

PULLENSHOPE

FAUNA & FLORA BIODIVERSITY ASSESSMENT

For the

**Proposed mine development on the farm Roodepoort 151 IS
near**

**Pullenshope
Mpumalanga Province**



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Pullenshope: Fauna and Flora Biodiversity Assessment for the proposed mine development on the farm Roodepoort 151 IS near Pullenshope, Mpumalanga Province

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EXECUTIVE SUMMARY

M2 Environmental Connections cc was commissioned by Eco Elementum (Pty) Ltd to undertake a baseline fauna and flora assessment at Roodepoort 151 IS, located near the town of Hendrina, Mpumalanga province to determine the potential impacts the proposed coal mining activities might have. A field assessment was conducted on the 10th of September 2013.

The desktop study indicated that species of conservation importance might occur in the area; however, several of the species found during the field assessment had a conservation importance status.

The study area is situated in the Grassland Biome in the Eastern Highveld Grassland (Gm12) vegetation unit. This vegetation unit is classified as having an “Endangered” conservation status with only a small fraction (< 1%) conserved but with a conservation target of 24%. It is estimated that 44% of this vegetation unit has already been transformed. SANBI’s terrestrial biodiversity assessment data indicates that a section of the farm is located in an area with a “Least Concern” status whilst the remainder of the farm is classified as having “No Natural Habitat Remaining”.

No flora species of conservation concern was identified at any of the sites. However, there are three species that may occur within the area that would raise concern which include *Alepidea peduncularis*, *Hypoxis hemerocallidea* and *Anacampseros subnuda* subsp. *lubbersii*. *Alepidea peduncularis* and *Hypoxis hemerocallidea* that are classified by the IUCN as “DDT” and “Declining” respectively of which the latter is being overexploited as a traditional healing plant. The species *Anacampseros subnuda* subsp. *lubbersii* is classified by the IUCN as “Vulnerable” and is listed on CITES (Appendix II) for all parts of the plant. No species from the Threatened and Protected Species (ToPS) List, as part of the National Environmental Management: Biodiversity Act (Act 10 of 2004) is found in this area. Also, *A. peduncularis* and *A. subnuda* subsp. *lubbersii* are both endemic to South Africa. The remainder of the species found in the study area or that may possibly occur within the area are classified with a “Least Concern” status. Two exotic/alien species were identified, however, none of them are listed as Category Invader species as provided in the Conservation of Agricultural Resources Act (Act 43 of 1983). Also, ten species were indicated on the SABIF database on SANBI’s website as having medicinal value.

Five sites were identified with homogenous vegetation to conduct the field survey. A large section of the farm is dominated by oldfields (*Zea mays*) with no occurrence of species. The grassland is very dry and a fire had occurred in the area prior to the visitation of the study area. The most sensitive areas are in the location of the proposed mining development and river/wetland region that is located east from the proposed development. The study area is subject to fragmentation as a result of the oldfields in the western section and the town, Pullenshope, east of the farm.

The faunal assessment showed that several red data species were listed for the area in which Roodepoort 151 IS, Portion 17 is situated (IUCN, SA Red Data Book & TOPS List). Additionally,



several species were identified as possibly sensitive within the framework of this study due to their dependence on the specific water habitat found within the area. One butterfly species (*Metisella meninx*) and several bird species are indicated. Two other mammalian spp. (Otter spp. and Serval) will be vulnerable largely due to habitat fragmentation (Otter) and the Serval due to its Near Threatened (SA Red Data Book) and Protective status (TOPS List). Several species were identified that has an IUCN status of “Least Concern” but have a different protection status within the country of South Africa.

The SA Red Data Book (Endangered Wildlife Fund) and the Threatened or Protected Species Regulations published in Government Gazette (23 February 2007), National Environmental Management: Biodiversity Act (Act No. 10 of 2004), also known as the TOPS List, was used to determine the degree of protection designated within the Environmental Management Plan.

The winter season is not the ideal time of the year to conduct a thorough assessment of the fauna and flora. It is therefore of utmost importance to conduct a summer assessment as part of the initial assessment. This is because many species was not identified due to factors such as hibernation and seasonal growth. During the field excursion the rainy season has not started, and the field condition may be described as dry and a recent field fire has destroyed most of the grassland area adjacent to the wetland zones.

The proposed coal mining activities are expected to have impacts at a local scale and medium significance that possibly may occur on the footprint and surrounding areas. Open cast is usually destructive, but with mitigation the impacts will have a low significance in the area, due to the expected short timeframe and small scale at which the operation will focus within Portion 17 of Roodepoort 151 IS.

Various mitigation measures for the fauna and flora is proposed and it is essential that these are followed strictly and on a continual and planned basis. To protect the naturally occurring species and the permanent wet zones indicated within the study, it is essential that a pro-active management policy is implemented that will ensure that potential impacts are minimized before they occur. Rehabilitation should be implemented as soon as the mining closure is indicated and concurrent rehabilitation and good house-keeping is advised to prevent accumulative negative results that may be expected during any developmental activity. The method proposed by the colliery is indicative of constant rehabilitation practices which will mitigate and prevent large-scale impacts to the surrounding habitat as well as accumulation of negative impacts and large degraded areas. This is described as the lateral rollover mining technique.



TABLE OF CONTENTS

1	INTRODUCTION	1
2	SCOPE OF WORK	2
2.1	OBJECTIVES OF STUDY	2
3	OVERVIEW OF STUDY AREA	4
3.1	LOCALITY OF PROPOSED ACTIVITIES.....	4
3.2	BRIEF OVERVIEW OF PROPOSED ACTIVITIES.....	4
3.3	LOCATION SYNOPSIS	6
4	METHODS.....	8
4.1	DESKTOP ASSESSMENT	8
4.1.1	Flora and Fauna	8
4.2	FIELD SURVEY	8
4.2.1	Sampling and Identification.....	8
4.3	DATA ANALYSIS	9
4.3.1	Comparison and Evaluation	9
4.3.2	Risk Determination.....	9
4.3.3	Management and Findings.....	9
4.4	Possible effects of surrounding urbanisation on the area.....	10
5	RESULTS	12
5.1	FLORA EVALUATION – DESKTOP STUDY	12
5.1.1	Description of local vegetation communities	12
5.2	FLORA EVALUATION – FIELD SURVEY	15
5.2.1	Description of sites surveyed.....	15
5.2.2	IUCN Red Data, CITES and Endemic Species	24
5.2.3	Invasive Species	25
5.2.4	Plants of cultural significance.....	26
5.2.5	Sensitivity of area	26
5.3	FAUNA EVALUATION	28
5.3.1	Description of Evaluation and Findings.....	28
5.3.2	Desktop Evaluation	29
5.3.2.1	Legislation relevant to Fauna	29



5.3.2.2	Species Determination	29
5.3.2.3	Ad hoc Sensitive species	30
5.3.2.4	Mammalian evaluation and Habitat analysis.....	31
5.3.2.5	Terrestrial richness.....	31
5.3.2.6	Amphibian evaluation	35
5.3.2.7	Reptile evaluation	36
5.3.2.8	Insect evaluation.....	37
5.3.3	Endemic Species and Status.....	38
5.3.4	Field Evaluation	41
5.3.4.1	Mammals recorded.....	41
5.3.4.2	Aves assessment.....	42
5.3.4.3	Reptiles recorded	43
5.3.4.4	Amphibian assessment	43
5.3.4.5	Insects assessment	43
6	ENVIRONMENTAL IMPACT ASSESSMENT.....	45
6.1	RISK ASSESSMENT CRITERIA	45
6.2	DETERMINATION OF SIGNIFICANCE	47
6.2.1	Identifying Potential Impacts without Mitigation Measures (WOM)	47
6.2.2	Identifying Potential Impacts with Mitigation Measures (WM)	48
6.2.3	Legal requirements	48
6.3	MITIGATION MEASURES.....	48
6.3.1	Mitigation Objectives: What Level of Mitigation must be aimed at?	48
6.3.2	Recommended Mitigation Measures.....	49
6.3.3	Effectiveness of Mitigation Measures.....	49
6.3.4	Recommended Monitoring and Evaluation Programme	49
6.3.5	Project Phasing.....	49
7	IMPACT ASSESSMENT AND MITIGATION MEASURES	50
7.1	DESIGN, PLANNING AND CONSTRUCTION PHASE.....	50
7.1.1	Impacts on the Natural environment	50
7.1.2	Impacts on Plant species.....	50
7.1.3	Impacts on Animal species	51
7.2	OPERATIONAL PHASE	52



7.2.1	Impacts on the Natural Environment	52
7.2.2	Impacts on Plant species.....	52
7.2.3	Impacts on Animal species	53
7.3	CLOSURE/POST-CLOSURE PHASE.....	54
7.3.1	Impacts on the Natural Environment	54
7.3.2	Impacts on Plant species.....	54
7.3.3	Impacts on Animal species	55
8	FLORA AND FAUNA MANAGEMENT PLAN	56
8.1	CONSTRUCTION AND OPERATIONAL PHASE	56
8.1.1	Aims and Objectives.....	56
8.1.2	Fauna and Flora Mitigation and Management measures.....	56
8.1.2.1	Flora Management.....	56
8.1.2.2	Fauna Management	58
8.1.3	Monitoring.....	59
8.1.4	General Mitigation and Management.....	60
8.2	DECOMMISSIONING AND CLOSURE PHASE	60
8.2.1	Aims and Objectives.....	60
8.2.2	Fauna and Flora Mitigation and Management measures.....	61
8.2.2.1	Flora Management.....	61
8.2.2.2	Fauna Management	61
8.2.2.3	General Management and Mitigation.....	62
8.2.2.4	Monitoring.....	62
9	CONCLUSIONS	63
10	LIMITATIONS AND ASSUMPTIONS.....	64
11	REFERENCES	65

LIST OF FIGURES

Figure 3-1: The farm Roodepoort 151 IS as situated within the Steve Tshwete Local Municipality, Mpumalanga Province.....	4
Figure 3-2: Location of wetlands on the farm Roodepoort 151 IS, as well as the proposed area and activities of the mine.....	5
Figure 3-3: Map indicating the critical terrestrial biodiversity areas in or surrounding the farm Roodepoort 151 IS.....	7



Figure 4-1: Five sites identified on and surrounding the farm Roodepoort 151 IS	9
Figure 5-1: The farm Roodepoort 151 IS as located within the Eastern Highveld Grassland vegetation unit.	12
Figure 5-2: An illustration of the oldfields on the western section of the farm Roodepoort 151 IS	16
Figure 5-3: An illustration of the slightly undulating plain with mainly <i>Eragrostis curvula</i> and <i>Stoebe plumosa</i> species.	17
Figure 5-4: An accumulation of salt within the proximity of the wetland/riverine area	19
Figure 5-5: An illustration of the grassland consisting mostly of <i>Arundinella nepalensis</i> and <i>Themeda triandra</i> species.	19
Figure 5-6: An illustration of the grassland located near the dam area. It is apparent that a veld fire occurred.	20
Figure 5-7: An illustration of the <i>Panicum schinzii</i> – <i>Eragrostis curvula</i> grassland.	22
Figure 5-8: Red coloring from the sedge <i>Cyperus</i> spp. within a wetland area.	23
Figure 5-9: Visual illustration of Protected beetles within the area	38

LIST OF TABLES

Table 3-1: Environmental variables and geomorphic description of the study area (Mucina & Rutherford, 2006).	6
Table 5-1: Number of families and species that occur within the four QDS grid cells.	13
Table 5-2: The South African Red List categories for extinct and threatened species	14
Table 5-3: Species identified in site 2	17
Table 5-4: Species identified in site 3	18
Table 5-5: Species identified in site 4	20
Table 5-6: Species identified in site 5	21
Table 5-7: Possible IUCN Red Data, CITES and Endemic Species	24
Table 5-8: Number of medicinal species in the various study sites	26
Table 5-9: Amphibian species within the area.	35
Table 5-10: Reptiles captured in desktop study	36
Table 5-11: Butterfly species known to occur within the area	37
Table 5-12: Endemic Avifauna.	38
Table 5-13: Endemic Amphibians and Reptiles	39
Table 5-14: Endemic Insecta	40
Table 5-15: Endemic Mammalian species.	40
Table 6-1: Explanation of the EIA criteria	45
Table 6-2: Assessment Criteria: Ranking Scales	46
Table 6-3: Significance Rating Scales without mitigation	47
Table 6-4: Significance Rating Scales with mitigation.	48



APPENDICES

Appendix A - IUCN red data categories

Appendix B - Avifauna Baseline study

Appendix C - AEWA Baseline study

Appendix D - Flora Baseline study

Appendix E - Flora field survey




ABBREVIATIONS

AOO	Area of Occupancy
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
IUCN	International Union for the Conservation of Nature
MAP	Mean Annual Precipitation
NDM	Nkangala District Municipality
NEMBA	National Environmental Management Act (Act 10 of 2004)
QDS	Quarter Degree Square
ROM	Run of Mine
SANBI	South African National Biodiversity Institute
SABAP	South African Bird Atlas Project
SABIF	South African Biodiversity Information Facility
SIBIS	SANBI's Integrated Biodiversity Information System
ToPS List	Threatened and Protected Species list as indicated within the National Environmental Management: Biodiversity Act, 2004 (Act 10 Of 2004): Publication Of Lists Of Critically Endangered, Endangered, Vulnerable And Protected Species within Government Gazette No 29657, February 2007.




DECLARATION OF INDEPENDENCE

I declare that I, Nicola Gouws, act as the independent specialist for the fauna and flora assessment of this application. I conduct assessments in an objective manner, even when the views and findings might not be favourable to the Applicant. I have the expertise to conduct the assessment and will comply with the Act, regulations and other applicable legislation. I do not have conflicting interests in the undertaking of the activity. I undertake to disclose all material information in my possession that has or may have the potential of influencing any decision to be taken in respect to the application.

Signature of Specialist	
Name of Company	M2 Environmental Connections cc (M2ENCO)
Date	14th of October 2013

I declare that I, Corlien Lambrechts, act as the independent specialist for the fauna and flora assessment of this application. I conduct assessments in an objective manner, even when the views and findings might not be favourable to the Applicant. I have the expertise to conduct the assessment and will comply with the Act, regulations and other applicable legislation. I do not have conflicting interests in the undertaking of the activity. I undertake to disclose all material information in my possession that has or may have the potential of influencing any decision to be taken in respect to the application.

Signature of Specialist	
Name of Company	M2 Environmental Connections cc (M2ENCO)
Date	14th of October 2013

1 INTRODUCTION

M2 Environmental Connections cc was commissioned by Eco Elementum (Pty) Ltd to undertake a baseline biodiversity assessment of the fauna and flora at the farm Roodepoort 151 IS. It is located in the vicinity of the town Pullenshope in the Mpumalanga Province and is located approximately 20km north-west of the town Hendrina. The towns of Middelburg and Emalahleni are located approximately 30km north and 40km north-west of the farm respectively. The proposed development falls under the jurisdiction of the Steve Tshwete Local Municipality and the Nkangala District Municipality.

The closest national roads to the proposed site are the N11 from Hendrina, where it intersects with the N4 near Middelburg. Other major roads in the area are the R35, R542 and R38.

The farm Roodepoort 151 IS is mainly zoned as an agricultural holding with several oldfields and alternative use as grazing for cattle which is the current land use on the vicinity.

The proposed mining area (Portion 17) is situated within the northern section of the Witbank Coalfield. The coal that will be extracted is mainly from the No. 2 and No. 4 seam within the strata layers. No processing will be conducted at the Kebrafield colliery, only washing and screening. The footprint of the proposed development will be in close proximity to the Woestalleen wetland system (linked to the Woestalleen Spruit). The wetland study indicated that the soils are permanently waterlogged which in itself is an indicator of sensitive habitat and several specialised species that may occur within this type of localized habitat.

Careful consideration needs to be given to these species due to their specialized niche and low tolerance of disturbance in general.



2 SCOPE OF WORK

M2 Environmental Connections cc was appointed to conduct a flora and fauna biodiversity assessment as one of the specialist studies required for the inclusion in the EIA/EMP. The scope of work encompassed an initial desktop study to determine the implications of the proposed development on the associated ecological system. The baseline desktop fauna and flora biodiversity study included the following aspects:

- A desktop vegetation study, which included:
 - Classification of the main biome and description of the dominant vegetation type;
 - Investigation of the dominant indigenous species within this region;
 - Listing the endemic species;
 - Listing the IUCN Red Data species; and
 - Determining the culturally significant species.
- A desktop invertebrate and mammal study, which included determining the:
 - Endemic species; and
 - Red Data species (IUCN, SA Red Data Book & TOPs List)
- A field survey will be conducted to determine the:
 - Actual floral composition in the area;
 - Likelihood of ecologically significant invertebrates and mammals occurring in the area based on status of the environment;
 - Presence of endemic species;
 - Presence of exotic and invasive species;
 - Presence of IUCN Red Data species; and
 - Presence of culturally significant species.

The information from both the desktop and field survey will be used to report on the following:

- Describing the affected flora communities in relation to the project area;
- Describing the project area in terms of the most recent International, National and regional biodiversity status for fauna/flora;
- Proposal of mitigation measures;

2.1 OBJECTIVES OF STUDY

The aim of this study includes the following objectives on the farm Roodepoort 151 IS:

- Identify sensitive areas and species that should be avoided during the proposed development of the mining operation on the farm. These issues will be identified, evaluated and discussed.



- Make use of the South African Biodiversity Institute Database to obtain specialized information and previous surveys within the area. This will supplement the field survey and support findings.
- To determine and complete an impact assessment and risk evaluation. Relevant mitigation measures and a management plan will be proposed to reduce severity of impacts to the flora and fauna in the region.
- To provide recommendations that will support the proposed management actions.



3 OVERVIEW OF STUDY AREA

3.1 LOCALITY OF PROPOSED ACTIVITIES

The project area is located in the Mpumalanga Province near the town of Hendrina and falls under the jurisdiction of the Steve Tshwete Local Municipality (**Figure 3-1**) and the Nkangala District Municipality. A small town in the vicinity of the area exists namely, Pullenshope. The closest main towns are Middelburg and Emalahleni which is located approximately 30 km north and 40km north-west of the proposed site respectively. The closest national roads to the proposed site are the N11 from Hendrina, where it intersects with the N4 near Middelburg. Other major roads in the area are the R35, R542 and R38.

