree | *Boscia albitrunca* | Small to medium-sized tree | LC (Natioally protected) |
| Umbrella thorn | *Acacia tortilis* | Small to medium-sized tree | LC |
| Mountain aloe | *Aloe marlothii* | Succulent plant | LC |
| Rhus karee | *Searsia pyroids var pyroids* | Deciduous shrub to medium-sized tree | LC |
| Hornpod tree | *Diplorhynchus condylocarpon* | Shrub or small decidous tree | LC |
| Sicklebush | *Dichrostachys cinera* | Decidous shrub or small tree | LC |
| Wild cotton | *Gossypium herbaceum subsp africanum* | Perennial shrub | LC |
| Anatree | *Faidherbia albida* | medium to large tree | LC |
| Mountain karee/Rock karee | *Searsia leptodictya* | Shrub or small tree | LC |
| Marula | *Sclerocarya birrea* | Medium to large deciduous tree | LC (Nationally protected) |
| Velvet raisin | *Grewia flava* | Shrub | LC |
| Peanut butter cassia | *Senna didymobotrya* | Shrub | Not Evaluated (SANBI) |
| Knobthorn | *Acacia nigrescense* | Deciduous tree | LC |
| Buffalo thorn | *Ziziphus mucronata* | Shrub to medium sized tree | LC |

Table 4.List of recorded birds

| Primary language | Tertiary language | English IOC | IUCN |
|---|---|---|---|
| White-browed Sparrow-Weaver | *Plocepasser mahali* | White-browed Sparrow-Weaver | LC |
| Crimson-breasted Shrike | *Laniarius atrococcineus* | Crimson-breasted Shrike | LC |
| Greater Double-collared Sunbird | *Cinnyris afer* | Greater Double-collared Sunbird | LC |
| Pied Crow | *Corvus albus* | Pied Crow | LC |
| Southern Masked Weaver | *Ploceus velatus* | Southern Masked Weaver | LC |
| White-fronted Bee-eater | *Merops bullockoides* | White-fronted Bee-eater | LC |

| | | | |
|---|---|---|---|
| Swift White-rumped | *Apus caffer* | Swift White-rumped | LC |
| Burchell's Coucal | *Centropus burchellii* | Burchell's Coucal | LC |
| Babbler Arrow-marked | *Turdoides jardineii* | Babbler Arrow-marked | LC |
| Brown-hooded Kingfisher | *Halcyon albiventris* | Brown-hooded Kingfisher | LC |
| Laughing Dove | *Spilopelia senegalensis* | Laughing Dove | LC |
| Myna Common | *Acridotheris tristis* | Myna Common | LC |
| Sparrow House | *Passer domesticus* | Sparrow House | LC |
| Stonechat African | *Saxicola torquatus* | Stonechat African | LC |
| African Hoopoe | *Upupa africana* | African Hoopoe | LC |
| Speckled Mousebird | *Colius striatus* | Speckled Mousebird | LC |

## IMPACT ASSESSMENT RATINGS AND MITIGATION REQUIREMENTS

The methodology is included as Appendix: Method of Environmental Assessment at the end of this report. The rating rankings for assessing impacts significance are as shown in Table 5 below. Table 6 & 7 is the impacts matrix used for scoring environmental significance and is a summary of impacts ratings for the proposed development using Appendix A.

Table 5. Impact rating scoring used for the impact assessment of the proposed development area.

| Points | Impact significance rating | Description |
|---|---|---|
| **6 to 28** | Negative low impact | The anticipated impact will have negligible negative effects and will require little to no mitigation. |
| **6 to 28** | Positive low impact | The anticipated impact will have minor positive effects. |
| **29 to 50** | Negative medium impact | The anticipated impact will have moderate negative effects and will require moderate mitigation measures. |
| **29 to 50** | Positive medium impact | The anticipated impact will have moderate positive effects. |
| **51 to 73** | Negative high impact | The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact. |
| **51 to 73** | Positive high impact | The anticipated impact will have significant positive effects. |
| **74 to 96** | Negative very high impact | The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws". |
| **74 to 96** | Positive very high impact | The anticipated impact will have highly significant positive effects. |

Table 6. Impact rating scoring used for the flora impact assessment at the proposed development area.

| **Construction Phase** | | |
|---|---|---|
| 1. **POTENTIAL IMPACT:** Vehicle movement and compaction of soil minimising plant growth of indigenous flora | | |
| • **MITIGATIONS**<br><br>**Essential mitigation measures for construction phase:** Vehicles should only use designated roadways to access the site. | | |
| | **Preferred Alternative** | |
| | **Rating Before Mitigation** | **Rating After Mitigation** |
| **Magnitude:** | 3 | 2 |
| **Duration:** | 2 | 1 |
| **Geographical Extent:** | 1 | 1 |
| **Loss of Resources:** | 3 | 2 |
| **Reversibility:** | 2 | 2 |
| **Cumulative Effect:** | 2 | 1 |
| **Probability:** | 2 | 1 |
| **Total SP:** | 36 | 16 |
| **Significance rating:** | Negative medium impact | Negative low impact |
| 2. **POTENTIAL IMPACT:** Alteration of natural environment and habitat loss | | |
| • **MITIGATIONS**<br><br>**Essential mitigation measures for construction phase:** Have a biodiversity protocol and rehabilitation plan in place that will be implemented upon closure. | | |
| | **Preferred Alternative** | |
| | **Rating Before Mitigation** | **Rating After Mitigation** |
| **Magnitude:** | 3 | 2 |
| **Duration:** | 2 | 1 |
| **Geographical Extent:** | 1 | 1 |
| **Loss of Resources:** | 2 | 1 |
| **Reversibility:** | 3 | 2 |
| **Cumulative Effect:** | 2 | 1 |
| **Probability:** | 2 | 2 |
| **Total SP:** | 33 | 16 |
| **Significance rating:** | Negative medium impact | Negative low impact |

3. **POTENTIAL IMPACT:** Spreading of invasive alien plants. The altered environment will also favour species that are better adapted to disturbed/transformed areas.

- **MITIGATIONS**

**Essential mitigation measures for construction phase:** Invasive plant material should be disposed by incineration, or alternatively, composting to break down seeds. If seedbank persists, invasive alien plant management and eradication measures should be implemented.

| | **Preferred Alternative** | |
|---|---|---|
| | **Rating Before Mitigation** | **Rating After Mitigation** |
| **Magnitude:** | 3 | 2 |
| **Duration:** | 2 | 1 |
| **Geographical Extent:** | 2 | 1 |
| **Loss of Resources:** | 3 | 2 |
| **Reversibility:** | 3 | 2 |
| **Cumulative Effect:** | 3 | 2 |
| **Probability:** | 3 | 2 |
| **Total SP:** | 48 | 20 |
| **Significance rating:** | Negative medium impact | Negative low impact |

**Operation Phase**

1. **POTENTIAL IMPACT:** Vehicle movement and compaction of soil minimising plant growth of indigenous flora.

