TERRESTRIAL BIODIVERSITY IMPACT ASSESSMENT REPORT FOR THE PROPOSED VOGELFONTEIN COLLIERY WITHIN THE JURISDICTION OF MSUKALIGWA LOCAL MUNICIPALITY, MPUMALANGA PROVINCE

Terrestrial Biodiversity Specialist Assessment

Prepared for:

Nsovo Environmental Consulting

April 2021

Report Type:	Terrestrial Biodiversity Specialist Assessment
Project Name:	**TERRESTRIAL BIODIVERSITY IMPACT ASSESSMENT REPORT FOR THE PROPOSED VOGELFONTEIN COLLIERY WITHIN THE JURISDICTION OF MSUKALIGWA LOCAL MUNICIPALITY, MPUMALANGA PROVINCE**
Report Compiler:	**Rudolph Greffrath (Pr. Sci. Nat. 400018/17)**

DECLARATION

I, Rudolph Greffrath, in my capacity as a specialist consultant, hereby declare that I –

■ Act as an independent consultant;

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

■ Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);

■ Have and will not have vested interest in the proposed activity proceeding;

■ Have no, and will not engage in, conflicting interests in the undertaking of the activity;

■ Undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);

■ Will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favorable to the applicant or not;

■ As a registered member of the South African Council for Natural Scientific Professions, will undertake my profession in accordance with the Code of Conduct of the Council, as well as any other societies to which I am a member;

■ Based on information provided to me by the project proponent and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of my professional ability;

■ Reserve the right to modify aspects pertaining to the present investigation should additional information become available through ongoing research and/or further work in this field; and

■ I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Rudolph Greffrath *Pr.Sci.Nat* (400018/17, Conservation Science)

May 2021

DECLARATION

I, Tyron Clark, declare that:

- I act as the independent specialist in this application;

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

- I declare that there are no circumstances that may compromise my objectivity in performing such work;

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

- I will comply with the Act, regulations and all other applicable legislation;

- I have no, and will not engage in, conflicting interests in the undertaking of the activity;

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

- All the particulars furnished by me in this form are true and correct; and

- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Tyron Clark (*Pr. Sci. Nat.* 121338) Terrestrial Ecologist

May 2021

EXECUTIVE SUMMARY

RJG Consulting has been appointed to complete a Biodiversity Assessment as per the Terrestrial Plant and Animal protocols which provided the criteria for this assessment and its reporting of impacts on terrestrial biodiversity for activities requiring environmental authorization. This report follows on the site verification screening report completed for the project area. Grammatikos Construction & Mining CC (Grammatikos) is applying for the mining right (MP 30/5/1/1/2/10214MR) and the application was accepted by Department Mineral Resources on 12 October 2018. Nsovo Environmental Consulting was appointed by Gramatikos to complete the EIA process, as fulfilment of the environmental authorisation for the proposed development and operation of an underground coal mine north of Ermelo, Mpumalanga Province. The project area proposed to be mined (underground) has a combined footprint of 1019,89 ha and is located within the Msukaligwa local municipality within the Gert Sibande district municipality.

The site falls partially within the regional vegetation types: Eastern Highveld Grasslands and partially in the Soweto Highveld Grasslands; both of which are listed as threatened ecosystems by the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004 (NEMBA).

According to the Mpumalanga Sector Plan, the Vogelfontein project area contains CBA Irreplaceable areas (wetlands mostly), CBA optimal areas (PAOI location), other natural areas (areas not under agriculture), moderately modified old land (grazing areas across the project site), and heavily modified areas (occurring across the project area). All these demarcations were taken into account during the field work studies planning and execution, as the Sector Plan's delineations were refined where applicable.