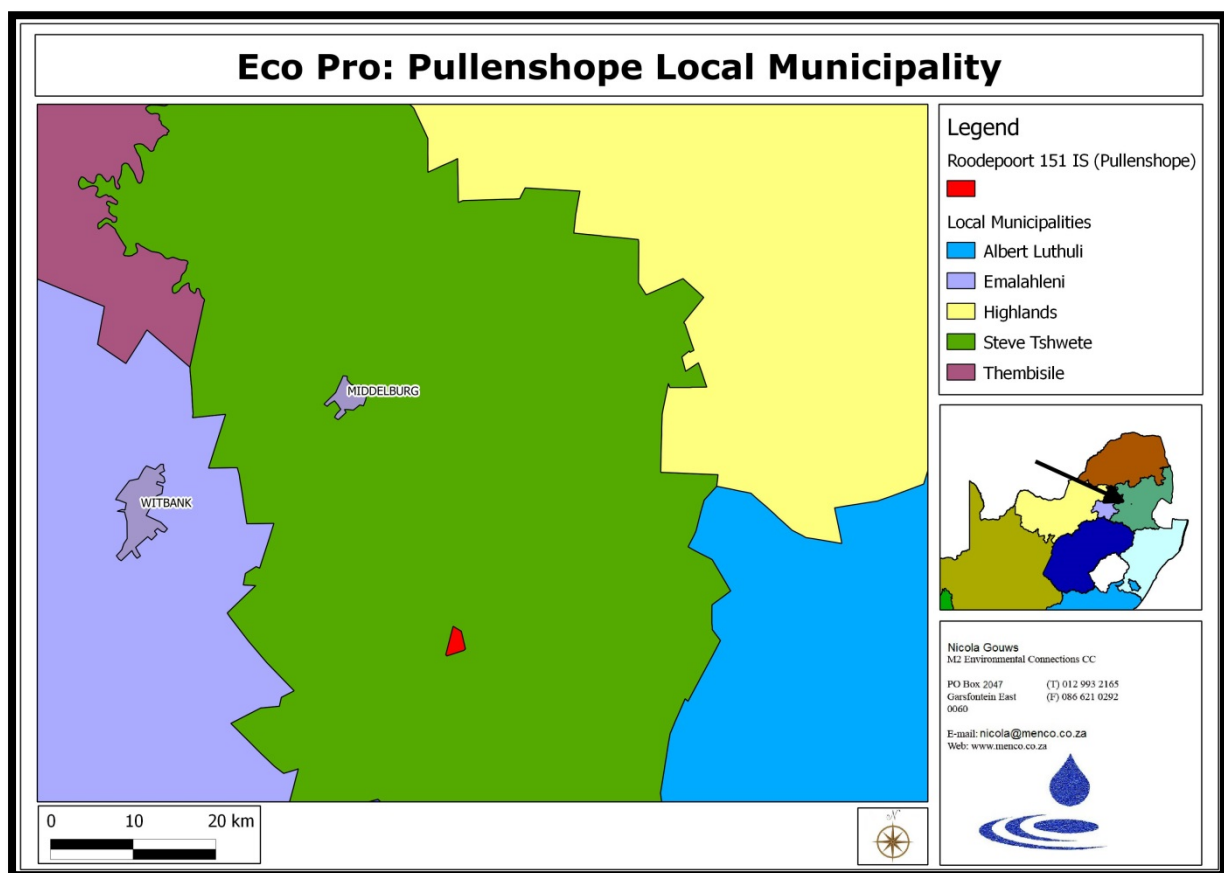


Figure 3-1: The farm Roodepoort 151 IS as situated within the Steve Tshwete Local Municipality, Mpumalanga Province.

**Please note: During the process of this study the company name changed from Eco Pro to Eco Elementum.*

3.2 BRIEF OVERVIEW OF PROPOSED ACTIVITIES

Kebrfields (Pty) Ltd is in the process of applying for the necessary authorisations for the proposed construction and operation of a new mining development on Portion 17 of the farm Roodepoort 151 IS. A full EIA is planned to investigate all possible impacts that may be expected in terms of the development of the open cast colliery. A roll over opencast coal mining method will be followed



to extract coal from the identified seam. It is estimated that the operational life of the mine is between 1 – 2 years after which the area will be fully rehabilitated.

In **Figure 3-2**, the proposed activities of the mine are indicated. The open cast mining area is located on the northern border of the farm Roodepoort 151 IS. The topsoil (A-zone) of the mine will be stored on the areas allocated as “Topsoil dumps” in the western section of the mine, where the oldfields are located. Similarly, the B-zones and C-zones of the soil will also be stored. However, this will be stored separately in the areas designated as “Overburden dumps”. All stored soil will be re-established during the rehabilitation phase. The ROM (Run of Mine) Stockpile indicates the area where the mined coal will be stored until it is transported offsite to be processed. Offices will also be located on site. The road will be situated in the western section where the oldfields are located. Both channelled valley-bottom and unchannelled valley-bottom wetlands are located on the farm and it is vital that a 100 m buffer is established along every wetland. No mining activities are allowed to occur within these areas and it should be a prohibited area where no access is allowed. This also implicates the need for the mine to apply for a Water Use License as stipulated in the National Water Act (Act 36 of 1998) under section 21 (c) and (i). It is also recommended that a wetland delineation study is conducted by a wetland specialist for all wetland areas on the farm.

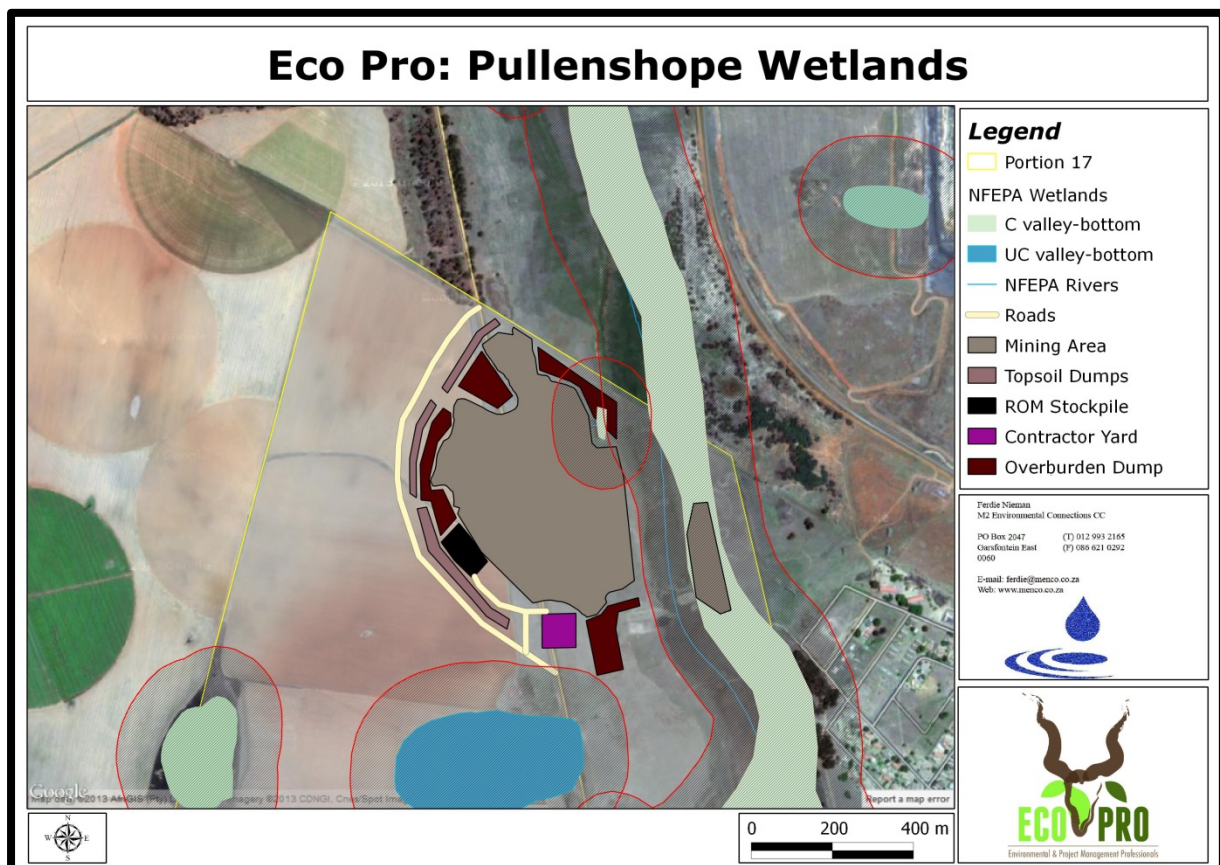


Figure 3-2: Location of wetlands on the farm Roodepoort 151 IS, as well as the proposed area and activities of the mine.



3.3 LOCATION SYNOPSIS

The study area is situated within the Mpumalanga Province. This province is located on the eastern section of South Africa and borders with Limpopo in the northern direction and with Free State and KwaZulu Natal in the south-western and southern direction respectively. Gauteng province is situated west of Mpumalanga.

The Steve Tshwete Local Municipality, which forms part of the Nkangala District Municipality, covers a total area of 397 645.3 ha of which 44.6% is still considered to be natural. It consists of two biomes and six vegetation types. The proposed development is located within the Grassland Biome within the Eastern Highveld Grassland vegetation unit (GM12).

The Eastern Highveld Grassland is classified as having an Endangered status. Only a small fraction of this vegetation unit is statutorily conserved with a conservation target of 24%. Please refer to **Table 3-1**. Other characteristics of this vegetation unit are that it has slightly-to-moderately undulating plains with some hills and depressions. It mostly consists of short grasses and few woody species with scattered rocky outcrops (**Table 3-1**). Shales and sandstones are the geological basis of this vegetation unit. The Mean Annual Precipitation (MAP) has an average of 726 mm with minimum and maximum MAP ranging between 650 mm and 900 mm respectively (**Table 3-1**). Frost incidences do occur from 13-42 days, but is usually higher at higher elevations.

Table 3-1: Environmental variables and geomorphic description of the study area (Mucina & Rutherford, 2006).

Eastern Highveld Grassland Characteristics	
Biome	Grassland Biome
Vegetation unit	Eastern Highveld Grassland
Landscape Features	Slightly to moderately undulating plains with some hills and pan depressions. Short grasses, scattered rocky outcrops, sour grasses and some woody species are characteristic of this vegetation unit.
Geology and soils	Red to yellow sandy soils of the Ba and Bb land types. Geology consists of shales and sandstones of the Madzaringwe Formation.
MAP (mm)	650 – 900 mm (average of 726 mm)
Status	Endangered

SANBI's interactive website was used to locate any critical biodiversity areas in or surrounding the proposed mining area on the farm Roodepoort 151 IS (**Figure 3-3**).

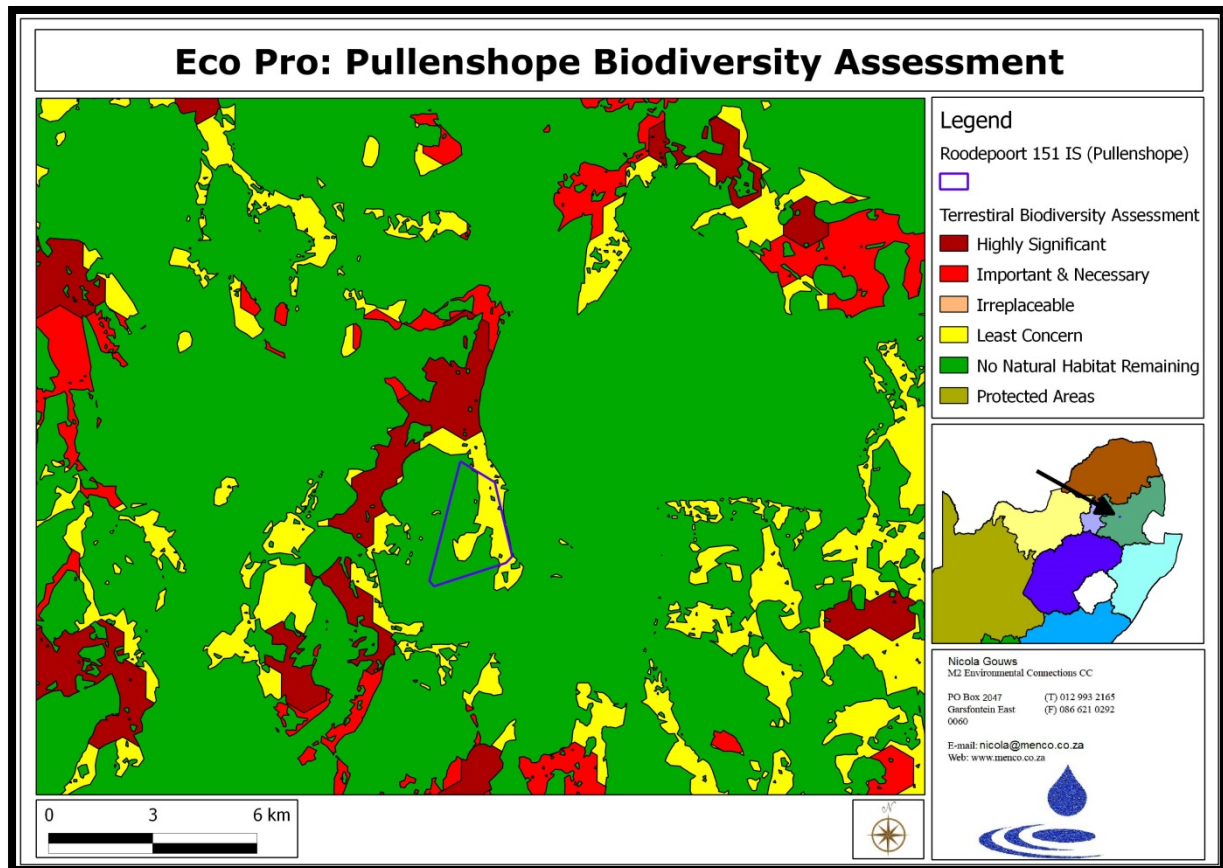


Figure 3-3: Map indicating the critical terrestrial biodiversity areas in or surrounding the farm Roodepoort 151 IS.

According to the terrestrial biodiversity assessment (as shown in **Figure 3-3**), the farm Roodepoort 151 IS is located within an area that has two ecological classifications. The first section on which the infrastructure of the mine will be constructed and the open cast mining conducted is classified with a “Least Concern” status whilst, the remainder of the farm is classified as having “No Natural Habitat Remaining” (**Figure 3-3**).

Mining and agriculture within the province is an important part of the economic development of the region. The province accounts for 83% of South Africa’s coal production of which 90% is used for South Africa’s electricity generation. Other minerals that are mined in Mpumalanga include gold, platinum group metals, silica, chromite, vanadiferous magnetite, cobalt, copper and iron to name a few. Additionally, the Nkangala District Municipality (NDM) states that mining is one of the three key sectors that should drive local economic development strategies (Ndaba, 2007). The other two key sectors are manufacturing and energy.



4 METHODS

4.1 DESKTOP ASSESSMENT

4.1.1 FLORA AND FAUNA

A baseline assessment was conducted to establish whether any potentially sensitive species might occur on site. The South African National Biodiversity Institute's (SANBI) online biodiversity tool was used to query a species list for the 2629BA quarter degree square grid cell (QDS). The vegetation map published in Mucina & Rutherford (2006) and illustrated on the SANBI website was consulted to determine the vegetation unit. Information regarding the red list and sensitive species found in the area was determined before the field survey. This was supplemented by researching all available books and peer reviewed websites.

The importance of a baseline study is to provide a reference condition to determine the current state of the environment and to draw comparisons between the potential of the area and current degradation from surrounding land uses. This will be conducted in terms of the future changes due to the proposed development by the client.

Aerial photographs and satellite imagery was used to delineate potential vegetation types and areas before the field visit. This served as the foundation for selecting various sample sites for field surveying.

4.2 FIELD SURVEY

4.2.1 SAMPLING AND IDENTIFICATION

A prefeasibility assessment was conducted on the 6th of August 2013 and a field assessment was conducted on the 10th of September 2013. The field investigation was conducted to supplement and confirm several findings during the desktop analysis. This mainly served as a fatal flaw analysis to determine whether there are any major ecological concerns with regards to the site selected for the proposed mining operation on the farm Roodepoort 151 IS.

Five sites were identified to conduct the field survey in (**Figure 4-1**). These sites were chosen based on areas in the vicinity of the proposed infrastructure of the mine as well as certain areas that still maintain a natural state (also refer to **Figure 3-2**). As indicated, Site 1 is the only area that was surveyed on the western section of the farm Roodepoort 151 IS. The reason for this is because those areas are devoid of any vegetation except ruined maize fields. It therefore only consists of oldfields in which maize was harvested for agricultural purposes.