- **MITIGATIONS**

**Essential mitigation measures for operational phase:** Vehicles should only use designated roadways to access the site.

| | **Preferred Alternative** | |
|---|---|---|
| | **Rating Before Mitigation** | **Rating After Mitigation** |
| **Magnitude:** | 3 | 2 |
| **Duration:** | 2 | 1 |
| **Geographical Extent:** | 1 | 1 |
| **Loss of Resources:** | 3 | 2 |
| **Reversibility:** | 3 | 2 |
| **Cumulative Effect:** | 2 | 1 |
| **Probability:** | 2 | 2 |
| **Total SP:** | 39 | 18 |

| | | |
|---|---|---|
| **Significance rating:** | Negative medium impact | Negative low impact |

2. **POTENTIAL IMPACT:** Long-term or permanent degradation and modification of the receiving environment due to uncontrolled construction activities and poor rehabilitation.

- **MITIGATIONS**

**Essential mitigation measures for decommissioning phase:** The ecological footprint of the proposed development should be restricted to the approved (less sensitive) area. Areas outside the area of the proposed development should not be cleared.

| | **Preferred Alternative** | |
|---|---|---|
| | **Rating Before Mitigation** | **Rating After Mitigation** |
| **Magnitude:** | 3 | 2 |
| **Duration:** | 2 | 1 |
| **Geographical Extent:** | 1 | 1 |
| **Loss of Resources:** | 2 | 1 |
| **Reversibility:** | 2 | 1 |
| **Cumulative Effect:** | 3 | 2 |
| **Probability:** | 3 | 2 |
| **Total SP:** | 39 | 16 |
| **Significance rating:** | Negative medium impact | Negative low impact |

Table 7. Animal species composition impact ratings for the proposed development area.

| **Construction Phase** | | |
|---|---|---|
| 1. **POTENTIAL IMPACT:** Loss of priority fauna species from important habits. | | |
| • **MITIGATIONS**<br>**Essen Reserves indigenous vegetation wherever possible.** Avoid vegetation clearance during the breeding essentials mitigation measures for construction phase: | | |
| | **Preferred Alternative** | |
| | **Rating Before Mitigation** | **Rating After Mitigation** |
| **Magnitude:** | 3 | 2 |
| **Duration:** | 3 | 2 |

| | | |
|---|---|---|
| **Geographical Extent:** | 2 | 1 |
| **Loss of Resources:** | 2 | 2 |
| **Reversibility:** | 3 | 2 |
| **Cumulative Effect:** | 3 | 2 |
| **Probability:** | 3 | 2 |
| **Total SP:** | 48 | 22 |
| **Significance rating:** | Negative medium impact | Negative low impact |

2. **POTENTIAL IMPACT:** Loss of resident fauna through increased disturbance

- **MITIGATIONS**

**Essential mitigation measures for construction phase:** Invasive plant material should be disposed by incineration, or alternatively, composting to break down seeds. If seedbank persists, invasive alien plant management and eradication measures should be implemented.

| | **Preferred Alternative** | |
|---|---|---|
| | **Rating Before Mitigation** | **Rating After Mitigation** |
| **Magnitude:** | 3 | 2 |
| **Duration:** | 2 | 1 |
| **Geographical Extent:** | 2 | 1 |
| **Loss of Resources:** | 2 | 2 |
| **Reversibility:** | 3 | 2 |
| **Cumulative Effect:** | 3 | 2 |
| **Probability:** | 3 | 2 |
| **Total SP:** | 45 | 20 |
| **Significance rating:** | Negative medium impact | Negative low impact |

3. **POTENTIAL IMPACT:** Long-term or permanent degradation and modification of the receiving environment resulting to the loss of important habitats.

- **MITIGATIONS**

**Essential mitigation measures for construction phase:** Have a biodiversity protocol and rehabilitation plan to mitigate long-term, or permanent degradation.

Use designated roads to access the site. Rehabilitate unused areas with indigenous flora.

| | **Preferred Alternative** | |
|---|---|---|
| | **Rating Before Mitigation** | **Rating After Mitigation** |
| **Magnitude:** | 3 | 2 |
| **Duration:** | 2 | 1 |
| **Geographical Extent:** | 2 | 1 |
| **Loss of Resources:** | 3 | 2 |
| **Reversibility:** | 3 | 2 |
| **Cumulative Effect:** | 2 | 1 |
| **Probability:** | 2 | 2 |
| **Total SP:** | 42 | 18 |
| **Significance rating:** | Negative medium impact | Negative low impact |

**Operation Phase**

1. **POTENTIAL IMPACT:** Long-term or permanent degradation and modification of the receiving environment resulting to the loss of important habitats for fauna species.

- **MITIGATIONS**

**Essential mitigation measures for operational phase:** Reserve indigenous vegetation wherever possible.

| | **Preferred Alternative** | |
|---|---|---|
| | **Rating Before Mitigation** | **Rating After Mitigation** |
| **Magnitude:** | 3 | 2 |
| **Duration:** | 2 | 2 |
| **Geographical Extent:** | 2 | 1 |

| | | |
|---|---|---|
| **Loss of Resources:** | 3 | 2 |
| **Reversibility:** | 2 | 2 |
| **Cumulative Effect:** | 2 | 1 |
| **Probability:** | 3 | 2 |
| **Total SP:** | 42 | 20 |
| **Significance rating:** | Negative medium impact | Negative low impact |

**2. POTENTIAL IMPACT:** Loss of resident fauna through increased disturbance.

- **MITIGATIONS**

**Essential mitigation measures for operation phase:** Reserve indigenous vegetation wherever possible. Avoid vegetation clearance during the breeding season. No hunting of fauna is allowed.

| | **Preferred Alternative** | |
|---|---|---|
| | **Rating Before Mitigation** | **Rating After Mitigation** |
| **Magnitude:** | 3 | 2 |
| **Duration:** | 2 | 1 |
| **Geographical Extent:** | 2 | 1 |
| **Loss of Resources:** | 3 | 2 |
| **Reversibility:** | 2 | 2 |
| **Cumulative Effect:** | 3 | 2 |
| **Probability:** | 3 | 2 |
| **Total SP:** | 45 | 20 |
| **Significance rating:** | Negative medium impact | Negative low impact |

## NO-GO AREAS, BUFFERS, AND ALTERNATIVES

No-go areas are applicable to the project site from an ecological perspective. These include the watercourse and areas with protected trees. Should the proposed activity not proceed, due to other specialist studies, the site will remain unchanged.