From an Avifauna perspective the assessment area investigated in this study was defined by a 1 km buffer placed on this project area and is referred area of influence (AOI). This study was triggered following the running of the National Web-Based Environmental Screening Tool (DEA 2021), which highlighted the north-eastern corner of the project area as being highly sensitive for Southern Bald Ibis (*Geronticus calvus*). After a brief desktop analysis, this was deemed valid and the area considered likely to support not only this species but likely several other regionally occurring avifaunal species of conservation concern (SCC). Consequently, a decision was made to conduct an avifaunal baseline and impact assessment

The field investigation indicated that the majority of the project area was dominated by cultivation in some or other form of progress. Areas not under cultivation was utilised in a variety of ways pertaining to Agriculture, mostly grazing. The dominant natural habitat type was broadly classified as *Eragrostis* dominated Grassland, or Primary grassland. In addition, Secondary moderately disturbed grassland, alien bushclumps (comprising of *Eucalyptus camuldulensis* and *Acacia mearnsii*,) *Gnidia – Diospyros* Rocky Grassland and *Crinum – Arundinella* Riparian habitat were also delineated. A total of 137 plant species were recorded on site of the 187 recorded for the region.

Two plant Species of Conservation Concern (SCC) were recorded for the regional list both Vulnerable (VU), these two were not recorded during field work, however seven provincially protected species were recorded, including: *Aloe ecklonis* (provincially protected), *Crinum bulbispermum* (Red Data Declining and provincially protected), *Eucomis autumnalis* (Red Data Declining and provincially protected), *Haemanthus humilis* (provincially protected) and *Boophone disticha* (Poison bulb). *Aloe ecklonis* found in the *Eragrostis* Grassland habitat;

Crinum bulbispermum and *Eucomis autumnalis* were found in the riparian habitat and *Boophone disticha* and *Haemanthus humilis* were found in the rocky grassland. Although no Red Listed SCC were recorded in the infrastructure areas (PAOI), the following Provincially protected species were recorded, *Gladiolus crassifolius*, *Boophone disticha* and *Eucomis autumnalis*. One protected plant species was recorded outside of the project area boundary, however suitable habitat for *Satyrium spp.* does exist inside the project area.

A total of 14 mammal, 60 Avifauna species and 13 invertebrate species were recorded on site (project area as well as PAOI), none of which are SCC.

The primary impact of the proposed development is a loss of flora and fauna habitat in the form of Agricultural areas and Alien invasive trees, due to infrastructure development. Two avifauna Red Data species were present within the PAOI however, however no plant or animal SCC were recorded. Due to the minimal extent and the very low sensitivity assigned to these habitats after mitigation, the impacts identified will be very low. Alien plant invasion is expected due to surface disturbance due to infrastructure and this should be managed by implementing an alien plant management plan for quarterly monitoring that should take place for at least two years after construction and an additional two years after decommissioning.

The direct impacts on fauna is expected to be low, and moderate with regards to avifauna. The impact of habitat destruction will not affect flora SCC as these species were not recorded. The impact on the two avifauna SCC recorded was rated as Medium after mitigation.

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List of Abbreviations

ADU	Animal Demography Unit
CARA	Conservation of Agricultural Resources Act, 1993 (Act 43 of 1983)
CC	Closed Corporation
CBA	Critical Biodiversity Area
C-Plan	Conservation Plan
CR	Critically Endangered
DARDLEA	Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs
DD	Data Deficient
DEA	Department of Environmental Affairs
DM	District Municipality
DMR	Department of Mineral Rights
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EBA	Endemic Bird Area
ESA	Ecological Support Areas
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMP	Environmental Management Plan

EN	Endangered
EW	Extinct in the Wild
EX	Extinct
Ha	Hectares
HL	Habitat linkage
HR	Habitat requirements
HS	Habitat status
IBA	Important Birding Area
IFC	International Finance Corporation
IUCN	International Union for the Conservation of Nature
IPP	Independent Power Plant
km	Kilometres
km^2	Square kilometres
LC	Least Concern
MTPA	Mpumalanga Tourism and Parks Agency
MBSP	Mpumalanga Biodiversity Sector Plan
MPNCA	Mpumalanga Nature Conservation Act, 1998 (Act No.10 of 1998)
m	Meters
mm	Millimetres
MRA	Mining Right Application
NBSAP	National Biodiversity Strategy and Acton Plan
NE	Not Evaluated
NEMA	National Environmental Management Act,1998 (Act 107 of 1998)
NEMBA	National Environmental Biodiversity Act, 2004 (Act 10 of 2014)
NFEPA	National Freshwater Ecosystem Priority Areas
No.	Number
NPAES	National Protected Areas Expansion Strategy
NT	Near Threatened
ONA	Other Natural Areas
PAOI	Project Area of Influence
PES	Present Ecological Status
PRECIS	Pretoria Computerised Information System
PS	Performance Standard
TMS	Timed Meander Searches
QDS	Quarter Degree Square