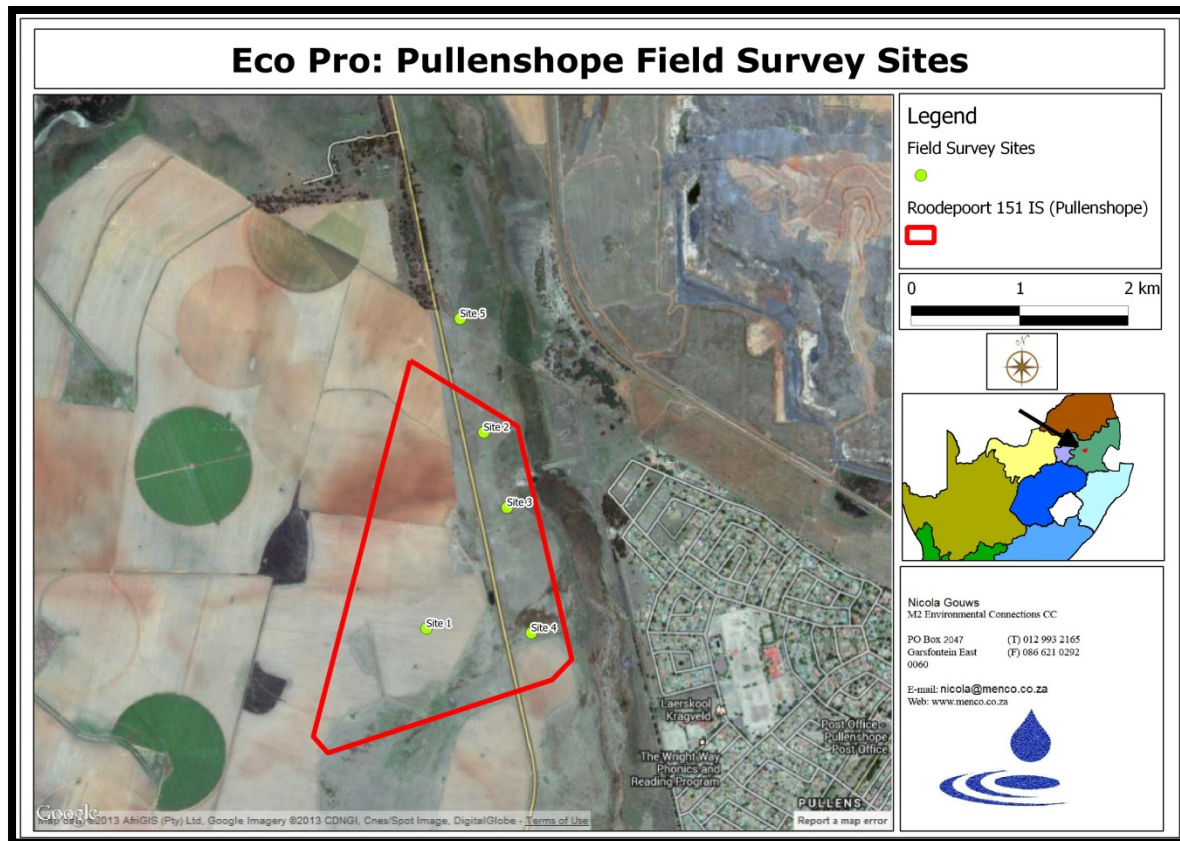


Figure 4-1: Five sites identified on and surrounding the farm Roodepoort 151 IS

4.3 DATA ANALYSIS

4.3.1 COMPARISON AND EVALUATION

Information obtained during the desktop assessment (baseline study) and the field survey was analysed and compared. Conclusions and interpretation of data obtained was deduced from knowledge, literature and case studies. Habitat analysis at various sampling points were included during the analysis and sensitive species and areas were identified for this specific development and what it infrastructure and operation entails.

4.3.2 RISK DETERMINATION

Impact assessment was conducted to determine the risk to these species and to analyse the anticipated impacts and their significance.

4.3.3 MANAGEMENT AND FINDINGS

A Fauna & Flora Management Plan was designed to mitigate these specific impacts and several recommendations were made in terms of findings.



4.4 POSSIBLE EFFECTS OF SURROUNDING URBANISATION ON THE AREA

The farm Roodepoort 151 IS is closely associated with the town Pullenshope. This town will definitely have an immense influence on the area. Towns are not only associated with alterations in land use but is also accompanied by an invasion of exotic species, an increase of fragmentation and ultimate loss of native biodiversity (Smith *et al.*, 2005). One of the culprits of towns is the increase in stormwater runoff. Stormwater runoff takes place in urban settings because anthropogenic structures such as concrete and alterations to the natural course of water prevents water from being absorbed within urban areas. Stormwater runoff collects pollutants, chemicals and debris as it flows over paved surfaces and into waterbodies. It also causes erosion, decreases groundwater recharge and alters aquatic environments. Excessive nutrients such as phosphates and nitrates can enter the stormwater from activities such as fertilization (possibly from the agricultural area), decomposition of soil and natural rocks, pollutants from vehicle exhausts and even detergents that may be used for washing cars as well as pet waste.

Also, towns usually have a high number of domestic animals such as cats and dogs that if not maintained to restricted areas may have an immense influence on the surrounding natural areas. Domestic cats (*Felis silvestris catus*) have a record for being exotic predators of native species. For example, a study conducted in Albany, USA has indicated that on a monthly average every domestic cat brings home 1.67 prey, with a kill rate of 13% (Kays & DeWan, 2004). Almost half of the prey was juvenile animals and most of them were considered to be common species for that area (Kays & DeWan, 2004). Domestic dogs (*Canis familiaris*) are also considered to be dangerous and a risk for native animals as a result of hunting. However, most dogs are confined to a specific home and will mostly only have an influence on the natural areas if they are allowed in these areas and allowed to hunt.

The farm Roodepoort 151 IS also had agricultural activities in the past as indicated by the remnants of the maize fields. Agriculture can also have detrimental effects on the surrounding natural areas. These effects include pollution due to leaching of agrochemicals, erosion of contaminated soil particles as well as imbalances that occur within nutrient cycles as a result of the agricultural production. Other impacts from agriculture are land conversion and habitat loss, the degradation and genetic erosion of the soil. It is possible that the historical farming may have also impacted the natural area (Sequi, 1999).

Mining and industrial facilities, such as the power generation stations may have detrimental impacts on the surrounding environment. These power generating facilities can be a significant source of pollutants which include sulfur dioxide (SO₂), nitrogen oxide (NO_x) and mercury. Sulfur dioxide and nitrogen oxide reacts with water and other compounds to form acidic compounds, fine particles and ozone. These pollutants usually form part of rainfall and/or gases and particles. The impacts from these pollutants include impaired air quality, acidification of water bodies and possibly harm to sensitive ecosystems. Another pollutant, mercury, is a product of coal-burning



which can be deposited into water bodies. Once deposited the mercury is transformed into methylmercury which bio-accumulate in the food chain effecting predatory fish, fish-eating birds and mammals.

It is therefore a possibility that the town Pullenshope, the Hendrina Power Station or the agricultural area could be impacting the proposed development significantly.



5 RESULTS

5.1 FLORA EVALUATION – DESKTOP STUDY

5.1.1 DESCRIPTION OF LOCAL VEGETATION COMMUNITIES

Vegetation types for the area were extracted from the South African National Vegetation Map (Mucina & Rutherford, 2006) while their conservation status was obtained from both Mucina & Rutherford (2006) and the National list of threatened terrestrial ecosystems for South Africa (2011).

The study area is situated in the Grassland Biome in the Eastern Highveld Grassland vegetation unit (Figure 5-1).

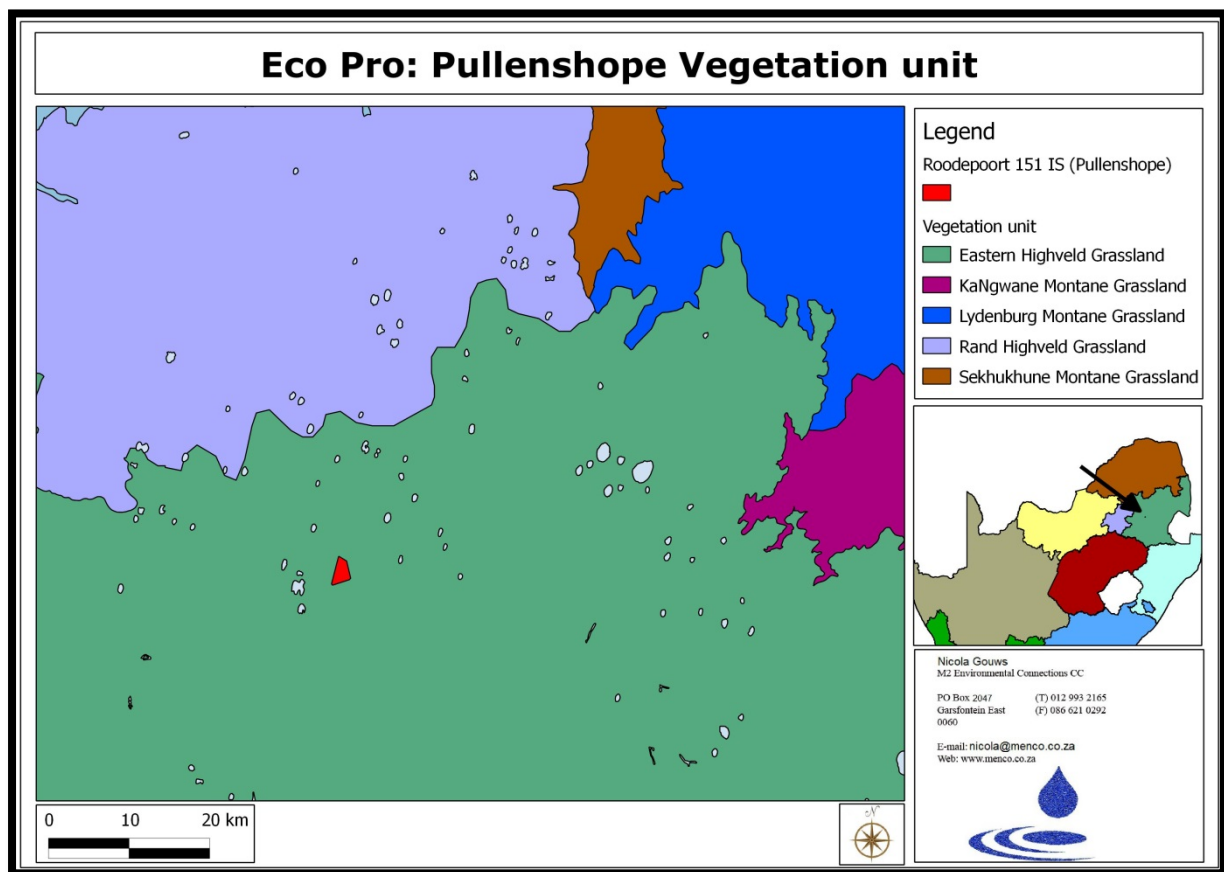


Figure 5-1: The farm Roodepoort 151 IS as located within the Eastern Highveld Grassland vegetation unit.

Eastern Highveld Grassland (Gm12) is characterized by slightly-to-moderately undulating plains with low hills and pan depressions. The vegetation is dominated by grassland with small, scattered rocky outcrops and some woody species occurring in the area. Typical grassland species are common within this vegetation unit including *Aristida*, *Digitaria*, *Eragrostis*, *Themeda* and *Tristachya* grass species. Typical herbs include members of the Family Asteraceae such as



Berkheya setifera, *Haplocarpha scaposa*, *Dicoma anomala*, *Euryops gilfillanii*, *Helichrysum* spp., *Senecio coronatus* and *Vernonia oligocephala* (Mucina & Rutherford, 2006). Other herbs that do not form part of the Asteraceae Family include *Justicia anagalloides*, *Pelargonium luridum*, *Acalypha angustata* and *Chamaecrista mimosoides* (Mucina & Rutherford, 2006). A few geophytic and succulent herbs also occur within the area such as *Gladiolus crassifolius* and *Aloe ecklonis* respectively. Two shrubs have also been classified as occurring within the area namely, *Anthospermum rigidum* subsp. *pumilum* and *Stoebe plumosa* (Mucina & Rutherford, 2006).

The soil is characterized as red to yellow sandy soils of the Ba and Bb land types with a plinthic horizon. The geology consists of shales and sandstones of the Madzaringwe Formation from the Karoo Supergroup (Mucina & Rutherford, 2006). The climate for this vegetation type falls within a summer rainfall period, with very dry winters. The mean annual precipitation ranges between 650 – 900 mm. This vegetation unit does receive frost but it varies between different areas and is usually higher at higher elevations (Mucina & Rutherford, 2006).

The Eastern Highveld Grassland in the Mpumalanga Province is classified as having an Endangered conservation status with only a small fraction statutorily conserved but with a conservation target of 24% (Mucina & Rutherford, 2006). The ecosystem is protected within the Nooitgedacht Dam Nature Reserve and the Jericho Dam Nature Reserve, as well as small private reserves (SANBI & DEAT, 2009). It is estimated that 44% of the vegetation unit is transformed as a result of primarily cultivation but also plantations, mines, urbanisation and the construction of dams.

Information on plant species recorded for the Quarter Degree Squares (QDS) was extracted from the POSA online database hosted by SANBI. A list of plant species that has a high probability of occurring in the 2629BA QDS grid is provided in Appendix D. However, plants species lists for the following QDS are also provided: 2629AB, 2629BC and 2529DC (**Appendix D**). This is a considerably larger area than the study area and consequently the list will contain more species than actually occur at the site. However, this is a conservative approach that takes into account the fact that not all parts of the study will have been sampled in the past. The results indicate that approximately 248 plant species occur within the four QDS grid cells, consisting of 59 Families (**Table 5-1**). The most prominent families are Poaceae (grasses) and Cyperaceae that has 51 and 31 species respectively. Other prominent families are Fabaceae with 19 species and Asteraceae with 18 species. The most species has a perennial lifecycle and only a few annual species is present (**Table 5-1**). A total of 16 exotic species are common in these four areas.

Table 5-1: Number of families and species that occur within the four QDS grid cells

Number of Families	Number of species	Perennial species	Annual species	Exotic species
59	248	197	51	16



Almost all of these species are classified with a “Least Concern” (LC) IUCN status (**Appendix A**) and is therefore considered at a low risk of extinction and includes widespread and abundant species. However, one species was classified with a “DDT” status namely, *Alepidea peduncularis* and one species with a “Declining” status namely, *Hypoxis hemerocallidea*. A species is classified by the IUCN as DDT (Data Deficient – Taxonomically Problematic) when taxonomic problems hinder the distribution range and habitat from being well defined. Therefore, it is difficult to assess whether this species is at a risk of becoming extinct. A species is classified as “Declining” by the national Red List categories when it does not meet any of the five IUCN criteria and does not qualify for any of the categories for Critically Endangered, Endangered, Vulnerable or Near Threatened species but when threatening processes are in place that cause a continuing decline of that species. An example of the South African Red List categories is provided in **Table 5-2** with DDT and LC classified species indicated as green. The Declining species are considered as one of the species of conservation concern indicated in orange. None of the species listed in the ToPS list (Threatened and Protected Species) as published in the Government Gazette (23 February 2007) as part NEMBA (Act 10 of 2004) was found on the plant species recorded in any of the four QDS grid cells.

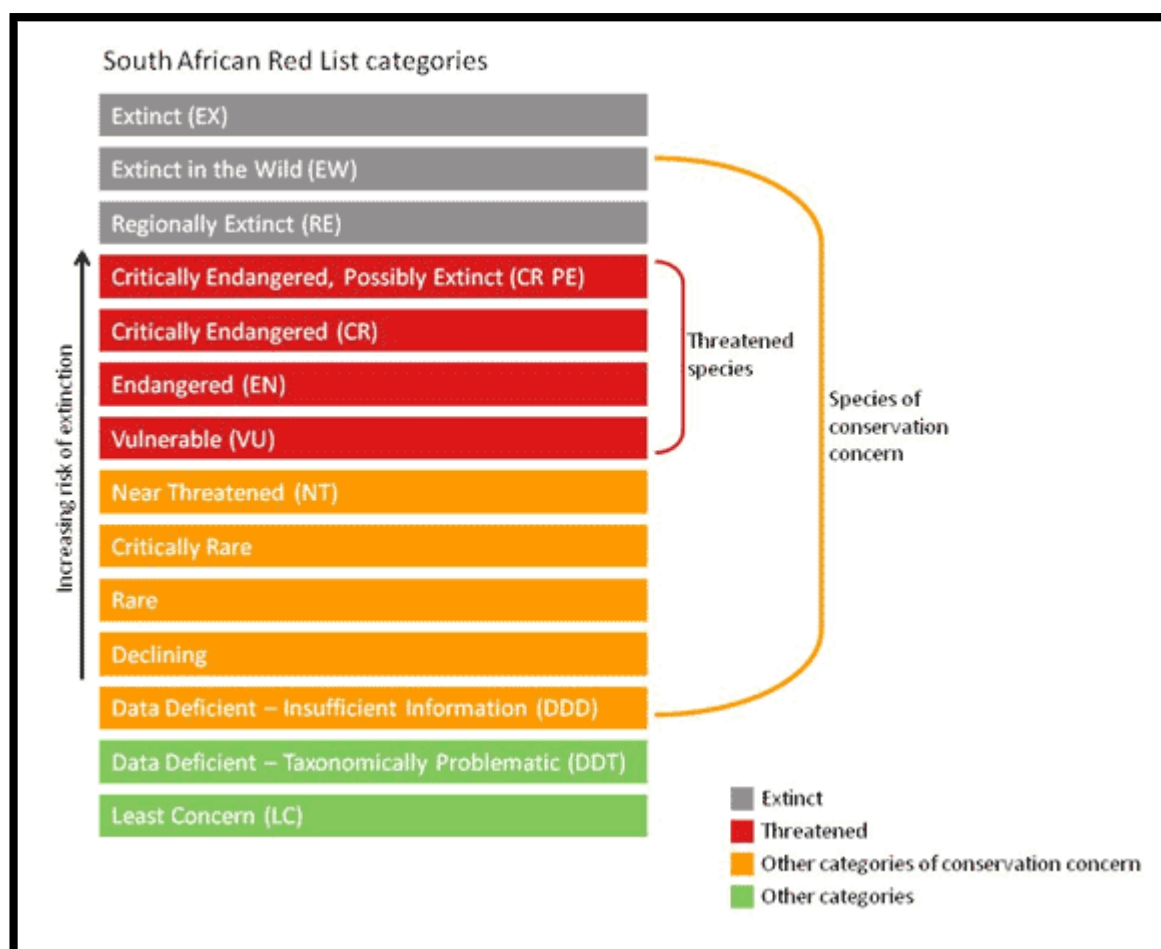


Table 5-2: The South African Red List categories for extinct and threatened species



These species was not identified during the field survey. It is however, the mines' responsibility that if these species are found during any period of the life of the mine, it be removed with the help of a specialist and replanted in favorable conditions where it will not be exposed to any threats on its survival.

5.2 FLORA EVALUATION – FIELD SURVEY

5.2.1 DESCRIPTION OF SITES SURVEYED

The SANBI interactive map and Google Earth maps were used to identify five areas to conduct the flora field survey (See **Figure 4-1** of **Section Error! Reference source not found.**). The field survey was conducted on the 10th of September 2013. The five areas that were chosen were based on areas in the vicinity of the proposed infrastructure of the mine as well as certain areas that still maintain a natural state. These areas were chosen to ensure that the current ecological conditions are surveyed and that they can be assessed and compared to future environmental impacts. Species were identified within a homogenous part of every site surveyed. Some of the species that were identified in the field survey corresponded with the typical species associated with the 2629BA QDS grid cell. However, very low species diversity was noted. It should also be noted that all the areas surveyed falls within the vicinity of a multifaceted channeled valley-bottom wetland. There are no trees within the natural areas, except for *Eucalyptus* spp. that was found along the roadsides. A description of each site will be discussed briefly.