No other possible sites were identified on the affected site for the developments.

## CONCLUSION AND RECOMMENDATIONS

Although the DFFE screening tool report classifies the site as having medium faunal and medium floral sensitivity, the on-site assessment revealed that the site is of low to medium sensitivity for both themes. ***Sclerocarya birrea*** and ***Boscia albitrunca*** are nationally protected and were identified during site inspection.

Important recommendations for the conservation of the current vegetation structure

- The proponent must be committed to a conservation approach of practice and the actual footprint of disturbance must be kept to a minimum.
- Watercourses should be avoided during all the phases of the construction. Relevant buffers will be obtained from the flood line or aquatic studies.
- As much of the natural environment must be conserved, there should be minimal vegetation clearing.
- Relocation of important species, identification and demarcation of specimens and sub habitats not to be disturbed will have to be done beforehand by a specialist.
- Important species (flora) that will be threatened by the development must be relocated to safer habitats by suitable specialists.
- Preventative erosion control measures to be put in place.
- Conduct alien invasive species monitoring on an annual basis.

Important recommendations for the invasive alien plants

The identified alien plants should be eradicated during operational phase. An alien management plan should be compiled by an Ecologist. The applicant can implement the alien management plan with the guide of an Ecologist.

Specific conditions recommended for the EA from a flora and vegetation perspective.

1. Implement mitigation controls during the construction phase as specified in the mitigation requirements. Monitor and report on their effectiveness.

2. Implement mitigation controls during the operational phase as specified in the mitigation. Monitor and report on their effectiveness.

3. Monitoring of implementation of mitigation controls, especially of invasive alien plants.

4. Effective restoration of the natural habitats that were intact before the development should be implemented and reported on upon completion of construction activities.

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# APPENDICES

## Appendix A: Method of Environmental Assessment

### METHOD OF ENVIRONMENTAL ASSESSMENT

The environmental assessment aims to identify the various possible environmental impacts that could results from the proposed activity. Different impacts need to be evaluated in terms of its significance and in doing so highlight the most critical issues to be addressed.

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e., site, local, national, or global whereas intensity is defined by the severity of the impact e.g., the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

### 1.1.1 Impact Rating System

Impact assessment must take account of the nature, scale, and duration of impacts on the environment whether such impacts are positive or negative. Each impact is also assessed according to the project phases:

- Planning
- Construction
- Operation
- Decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance should also be included. The rating system is applied to the potential impacts on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each impact, the following criteria is used:

Table 8. The rating system

| | | |
|---|---|---|
| **NATURE** | | |
| Include a brief description of the impact of the environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted by a particular action or activity. | | |
| **GEOGRAPHICAL EXTENT** | | |
| This is defined as the area over which the impact will be experienced. | | |
| 1 | Site | The impact will only affect the site. |
| 2 | Local/district | Will affect the local area or district. |
| 3 | Province/region | Will affect the entire province or region. |
| 4 | International and National | Will affect the entire country. |
| **PROBABILITY** | | |
| This describes the chance of occurrence of an impact. | | |
| 1 | Unlikely | The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence). |
| 2 | Possible | The impact may occur (Between a 25% to 50% chance of occurrence). |
| 3 | Probable | The impact will likely occur (Between a 50% to 75% chance of occurrence). |
| 4 | Definite | Impact will certainly occur (Greater than a 75% chance of occurrence). |
| **DURATION** | | |
| This describes the duration of the impacts. Duration indicates the lifetime of the impact because of the proposed activity. | | |
| 1 | Short term | The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years). |
| 2 | Medium term | The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years). |

| | | |
|---|---|---|
| 3 | Long term | The impact and its effects will continue or last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years). |
| 4 | Permanent | The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite. |
| **INTENSITY/ MAGNITUDE** | | |
| Describes the severity of an impact. | | |
| 1 | Low | Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible. |
| 2 | Medium | Impact alters the quality, use and integrity of the system/component but system/component continues to function in a moderately modified way and maintains general integrity (some impact on integrity). |
| 3 | High | Impact affects the continued viability of the system/ component, and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation. |
| 4 | Very high | Impact affects the continued viability of the system/component, and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible, rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation. |
| **REVERSIBILITY** | | |
| This describes the degree to which an impact can be successfully reversed upon completion of the proposed activity. | | |
| 1 | Completely reversible | The impact is reversible with implementation of minor mitigation measures. |
| 2 | Partly reversible | The impact is partly reversible but more intense mitigation measures are required. |
| 3 | Barely reversible | The impact is unlikely to be reversed even with intense mitigation measures. |

| | | |
|---|---|---|
| 4 | Irreversible | The impact is irreversible, and no mitigation measures exist. |
| **IRREPLACEABLE LOSS OF RESOURCES** | | |
| This describes the degree to which resources will be irreplaceably lost because of a proposed activity. | | |
| 1 | No loss of resource | The impact will not result in the loss of any resources. |
| 2 | Marginal loss of resource | The impact will result in marginal loss of resources. |
| 3 | Significant loss of resources | The impact will result in significant loss of resources. |
| 4 | Complete loss of resources | The impact is result in a complete loss of all resources. |
| **CUMULATIVE EFFECT** | | |
| This describes the cumulative effect of the impacts. A cumulative impact is an effect which may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question. | | |
| 1 | Negligible cumulative impact | The impact would result in negligible to no cumulative effects. |
| 2 | Low cumulative impact | The impact would result in insignificant cumulative effects. |
| 3 | Medium cumulative impact | The impact would result in minor cumulative effects. |
| 4 | High cumulative impact | The impact would result in significant cumulative effects |
| **SIGNIFICANCE** | | |
| Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula: (Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.<br><br>The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating. | | |
| Points | Impact significance rating | Description |
| 6 to 28 | Negative low impact | The anticipated impact will have negligible negative effects and will require little to no mitigation. |
| 6 to 28 | Positive low impact | The anticipated impact will have minor positive effects. |

| | | |
|---|---|---|
| 29 to 50 | Negative medium impact | The anticipated impact will have moderate negative effects and will require moderate mitigation measures. |
| 29 to 50 | Positive medium impact | The anticipated impact will have moderate positive effects. |
| 51 to 73 | Negative high impact | The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact. |
| 51 to 73 | Positive high impact | The anticipated impact will have significant positive effects. |
| 74 to 96 | Negative very high impact | The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws". |
| 74 to 96 | Positive very high impact | The anticipated impact will have highly significant positive effects. |