RE	Remainder Extend
SABAP	South African Bird Atlas Project
SACNASP	South African Council for Natural Scientific Professions
SANBI	South African National Biodiversity Institute
SCC	Species of Conservation Concern
SEI	Site Ecological Importance
VU	Vulnerable

1   Introduction

1.1   Project Overview

The company Grammatikos Construction & Mining CC is applying for the mining right (MP 30/5/1/1/2/10214MR) and the application was accepted by Department Mineral Resources on 12 October 2018. The application will cover the total mining right's area. It stretches over an area (1027.38 ha) in the Msukaligwa local municipality within the Gert Sibande District Municipality within the Mpumalanga Province. The mining rights area location is shown in Figure 1-1.
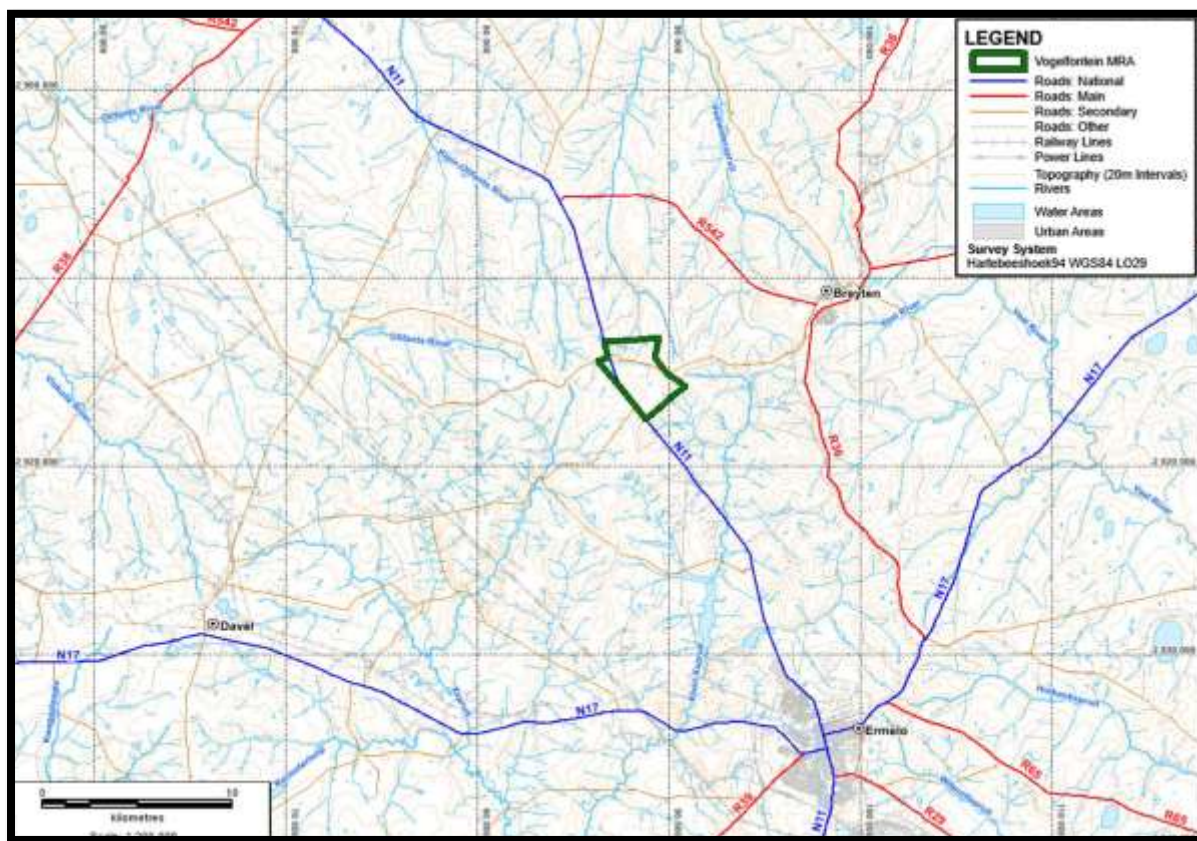
Figure 1-1: Locality