Site 1: Old Maize fields

Site 1 is the only area that was surveyed on the western section of the farm Roodepoort 151 IS. It consists of old maize (*Zea mays*) fields that were harvested in the past but have been destroyed. As a result this area is devoid of any vegetation, which is similar to the terrestrial biodiversity assessment's classification that this area has no natural habitat remaining (See **Figure 3-3**). Only some remnants of the maize remain (**Figure 5-2**). The whole western section of the farm consists of these areas; therefore no other sites were assessed in this area because of the low plant diversity. A veld fire also recently took place in this area, especially near the unchanneled valley-bottom wetland. Since this area is devoid of any natural flora, the proposed impact of the mine is expected to be very low. This area will also be the least impacted because it has no vegetation. A small portion of the oldfields will be mined, a section thereof will be used for the storage of the topsoil and the overburden dump, and the road will be constructed to transport the coal from site. The remainder of the farm will not be utilized. The oldfields would be the most appropriate location for the open cast mine since the area is devoid of any vegetation. Unfortunately, the proposed area of the mine is the only area that has the preferred quality coal for mining and includes only a section of the oldfields. Therefore, even though the area of the oldfields as a mining site would have had a lower impact on the environment, it is not considered as an alternative site for mining.



Figure 5-2: An illustration of the oldfields on the western section of the farm Roodepoort 151 IS

Site 2: *Eragrostis gummiflua*-*Stoebe plumosa* grassland

This area consists of short grassland that is dominated by *Eragrostis gummiflua* species with many *Stoebe plumosa* shrubs (**Figure 5-3**). See also **Figure 4-1**. It is situated on a slightly undulating plain descending towards an eastern direction. Overall the veld is in a good condition with many perennial grass species such *Arundinella nepalensis* and *Sporobolus pyramidalis*. Only nine species were identified at the site with six of them forming part of the Poaceae and the remaining three species from the Asteraceae family (**Table 5-3**). Only one exotic species occurred within the area namely, *Schkuhria pinnata* (**Table 5-3**). However, even though *S. pinnata* is an exotic herb species it is not listed as a category invader as detailed in the Conservation of Agricultural Resources Act (Act 43 of 1983) and the proposed Amendments of 2000.

The location of this site falls within the proposed opencast mining operation. Therefore, it will be severely influenced by the mining development and is considered to be the most impacted area of all sites visited during the field survey. All the vegetation in this area will be destroyed. As discussed previously, this area is the only preferred site for mining with no other alternative sites; the reason being that it contains the quality of coal required for the mining operation. The species that were identified within site 2 are indicated in **Table 5-3**.



Figure 5-3: An illustration of the slightly undulating plain with mainly *Eragrostis curvula* and *Stoebe plumosa* species.

Table 5-3: Species identified in site 2

Species	Family	Perennial/Annual	Growth form
<i>Arundinella nepalensis</i>	Poaceae	Perennial	Graminoid
<i>Berkheya zeyheri</i>	Asteraceae	Perennial	Herb
<i>Cynodon dactylon</i>	Poaceae	Perennial	Graminoid
<i>Eragrostis gummiflua</i>	Poaceae	Perennial	Graminoid
<i>Panicum schinzii</i>	Poaceae	Annual	Graminoid
<i>Schkuhria pinnata</i> *	Asteraceae	Annual	Herb
<i>Sporobolus pyramidalis</i>	Poaceae	Perennial	Graminoid
<i>Stoebe plumosa</i>	Asteraceae	Perennial	Shrub
<i>Triraphis andropogonoides</i>	Poaceae	Perennial	Graminoid

* indicates exotic species

Site 3: *Themeda triandra* – *Arundinella nepalensis* grassland

Site 3 is located in the vicinity of a channeled valley-bottom wetland (**Figure 4-1**). It consists of a plain grassland area that descends towards the east to the river/wetland zone. An accumulation of salt was closely associated to the wetland area (**Figure 5.4**). This accumulation of salt could be



the result of leaching from the surrounding mining areas. Two grasses dominated the site namely, *Themeda triandra* and *Arundinella nepalensis*. *A. nepalensis* is considered to be a river grass because they tend to grow in wet areas such as riverbanks. It also prefers sandy soil and open grassland regions. *Themeda triandra* however, is an extremely valuable grass because it is considered to be the most important grazing grass in open grassland regions. It is highly palatable and is a good indicator that the area has a good veld condition (Van Oudtshoorn, 1999). It is also resistant to fire and will increase when the veld is burned regularly. One abundant species that was found within the area was *Berkheya bipinnatifida* subsp. *echinopsoides* (Table 5-3). This species has a Least Concern (LC) status and is known to occur within KwaZulu-Natal, Limpopo and Mpumalanga provinces. Many members of this species occurred within the area. Seven species were identified with three and two species forming part of the Asteraceae and Poaceae families respectively. One species, *Tagetes minuta*, identified was an exotic species that is common throughout South Africa. This species is however not classified as a category invader species as detailed in the Conservation of Agricultural Resources Act (Act 43 of 1983) and the proposed Amendments of 2000.

Table 5-4: Species identified in site 3

Species	Family	Perennial/Annual	Growth form
<i>Arundinella nepalensis</i>	Poaceae	Perennial	Graminoid
<i>Berkheya bipinnatifida</i> subsp. <i>echinopsoides</i>	Asteraceae	Perennial	Herb
<i>Eragrostis</i> spp.	Poaceae		Graminoid
<i>Helichrysum monticola</i>	Asteraceae	Perennial	Herb
<i>Tagetes minuta</i> *	Asteraceae	Annual	Herb
<i>Tetradenia</i> spp.	Lamiaceae		Shrub
<i>Themeda triandra</i>	Poaceae	Perennial	Graminoid



Figure 5-4: An accumulation of salt within the proximity of the wetland/riverine area



Figure 5-5: An illustration of the grassland consisting mostly of *Arundinella nepalensis* and *Themeda triandra* species.



Site 4: Area within the vicinity of the dam

This site is located on the south-eastern border of portion 17 of the farm Roodepoort 151 IS (Figure 4-1). The dam is situated within this grassland and a veld fire had recently occurred surrounding the dam. As a result of the veld fire only three species have been sited (Figure 5-6). The site has a western slope leading to the river and is therefore situated in a wetland area with moist soils. The three species found within this area is *Triraphis andropogonoides*, *Tetradenia* spp. and *Juncus effusus*. Of these species, only *Juncus effusus* is considered to be exotic. This is a cosmopolitan species and it has been stated that this species may possibly have been introduced into South Africa and has now become naturalised (Van Ginkel *et al.*, 2011). The most dominant grass species of this area is *Triraphis andropogonoides*, which is a perennial species (Table 5-5).



Figure 5-6: An illustration of the grassland located near the dam area. It is apparent that a veld fire occurred.

Table 5-5: Species identified in site 4

Species	Family	Perennial/Annual	Growth form
<i>Juncus effusus</i> *	Juncaceae	Perennial	Helophyte, herb
<i>Tetradenia</i> spp.	Lamiaceae		Shrub
<i>Triraphis andropogonoides</i>	Poaceae	Perennial	Graminoid

* indicates exotic species. Considered to be introduced to SA and has become naturalised.



Similar to site 3, this area also has an accumulation of salt. This accumulation of salt is severe because of the white salt crust that is apparent on the ground (refer to Fig. 5-4). Salinisation is the process that leads to an excessive increase of water-soluble salts in the soil. According to the European Commission's Joint Research Centre on soil there are two processes responsible for the salinisation of soil. The first process, primary salinisation is an accumulation of salt through natural processes due to the parent material or groundwater having a naturally high salt content.

Secondary salinisation is the result of human activities such as inappropriate irrigation practices. It is possible that either the mining, historic agricultural activities or the town of Pullenshope's irrigation activities are causing this severe salinisation. The accumulated salts usually consist of sodium, potassium, magnesium and calcium and in excess these salts have detrimental effects on the soil. High levels of salts inhibit seed germination and plant growth because it disrupts the normal water quality and nutrient uptake in plants. It is therefore recommended that a thorough soil analysis is completed to determine the saline constituents that are accumulating. It is also important for the mine to establish mitigation measures to rehabilitate the existing soil conditions and to prevent further degradation from occurring during the operation of the mine.

Site 5: *Panicum schinzii* – *Eragrostis curvula* grassland

The fifth site that was visited during the field assessment is located outside of the border of the portion of the proposed development and is north of site 2 (**Figure 4-1**). This site is dominated by two grass species namely, *Panicum schinzii* and *Eragrostis curvula* (**Figure 5-7**). The area consists of flat plains. Cattle dung was found suggesting that cattle graze the area. Two species that was also common within the area is *Berkheya bipinnatifida* subsp. *echinopsoides* and *Senecio consanguineus*. Nine species were identified within the area of which four of them are from the families Poaceae and Asteraceae each.

Table 5-6: Species identified in site 5

Species	Family	Perennial/Annual	Growth form
<i>Arundinella nepalensis</i>	Poaceae	Perennial	Graminoid
<i>Berkheya bipinnatifida</i> subsp. <i>echinopsoides</i>	Asteraceae	Perennial	Herb
<i>Berkheya setifera</i>	Asteraceae	Perennial	Herb
<i>Eragrostis curvula</i>	Poaceae	Perennial	Graminoid
<i>Panicum schinzii</i>	Poaceae	Annual	Graminoid
<i>Senecio consanguineus</i>	Asteraceae	Annual	Herb
<i>Tagetes minuta</i> *	Asteraceae	Annual	Herb
<i>Tetradenia</i> spp.	Lamiaceae		Shrub
<i>Themeda triandra</i>	Poaceae	Perennial	Graminoid

*indicates exotic species

One exotic species, *Tagetes minuta*, was identified. As indicated previously, this species is not listed as a category invader species. Site 5 is located just north of the proposed development site



for the opencast mine and will therefore be greatly influenced by the development and its associated activities. One of the mitigation measures recommended for this site is the removal of alien/invasive species that may become established.



Figure 5-7: An illustration of the *Panicum schinzii* – *Eragrostis curvula* grassland.

A particular interest in close proximity to site 5 was the occurrence of a species that had a prominent red colouring. This sedge as indicated in **Figure 5-8** occurred in patches below a hill. There is a slope from the hill reaching towards the riverine/wetland area. These patches stood out from the surrounding vegetation and initially it seemed as if though it was the result of toxicity. However, with closer inspection it was indicated that this species was from the genus *Cyperus* (**Figure 5-8**). This species is located within the proximity of the multifaceted channeled valley-bottom wetland in the palustrine zone. It is proposed that a thorough wetland delineation and aquatic survey should be conducted by a wetland specialist since the wetlands are one of the most sensitive areas on the farm and is valuable. Any type of mining activities in these areas is strictly prohibited. The wetland and/or river areas need to be strictly monitored and should have a 100 m buffer for the duration of the mine.



Figure 5-8: Red coloring from the sedge *Cyperus* spp. within a wetland area.

Ecological status of grasses

Two species that were found at site 3 (**Figure 4-1**) namely, *Arundinella nepalensis* and *Themeda triandra*, are referred to as “Decreaser” species. Decreaser species are usually highly palatable climax grasses and are good indicators of the veld condition. *Themeda triandra* is considered to be one of the most important grazing grass species. *Arundinella nepalensis*, however, is only a valuable grazing grass early in the growing season after which it becomes hard and unpalatable. The abundance of these two species indicates that site 3 is considered to be in a healthy veld condition and that it will be greatly affected by alterations during the construction and operation phase of the mine. This site is also situated in close proximity to the proposed location of the mine and it therefore makes this site very sensitive.

All the other grass species are either indicated as “Increaser I” or “Increaser II” species, of which most species form part of the Increaser II group. Increaser II grasses are abundant in overgrazed veld. These grasses increase as a result of the disturbing effect of overgrazing. It mostly consists of pioneer and subclimax grasses and because they are able to quickly produce many viable seeds, they easily become established. These species include:

- *Cynodon dactylon*
- *Eragrostis curvula*



- *Eragrostis gummiflua*
- *Panicum schinzii*
- *Sporobolus pyramidalis*

The areas in which these species usually occur include road reserves, trampled veld and old cultivated land. Two of these species prefer well drained soil namely *Panicum schinzii* and *Eragrostis curvula*. Both these species occurred at site 5 (**Figure 4-1**) indicating that this site possibly has a higher level of soil moisture in comparison with the other sites. Most of these species occur at site 2 which is located at the proposed development area of the mine. This area is therefore considered to be highly sensitive and would be severely affected and completely destroyed during the construction and operation of the mine.

Increase I species tend to be abundant in underutilised grassland and they usually consist of unpalatable, robust climax species such as *Triraphis andropogonoides* found at sites 2 and 4.

5.2.2 IUCN RED DATA, CITES AND ENDEMIC SPECIES

No Red Data, CITES or Endemic species were encountered during the field assessment. However, from the QDS grid cells in and surrounding the area (Appendix A and B), three species may occur within the area that is either red listed on the IUCN database and/or endemic. These species and their status are indicated in **Table 5-7**.

Table 5-7: Possible IUCN Red Data, CITES and Endemic Species

Species	IUCN Status / CITES	Endemism and Distribution
• <i>Alepidea peduncularis</i>	DDT*	<u>South African Endemic</u> Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo and Mpumalanga
• <i>Hypoxis hemerocallidea</i>	Declining*	<u>Not endemic to South Africa</u> Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga and North-West
• <i>Anacampseros subnuda</i> subsp. <i>lubbersii</i>	VU*; CITES Appendix 4	<u>South African Endemic</u> Mpumalanga (Witbank and Middelburg)

***DDT (Data Deficient – Taxonomically Problematic):** A species is classified as DDT when taxonomic problems hinder the distribution range and habitat from being well defined, so that an assessment of risk of extinction is not possible.

***Declining:** A species is classified as Declining when it does not meet any of the five IUCN criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened, but there are threatening processes causing a continuing decline of the species.

***VU (Vulnerable):** A species is classified as Vulnerable when the best available evidence indicates that it



meets at least one of the five IUCN criteria for Vulnerable, indicating that the species is facing a high risk of extinction.

Alepidea peduncularis is a perennial herb that is often found in grassland, especially in areas where burning took place. The distribution of this species is located along the eastern section of South Africa and it is therefore a possibility that this species may occur within the proposed development area. *Hypoxis hemerocallidea* is classified by SANBI's red list categories as "declining". It is declining because of an increase in harvesting of this species. This species has been over-exploited since 1997 when an article in a magazine claimed that the bulb of this species was effective in treating the immune system of HIV sufferers. It was named as South Africa's "miracle muthi". It is therefore a popular plant that is mostly sold at muthi shops in Gauteng, KwaZulu-Natal and Eastern Cape. Therefore, even though this species is not vulnerable, it may become threatened if exploitation is continued. *Anacampseros subnuda* subsp. *lubbersii* is classified by SANBI's red list categories as "vulnerable". This species is endemic to South Africa and its distribution is only within the Mpumalanga region in the areas surrounding the towns of Middelburg and Witbank (AOO < 10 km²). *A. subnuda* subsp. *lubbersii* is a habitat specialist that is threatened by mining and urban expansion within the Witbank and/or Middelburg area. Also, the species is listed in Appendix II of the CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) categories for all parts of the plant. Appendix II list species that are not necessarily threatened at this stage with extinction but that may become so unless trade is closely controlled. If this species is found at any stage during the development within or in close proximity to the proposed site, it is important that a specialist investigates the population of the species. A decision should then be made on whether to relocate the species to a favourable area or to prevent construction in that area.

The Eastern Highveld Grassland (GM12) vegetation unit's conservation status is classified as an "Endangered" conservation status. Only a small fraction is statutorily conserved with a conservation target of 24%. Also, 44% of this vegetation unit is transformed as a result of primarily cultivation but also plantations, mines, urbanisation and the construction of dams. The terrestrial biodiversity assessment indicated that the proposed development would fall within an area classified with a "Least Concern" status whilst the remainder of the area is classified as having "No Natural Habitat Remaining". The proposed site however, falls within a "Vulnerable" ecosystem as depicted in the National list of threatened ecosystems of South Africa (2011).

5.2.3 INVASIVE SPECIES

None of the invader species as listed in the Conservation of Agricultural Resources Act (Act 43 of 1983) was observed during the field assessment. Exotic species that were observed are not classified in any of the three invader categories. However, they have to be mitigated to prevent further distribution. These species include:

- *Schkuhria pinnata* (Lam.) Kuntze ex Thell
- *Tagetes minuta* L.



5.2.4 PLANTS OF CULTURAL SIGNIFICANCE

Some of the species that were encountered during the field survey have cultural significance and/or medicinal use. The SIBIS (SANBI's Integrated Biodiversity Information System) and SABIF (South African Biodiversity Information Facility) databases on SANBI's website were used to verify whether the species have any medicinal uses. Ten species were found that have medicinal use and their distribution in the various study sites are indicated in Table 5-8.

Table 5-8: Number of medicinal species in the various study sites

Site	Total number of species in the study unit	Number of medicinal species in study unit
Site 1 (Oldfields)	0	0
Site 2	9	6
Site 3	7	4
Site 4	3	1
Site 5	9	5

From Table 5.8, it is evident that many of the species occurring within each area (apart from site 1) has medicinal value to some extent. This indicates that these sites could possibly have a high cultural significance. (Please refer to **Figure 4-1** for map.)

The species that had medicinal value as verified on the SABIF and SIBIS databases are:

- *Arundinella nepalensis* Trin.
- *Berkheya bipinnatifida* (Harv.) Roessler subsp. *echinopsoides* (Baker) Roessler
- *Berkheya setifera* DC.
- *Cynodon dactylon* (L.) Pers.
- *Eragrostis gummiflua* Nees
- *Juncus effusus* L.
- *Schkuhria pinnata* (Lam.) Kuntze ex Thell.
- *Sporobolus pyramidalis* P.Beauv.
- *Tagetes minuta* L.
- *Themeda triandra* Forssk.

5.2.5 SENSITIVITY OF AREA

Some areas would be affected more severely during the proposed development than others and would therefore have a higher level of sensitivity. Site 2 and the riverine/wetland area will have the highest level of sensitivity with site 2 being completely destroyed during the construction phase of the mine since it falls within the proposed area of the mine. It is recommended that a buffer area is established at 100 m surrounding the river as well as the wetland. No mining activities are to occur within the wetland or associated buffer area. Sites 3 and 5 are predicted to have a moderate level of sensitivity and would be affected by the development of the mine. However, if mitigation measures such as alien species eradication is established and implemented,



the proposed impact will be low. The remaining areas of the farm are considered to have a low sensitivity because of the oldfields that are devoid of any vegetation. These areas cover the majority of the study area and will not be influenced by the proposed activities.