## Appendix B: Historical mammal species records from the broader study area.

| # | Family | Scientific name | Common name | Red list |
|---|---|---|---|---|
| 1 | Bovidae | Aepyceros melampus | Impala | Least Concern |
| 2 | Bovidae | Alcelaphus buselaphus | Hartebeest | |
| 3 | Bovidae | Kobus ellipsiprymnus ellipsiprymnus | | Least Concern (2016) |
| 4 | Bovidae | Oreotragus oreotragus | Klipspringer | Least Concern (2016) |
| 5 | Bovidae | Sylvicapra grimmia | Bush Duiker | Least Concern (2016) |
| 6 | Bovidae | Tragelaphus strepsiceros | Greater Kudu | Least Concern (2016) |
| 7 | Felidae | Panthera pardus | Leopard | Vulnerable (2016) |
| 8 | Giraffidae | Giraffa giraffa giraffa | South African Giraffe | Least Concern (2016) |
| 9 | Macroscelididae | Elephantulus myurus | Eastern Rock Elephant Shrew | Least Concern (2016) |
| 10 | Muridae | Gerbilliscus leucogaster | Bushveld Gerbil | Least Concern (2016) |
| 11 | Muridae | Rattus rattus | Roof Rat | Least Concern |
| 12 | Mustelidae | Mellivora capensis | Honey Badger | Least Concern (2016) |
| 13 | Rhinolophidae | Rhinolophus smithersi | Smithers' Horseshoe Bat | Near Threatened (2016) |

## Appendix C: Historical amphibian species records from the broader study area.

| # | Family | Scientific name | Common name | Red list |
|---|---|---|---|---|
| 1 | Brevicipitidae | *Breviceps adspersus* | Bushveld Rain Frog | Least Concern |
| 2 | Bufonidae | *Schismaderma carens* | Red Toad | Least Concern |
| 3 | Bufonidae | *Sclerophrys garmani* | Olive Toad | Least Concern (IUCN, 2016) |
| 4 | Bufonidae | *Sclerophrys gutturalis* | Guttural Toad | Least Concern (IUCN, 2016) |
| 5 | Hyperoliidae | *Kassina senegalensis* | Bubbling Kassina | Least Concern |
| 6 | Microhylidae | *Phrynomantis bifasciatus* | Banded Rubber Frog | Least Concern |
| 7 | Phrynobatrachidae | *Phrynobatrachus natalensis* | Snoring Puddle Frog | Least Concern (IUCN, 2013) |
| 8 | Pipidae | *Xenopus laevis* | Common Platanna | Least Concern (IUCN 2020) |
| 9 | Pyxicephalidae | *Amietia delalandii* | Delalande's River Frog | Least Concern (2017) |
| 10 | Pyxicephalidae | *Tomopterna cryptotis* | Tremelo Sand Frog | Least Concern (IUCN 2016) |
| 11 | Pyxicephalidae | *Tomopterna natalensis* | Natal Sand Frog | Least Concern (IUCN 2013) |

## Appendix D: Historical reptiles species records from the broader study area.

| # | Family | Scientific name | Common name | Red list |
|---|---|---|---|---|
| 1 | Agamidae | Agama aculeata distanti | Distant's Ground Agama | Least Concern (SARCA 2014) |
| 2 | Chamaeleonidae | Chamaeleo dilepis | Common Flap-neck Chameleon | Least Concern (SARCA 2014) |
| 3 | Cordylidae | Platysaurus orientalis fitzsimonsi | FitzSimons' Flat Lizard | Near Threatened (SARCA 2014) |
| 4 | Cordylidae | Platysaurus orientalis orientalis | Sekhukhune Flat Lizard | Least Concern (SARCA 2014) |
| 5 | Cordylidae | Smaug vandami | Van Dam's Girdled Lizard | Least Concern (SARCA 2014) |
| 6 | Gekkonidae | Lygodactylus capensis | Common Dwarf Gecko | Least Concern (SARCA 2014) |
| 7 | Gerrhosauridae | Gerrhosaurus flavigularis | Yellow-throated Plated Lizard | Least Concern (SARCA 2014) |
| 8 | Gerrhosauridae | Matobosaurus validus | Common Giant Plated Lizard | Least Concern (SARCA 2014) |
| 9 | Lacertidae | Heliobolus lugubris | Bushveld Lizard | Least Concern (SARCA 2014) |
| 10 | Lacertidae | Pedioplanis lineoocellata lineoocellata | Spotted Sand Lizard | Least Concern (SARCA 2014) |
| 11 | Lamprophiidae | Psammophis brevirostris | Short-snouted Grass Snake | Least Concern (SARCA 2014) |
| 12 | Pelomedusidae | Pelomedusa subrufa | Central Marsh Terrapin | Least Concern (SARCA 2014) |
| 13 | Pelomedusidae | Pelusios sinuatus | Serrated Hinged Terrapin | Least Concern (SARCA 2014) |

| | | | | |
|---|---|---|---|---|
| 14 | Scincidae | Trachylepis margaritifera | Rainbow Skink | Least Concern (SARCA 2014) |
| 15 | Scincidae | Trachylepis varia sensu lato | Common Variable Skink Complex | Least Concern (SARCA 2014) |
| 16 | Testudinidae | Kinixys lobatsiana | Lobatse Hinged Tortoise | Least Concern (SARCA 2014) |
| 17 | Testudinidae | Kinixys zombensis | Eastern Hinged Tortoise | Least Concern (SARCA 2014) |
| 18 | Testudinidae | Psammobates oculifer | Serrated Tent Tortoise | Least Concern (SARCA 2014) |
| 19 | Testudinidae | Stigmochelys pardalis | Leopard Tortoise | Least Concern (SARCA 2014) |