1.2   Project Area of Influence

The IFC PS section 8 states: Where the project involves specifically identified physical elements, aspects, and facilities that are likely to generate impacts, environmental and social risks and impacts will be identified in the context of the project's area of influence. This area of influence encompasses, as appropriate:

The area likely to be affected by:

(i)   the project and the client's activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project;

(ii)   impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or

(iii)   indirect project impacts on biodiversity or on ecosystem services upon which Affected Communities' livelihoods are dependent.

The Vogelfontein project area coal reserve is located deep, ranging from 70 to 160 m below surface. Due to the depth of mining, it is unlikely that subsidence will occur, provided that no pillar-robbing and stooping is undertaken. In the event that subsidence does occur it will not lead to a change in the surface topography, due the depth of the resource. Other infrastructure like stockpiles, roads, dirty water management structures, workshops, wash bay, diesel storage facilities, mobile offices, change house and a stone dust silo will be created and these will be impacting on the surface topography.
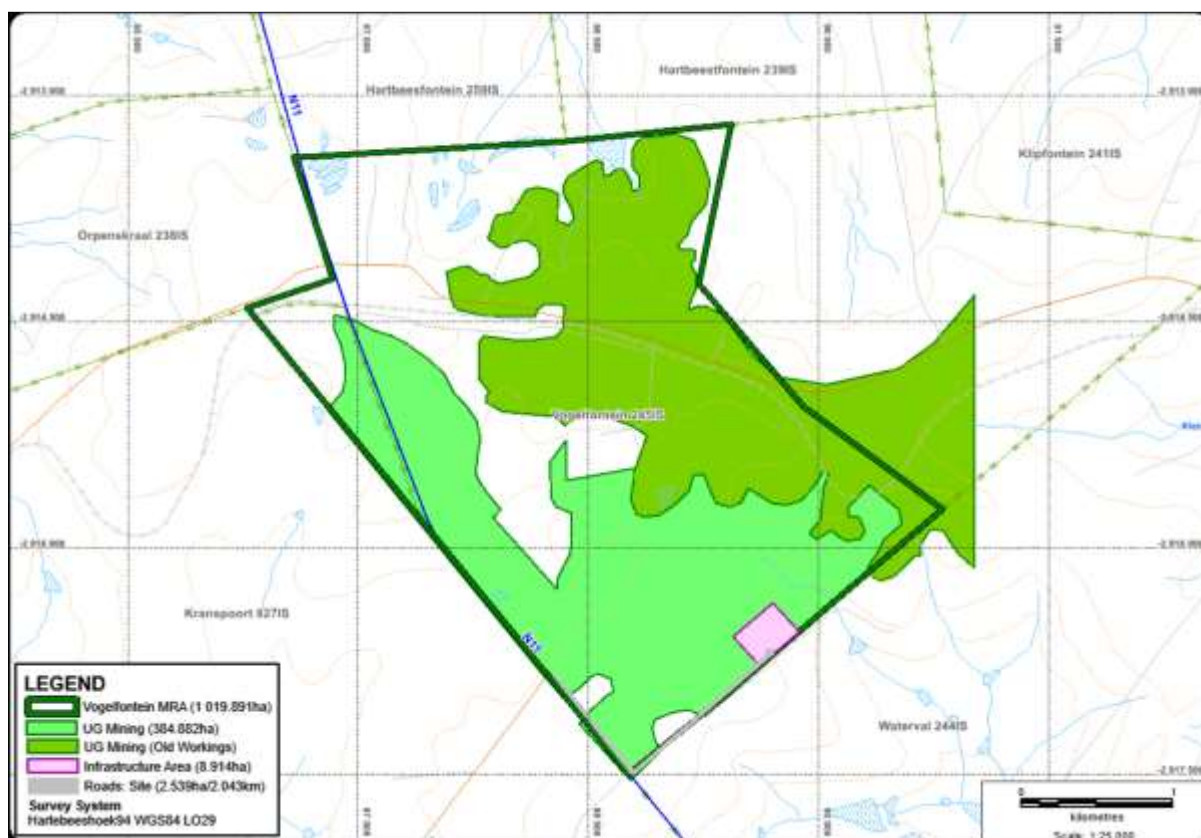
Figure 1-2: Vogelfontein project footprint and PAOI