When compared on a broader geographical scale, Roodepoort 151 IS is subject to cumulative impacts from its surrounding areas. The western section of the farm consist mostly of stripped oldfields (*Zea mays*), whilst many other areas in the region are also being used for agricultural purposes. The farm is also in close proximity to the local town, Pullenshope, with mining and energy generation facilities occurring within the area such as the Hendrina Power Station. The accumulation of salt at site 3 near the riverine/wetland area is a possible example of these impacts. This could be the result of stormwater runoff containing high levels of pollution. A large portion of the farm is fragmented because of the oldfields and fencing on the farm, as well as the town which is located east of the farm. The remaining natural areas that are fragmented will increase the “edge effects” of the habitat. Therefore, because of the severity of the surrounding areas, as well as the low biodiversity, the proposed development will have a low impact on the local scale and a medium to low impact on the footprint of the mine.



5.3 FAUNA EVALUATION

5.3.1 DESCRIPTION OF EVALUATION AND FINDINGS

The faunal investigation provides a description of the ecological diversity in terms of species identification as well as the occurrence of threatened/sensitive species that is dependent on available habitat. During the desktop analysis, it was determined that several Red Data species were listed on the South African National Biodiversity database (SANBI) for the specific area.

The most important species of concern that will lead the management of the open cast is determined to be:

- a specific butterfly species (Hesperiidae family): *Metisella meninx* (Marsh sylph)
- *Aonyx spp.* that was discovered to inhabit the area
- Near Threatened Serval spp (*Leptailurus serval*)
- The Waderbird families that is expected to occur within the aquatic areas (AEWA protected and Red Data species identified)

The species of butterfly is Vulnerable due to its Endemic status to the wet wetlands within the Eastern Highveld grasslands within the area and has become extinct in several areas due to building developments and the resulting habitat destruction. They are specifically dependent on the availability of the Poaceae marsh grass species, preferably *Leersia hexandra* on which the larvae feed and females will only lay their eggs on this specific plant. These grass species are known to occur within this area. It is also important to note that previous biodiversity assessments have also indicated its occurrence within the area. This leads to the conclusion that numbers are expected to be favourable. None was observed during the field survey (except for their specific habitat), which is understandable due to their wing period being only between December and March. It was thus difficult to locate this rare and sensitive butterfly species within their egg or larvae form on the property. It is important to note that previous studies have recorded this species within the area and are also listed on the SANBI Database for the specific quarter degree cell.

The Otter droppings that were discovered near the edge of the dam indicate the presence of the Otter spp. within this area. The Clawless Otter is listed as Least Concern (IUCN and SA Red Data Book) while the Spotted necked Otter are listed as Protected within the ToPS List (2007) and Near Threatened within the SA Red Data Book. It is presumed the Otter spp. discovered will be African clawless otter. These will live in neighboring territories of family groups of up to five individuals. Each still having its own range within that territory, they mostly keep to themselves unless seeking a mate. It signals thus the importance of maintaining the linear corridor along the wetland systems and the Woestalleen spruit (and the main river tributaries) at all times during the development.



5.3.2 DESKTOP EVALUATION

5.3.2.1 Legislation relevant to Fauna

Provincial legislation and South African National Environmental Biodiversity Act also grant protective status over several species that are globally (IUCN) of least concern (LC). These species are listed within this document body as well as the complete baseline study that is included within the Appendices for reference.

The South African National Environmental Biodiversity Act (Act 10 of 2004) has also included several species that have to be protected if they occur in the proposed development Area; these lists have been published in the Government Gazette No. 29657 of 23 February 2007 (ToPS List) and have been incorporated into the Fauna study that was conducted at the Roodepoort 151 IS Farm.

Several species that do not have an IUCN (Global) Red Data Listing but have Protective Status within the country itself and if identified or appropriate habitat found, it should be recommended for a specialist herpetological study. A special permit is needed in terms of handling or acting in a way that may impact on these animals and most developments are prohibited in areas where suitable breeding grounds have been found.

Other species which are awarded Protective status in terms of NEMBA (Act 10 of 2004) that might occur within the area is Stag beetles and Tiger beetles. These should be protected when encountered during any stage of development. An illustration is provided below for easy identification of these beetles.

5.3.2.2 Species Determination

During the Desktop study, a list of potential fauna species occurring in the area were compiled and included in the base of the document. Please refer to **Appendix C** for a complete species list as part of the baseline assessment for the Roodepoort area and 2629BA quarter degree grid cell.

The following faunal species are known to occur in the study area:

According to SANBI National Database:

- 1 species of Butterflies
- 13 Frog species (amphibians)
- 14 Reptile species
- 574 bird species have been recorded in the area (SABAP2)
- No Mammal species are listed for the area

According to NEMBA Protection:¹

Threatened species: (Threatened or Endangered Species List: ToPS)

¹ NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 2004 (ACT 10 of 2004): PUBLICATION OF LISTS OF CRITICALLY ENDANGERED, ENDANGERED, VULNERABLE AND PROTECTED SPECIES. GG No. 29657 (February 2007)



- Vulture species that do occur in the Limpopo Area are listed (Endangered)
- 4 Mammalian species may occur within the area (Endangered)
- 2 Endangered bird species listed do occur within the area (Blue crane & Grey crowned crane)
- All Vulnerable Bird Species listed in NEMBA are located within the area

Protected species: (Threatened or Protected Species List: ToPS)

- 16 Invertebrates species are listed that may occur within the area
- 2 Amphibian species (Bullfrog species)
- 1 Reptiles that may occur within the area
- 3 Bird species that occur in the area
- 4 Mammalian species

It is important to note that no species for mammals were listed in the SANBI database for the specific area. A baseline mammalian description of the area was created through comparing mammal populations in vegetation types similar to the Eastern Highveld Grassland vegetation unit on the farm. Habitat analysis provided indications to which species would possibly inhabit this area during the desktop study. The field survey was important to confirm or dispute these findings.

In terms of birds, it is important to note that the availability of water and amount of wetland habitat type within the proposed area, signal the additional protection granted by the AEWA² Agreement that may be described as an intergovernmental treaty dedicated to the conservation of migratory waterbirds and their habitat protection across Africa, Europe, Asia, Greenland and Canadian Archipelago. These will be listed as sensitive species within the next section (Please refer to **Section 5.3.2.3** below).

5.3.2.3 Ad hoc Sensitive species

Several species were identified as possibly sensitive species within the framework of this study. The sensitive species were determined according to their close relationship and dependence on the Eastern Highveld grassland, especially *Poaceae* species within the area and *Leersia hexandra* that do occur on site. These mostly consist of a butterfly which depends on the *Leersia hexandra* species during its life stages (Please refer to **Section 5.3.3.6.1** below for more details).

Specific bird species may be classified as sensitive within the particular site because, if the wetland habitat and habitat integrity declines, they will most likely be the first to leave the area. The relation between wetlands and birds is shaped by many factors. These include the availability, depth, and quality of water, the availability of food and shelter and the presence or absence of predators. Birds that use wetlands for breeding depend on the physical and biological attributes of the wetland. Birds have daily and seasonal dependencies on wetlands for food and other life-support systems. They are all dependent on a specific plant community to either construct their nests or as food and preferred habitat. Migratory birds will also be harshly affected if the wetland areas are impacted and destroyed during their absence.

² African-Eurasian Waterbird Agreement



Results of the declining plant community (wetland specific and riparian vegetation) will be that inter- and intra-specific competition will increase, leading to detrimental results for most of these species.

A decline of the listed mammalian species that may occur within the area will also be expected due to these complex interacting factors. Due to the habitat type, there are several smaller species that is considered for conservation status in terms of their endemic nature (Please refer to **Section 5.3.3.7** below) and will not be repeated here.

Sensitive species that may occur as a result of the wetland and permanent riverine habitat and does not respond well to disturbance may be listed as the water bird species indicated (please refer to **Section 5.3.3.3.2** below), water fowl (refuge and breeding habitat) and the Otter spp. that are closely related to a specific water habitat for survival.

5.3.2.4 Mammalian evaluation and Habitat analysis

In the desktop study it was determined that no mammal species is included on the SANBI database for the specific quarter degree grid area. This led to the assumption that there are not any data recorded in terms of mammals in the area (due to the fact that there were other species listed for the specific area). The Eastern Highveld Grassland vegetation type is considered an adequate habitat source with several niches and microhabitats (especially near and within the riparian zones) to assume that mammals will be present on site. In relation to observations conducted of the habitat during the site survey it may be noted that the field seemed in a good condition in terms of grazing possibilities and dung found on the site was both herbivore and carnivore based. This indicates that several trophic levels are intact on the Roodepoort 151 IS farm.

No ridges were also observed on site and habitat characteristics was mostly flat plains and valleys with grassland indicative for smaller mammal species to occur.

Sensitive areas are considered to be all the areas indicated in the wetland study and located within the buffer zones around the natural drainage system within the area.

5.3.2.5 Terrestrial richness

An evaluation of the habitat type and the state of the environment leads to the assumption that there is ample wildlife diversity but moderate richness within this area. During the time of field survey, no rains have fallen after the winter yet, and seasons have just begun to change, which may indicate the nature of the assumption. The diversity and richness in numbers were mostly made on quantity of droppings and spoor found in bare patches and visible routes travelled by these animals. The animals within this area (porcupines, serval, jackals etc.) are known to have a predominant nocturnal nature and activity during daytime is not expected.

A previous study conducted on the Original Farm Roodepoort 151 IS during 2010, indicated the following findings:

- Two antelope species
- One suid (pig species)



- Three rodents species
- Two canines (jackal species)
- Two mustelids (otters, badgers)
- Three herpestids (mongoose species)
- One viverrid (genets & civets)
- One leporid species (hares)
- One felid species

The possible occurrence of the Rough-haired Golden Mole (*Chrysospalax villosus*) may be expected due to their known occurrence within Mpumalanga and their preference of temperate bogs, marsh areas and peatlands which is all indicated on the specific Portion 17. This mole is Critically Endangered (C) and may be present within the larger area due to the vast availability of ideal habitat within the Roodepoort 151 IS farm and neighboring farms. The Highveld Golden mole (*Amblysomus septentrionalis*), considered to be Near-Threatened (NT), may also be present within the area (due to their geographical range) and evidence of their occurrence will be investigated during the field survey analysis of the study.

In accordance with GDACE³; "All wetland and riverine habitats must be surveyed for the following mammal species:

Chrysospalax villosus – (Rough-haired Golden Mole) Vulnerable (IUCN Database)

Myosorex varius – (Forest Shrew) Least Concern (IUCN Database 2013.1)

Mystromys albicaudatus – (White tailed rat) Endangered (IUCN Database)

Lutra maculicollis – (Spotted-neck Otter) Least Concern (IUCN Database)

Amblysomus septentrionalis – (Highveld Golden Mole) Near Threatened (IUCN Database)

Dasymys incommutus. – (African Marsh Rat) Least Concern (IUCN Database)

All these species have a protective status within the South African databases, although they may be common within their Northern ranges and distribution areas.

These findings will be used as a baseline study within this area.

5.3.2.5.1 Birds that could occur in the area

A complete list of potential bird species occurring in the 2629BA quarter degree cell was included at the foot of the document. Please refer to **Appendix B** for a complete list of birds that are expected to occur within the area.

There are several birds recorded in the baseline study that enjoys conservation status and a summary are provided below. The following summary was created by comparing results obtained in the Baseline Quarter degree with the SABAP2⁴ Database in terms of protective status.

³ Minimum Requirements for Biodiversity Assessments

⁴ South African Bird Atlas Project 2



The Near Threatened (NT) species are listed as follows:

• <i>Apalis ruddi</i>	-	Rudd's Apalis
• <i>Lioptilus nigricapillus</i>	-	Bush Blackcap
• <i>Lissotis melanogaster</i>	-	Black-bellied Bustard
• <i>Centropus grillii</i>	-	Black Coucal
• <i>Stephanoaetus coronatus</i>	-	African Crowned Eagle
• <i>Falco biarmicus</i>	-	Lanner Falcon
• <i>Falco peregrinus</i>	-	Peregrine Falcon
• <i>Phoenicopus ruber</i>	-	Greater Flamingo
• <i>Phoenicopus minor</i>	-	Lessor Flamingo
• <i>Circus pygargus</i>	-	Black Harrier
• <i>Circus macrourus</i>	-	Pallid Harrier
• <i>Marcheiramphus alcinus</i>	-	Bat hawk
• <i>Aquila ayresii</i>	-	Ayres's Hawk-Eagle
• <i>Microparra capensis</i>	-	Jacana, Lesser
• <i>Eupodotis caerulescens</i>	-	Korhaan, Blue
• <i>Vanellus melanopterus</i>	-	Lapwing, Black-winged
• <i>Vanellus albicep</i>	-	Lapwing, White-crowned
• <i>Spermestes fringilloides</i>	-	Mannikin, Magpie
• <i>Mirafra cheniana</i>	-	Lark, Melodious
• <i>Anastomus lamelligerus</i>	-	Openbill, African
• <i>Buphagus erythrorhynchus</i>	-	Oxpecker, Red-billed
• <i>Rostratula benghalensis</i>	-	Painted-snipe, Greater
• <i>Pelecanus onocrotalus</i>	-	Pelican, Great White
• <i>Charadrius pallidus</i>	-	Plover, Chestnut-banded
• <i>Nettapus auritus</i>	-	Pygmy-Goose, African
• <i>Glareola pratincola</i>	-	Pratincole, Collared
• <i>Glareola nordmanni</i>	-	Pratincole, Black-winged
• <i>Ciconia nigra</i>	-	Stork, Black
• <i>Leptoptilos crumeniferus</i>	-	Stork, Marabou
• <i>Ciconia episcopus</i>	-	Stork, Woolly-necked
• <i>Mycteria ibis</i>	-	Stork, Yellow-billed
• <i>Sterna caspia</i>	-	Tern, Caspian
• <i>Platysteira peltata</i>	-	Wattle-eye, Black-throated
• <i>Schoenicola brevirostris</i>	-	Warbler, Broad-tailed
• <i>Hypargos margaritatus</i>	-	Twinspot, Pink-throated

The Vulnerable species (V) are listed as follows:

• <i>Terathopius ecaudatus</i>	-	Bataleur Bataleur
• <i>Neotis denhami</i>	-	Denham's Bustard
• <i>Ardeotis kori</i>	-	Kori Bustard
• <i>Polemaetus bellicosus</i>	-	Martial Eagle



• <i>Aquila rapax</i>	-	Tawny Eagle
• <i>Sarothrura affinis</i>	-	Striped Flufftail
• <i>Gyps coprotheres</i>	-	Vulture, Cape
• <i>Torgos tracheliotus</i>	-	Vulture, Lappet-faced
• <i>Podica senegalensis</i>	-	African Finfoot
• <i>Sagittarius serpentarius</i>	-	Secretarybird
• <i>Scotopelia peli</i>	-	Pel's Fishing-Owl
• <i>Tyto capensis</i>	-	African Grass-Owl
• <i>Bucconus leadbeateri</i>	-	Southern Ground-Hornbill
• <i>Geronticus calvus</i>	-	Southern-bald Ibis
• <i>Eupodotis senegalensis</i>	-	Korhaan, White-bellied
• <i>Falco naumanni</i>	-	Kestrel, Lesser
• <i>Circus ranivorus</i>	-	Marsh-Harrier, African
• <i>Gorsachius leuconotus</i>	-	Night-Heron, White-backed
• <i>Pelecanus rufescens</i>	-	Pelican, Pink-backed
• <i>Buphagus africanus</i>	-	Oxpecker, Yellow-billed
• <i>Anthus brachyurus</i>	-	Pipit, Short-tailed
• <i>Anthus chori</i>	-	Pipit, Yellow-breasted

The Endangered (EN) species are:

• <i>Turnix nanus</i>	-	Black-rumped Buttonquail
• <i>Crex crex</i>	-	Corn Crake
• <i>Anthropoides paradiseus</i>	-	Blue Crane
• <i>Balearica regulorum</i>	-	Grey-crowned Crane
• <i>Spizocorys fringillaris</i>	-	Lark, Botha's
• <i>Ephippiorhynchus senegalensis</i>	-	Stork, Saddle-billed
• <i>Gyps africanus</i>	-	Vulture, White-backed

The Critically Endangered (C) Species are listed as:

• <i>Buggeranus carunculatus</i>	-	Wattled Crane
• <i>Sarothrura ayresii</i>	-	White-winged Flufftail
• <i>Heteromirafraga rudd</i>	-	Lark, Rudd's
• <i>Hirundo atrocaerulea</i>	-	Swallow, Blue

Sensitive wader bird species were observed in the area during the site visit, near and on the surface water body found to the South of the proposed development. These birds are deemed sensitive due to their dependence on water quality and quantity as well as the level of disturbance near the water. A complete list of these wader species is included in **Appendix C** at the foot of the document.



5.3.2.6 Amphibian evaluation

The habitat type within the area implies that there are many suitable areas or niches for amphibian species. A large body of surface water is present within Portion 17 to the Southern side of the proposed mining area as well as several wetland zones that may be ideal for breeding and permanent living. This is confirmed in the number of sightings within the area that was included in the table given below and richness is considered to be high.

The amphibian study conducted was mainly of a desktop nature, gathering information from the Frog Atlas of South Africa for the specific Quarter Degree Square, 2629BA; indicating several species have been observed within the area.

These Frogs (13 recorded spp.) known to occur within the area and are included in the table given below.

Table 5-9: Amphibian species within the area

Family	Genus	Common Name	Status	No. of Records
Bufonidae	<i>Amietophrynus gutturalis</i>	Guttural Toad	Least Concern	4050
Bufonidae	<i>Amietophrynus rangeri</i>	Raucous Toad	Least Concern	2025
Hyperoliidae	<i>Kassina senegalensis</i>	Bubbling Kassina	Least Concern	8100
Hyperoliidae	<i>Semnodactylus wealii</i>	Rattling Frog	Least Concern	10125
Phrynobatrachidae	<i>Phrynobatrachus natalensis</i>	Snoring Puddle Frog	Least Concern	2025
Pipidae	<i>Xenopus laevis</i>	Common Platanna	Least Concern	6075
Pyxicephalidae	<i>Amietia angolensis</i>	Common or Angola River Frog	Least Concern	6075
Pyxicephalidae	<i>Amietia fuscigula</i>	Cape River Frog	Least Concern	2025
Pyxicephalidae	<i>Cacosternum boettgeri</i>	Common Caco	Least Concern	12150
Pyxicephalidae	<i>Strongylopus fasciatus</i>	Striped Stream Frog	Least Concern	2025
Pyxicephalidae	<i>Tomopterna cryptotis</i>	Tremelo Sand Frog	Least Concern	4050
Pyxicephalidae	<i>Tomopterna natalensis</i>	Natal Sand Frog	Least Concern	4050
Pyxicephalidae	<i>Tomopterna tandyi</i>	Tandy's Sand Frog	Least Concern	2025



5.3.2.7 Reptile evaluation

As mentioned above, due to the seasonal status during the field survey, it is rare to observe reptile species during these months. The fact that reptiles are cold-blooded species will cause them to become inactive during the colder months and remain in hiding.