## Appendix E: Historical Data for Avifaunal Species

| Common_group | Common_species | Genus | Species |
|---|---|---|---|
| | Hamerkop | Scopus | umbretta |
| Apalis | Yellow-breasted | Apalis | flavida |
| Barbet | Acacia Pied | Tricholaema | leucomelas |
| Barbet | Crested | Trachyphonus | vaillantii |
| Batis | Chinspot | Batis | molitor |
| Bee-eater | European | Merops | apiaster |
| Bee-eater | Little | Merops | pusillus |
| Bee-eater | White-fronted | Merops | bullockoides |
| Boubou | Southern | Laniarius | ferrugineus |
| Bulbul | Dark-capped | Pycnonotus | tricolor |
| Bunting | Cinnamon-breasted | Emberiza | tahapisi |
| Bunting | Golden-breasted | Emberiza | flaviventris |
| Camaroptera | Grey-backed | Camaroptera | brevicaudata |
| Canary | Yellow-fronted | Crithagra | mozambica |
| Cisticola | Rattling | Cisticola | chiniana |
| Crombec | Long-billed | Sylvietta | rufescens |
| Crow | Pied | Corvus | albus |
| Cuckoo | Black | Cuculus | clamosus |
| Cuckoo | Diederik | Chrysococcyx | caprius |
| Cuckoo | Klaas's | Chrysococcyx | klaas |
| Cuckoo | Red-chested | Cuculus | solitarius |
| Dove | Laughing | Spilopelia | senegalensis |
| Dove | Namaqua | Oena | capensis |
| Dove | Red-eyed | Streptopelia | semitorquata |
| Dove | Ring-necked | Streptopelia | capicola |
| Dove | Rock | Columba | livia |
| Drongo | Fork-tailed | Dicrurus | adsimilis |
| Egret | Western Cattle | Bubulcus | ibis |

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|---|---|---|---|
| Fiscal | Southern | Lanius | collaris |
| Flycatcher | African Paradise | Terpsiphone | viridis |
| Flycatcher | Marico | Melaenornis | mariquensis |
| Flycatcher | Spotted | Muscicapa | striata |
| Greenbul | Sombre | Andropadus | importunus |
| Greenbul | Yellow-bellied | Chlorocichla | flaviventris |
| House Martin | Common | Delichon | urbicum |
| Kestrel | Rock | Falco | rupicolus |
| Kingfisher | Brown-hooded | Halcyon | albiventris |
| Kite | Yellow-billed | Milvus | aegyptius |
| Lark | Sabota | Calendulauda | sabota |
| Mousebird | Red-faced | Urocolius | indicus |
| Mousebird | Speckled | Colius | striatus |
| Myna | Common | Acridotheres | tristis |
| Pigeon | Speckled | Columba | guinea |
| Plover | Three-banded | Charadrius | tricollaris |
| Prinia | Black-chested | Prinia | flavicans |
| Prinia | Tawny-flanked | Prinia | subflava |
| Puffback | Black-backed | Dryoscopus | cubla |
| Pytilia | Green-winged | Pytilia | melba |
| Quelea | Red-billed | Quelea | quelea |
| Sandpiper | Wood | Tringa | glareola |
| Scrub Robin | White-browed | Cercotrichas | leucophrys |
| Seedeater | Streaky-headed | Crithagra | gularis |
| Shrike | Red-backed | Lanius | collurio |
| Sparrow | Cape | Passer | melanurus |
| Sparrow | House | Passer | domesticus |
| Sparrow | Southern Grey-headed | Passer | diffusus |
| Sparrow-Weaver | White-browed | Plocepasser | mahali |
| Starling | Cape | Lamprotornis | nitens |
| Starling | Red-winged | Onychognathus | morio |
| Stork | Abdim's | Ciconia | abdimii |
| Sunbird | Marico | Cinnyris | mariquensis |
| Sunbird | White-bellied | Cinnyris | talatala |
| Swallow | Barn | Hirundo | rustica |
| Swallow | Lesser Striped | Cecropis | abyssinica |
| Swallow | Red-breasted | Cecropis | semirufa |
| Swift | African Palm | Cypsiurus | parvus |
| Swift | White-rumped | Apus | caffer |
| Thrush | Kurrichane | Turdus | libonyana |
| Tinkerbird | Yellow-fronted | Pogoniulus | chrysoconus |

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|---|---|---|---|
| Tit | Southern Black | Melaniparus | niger |
| Vulture | Cape | Gyps | coprotheres |
| Warbler | Chestnut-vented | Curruca | subcoerulea |
| Warbler | Willow | Phylloscopus | trochilus |
| Waxbill | Blue | Uraeginthus | angolensis |
| Weaver | Scaly-feathered | Sporopipes | squamifrons |
| Weaver | Southern Masked | Ploceus | velatus |
| Whydah | Long-tailed Paradise | Vidua | paradisaea |
| Wood-Dove | Emerald-spotted | Turtur | chalcospilos |

## Appendix F: Historical Data for Tree species.

| Family | Genus | Sp1 | Author1 |
|---|---|---|---|
| Lobeliaceae | Lobelia | *erinus* | L. |
| Asteraceae | Psiadia | *punctulata* | (DC.) Vatke |
| Fabaceae | Schotia | *brachypetala* | Sond. |
| Malvaceae | Sterculia | *rogersii* | N.E.Br. |
| Asphodelaceae | Aloe | *longibracteata* | Pole-Evans |
| Malvaceae | Hermannia | *modesta* | (Ehrenb.) Mast. |
| Combretaceae | Combretum | *zeyheri* | Sond. |
| Apocynaceae | Ceropegia | *stapeliiformis* | Haw. |
| Apocynaceae | Gomphocarpus | *fruticosus* | (L.) W.T.Aiton |
| Capparaceae | Maerua | *angolensis* | DC. |
| Asphodelaceae | Aloe | *greatheadii* | Schonland |
| Malpighiaceae | Triaspis | *hypericoides* | (DC.) Burch. |
| Commelinaceae | Aneilema | *longirrhizum* | Faden |
| Malvaceae | Grewia | *subspathulata* | N.E.Br. |
| Apocynaceae | Ceropegia | *ampliata* | E.Mey. |
| Burseraceae | Commiphora | *viminea* | Burtt Davy |
| Burseraceae | Commiphora | *africana* | (A.Rich.) Engl. |
| Apocynaceae | Fockea | *angustifolia* | K.Schum. |
| Malvaceae | Melhania | *forbesii* | Planch. ex Mast. |
| Burseraceae | Commiphora | *marlothii* | Engl. |
| Cleomaceae | Cleome | *angustifolia* | Forssk. |
| Malvaceae | Grewia | *vernicosa* | Schinz |
| Lamiaceae | Karomia | *speciosa* | (Hutch. & Corbishley) R.Fern. |
| Araceae | Stylochaeton | *natalensis* | Schott |
| Acanthaceae | Dyschoriste | *fischeri* | Lindau |
| Asteraceae | Senecio | *inaequidens* | DC. |
| Corsiniaceae | Exormotheca | *holstii* | Steph. |