Note, that although all the mining right properties are included in the application, the planned mining activities are focused on Portions 1, 4, 5 and 13 of the farm Vogelfontein 245 IS and a portion of the Remainder Extend (RE) of the Farm Kranspoort 827 IS in the southern section of the application area.

Grammatikos is planning to mine coal at Vogelfontein Colliery by means of underground mining methods over a period of between 8 and 12 years and an incline shaft will be located on Portion 5 of the Farm Vogelfontein245 IS. The preliminary production schedule indicates approximately 120 000 to 150 000 tons/month. Current geological information indicates that approximately 35 Million tons of coal can be mined at Vogelfontein.

1.3 Terms of Reference

The terms of reference include the following deliverables for this Terrestrial Plants and Animals and Biodiversity Assessment include the following:

- Record representative samples of the plant species that occur within the study area based on field surveys;

- Record representative samples and baseline community of the animal species (mammals, birds and invertebrates (avifauna and butterflies specifically) that occur within the study area based on field surveys;

- Identify which of these species are SCC based on the following lists:

  - International Union for the Conservation of Nature (IUCN) red data list,

  - The South African National Biodiversity Institute (SANBI) red data list,

  - The South African Red Data lists for mammals, butterflies,

  - The National Environmental Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA), and

  - The Convention on International Trade in Endangered Species of Flora and Fauna (CITES) list.

- Determine if any of the recorded species are alien invasive species or problem species in terms of NEMBA alien invasive species classification;

- Using data gathered from the field, determine the vegetation communities occurring within the study area and map these;

- Map important habitats for fauna within the study area;

- Determine the biodiversity value of the study area using information gathered on both flora and fauna and map this;

- Sensitivity assessment and map to identify sensitive areas in the project area;

- Impact assessment, mitigation measures to prevent or reduce the possible impacts and;

- Assess the identified impact of the proposed project and recommend mitigation measures to avoid or mitigate negative impacts.

1.4 Assumptions and Limitations

Whilst every effort is made to cover as much of the site as possible, representative sampling was completed as per the nature of this type of investigation. It is therefore possible that some plant and animal species that are present on site were not recorded during the field investigations.

Every effort is made to identify all plant species present on site during field investigations, this being the wet season, any winter flowering species would have been omitted from field data.

This report lists the findings of an on-site baseline evaluation within the area selected by Grammatikos for its underground mining activities. Potential impacts of the proposed mining operations were evaluated based on the layout provided at the time of writing, and where necessary, recommendations for the most appropriate mitigation measures have been included.

To obtain a comprehensive understanding of the dynamics of the biota on a site, including SCC, studies should include investigations through the different seasons of the year, over a number of years, and extensive sampling of the area. Due to the EIA process time constraints, such long-term research was not feasible, and information contained within this report is based on a wet season field survey.

In terms of limitations relevant to this study, it must be noted that field investigations did not include a nocturnal survey for safety reasons, therefore nocturnal species (specifically bat and owl species) were not recorded by this means.