It is however important to note that no apparent Red data species occur within this area (according to SANBI database) and all species recorded during the baseline study is of the “Not Evaluated” status within the IUCN list. Please refer to **Appendix C** for a potential list of reptiles that have been recorded within the area during previous surveys and captured on the SANBI database.

Table 5-10: Reptiles captured in desktop study

Family	Genus	Common Name	Status	No. of Records
Agamidae	<i>Agama aculeate</i>	Distant's Ground Agama	NE	10125
Atractaspididae	<i>Aparallactus capensis</i>	Black-headed Centipede-eater	NE	2025
Atractaspididae	<i>Homoroselaps lacteus</i>	Spotted Harlequin Snake	NE	4050
Colubridae	<i>Crotaphopeltis hotamboeia</i>	Red-lipped Snake	NE	2025
Colubridae	<i>Dasypeltis scabra</i>	Rhombic Egg-eater	NE	6075
Colubridae	<i>Lycodonomorphus rufulus</i>	Brown Water Snake	NE	4050
Colubridae	<i>Psammophis crucifer</i>	Cross-marked Grass Snake	NE	4050
Colubridae	<i>Psammophylax rhombeatus</i>	Spotted Grass Snake	NE	2025
Colubridae	<i>Pseudaspis cana</i>	Mole Snake	NE	2025
Elapidae	<i>Hemachatus haemachatus</i>	Rinkhals	NE	4050
Gekkonidae	<i>Pachydactylus affinis</i>	Transvaal Gecko	NE	2025
Gekkonidae	<i>Pachydactylus capensis</i>	Cape Gecko	NE	2025
Gekkonidae	<i>Pachydactylus vansonii</i>	Van Son's Gecko	NE	2025
Scincidae	<i>Trachylepis punctatissima</i>	Speckled Rock Skink	NE	4050

A reptile species that should be included within the baseline study is the *Cordylus giganteus* lizard, also known as “ouvolk” in Afrikaans. This lizard species is common within *Themeda* Grasslands, which is indicated within the Eastern Highveld Biome in which Portion 17 is located.



Although the site survey could not confirm the occurrence of this species within the relevant area, it should be noted that they should be protected if encountered during any stage of development, due to its Vulnerable status (IUCN), Endangered listing (ToPS List) and CITES Appendix II listing.

5.3.2.8 Insect evaluation

Insects were not considered in detail within this document due to their abundance in the veld and low importance in the framework and objective of this study. Insects are considered to be hardy species and will remain if habitat stays favorable. Insects are also mostly dependent on smaller scale variations and habitats and are unlikely to be disturbed due to activities happening in Portion 17.

Only one species within the area are known to be threatened or listed on the global conservancy list (IUCN). This species is Endemic and have only a small amount of favorable habitat remaining in the geographical range within Highveld Grasslands (Please refer to **Section 5.3.3.6.1.** below). These should be protected by ensuring the EMP makes provision for adequate habitat protection to protect the various micro-habitats of these insects.

5.3.2.8.1 Butterflies

The species that was recorded during the desktop assessment is included below:

Table 5-11: Butterfly species known to occur within the area

Family	Genus	Common Name	Status	No. of Records
Hesperiidae	<i>Metisella meninx</i>	Marsh Sylph	Vulnerable	2025

This species captured within the baseline study was listed on SANBI database. This species is listed as Vulnerable according to the IUCN listing definitions. The habitat of this species is particularly sensitive due to its dependence on *Leersia hexandra* spp. (which is known to occur on site). The destruction of this plant species will lead to the loss of natural habitat for this species, due to the fact that females lay their eggs on this plant and larvae feed only on this plant during its instars.

Butterflies are sensitive due to small changes in habitat and climatic differentiations will affect the success of butterflies within the area. Vast clearances or change in vegetation may be detrimental for the species that reside here. The result will be that butterflies will migrate to avoid adverse environmental conditions, but only for short distances, thus suitable habitat should remain in close range of development activities. Butterflies are important contributors to pollination and are considered important biodiversity indicators, since many species have specific relationships with plant hosts and may give an indication of intact communities within habitat types.

It is important to note that many groups of invertebrates actually have the tendency to increase their overall diversity and abundance in disturbed areas such as edges around natural areas. This is because edge environments tend to have a high density of potential food plants as well as providing niches for other species that are not frequently recorded within the sampling area itself.



This is the opposite of what one would expect in disturbed situations and is only noted in invertebrate species.

5.3.2.8.2 Beetles

As mentioned under **Section 5.3.1**, two beetle species that occur within the area should receive protection when encountered during the construction activities. These are the Stag beetle family and the Tiger beetle families. An illustration is provided for easy identification of these species. These species are easily identified due to their large mandibles and the Tiger beetle often has yellowish markings displayed on the elytron.⁵ This is not always the case and they may be uniform or even dark or luminous green depending on specific species. Tiger beetles are considered a good indicator species and have been used in ecological studies on biodiversity

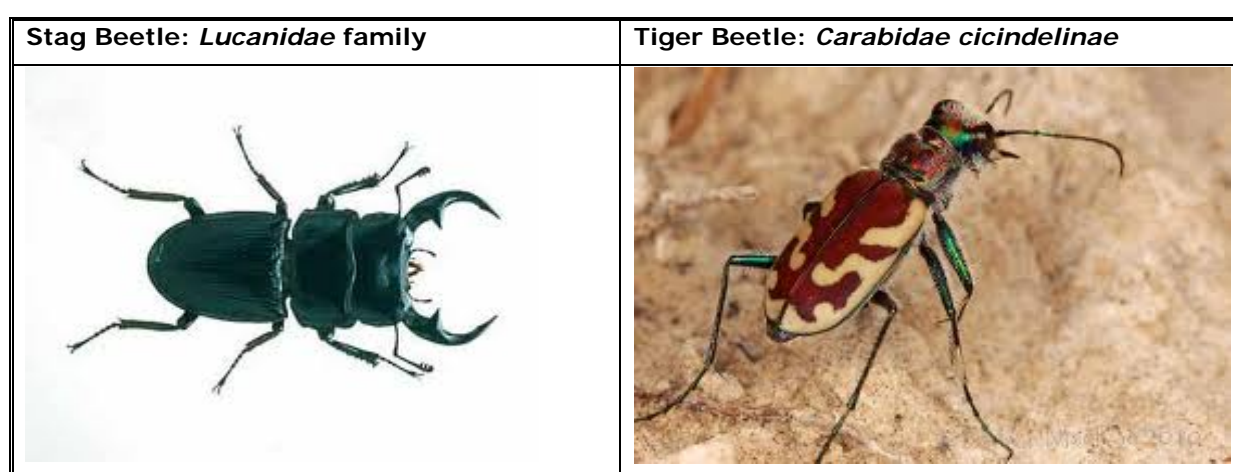


Figure 5-9: Visual illustration of Protected beetles within the area

5.3.3 ENDEMIC SPECIES AND STATUS

This section will include a summary of all Endemic species identified under the fauna evaluation. Please note that sensitive species is included under **Section 5.3.2.3** above and is not repeated below due to their status as *Ad hoc* and not National or International deemed to be threatened. A list of Endemic species will be provided under this section.

The Endemic Species list consists of the following:

(The given table has been adapted to only include species that is likely to occur within Roodepoort Farm 151 IS)

Table 5-12: Endemic Avifauna

Babbler, Southern Pied (<i>Turdoides bicolor</i>)	Endemic
Blackcap, Bush (<i>Lioptilus nigricapillus</i>)	Endemic
Boubou, Southern (<i>Laniarius ferrugineus</i>)	Endemic
Buzzard, Forest (<i>Buteo trizonatus</i>)	Endemic
Buzzard, Jackal (<i>Buteo rufofuscus</i>)	Endemic
Canary, Cape (<i>Serinus canicollis</i>)	Endemic

⁵ Modified hardened forewing serving as a protective wing-case for the hindwings underneath



Canary, Forest (<i>Crithagra scotops</i>)	Endemic
Crane, Blue (<i>Anthopoides paradiseus</i>)	Endemic
Flycatcher, Fairy (<i>Stenostira scita</i>)	Endemic
Flycatcher, Fiscal (<i>Sigelus silens</i>)	Endemic
Grassbird, Cape (<i>Sphenoeacus afer</i>)	Endemic
Harrier, Black (<i>Circus maurus</i>)	Endemic
Ibis, Southern Bald (<i>Geronticus calvus</i>)	Endemic
Korhaan, Southern Black (<i>Afrotis afra</i>)	Endemic
Korhaan, Blue (<i>Eupodotis caerulescens</i>)	Endemic
Korhaan, Northern Black (<i>Afrotis afraoides</i>)	Endemic
Lark, Botha's (<i>Spizocorys fringillaris</i>)	Endemic
Lark, Melodious (<i>Mirafra cheniana</i>)	Endemic
Longclaw, Cape (<i>Macronyx capensis</i>)	Endemic
Mousebird, White-backed (<i>Colius colius</i>)	Endemic
Pipit, African Rock (<i>Anthus crenatus</i>)	Endemic
Pipit, Yellow-breasted (<i>Anthus chloris</i>)	Endemic
Robin-Chat, Chorister (<i>Cossypha dichroa</i>)	Endemic
Robin-Chat, White-throated (<i>Cossypha humeralis</i>)	Endemic
Rock-Thrush, Cape (<i>Monticola rupestris</i>)	Endemic
Rock-Thrush, Sentinel (<i>Monticola explorator</i>)	Endemic
Robin-Chat, Chorister (<i>Cossypha dichroa</i>)	Endemic
Scrub-Robin, Brown (<i>Cercotrichas signata</i>)	Endemic
Shelduck, South African (<i>Tadorna cana</i>)	Endemic
Starling, Pied (<i>Spreo bicolor</i>)	Endemic
Sunbird, Greater Double-collared (<i>Cinnyris afer</i>)	Endemic
Sugarbird, Gurney's (<i>Promerops gurneyi</i>)	Endemic
Sunbird, Southern Double-collared (<i>Cinnyris chalybeus</i>)	Endemic
Tchagra, Southern (<i>Tchagra tchagra</i>)	Endemic
Thrush, Karoo (<i>Turdus smithi</i>)	Endemic
Turaco, Knysna Turaco (<i>Tauraco corythaix</i>)	Endemic
Twinspot, Pink-throated (<i>Hypargos margaritatus</i>)	Endemic
Warbler, Barratt's (<i>Bradypterus barratti</i>)	Endemic
Waxbill, Swee (<i>Coccygia melanotis</i>)	Endemic
Weaver, Cape (<i>Ploceus capensis</i>)	Endemic
White-eye, Cape (<i>Zosterops virens</i>)	Endemic
Woodpecker, Ground (<i>Geocolaptes olivaceus</i>)	Endemic

Table 5-13: Endemic Amphibians and Reptiles

Giant Bullfrog (<i>Pyxicephalus adspersus</i>)	Endemic
Transvaal Gecko (<i>Pachydactylus affinis</i>)	Endemic
Giant girdled lizard (<i>Cordylus giganteus</i>)	Endemic

**Table 5-14: Endemic Insecta**

Marsh Sylph (<i>Metisella meninx</i>)	Endemic
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Table 5-15: Endemic Mammalian species

Rough-haired Golden Mole (<i>chrysospalax villosus</i>) (if present)	Endemic
Highveld Golden mole (<i>Amblysomus septentrionalis</i>)	Endemic



5.3.4 FIELD EVALUATION

In accordance with legislative requirements for a Biodiversity Assessment⁶, the fact that the area included a wetland zone, the following species was specifically searched for during the field assessment:

- *Chrysospalax villosus* (Rough-haired golden mole)
- *Mystromys albicaudatus* (White-tailed rat)
- *Lutra maculicollis* (Spotted-neck Otter)
- *Amblysomus septentrionalis* (Highveld Golden mole)
- *Dasymys incomtus* (African Marsh rat)

The possibility of these species occurring within the designated zone have been investigated, and the conclusion have been reached that it may be likely for the moles and the rat species to occur within the permanent wetland and surface waterbody areas noted near the proposed development. The permanent dam should be avoided and suitable buffer zones should be implemented surrounding this sensitive area. This will also aid the protection of the sensitive bird species identified (please refer to **Section 5.3.2.5.1** above and **Section 5.3.4.2 - 5.3.4.2.1** below for a list compiled of Wader birds that are anticipated to occur.

In terms of the *Lutra maculicollis* (Spotted-neck otter), it is deemed unlikely that the Otter found are from this genus, but rather the Cape clawless Otter (Also confirmed by the previously conducted Biodiversity study conducted by Pachnoda Consulting cc (2010).

Additionally, South African Scoring System (SASS 5) sampling was conducted to determine the state of the aquatic ecosystems on the proposed area. The results indicated positive health and moderate to high scores indicating the health of the wetland systems is acceptable and may be easily impacted if not protected. This will be the same for the species that prefer this type of habitat. They will be affected as soon as the wetland health declines. Compared to other Highveld zones, 2.9 – 3.4 is given as a minimum, thus interpreted would mean that the area is already impacted when compared to other areas recorded within the Highveld EcoRegion in terms of aquatic biodiversity.

5.3.4.1 Mammals recorded

The habitat type suggests sparse species diversity in terms of mammalian groups. The farm has cattle that forage on the farm within the grass fields. Sightings of mammals were limited. Limited sightings are expected within the area and specific habitat type during the day. Dung pellets/droppings/scat and spoor were investigated, due to the lack of sightings for larger animals during the field visit.

Mammal species recorded during the field survey were:

⁶ GDACE requirements



- *Canidae canis* (Jackals holes were sighted, as well as the remains of a duiker, indicative of their activity)
- *Sylvicapra grimmia* (Common duiker) carcass, droppings and spoor were sighted
- *Hystrix africaeaustralis* (Porcupine spines and scat were collected on site)
- *Atilax palundinosus* (Marsh mongoose) spoor was identified near the large water body observed on site
- *Canis mesomelas* / *Vulpes chama* droppings
- *Aonyx capensis* Droppings (Recorded near the Surface Water Body)
- *Leptailurus serval* (scat and spoor of the Serval was recorded on site)

The Serval is also listed in CITES Appendix II, indicating it is "not necessarily now threatened with extinction, but that may become so unless trade is closely controlled." Serval are considered as Near Threatened and listed in the SA Red Data Book and considered Protected within the TOPS List (2007) along with the Cape fox that is also present on site.

Civet, Genet and Honeybadger activity was recorded in the 2010 study conducted by Pachnoda Consulting cc, but could not be confirmed during the field survey in the relevant area of Portion 17 of Roodepoort 151 IS. This does not necessarily dispute their findings.

These species listed above are all considered typical species communities which inhabit Highveld grassveld vegetation areas.

5.3.4.2 Aves assessment

The birds noted in the desktop study show that the species richness and diversity is high within the area. Most birds expected to be seen within the area are Wading Birds and Aquatic birds that utilise the wetland zones and large surface water body to the South of the proposed development area. This may be due of the fact that the grass layer within the area is considered dominant.

5.3.4.2.1 Birds recorded

Bird species recorded during the field survey were mostly related to the wet areas and surface water body that are present. The following species were sighted:

•	<i>Numida meleagris</i>	-	Common Guinea fowl
•	<i>Coturnix coturnix</i>	-	Common Quail
•	<i>Vanellus coronatus</i>	-	Crowned Lapwing
•	<i>Vanellus lugubris</i>	-	Senegal Lapwing
•	<i>Upupa epops</i>	-	African Hoopoe
•	<i>Phalacrocorax africanus</i>	-	Reed Cormorant
•	<i>Dendrocygna viduata</i>	-	White faced Duck
•	<i>Bubulcus ibis</i>	-	Cattle Egret
•	<i>Fulica cristata</i>	-	Red-knobbed Coot
•	<i>Streptopelia semitorquata</i>	-	Laughing Dove
•	<i>Egretta garzetta</i>	-	Little Egret
•	<i>Ploceus xanthops</i>	-	Golden Weaver nests



- *Euplectus progne* - Long-tailed widowbird
- Numerous waterbird species were sighted within the proximity that is expected within permanent water zones. These are all included within the baseline study recorded within the next section and **Appendix C** (indicating water birds and waders).

5.3.4.3 Reptiles recorded

No reptiles were recorded during the field survey, possibly due to the weather conditions and the recent veld fire that has leveled most of the field. No ridges or rocky formations were observed during the field assessment, which is usually the preferred habitat for these creatures.

This confirms the possibility for the previous mention of the occurrence of “ouvolk” within this area. The giant girdled lizard’s preferred habitat is typically that which may be observed on Portion 17 which is mostly Highveld grassfields and marshy terrain within some areas.

It is also evident that snakes will be fairly common within the area during summer, with adequate food and shelter available (Please refer to **Table 5-10** for a potential list of species).

5.3.4.4 Amphibian assessment

The following limitations are associated with the finding in this regard:

- The survey was done after the winter months in the Southern hemisphere, but before any rain have occurred within the area. The area has ample wetland zones and water availability which leads to the conclusion that amphibians are rich within the area.
- A comprehensive amphibian survey by a qualified herpetologist will be the most reliable source to establish the distribution of this or any other amphibians associated with this habitat. It should be conducted during the wet season to provide an accurate account of the species type. The study should determine if Bullfrog breeding areas are present.
- Most frogs spend the dry season underground and only surface after adequate rains have fallen and was thus not visibly present at the time of the field survey. This is especially the case for the Threatened and Protected Bullfrog species within South Africa. It is unlikely that Bullfrogs may be breeding within this specific area due to their preference for seasonal wetland zones with short grass and the nature of the wetland areas within the development footprint may be classified as permanent wet zones with a clear riparian zone consisting of *Pragmites* spp. (not ideally indicative of bullfrog breeding habitat) but this will have to be confirmed by a qualified herpetologist as it may have implications in terms of development within proximity of the water body.