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|---|---|---|---|
| Santalaceae | Viscum | *verrucosum* | Harv. |
| Passifloraceae | Adenia | *spinosa* | Burtt Davy |
| Asphodelaceae | Aloe | *globuligemma* | Pole-Evans |
| Malvaceae | Hibiscus | *mastersianus* | Hiern |
| Euphorbiaceae | Croton | *sylvaticus* | Hochst. |
| Agavaceae | Chlorophytum | *bowkeri* | Baker |
| Euphorbiaceae | Euphorbia | *tirucalli* | L. |
| Fabaceae | Senegalia | *senegal* | (L.) Britton |
| Pedaliaceae | Ceratotheca | *triloba* | (Bernh.) Hook.f. |
| Asteraceae | Lopholaena | *coriifolia* | (Sond.) E.Phillips & C.A.Sm. |
| Bignoniaceae | Kigelia | *africana* | (Lam.) Benth. |
| Apocynaceae | Orbea | *tapscottii* | (I.Verd.) L.C.Leach |
| Pottiaceae | Pseudocrossidium | *porphyreoneurum* | (Mull.Hal.) R.H.Zander |
| Capparaceae | Maerua | *parvifolia* | Pax |
| Asphodelaceae | Aloe | *pienaarii* | Pole-Evans |
| Kirkiaceae | Kirkia | *wilmsii* | Engl. |
| Poaceae | Rendlia | *altera* | (Rendle) Chiov. |
| Fabaceae | Melolobium | *canescens* | Benth. |
| Apocynaceae | Stomatostemma | *monteiroae* | (Oliv.) N.E.Br. |
| Asphodelaceae | Aloe | *zebrina* | Baker |
| Cucurbitaceae | Coccinia | *rehmannii* | Cogn. |
| Apocynaceae | Ceropegia | *multiflora* | Baker |
| Combretaceae | Combretum | *erythrophyllum* | (Burch.) Sond. |
| Thymelaeaceae | Lasiosiphon | *splendens* | (Meisn.) Endl. |
| Asphodelaceae | Aloe | *affinis* | A.Berger |
| Crassulaceae | Cotyledon | *barbeyi* | Schweinf. ex Baker |
| Apocynaceae | Orthanthera | *jasminiflora* | (Decne.) Schinz |
| Fabaceae | Senegalia | *caffra* | (Thunb.) P.J.H.Hurter & Mabb. |
| Passifloraceae | Adenia | *fruticosa* | Burtt Davy |
| Burseraceae | Commiphora | *mollis* | (Oliv.) Engl. |
| Malvaceae | Pavonia | *transvaalensis* | (Ulbr.) A.Meeuse |
| Apocynaceae | Tavaresia | *barklyi* | (Dyer) N.E.Br. |
| Fabaceae | Vachellia | *gerrardii* | (Benth.) P.J.H.Hurter |
| Amaryllidaceae | Ammocharis | *coranica* | (Ker Gawl.) Herb. |
| Fabaceae | Elephantorrhiza | *burkei* | Benth. |
| Acanthaceae | Ruellia | *malacophylla* | C.B.Clarke |
| Asphodelaceae | Aloe | *wickensii* | Pole-Evans |
| Euphorbiaceae | Croton | *menyharthii* | Pax |
| Velloziaceae | Xerophyta | *schlechteri* | (Baker) N.L.Menezes |

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|---|---|---|---|
| Moraceae | Ficus | *thonningii* | Blume |
| Asphodelaceae | Aloe | *wickensii* | Pole-Evans |
| Asphodelaceae | Aloe | *aculeata* | Pole-Evans |
| Celastraceae | Maytenus | *undata* | (Thunb.) Blakelock |
| Anacardiaceae | Searsia | *leptodictya* | (Diels) T.S.Yi, A.J.Mill. & J.Wen |
| Lamiaceae | Plectranthus | *xerophilus* | Codd |
| Cleomaceae | Cleome | *hirta* | (Klotzsch) Oliv. |
| Asphodelaceae | Aloe | *mutans* | Reynolds |
| Capparaceae | Boscia | *foetida* | Schinz |
| Asteraceae | Kleinia | *stapeliiformis* | (E.Phillips) Stapf |
| Solanaceae | Solanum | *tettense* | Klotzsch |
| Celastraceae | Lydenburgia | *cassinoides* | N.Robson |
| Euphorbiaceae | Euphorbia | *enormis* | N.E.Br. |
| Didiereaceae | Portulacaria | *afra* | Jacq. |
| Euphorbiaceae | Croton | *gratissimus* | Burch. |
| Asteraceae | Senecio | *madagascariensis* | Poir. |
| Malvaceae | Melhania | *transvaalensis* | Szyszyl. |
| Vitaceae | Cyphostemma | *subciliatum* | (Baker) Desc. ex Wild & R.B.Drumm. |
| Anacardiaceae | Searsia | *keetii* | (Schonland) Moffett |
| Fabaceae | Senegalia | *ataxacantha* | (DC.) Kyal. & Boatwr. |
| Asteraceae | Aster | *nubimontis* | W.Lippert |
| Asphodelaceae | Aloe | *greatheadii* | Schonland |
| Verbenaceae | Chascanum | *hederaceum* | (Sond.) Moldenke |
| Lamiaceae | Clerodendrum | *ternatum* | Schinz |
| Asteraceae | Senecio | *pleistocephalus* | S.Moore |
| Malpighiaceae | Triaspis | *glaucophylla* | Engl. |
| Asteraceae | Gerbera | *viridifolia* | (DC.) Sch.Bip. |
| Asteraceae | Senecio | *digitalifolius* | DC. |
| Acanthaceae | Dicliptera | *fruticosa* | K.Balkwill |
| Lamiaceae | Tinnea | *rhodesiana* | S.Moore |
| Ebenaceae | Euclea | *undulata* | Thunb. |
| Ophioglossaceae | Ophioglossum | *polyphyllum* | A.Braun |
| Fabaceae | Elephantorrhiza | *goetzei* | (Harms) Harms |
| Myrothamnaceae | Myrothamnus | *flabellifolius* | Welw. |
| Fabaceae | Dolichos | *trilobus* | L. |
| Acanthaceae | Petalidium | *oblongifolium* | C.B.Clarke |
| Malvaceae | Hibiscus | *cannabinus* | L. |
| Santalaceae | Osyris | *lanceolata* | Hochst. & Steud. |
| Convolvulaceae | Ipomoea | *adenioides* | Schinz |
| Oleaceae | Jasminum | *stenolobum* | Rolfe |