5.3.4.5 Insects assessment

The insect evaluation was conducted on a desktop level and no pits or traps were implemented during the field assessment. The desktop findings were decided to be adequate and descriptive of the overall area of which Portion 17 will form part of (Please refer to **Section 5.3.2.8** above for the Insect evaluation conducted). The beetles (Stag Beetle: *Lucanidae* family and the Tiger Beetle: *Carabidae cicindelinae*) and the butterfly species (Marsh Sylph: *Metisella meninx*) noted



will be deemed the most important aspect in terms of the Insect assessment conducted. These will be incorporated within the Management Plan provided (Please refer to **Section 8** below).



6 ENVIRONMENTAL IMPACT ASSESSMENT

All forms of development, albeit for mining, industrial, urban or residential purposes, will have an immediate effect on the natural environment. It is therefore of utmost importance to provide information on the environmental consequences these activities will have and to inform the decision-makers thereof.

This assessment will determine the potential impacts on the fauna and flora of the proposed mining activities at the farm Roodepoort 151 IS and the aspects that will be determined are the:

- Future impacts on the fauna and flora deriving from the proposed activities at Roodepoort, especially portion 17 of the farm.
- Mitigation procedures that need to be followed for all significant impacts.
- Proposed factors that would require further study and/or more specialized studies.

An explanation of the impact assessment criteria is defined below in **Table 6-1**.

6.1 RISK ASSESSMENT CRITERIA

Table 6-1: Explanation of the EIA criteria

Extent	
Classification of the physical and spatial scale of the impact	
Footprint (F)	The impacted area extends only as far as the activity, such as footprint occurring within the total site area.
Site (S)	The impact could affect the whole, or a significant portion of the site.
Regional (R)	The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns.
National (N)	The impact could have an effect that expands throughout the country (South Africa).
International (I)	Where the impact has international ramifications that extend beyond the boundaries of South Africa.
Duration	
The lifetime of the impact that is measured in relation to the lifetime of the proposed development.	
Short (ST)	The impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than that of the construction phase.
Short to Medium (S-M)	The impact will be relevant through to the end of a construction phase (1.5 years)
Medium (M)	The impact will last up to the end of the development phases, where after it will be entirely negated.
Long (LT)	The impact will continue or last for the entire operational lifetime i.e. exceed 30 years of the development, but will be mitigated by direct human action or by natural processes thereafter.
Permanent (P)	This is the only class of impact, which will be non-transitory. Mitigation either by



	man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.
Intensity	
The intensity of the impact is considered by examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning, or slightly alters the environment itself. The intensity is rated as	
Low (L)	The impact alters the affected environment in such a way that the natural processes or functions are not affected.
Medium (M)	The affected environment is altered, but functions and processes continue, albeit in a modified way.
High (H)	Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.
Probability	
This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the life cycle of the activity, and not at any given time. The classes are rated as follows:	
Probable (Pr)	The possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is zero (0 %).
Possible (Po)	The possibility of the impact occurring is very low, due either to the circumstances, design or experience. The chances of this impact occurring is defined as 25 %.
Likely (L)	There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined as 50 %.
Highly Likely (HL)	It is most likely that the impacts will occur at some stage of the development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined as 75 %.
Definite (D)	The impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied on. The chance of this impact occurring is defined as 100 %.

To assess each of these factors for each impact, the ranking scales as depicted in Table 6.2 will be used.

Table 6-2: Assessment Criteria: Ranking Scales

PROBABILITY		MAGNITUDE / INTENSITY	
Description / Meaning	Score	Description / Meaning	Score
Definite/don't know	5	Very high/don't know	10
Highly likely	4	High	8
Likely	3	Moderate	6
Possible	2	Low	4
Improbable	1	Insignificant	2



DURATION		SPATIAL SCALE / EXTEND	
Description / Meaning	Score	Description / Meaning	Score
Permanent	5	International	5
Long Term	4	National	4
Medium Term	3	Regional	3
Short term	2	Local	2
Temporary	1	Footprint	1/0

6.2 DETERMINATION OF SIGNIFICANCE

Determination of significance refers to the foreseeable significance of the impact after the successful implementation of the necessary mitigation measures. The Significance Rating (SR) is determined as follows:

Equation 1:

$$\text{Significance Rating (SR)} = (\text{Extent} + \text{Intensity} + \text{Duration}) \times \text{Probability}$$

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

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

6.2.1 IDENTIFYING POTENTIAL IMPACTS WITHOUT MITIGATION MEASURES (WOM)

Following the assignment of the necessary weights to the respective aspects, criteria are summed and multiplied by their assigned probabilities, resulting in a value for each impact (prior to the implementation of mitigation measures). Significance without mitigation is rated on the following scale:

Table 6-3: Significance Rating Scales without mitigation

SR < 30	Low (L)	Impacts with little real effect and which should not have an influence on or require modification of the project design or alternative mitigation. No mitigation is required.
30 > SR < 60	Medium (M)	Where it could have an influence on the decision unless it is mitigated. An impact or benefit which is sufficiently important to require management.



		Of moderate significance - could influence the decisions about the project if left unmanaged.
SR > 60	High (H)	Impact is significant, mitigation is critical to reduce impact or risk. Resulting impact could influence the decision depending on the possible mitigation. An impact which could influence the decision about whether or not to proceed with the project.

6.2.2 IDENTIFYING POTENTIAL IMPACTS WITH MITIGATION MEASURES (WM)

To gain a comprehensive understanding of the overall significance of the impact, after implementation of the mitigation measures, it will be necessary to re-evaluate the impact. Significance with mitigation is rated on the following scale as contemplated in

Table 6-4: Significance Rating Scales with mitigation

SR < 30	Low (L)	The impact is mitigated to the point where it is of limited importance.
30 > SR < 60	Medium (M)	Notwithstanding the successful implementation of the mitigation measures, to reduce the negative impacts to acceptable levels, the negative impact will remain of significance. However, taken within the overall context of the project, the persistent impact does not constitute a fatal flaw.
SR > 60	High (H)	The impact is of major importance. Mitigation of the impact is not possible on a cost-effective basis. The impact is regarded as high importance and taken within the overall context of the project, is regarded as a fatal flaw. An impact regarded as high significance, after mitigation could render the entire development option or entire project proposal unacceptable.

6.2.3 LEGAL REQUIREMENTS

The specialist should identify and list the relevant South African legislation and permit requirements pertaining to the development proposals. He/she should provide reference to the procedures required to obtain permits and describe whether the development proposals contravene the applicable legislation.

6.3 MITIGATION MEASURES

Mitigation measures should be recommended in order to enhance benefits and minimise negative impacts and they should address the following:

6.3.1 MITIGATION OBJECTIVES: WHAT LEVEL OF MITIGATION MUST BE AIMED AT?

For each identified impact, the specialist must provide mitigation objectives (tolerance limits) which would result in a measurable reduction in impact. Where limited knowledge or expertise



exists on such tolerance limits, the specialist must make an “educated guess” based on his/her professional experience.

6.3.2 RECOMMENDED MITIGATION MEASURES

For each impact the specialist must recommend practical mitigation actions that can measurably affect the significance rating. The specialist must also identify management actions, which could enhance the condition of the environment. Where no mitigation is considered feasible, this must be stated and reasons provided.

6.3.3 EFFECTIVENESS OF MITIGATION MEASURES

The specialist must provide quantifiable standards (performance criteria) for reviewing or tracking the effectiveness of the proposed mitigation actions, where possible.

6.3.4 RECOMMENDED MONITORING AND EVALUATION PROGRAMME

The specialist is required to recommend an appropriate monitoring and review programme, which can track the efficacy of the mitigation objectives. Each environmental impact is to be assessed before and after mitigation measures have been implemented. The management objectives, design standards etc., which, if achieved, can eliminate, minimise or enhance potential impacts or benefits must, wherever possible, be expressed as measurable targets. National standards or criteria are examples, which can be stated as mitigation objectives.

Once the above objectives have been stated, feasible management actions, which can be applied as mitigation, must be provided. A duplicate column on the impact assessment tables described above should indicate how the application of the proposed mitigation or management actions has reduced the impact. If the proposed mitigation is to be of any consequence, it should result in a measurable reduction in impacts (or, where relevant, a measurable benefit).

6.3.5 PROJECT PHASING

The impact assessment will provide an evaluation of the significance of each of the three phases of the project i.e. Design, Planning and Construction Phase; Operational Phase; and Closure/Post closure Phase.



7 IMPACT ASSESSMENT AND MITIGATION MEASURES

7.1 DESIGN, PLANNING AND CONSTRUCTION PHASE

7.1.1 IMPACTS ON THE NATURAL ENVIRONMENT

Impact

The construction activities might result in impacts to the natural environment due to increased traffic and construction personnel to the area. Constructing activities and heavy construction vehicles might result in compaction of the soil. Storing of construction material, mixing of concrete or collection and delivering could result in pollution. Pristine areas will be severely impacted if not managed well.

Mitigation

- The construction area should be well demarcated and construction workers should not enter into adjacent areas.
- Mixing of concrete or collection of building material must be restricted to designated sites to minimize the impact.
- Plant removal may result in soil erosion, thus storm water management procedures need to be put into place.
- Continuous rehabilitation of the area should occur during construction.

Mitigation	Extent	Duration	Intensity	Probability	Significance
Without	3	4	8	4	60
With	2	2	6	3	30

7.1.2 IMPACTS ON PLANT SPECIES

Impact

Most of the impacts on plant species will occur during the construction phase. The species found at site 2 will be completely destroyed and cleared for construction to take place. Pathways should be clearly demarcated and kept to.

Mitigation

- A management plan for control of invasive plant species needs to be implemented on all areas of the farm Roodepoort 151 IS. This will be most viable with the implementation of a buffer zone.
- During the removal of the soil, the topsoil or A-zone should be stored separately from the other zones. A soil scientist should be employed during this phase of the mine. The scientist should test the soil during this phase of the mine.
- A buffer zone should be implemented surrounding the wetland areas. The wetlands are extremely important in providing valuable ecosystem services and it is essential that no mining occurs there. Buffer zones should be clearly demarcated as a no go zone. Thorough wetland delineation should be conducted by a wetland specialist. This should be completed before any construction within the area is initiated.
- Any species that are either endemic or vulnerable should be relocated to favorable sites with



the help of a specialist prior to vegetation removal for the construction of the mine. This should be done or assessed before the construction of the mine commences to ensure that these species are relocated.

Mitigation	Extent	Duration	Intensity	Probability	Significance
Without	1	4	10	5	75
With	1	3	10	5	70

7.1.3 IMPACTS ON ANIMAL SPECIES

Impact

The removal of vegetation (open cast mining) in Portion 17 will result in the destruction of macro- and microhabitats. It might also result in the disturbance of sensitive animal species identified within the body of the text, especially the animals that are dependent on the water body. This will lead to increases in inter- and intra-specific competition between species for the remaining habitats and food. The result is the out competing of individuals and certain species.

Mitigation

- To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.
- Activities on site must comply with the regulations of the Animal Protection Act 1962 (Act No. 71 of 1962). Workers should also be advised on the penalties associated with the needless destruction of wildlife, as set out in this act.
- Activities should not commence near the surface water areas or wetlands on the specific Portion of Roodepoort 151 IS.

Mitigation	Extent	Duration	Intensity	Probability	Significance
Without	2	4	6	5	60
With	2	4	3	3	27

Impact

The possible drainage (due to open cast mining) of the wetland areas within in Portion 17 will result in the destruction of aquatic habitat for the sensitive species identified within the document (Otter, Butterfly, Golden Mole & Waterbirds). This will lead to destruction and degradation of habitats and food.

Mitigation

- To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.
- Activities should not commence near the surface water areas or wetlands on the specific Portion of Roodepoort 151 IS.
- A linear corridor between the wetlands and river should be maintained at all times during construction and operational phases.

Mitigation	Extent	Duration	Intensity	Probability	Significance
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Without	3	4	8	4	60
With	2	4	8	2	28

7.2 OPERATIONAL PHASE

7.2.1 IMPACTS ON THE NATURAL ENVIRONMENT

Impact <p>The operational activities might result in impacts to the natural environment due to increased traffic and personnel to the area. Activities and heavy vehicles might result in compaction of the soil.</p>					
Mitigation <ul style="list-style-type: none"> The activity area should be well demarcated and workers should not enter into adjacent areas. Plant removal may result in soil erosion, thus storm water management procedures need to be put into place. Continuous rehabilitation of the area should take place. 					
Mitigation	Extent	Duration	Intensity	Probability	Significance
Without	3	4	6	3	39
With	2	4	2	2	16

7.2.2 IMPACTS ON PLANT SPECIES

Impact <p>Once in operation the mine may have an increase of traffic in the area. Pathways should be clearly demarcated and kept to.</p> <p>Exotic/invasive species may become established. Native and endemic species may become threatened.</p> <p>Wetland areas may be disturbed.</p> <p>Dust from open cast mining may increase tremendously.</p>					
Mitigation <ul style="list-style-type: none"> A management plan for control of invasive/exotic plant species needs to be implemented. This should be an ongoing activity on all areas of the farm Roodepoort 151 IS. Continuous rehabilitation of area should be implemented during the operational phase. Ensure awareness amongst all staff, contractors and visitors to site to not needlessly damage flora and ensure they stay clear from the no go zones in the wetland buffer area. A post-closure plan for the mine should be developed. A possible solution is to utilize the land for grazing. This will be conducted with the assistance of a veld management expert during operational phase. Limit activities (transport etc.) to the smallest area possible. This is to prevent fragmentation that may have irreversible changes to flora and fauna communities. It also increases the invasion of exotic/invasive species. The remaining natural areas after construction should be managed to prevent further 					



degradation. No staff, contractors or visitors are allowed to access these areas.

- Dust pollution measures should be set in place to prevent vegetation from being covered in layers of dust.
- Relocate plants, particularly protected and endemic species, with specialist advice.

Mitigation	Extent	Duration	Intensity	Probability	Significance
Without	2	4	8	4	56
With	1	2	6	3	30

7.2.3 IMPACTS ON ANIMAL SPECIES

Impact

- The damage to plant communities will result in the destruction of microhabitats and burrows of animals. It might also result in the disturbance of sensitive animal species.
- Noises during the operational phase due to blasting and other mining activities will result in a less favourable habitat for species and several communities may seek other more favourable areas to inhabit.
- Fragmentation of habitat areas due to fencing and activity will fragment ranges that certain areas may need to sustain adequate foraging area and breeding grounds.
- Anthropogenic influence stemming from workers that infiltrate/penetrate the natural veld areas will damage and impact on species communities within certain areas.

Mitigation

- To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.
- Activities on site must comply with the regulations of the Animal Protection Act 1962 (Act No. 71 of 1962). Workers should also be advised on the penalties associated with the needless destruction of wildlife, as set out in this act.
- All mining activities should be restricted to one are within the farm and activity and access into larger intact areas should be avoided at all cost. Strict measurements should be implemented. No foraging, food and wood collecting within the veld should be allowed.
- Activity and housing of workers should be kept out of restricted areas.
- Implementation of a buffer-zone is suggested to limit impacts on larger extent of farm.
- All noisy equipment should be mitigated to lessen the sound levels.

Mitigation	Extent	Duration	Intensity	Probability	Significance
Without	2	4	8	5	70
With	2	2	4	3	24

Impact

(Accumulative Impact) The possible drainage (due to open cast mining) of the wetland areas within in Portion 17 will result in the destruction of aquatic habitat for the sensitive species identified within the document (Otter, Butterfly, Golden Mole & Waterbirds). This will lead to destruction and degradation of habitats and food.

**Mitigation**

- To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.
- Activities should not commence near the surface water areas or wetlands on the specific Portion of Roodepoort 151 IS.
- A linear corridor between the wetlands and river should be maintained at all times during construction and operational phases.

Mitigation	Extent	Duration	Intensity	Probability	Significance
Without	3	4	8	4	60
With	2	4	8	2	28

7.3 CLOSURE/POST-CLOSURE PHASE

7.3.1 IMPACTS ON THE NATURAL ENVIRONMENT

Impact

Increased activity and traffic within a shorter timeframe (closure phase) may degrade the area

Mitigation

- Pathways should be clearly demarcated and be kept to. It is important that animals (wildlife and domestic animals) are not handled, removed, killed or interfered with.
- Activities must comply with the regulations of the Animal Protection Act 1962 (Act No. 71 of 1962).
- Rehabilitation of degraded areas is a must.

Mitigation	Extent	Duration	Intensity	Probability	Significance
Without	2	3	6	4	44
With	0	2	4	2	12

7.3.2 IMPACTS ON PLANT SPECIES

Impact

Most of the impacts on plant species will occur during the construction- and operational phases. Final steps in the rehabilitation process will take place. Without the necessary mitigation measures, rehabilitation will be unsuccessful and the environment will not be self-sustaining. If these mitigation measures are not planned well in advance before the rehabilitation phase commences, the rehabilitation process will be unsuccessful.

Mitigation

- A management plan for control of invasive/exotic plant species needs to be implemented. This will be ongoing until the end of the mining closure phase. The mine will be held accountable in this regard.
- Rehabilitation plan should be implemented. This includes the return of the topsoil and the process of replanting the vegetation. The replacement of the topsoil should be done with the



assistance of a soil scientist. Topsoil should be tested closer to the rehabilitation phase to ensure that the soil is of an adequate quality. The post-closure rehabilitation plans should be adopted according to the necessary actions needed during the final stage of the life of mine.

- The use of the farm post-closure should be grazing. The veld management plan that was created by the veld management expert should be thoroughly implemented.
- Close monitoring of plant communities to ensure that ecology is restored and self-sustaining. The monitoring of the flora should be conducted every six months by the environmental practitioner. A report should be written and stored to be made available and should be available at all times.

Mitigation	Extent	Duration	Intensity	Probability	Significance
Without	2	4	8	4	56
With	1	2	4	2	14

7.3.3 IMPACTS ON ANIMAL SPECIES

Impact

The completion of the decommissioning process might create microhabitats and burrows that had been destroyed in the construction/operational phase. The impact is therefore seen as minimal and animals will start to inhabit previous areas that have been deemed inhabitable due to activity and noises.

Mitigation

- To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.
- Activities on site must comply with the regulations of the Animal Protection Act 1962 (Act No. 71 of 1962). Workers should also be advised on the penalties associated with the needless destruction of wildlife, as set out in this act.
- Ensure that an acceptable aesthetic scenario is created post closure. This will be reached through adequate rehabilitation practices by restoring damaged and degraded habitat areas.
- When closure is considered successful and rehabilitation complete, unnecessary fences should be lifted to restore larger foraging areas, especially for larger mammalian species within the area.