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|---|---|---|---|
| Fabaceae | Ormocarpum | *trichocarpum* | (Taub.) Engl. |
| Moraceae | Ficus | *abutilifolia* | (Miq.) Miq. |
| Celastraceae | Mystroxylon | *aethiopicum* | (Thunb.) Loes. |
| Anacardiaceae | Searsia | *engleri* | (Britten) Moffett |
| Scrophulariaceae | Jamesbrittenia | *aurantiaca* | (Burch.) Hilliard |
| Lamiaceae | Vitex | *patula* | E.A.Bruce |
| Capparaceae | Maerua | *juncea* | Pax |
| Poaceae | Sporobolus | *panicoides* | A.Rich. |
| Polygalaceae | Polygala | *leptophylla* | Burch. |
| Combretaceae | Combretum | *molle* | R.Br. ex G.Don |
| Lamiaceae | Acrotome | *hispida* | Benth. |
| Fabaceae | Bolusanthus | *speciosus* | (Bolus) Harms |
| Poaceae | Eragrostis | *curvula* | (Schrad.) Nees |
| Fabaceae | Indigofera | *torulosa* | E.Mey. |
| Polygonaceae | Persicaria | *decipiens* | (R.Br.) K.L.Wilson |
| Scrophulariaceae | Jamesbrittenia | *candida* | Hilliard |
| Asteraceae | Tripteris | *auriculata* | S.Moore |
| Acanthaceae | Dyschoriste | *rogersii* | S.Moore |
| Fabaceae | Acacia | *mellifera* | (Vahl) Benth. |
| Santalaceae | Osyridicarpos | *schimperianus* | (Hochst. ex A.Rich.) A.DC. |
| Malvaceae | Abutilon | *piloso-cinereum* | A.Meeuse |
| Moraceae | Ficus | *ingens* | (Miq.) Miq. |
| Acanthaceae | Justicia | *odora* | (Forssk.) Lam. |
| Euphorbiaceae | Euphorbia | *monteiroi* | Hook.f. |
| Acanthaceae | Barleria | *saxatilis* | Oberm. |
| Acanthaceae | Lepidagathis | *scabra* | C.B.Clarke |
| Asparagaceae | Asparagus | *schroederi* | Engl. |
| Amaryllidaceae | Crinum | *crassicaule* | Baker |
| Acanthaceae | Blepharis | *subvolubilis* | C.B.Clarke |
| Euphorbiaceae | Euphorbia | *schinzii* | Pax |
| Acanthaceae | Barleria | *crossandriformis* | C.B.Clarke |
| Nyctaginaceae | Commicarpus | *pentandrus* | (Burch.) Heimerl |
| Apocynaceae | Secamone | *filiformis* | (L.f.) J.H.Ross |
| Malvaceae | Melhania | *prostrata* | DC. |
| Velloziaceae | Xerophyta | *villosa* | (Baker) L.B.Sm. & Ayensu |
| Fabaceae | Decorsea | *galpinii* | (Burtt Davy) Verdc. |
| Fabaceae | Vachellia | *permixta* | (Burtt Davy) Kyal. & Boatwr. |
| Fabaceae | Burkea | *africana* | Hook. |
| Apocynaceae | Huernia | *stapelioides* | Schltr. |

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|---|---|---|---|
| Asphodelaceae | Aloe | *mutabilis* | Pillans |
| Capparaceae | Maerua | *cafra* | (DC.) Pax |

# SPECIALIST DETAILS, CURRICULUM VITAE AND DECLARTION

The surveys and assessment were undertaken by Mokgatla Jerry Molepo, a registered Ecologist and Director of MORA Ecological Services (Pty) Ltd.

## Curriculum Vitae

## EDUCATION:

- MSc Zoology, Nelson Mandela University (Percy FitzPatrick Institute of African Ornithology Centre of Excellence)

Research Project Topic: Foraging behaviour and thermal physiology in Cape Sugarbirds: sex-specific responses to temperature.

- BSc Honours in Zoology, University of Limpopo

Research Project Topic: Morphometrics and plumage variation in the South African Fiscal flycatcher *Sigelus silens* Shaw 1809.

- BSc Botany & Zoology, University of Venda
- Grade 12, Marobathota High School

## CERTIFICATES:

- SASS5 Aquatic Biomonitoring, GroundTruth
- Hydropedology and Wetland Functioning, Terra Soil Science & Water Business Academy
- Section 21 (c) & (i) Water Use Authorisation Training, Department of Water and Sanitation
- Basic Project Management, Hudisa Business School

## PROFESSIONAL MEMBERSHIP:

- South African Council for Natural Scientific Professions (SACNASP) – Professionally registered as Professional Natural Scientist. **Registration number:** 009509
- British Ecological Society (BES). **Membership number**: 1010709
- Zoological Society of Southern Africa (ZSSA). **Membership number**: 691

## WORK EXPERIENCE:

- MORA Ecological Services (Pty) Ltd: April 2018 – Current, I am Biodiversity Specialist, and my duties include (i) Conducting Biodiversity, Aquatic Impact Assessments, Rehabilitation (ii) Compilation of specialist reports.
- Arcus Consulting: May - November 2017, I was a subcontracted avifaunal surveyor for the proposed Highlands Wind Energy Farm, Somerset East, Eastern Cape.
- Centre for African Conservation Ecology (ACE), Nelson Mandela University: 2015 - 2016, I was a field guide/ environmental educator. Responsibilities: taking school learners on trial walks inside the Nelson Mandela University Nature Reserve.
- South African National Biodiversity Institute (SANBI): May – December 2014, I was a Zoological Systematics Technician. Responsibilities: (i) Insect identification and curation, and (ii) compiling the animal checklist of South Africa, (iii) Sourcing wildlife crime reports on endangered animals and plants for Barcode of Wildlife Project, (iv) Monitoring the bird population in the Botanical Garden.

- Department of Zoology, University of Venda: 2009 – 2013, I was a Research Assistant under Dr. T.C Munyai who was conducting a long-term research project which monitored the effects of climate change on biota and processes influencing ecosystem functioning and species diversity patterns.
- Percy FitzPatrick Institute of African Ornithology: March – April 2014, I was a Research Assistant under Dr. Rita Covas' Sociable Weaver Research Project. This is a long-term study which looks at the reproductive success of Sociable weavers at Benfontein Nature Reserve in Kimberley.