Mitigation	Extent	Duration	Intensity	Probability	Significance
Without	2	3	5	4	40
With	0	2	4	2	12



8 FLORA AND FAUNA MANAGEMENT PLAN

8.1 CONSTRUCTION AND OPERATIONAL PHASE

8.1.1 AIMS AND OBJECTIVES

- Prevent the needless loss of or damage to flora particularly with regard to protected, endemic, near-endemic and rare species.
- Prevent death, injury or hindrance to fauna particularly with regard to protected species.
- Prevent significant alteration to the ecosystems in the area.
- Control the introduction of alien invasive species to the area.
- Establish a monitoring programme for early detection of alien invasive species and establish an alien invasive eradication and control programme.

8.1.2 FAUNA AND FLORA MITIGATION AND MANAGEMENT MEASURES

8.1.2.1 Flora Management

The greatest impact on the flora from the mine will take place on the proposed mining area where the open cast mining and infrastructure will be constructed. This development will result in the loss of many plant species and is considered to have the highest sensitivity. The areas surrounding the proposed open cast mine and infrastructure will also be impacted moderately. However, if all the necessary mitigation measures are implemented, the proposed impact on these areas will be low. The oldfields in the western section of the farm Roodepoort 151 IS has a very low sensitivity and the impacts in these areas will be minor.

Each phase of the mine will have different impacts on the surrounding areas and needs to be managed differently. A few management principles for every mine phase will be discussed briefly.

Construction phase:

- Responsible persons from the staff members/workers should be identified to ensure that the necessary mitigation measures are implemented and established. These personnel should also enforce the collaboration of other staff members, contractors and workers to comply with these mitigation measures.
- A management plan for the control of invasive/alien weed species needs to be implemented. This should not only be conducted within the direct location of the mining area but, also the remainder of the farm Roodepoort 151 IS. This will be most viable with the implementation of a buffer zone. Staff members are prohibited from these buffered areas and the responsible person (mentioned previously) should authorize these areas.
- A buffer zone should be implemented surrounding the wetland areas. The wetlands are extremely important in providing valuable ecosystem services and it is essential that no mining occurs there. Buffer zones should be clearly demarcated as a no go zone. It is highly recommended that a wetland specialist conduct a thorough wetland delineation of



all wetland areas located on the farm Roodepoort 151 IS. This should be completed before any construction within the area is initiated.

- During the construction phase the soil is removed. The A-zone of the soil (topsoil) should be stored separately from the other zones. Fortunately, this is part of the plan of the mine. However, it is highly recommended that a soil scientist is employed during this phase of the mine to ensure that it is done correctly. The soil scientist should test the topsoil during the construction phase as well as before the rehabilitation phase is to commence to ensure that the quality of the soil is good. It is also essential that during the rehabilitation phase the soil is replaced within the correct order, with the A-zone at the top part. This process should also be accompanied with the assistance of a soil scientist.
- Any species that are either endemic or vulnerable should be relocated to favorable sites with the help of a specialist prior to vegetation removal for the construction of the mine. This should be done or assessed before the construction of the mine commences to ensure that these species are relocated. The vegetation removal (and associated fauna) should be controlled and should be very specific. For example, it is viable to store/collect the seeds of plants and other plant propagules, soil nutrients and biota, decaying organic matter etc. that can be used during the rehabilitation phases.

Operational phase:

- A management plan for the control of invasive/exotic weed species needs to be implemented. This is not a once-off activity and needs to be ongoing. Also, this should not only be implemented in the mining location but also all other areas of the farm Roodepoort 151 IS. The mine will be the responsible party for these areas as well. The removal of exotic/invasive species can be conducted with the use of herbicides. However, it is essential that these herbicides are low in human toxicity, effective against target species and have minimal effects on non-target species and the environment. It is advised not to use herbicides within the wetland/riverine areas to prevent possible pollution of fresh water systems.
- Ensure linear structures, like roads and pipelines, are well managed to reduce the degradation of vegetation due to edge effects. This will be facilitated by ensuring vehicles remain on roads and alien invasive species introduction is controlled along road verges.
- Continuous rehabilitation should be implemented during the operational phase. However, open cast mining deepens and widens progressively which halts the implementation for early rehabilitation procedures. Fortunately, progressive rehabilitation can be implemented as the mined areas may be re-contoured behind the active mining areas.
- During this phase of the mine, possible post-closure land-use for the area should be determined. Although the use of the farm for conservation purposes after rehabilitation is very low, it is recommended to utilize it for grazing. In this stage of the mine, a veld management specialist should be employed to develop an adequate veld management plan for the area.
- Ensure awareness amongst all staff, contractors and visitors to site to not needlessly damage flora and ensure they stay clear from the no go zones in the wetland buffer area.



- Limit activities (transport etc.) to the smallest area possible. This is to prevent fragmentation that may have irreversible changes to flora and fauna communities. Fragmentation also increases the invasion of exotic/invasive species.
- The remaining natural areas after construction should be managed to prevent further degradation. No staff, contractors or visitors are allowed to access these areas; only the responsible authorities are to be permitted.
- Dust pollution measures should be set in place to prevent vegetation from being covered in thick layers of dust.
- Relocate plants, particularly protected and endemic species, with specialist advice.

Mitigation measures for the closure phase are provided in section 8.2.

8.1.2.2 Fauna Management

- Ensure awareness amongst all staff, contractors and visitors to site to not needlessly harm or hinder animals or damage flora.
- Allow animals to escape areas of activity freely and do not hinder their movement.
- Have a policy in place to prohibit hunting (rifles, snares, dogs). These conditions should be written into contractors agreements with strict penalty clauses. Employees engaging in any of these activities should be faced with disciplinary action.
- To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.
- Have a policy in place preventing domesticated animals for being kept on site.
- Domestic cats should be managed and preferably neutered to prevent large domestic cat populations that will utilize the natural bushveld as hunting and breeding areas (they will act as "unnatural predators" that is introduced with quick breeding cycles and populations will easily escalate if left unchecked). They will destroy bird populations within the area, as well as impact smaller mammalian species which will have detrimental effects on the natural environment. Several instances are documented where domestic cats have destroyed natural areas due to unchecked numbers and will lead to degraded state of pristine areas and populations. This could be implemented by an "Observe-and-Report" programme (which could be applied to every aspect within this management plan), where anyone who sees a kittens should report to the ECO or Environmental Department. Penalties should be investigated to limit the occurrence of this happening inside employee residential areas. Environmental awareness may also help to prevent this by educating the people about this possibility if bringing pets into the area. Due the difficulty in preventing and management of this aspect, it is recommended that no pets be allowed from the beginning of the construction phase until closure.
- Activities on site must comply with the regulations of the Animal Protection Act 1962 (Act No. 71 of 1962). Workers should also be advised on the penalties associated with the needless destruction of wildlife, as set out in this act.



- All mining activities should be restricted to one area within the farm and activity and access into larger intact areas should be avoided at all cost. Strict measurements should be implemented. No foraging, food and wood collecting within the veld should be allowed.
- A strict policy should be developed and communicated to all employees in terms of injured animals and prescribed plan of action in such a case scenario.
- Activity and housing of workers should be kept out of restricted areas.
- All noisy equipment should be mitigated to lessen the sound levels as well as vibration levels should be controlled to limit impact on biodiversity and sensitive species.
- Large undisturbed natural areas should be designated from the planning phase and should remain intact throughout the lifetime of the proposed development as well as closure and decommissioning phase.
- Special lighting in the evenings should be used to limit disturbance of animals (especially since most of these animals are deemed nocturnal) and the attraction of insects to these lights that lead to their death. The current use of high-power security lighting for public areas and arenas have a devastating effect on the nocturnal animals and insects by attracting them away from their natural environment, leading to certain death. A Mercury arc and halogen lamps emit light in the white spectrum, disorientating nocturnal insects and animals and in turn prevents mating and depletes the natural environment of many species as they die circling the lights. Yellow Sodium lights are prescribed as they do not attract invertebrates at night and will not disturb the existing wildlife on the ridge system of the southern landscape. Sodium lamps require a third less energy. When used in thousands of streetlights, they could yield big financial savings and in turn reductions in power-plant emissions.
- An active body to report any problems and observations made (of prohibited activities) or should be designated to an existing committee; this may be the ECO or the Environmental Department of the Kebrafields Pty Ltd. or any other decided management body within the operational framework.

8.1.3 MONITORING

Monitorings framework should be instigated and managed by their Environmental Control Officer (ECO) due to the fact that Kebrafields (Pty) Ltd will follow a SHEQ Management System.

- Quarterly visual assessment of areas to determine if vegetation in undisturbed areas is being impacted.
- A biodiversity baseline assessment conducted should be used to compare results with future biodiversity assessments. Annual biodiversity monitoring of areas both affected and unaffected by activities should be initiated to determine annual fluctuation in species numbers and if necessary relate this to activities on site.
- Determine annual fluctuation in species numbers and if necessary relate this to activities on site.
- Establish a monitoring programme for early detection of alien invasive species and establish and alien invasive awareness, eradication and control programme.



8.1.4 GENERAL MITIGATION AND MANAGEMENT

General

- Protect and preserve all surrounding areas unaffected by the mining operation.

Traffic

- Ensure trucks and vehicles remain on roads and areas designated as a construction site to limit disturbance to areas unaffected by construction.
- Ensure drivers are informed that off-road travelling is prohibited.
- Ensure speed limits are set on all roads and enforce speed limits. Ensure all drivers at the site are informed about speed limits.

Spills

- Regularly maintain equipment to reduce risk of hydrocarbon leaks, and have communication channels set up to report incidences and action plans in place to address issues immediately.
- Report all incidences immediately and have action plans in place to deal with any issues arising immediately.

Dust

- Have dust suppression mechanisms in place such as water sprays.

Noise

- Consider enclosing point sources of noise to reduce noise levels
- Consider use of silencers and other noise muffling devices on equipment and vehicles.
- Consider screening areas of high noise off from sensitive areas.

Housekeeping

- Ensure adequate domestic waste bins are supplied and that domestic waste is removed by a reputable contractor. Adhere to the waste management plan.
- Erect posters to educate staff about the dangers of littering and dangers of damaging sensitive and endemic plant species they may encounter.

8.2 DECOMMISSIONING AND CLOSURE PHASE

8.2.1 AIMS AND OBJECTIVES

- Prevent needless loss of or damage to flora particularly with regard to protected and endemic species.
- Prevent death, injury or hindrance to fauna particularly with regard to protected species.
- Prevent alien invasive species introduction.



8.2.2 FAUNA AND FLORA MITIGATION AND MANAGEMENT MEASURES

8.2.2.1 Flora Management

Closure phase:

- A management plan for control of invasive/exotic plant species needs to be implemented. This will be ongoing until the end of the mining closure phase. The mine will be held accountable in this regard.
- A rehabilitation plan should be implemented. This includes the return of the topsoil and the process of replanting the vegetation. It is recommended that the replacement of the topsoil is done with the assistance of a soil scientist. The topsoil should also be tested closer to the rehabilitation phase to ensure that the soil is of an adequate quality. The post-closure rehabilitation plans should be adopted according to the necessary actions needed during the final stage of the life of the mine. The focus of the rehabilitation plan would be to deliver the best overall environmental, economic and social outcomes.
- Close monitoring of plant communities to ensure that ecology is restored and self-sustaining. The monitoring of the flora should be conducted every six months by the environmental practitioner. A report should be written and stored to be made available and should be available at all times.
- The use of the farm for conservation purposes post-closure of the mine is very low. Therefore, a possible use after rehabilitation would be to utilize it for grazing purposes. For grazing to be efficient, a veld management expert should be employed to develop a veld management programme for the area. This should be done long before rehabilitation is started, especially before the replacing of the soil, to ensure that an adequate and realistic programme is implemented. A possible method for reseeding should be to sow many pioneer species during the first process that will become established more easily. It will make the area suitable for other species to also become established. Therefore, a successional process should be followed. For example, *Themeda triandra* currently occurs within the area which is a climax species. Once removed these species take a long time before becoming established again. This should be taken into consideration and it should be followed by processes that initiate succession.
- Ensure awareness amongst all staff, contractors and visitors to the site to not needlessly damage flora.
- Rehabilitate surrounding area and the TSF walls with natural, indigenous vegetation as much as possible, consulting with specialists as to the most appropriate methods.
- Re-vegetation of all degraded areas and bare patches is advised to speed recovery to natural, self-sustaining state as soon as possible

8.2.2.2 Fauna Management

- Ensure awareness amongst all staff, contractors and visitors to the site to not needlessly harm or hinder animals. At this stage after years of operation, there is a good chance that smaller animals and birds have utilized several man-made structures as their home or breeding area. Caution to avoid these species and destruction of their nests are also advised.



- General management in terms of dust and traffic control will ensure low hindrance to the fauna communities and should be adequate. These measures are discussed below in the following section.

8.2.2.3 General Management and Mitigation

Traffic

- Ensure trucks and vehicles remain on roads and areas designated as construction sites to limit disturbance to areas unaffected by construction.
- Ensure drivers are informed that off-road travelling is prohibited.
- Ensure speed limits are set on all roads and enforced. Ensure all drivers at the site are informed about speed limits.

Spills

- Regularly maintain equipment to reduce risk of hydrocarbon leaks, and have communication channels set up to report incidences and action plans in place to address issues immediately.

Dust

- Have dust suppression mechanisms in place.

8.2.2.4 Monitoring

- Continue with annual biodiversity monitoring. Include biodiversity monitoring sites in rehabilitated areas to determine if these are improving with regard to habitat.
- Continue with alien invasive monitoring, eradication and control programme.



9 CONCLUSIONS

The proposed mining activities at the farm Roodepoort 151 IS are expected to have a medium impact on the footprint and surrounding areas. However, if mitigation measures are implemented these impacts will have a low significance in the area.

The site consists of different areas with contrasting ecological sensitivity expected. Biodiversity is thought to be impacted to variable degrees within Portion 17, with areas closest to the wetlands and proposed mining area to be impacted the most severely.

The following recommendations are made:

- All mitigation must be implemented as stipulated in the Environmental Management Plan.
- Fragmentation of the landscape should be avoided and/or limited at all costs.
- Linear corridor and connectivity between the wetland areas and the main river should be maintained to enable active movement of animals along the water zones. This will protect breeding and migratory movements (both seasonal and non-seasonal behaviour).
- It may be concluded from the study conducted that there are Threatened or Protected species within the Roodepoort farm vicinity and these species should enjoy adequate protection to abide by the National Environmental Law of South Africa. If necessary, these species should be relocated to favourable areas with the assistance of a specialist.
- A follow-up summer assessment could be conducted for comparative purposes, due to the recognized limitations identified within this biodiversity study, but is not a necessity.
- Injured animals should be protected and moved to receive rehabilitation at the designated centre (identified within the EMP) and should not be handled by the employees under any circumstance. Clear protocol should be developed on the matter.

If all mitigation measures are adhered to and implemented, the impact is considered to be low on a local scale and low/medium with regards to the footprint of the mining activities. The EMP should make adequate provision to protect and control local animal populations and the impacting activities that the development will have on these community structures and habitat integrity within the Roodepoort Farm Area.

The mining operation is considered small scale and short-term, which count as favourable attributes. For the most part it is expected that the rehabilitation during the closure phase, if conducted according to standards, will be successful and that the habitat could be restored as a sustainable system. However, it is important to note that the process leading to a sustainable rehabilitation will take many years and that strict monitoring should be implemented. This is the mines responsibility and they will be held accountable for the rehabilitation of the farm Roodepoort 151 IS. It is however also important to know that the possibility exists that even when all the vegetation has been restored, the associated ecosystem services will not have been restored successfully.



10 LIMITATIONS AND ASSUMPTIONS

The desktop study was conducted with up to date resources and as meticulously as possible. The site visit was also conducted as thoroughly as possible. It might however be probable that additional information become available in due time which are not included in this document. It is therefore important that the report be viewed and acted upon with these limitations in mind.

The field survey was conducted in September 2013 and the seasonal rain had not begun prior to the survey. Many of the flora and fauna species may not have been found during the field survey because of this. Most grasses may still not have grown inflorescences and many herbaceous plants and geophytes may still have been dormant impeding the identification of these species.

To perform an exhaustive fauna survey of a study area requires an extensive amount of time (years) due to the very secretive and unpredictable movements of most reptile and mammal species and the migratory movements of bird species across seasons and time scales. Results of fauna field surveys are limited by time and funding availability as well as the movement/activity patterns of the herpetofauna, avifauna and mammalian community during the survey period.

In this specific case (Portion 17), the findings may be considered to have a higher degree of confidence due to several species indicated within a previous biodiversity study conducted during 2010, although recommendations may differ due to specific project details and area considered during the investigation. The short lifetime of the proposed colliery also changed accumulative impacts that might have occurred during longer timeframes. Some effects that are currently taking place is possibly from activities in the adjacent town, Pullenshope, Hendrina Power Station or historical agriculture activities that took place within the area. This is apparent because of the accumulation of salt observed within the wetland region. Regardless of the current activities, the mine will be solely responsible for the rehabilitation of the area and will be held accountable to ensure that all the necessary mitigation measures are put in place to ensure that the area will return to a self-sustaining ecosystem.

The perfect rehabilitation outcome may be unrealistic due to the low importance of the specific area in terms of ecological reserve (partly due to the impacts already irreversible by the close proximity of the town and impacting industrial activities), it may be more suitable to rehabilitate the area impacted towards the previous land-use, for example as grazing area and the specific carry capacity be restored to the original pre-mining field.



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National Legislation of South Africa:

- NEMBA: National Environmental Biodiversity Act (Act 10 of 2004)
- Threatened or Protected Species (ToPS List); Species lists published in the Government Gazette No 29657 of 23 February 2007
- LEMA: Limpopo Environmental Management Act (Act No. 7 of 2003)
- Conservation of Agricultural Resources Act (Act 43 of 1983)



Internet Databases:

European Commission: www.eusoils.jrc.ec.europa.eu

Web: Biodiversityexplorer.org

SANBI Database: www.sanbi.org

SANBI GIS: www.bgis.sanbi.org

sabap2.adu.org.za



Appendix A

IUCN red data categories



Appendix B

Avifauna Baseline study



Appendix C

AEWA Baseline study



Appendix D

Flora Baseline Study



Appendix E

Flora Field Survey