## Key Experience in Specialist Projects

| Year | Project | Location: | Role(s) |
|---|---|---|---|
| 2022 | Avifaunal Impact Assessment for the proposed 132kV for Musina-Makhado Special Economic Zone North Site | Musina, Limpopo | Avifaunal Specialist/Ornithologist |
| 2022 | Avifaunal Impact Assessment for the proposed Khauta PV Solar including 44kV and 132kV Powerline | Welkom, Free State | Avifaunal Specialist/Ornithologist |
| 2022 | Avifaunal Impact Assessment for the proposed NAOS PV Solar including 132kV Powerline | Free State | Avifaunal Specialist/Ornithologist |
| 2022 | Preconstruction Avifaunal Assessment for the proposed Lichtenburg PV Solar including 132kV Powerline | Lichtenburg, North West | Avifaunal Specialist/Ornithologist |
| 2022 | Preconstruction Botanical Assessment for the proposed Lichtenburg PV Solar including 132kV Powerline | Lichtenburg, North West | Ecologist |
| 2022 | Biodiversity Assessment, Land Capability and Veld Condition Assessment for PPC Cement SA Slurry | Slurry, North West | Ecologist |
| 2021 | Avifaunal Impact Assessment for the proposed Upington-Aries 2x 400kV | Upington, Northern Cape | Avifaunal Specialist/Ornithologist |
| 2021 | Habitat Assessment Post Rehabilitation for PPC Cement SA Dwaalboom Factory | Dwaalboom, Limpopo | Ecologist |
| 2021 | Habitat Assessment Post Rehabilitation for Gibson Bay Wind Energy Farm | Humansdorp, Eastern Cape | Ecologist |
| 2021 | Wetland Rehabilitation for the sewer pipeline construction in Daveyton | Ekurhuleni East College Campus, Daveyton, Gauteng | Wetland Ecologist |
| 2021 | 12 Months Wetland Rehabilitation Supervision for Ekangala Ext F Waterborne Sanitation Project | City of Tshwane Metropolitan Municipality, Ekangala, Gauteng | Aquatic Ecologist |
| 2021 | Bi-annual Aquatic Biomonitoring for Ekangala Ext F Waterborne Sanitation Project | City of Tshwane Metropolitan Municipality, Ekangala, Gauteng | Aquatic Ecologist |

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|---|---|---|---|
| 2021 | 12 Months Surface water and Groundwater monitoring for Ekangala Ext F Waterborne Sanitation Project | City of Tshwane Metropolitan Municipality, Ekangala, Gauteng | Aquatic Ecologist |
| 2021 | Estuarine Impact Assessments for the Proposed Mkhambathi and Mbotyi Beach Developments, Ingquza Hill Municipality, Eastern Cape | Ingquza Hill Municipality, Eastern Cape | Ecologist |
| 2021 | Botanical Search and Rescue Monitoring Report for A 140 Megawatt Roggeveld Wind Farm and Associated Infrastructure. | Karoo Hoogland Local Municipality, Northern Cape & Laingsburg Local Municipality, Western Cape Provinces | Ecologist |
| 2021 | Ecological walkthrough for the proposed National Route 3 (N3) between Cato Ridge and Camperdown in KwaZulu-Natal. | Cato Ridge, KwaZulu-Natal | Ecologist |
| 2021 | Avifaunal Impact Assessment for the proposed Musina-Makhado Special Economic Zone South Site | Musina-Makhado, Limpopo | Avifaunal Specialist/Ornithologist |
| 2021 | Ecological Impact Assessment for the proposed prospecting on Farm In Die Kom 345 JQ | North West | Ecologist |
| 2021 | Rehabilitation Plan for Roggeveld Wind Energy Facility and associated Substation and 33kV and 132kV transmission powerlines. | Karoo Hoogland Local Municipality, Northern Cape & Laingsburg Local Municipality, Western Cape Provinces | Rehabilitation Specialist |
| 2021 | Rehabilitation Plan of the sewage effluent in Bethal. | Bethal, Mpumalanga | Rehabilitation Specialist |
| 2021 | Invasive Alien Plants Species Eradication and Control Program for Castle Gate Shopping Centre. | Pretoria, Gauteng | Ecologist |
| 2020 | Avifaunal Impact Assessment for the proposed 33kV overhead powerlines on Roggeveld Wind Energy Farm. | Karoo Hoogland Local Municipality, Northern Cape & Laingsburg Local Municipality, Western Cape Provinces | Avifaunal Specialist/Ornithologist |
| 2020 | Avifaunal & Ecological Impact Assessment for the proposed solar farm on Vaalkloof Nature Reserve. | Breede Valley Municipality, Western Cape | Ecologist |
| 2020 | Wetland assessment for the proposed water pipeline upgrade. | Daveyton, Gauteng | Ecologist |
| 2020 | Biodiversity Impact Assessment (BIA) for the proposed bridge and access road construction in Nonyentu, Engcobo Local Municipality, Eastern Cape. | Pretoria, Gauteng | Ecologist |
| 2020 | Freshwater impact assessment for the proposed water Kagiso Regional Park. | Kagiso, Gauteng | Ecologist |

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|---|---|---|---|
| 2019 | Basic Assessment Report and EMPr for the proposed borehole drilling to supplement water supply for broiler in Delmas, Mpumalanga Province. | Delmas, Mpumalanga | Environmental Assessment Practitioner |
| 2019 | Wetland and Ecological Assessment for the proposed upgrading of bulk sewer pipeline in Amsterdam. | Amsterdam, Mkhondo Local Municipality | Ecologist |
| 2019 | Ecological assessment for the proposed mine on Farm Palmietfontein 189 IP situated within JB Marks Local Municipality, North West Province. | Ventersdorp, North West | Ecologist |
| 2019 | Biodiversity Management Plans for Evander Gold Mine. | Evander, Mpumalanga | Ecologist |
| 2019 | Avifaunal assessment for the proposed granite mine outside Mokopane. | Mogalakwena Local Municipality, Limpopo | Avifaunal Specialist/ Ornithologist |
| 2019 | Wetland assessment for the proposed grey water pipeline for irrigation. | Makhado Municipality, Limpopo | Ecologist |
| 2019 | Ecological assessment for the proposed for Nandoni mixed development. | Nandoni, Thulamela Local Municipality, Limpopo | Ecologist |
| 2019 | Ecological assessment for the proposed cultural village on farm Mphaphuli 278MT. | Mukomaasinandu, Thulamela Local Municipality, Limpopo | Ecologist |
| 2019 | Ecological assessment for the proposed Musina mixed development. | Musina, Limpopo | Ecologist |
| 2019 | Preliminary Ecological assessment for the prospecting on Kroomdrai farm, Mokopane. | Mokopane, Mogalakwena Local Municipality, Limpopo | Ecologist |
| 2018 | Invasive Alien Plants Species Eradication and Control Program Plan for Kwazenzele Ext. 1 Phase 2. | Lesedi Local Municipality, Gauteng province | Ecologist |
| 2018 | Biodiversity Assessment & Management Plan for Cullinan Diamond Mine. | Cullinan, Gauteng province | Ecologist (Faunal Specialist) |
| 2017 | Preconstruction Avifaunal Assessment for the Proposed Highlands Wind Energy Farm. | Somerset East, Eastern Cape province. | Ornithologist |