The following field work limitations are noted:

- Only a single season survey was conducted for the respective studies, which constituted a late summer season survey;

- Access was only arranged for survey work within the project area (MRA) and as such data collection from the AOI was limited to where access could be gained along national or regional road routes;

- The impact assessment was based on the project description as supplied in the scoping report (Jaco-K Consulting, 2021). This was based on the small surface infrastructure footprint provided and that the underground workings would be restricted to the south-western half of the project area; and

- The impact on habitat loss and degradation should be considered tentative. A more conclusive impact rating is precluded by a lack of information on the level of connectivity between the ground and surface water (wetland) aquifers and to what extent any mine dewatering or decant would impact on the water quantity or quality of the wetlands and hydromorphic grasslands. This will remain so until such time as a geohydrological report investigating these aspects has been conducted.

1.5 Report Conditions

Findings, recommendations and conclusions provided in this report are based on the authors' best scientific and professional knowledge as well as information available at the time of compilation. The author, however, accepts no liability for any actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, and by the use of the information contained in this document.

This report should be interpreted after taking into consideration the findings and recommendations provided by the specialist herein. Further, this report should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making, as to the ecological viability of the proposed project.

No form of this report may be amended or extended *without the prior written consent of the author.* Any recommendations, statements or conclusions drawn from or based on this report must clearly cite or make reference to this report. Whenever such recommendations, statements or conclusions form part of a main report relating to the current investigation, this report must be included in its entirety.

The author reserves the right to modify aspects pertaining to the present investigation should additional information become available through ongoing research and/or further work in this field.

1.6 Regulatory and Institutional Framework

The intention to undertake mining activities requires an application for a Mining Right (MR) in terms of the MPRDA. As per section 22(4) (a) of the MPRDA, an applicant is required to complete the required environmental authorisation application process to obtain regulatory approval (provided it is approved) prior to the commencement of any mining activities.

The Terrestrial plant and Animal studies were completed strictly according to the recently published Government Notice 320 (dated 20 March 2020) and Government Notice 1150 (dated 30 October 2020) in terms of NEMA: "Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation".

This report is based on the Species Environmental Assessment Guideline: Guidelines for the implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for environmental impact assessments in South Africa. This guideline provides details for implementing relevant species protocols as they have been identified through the screening tool.

In terms of the NEMA and other applicable laws as listed below, it is required that the environmental and social impacts associated with mining activities be assessed to identify any potential negative and/or positive consequences as a result thereof. Following which, measures must be proposed to avoid or minimise these impacts.

The following legislative requirements were considered during this assessment:

- Section 24 of the Constitution – Environment, 1996 (Act No. 108 of 1996);

- The Minerals and Petroleum Resources Development Act, (Act No. 28 of 2002) (MPRDA) and it's Regulations;

- National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2014) (NEM: BA);

- Section 5 of the National Environmental Management Act, 1998 (Act No. 7 of 1998) (NEMA);

- National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) (NEM: PAA) as amended;

- National Forest Act,1998, (Act No. 84 of 1998) (NFA);

- Mpumalanga Nature Conservation Act, 1998 (Act No.10 of 1998) (MPNCA); and

- Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA).

1.7 Details of Specialists

Rudolph Greffrath (*Pr. Sci Nat* 400018/17) is a terrestrial ecology specialist with 14 years of experience in biodiversity baseline assessments, biodiversity action planning design and development, biodiversity off-set design and implementation, biodiversity strategy design, conservation management planning and implementation, IFC performance standards best practice, ecological restoration, ecosystems services and environmental impact assessments, across Africa.

Tyron Clark (*Pr. Sci. Nat.* 121338) has 10 years of experience conducting biodiversity assessments in a number of African countries, affording him good experience in variety of development types. He attained his MSC in Zoological science from the University of the Witwatersrand. His research interests centre on biogeography and ecological niche modelling. Tyron has completed courses in wetland delineation and management hosted by the University of the Free State.

2 Methodology

2.1 Species Protocols and Associated Species Environmental Assessment Guidelines

The purpose of the Species Environmental Assessment Guideline is to provide background and context to the assessment and minimum reporting criteria contained within the Terrestrial Animal and Plant Species Protocols; as well as to provide guidance on sampling and data collection methodologies for the different taxonomic groups that are represented in the respective protocols. This guideline is intended for specialist studies undertaken for activities that have triggered a listed and specified activity in terms of the National Environmental Management Act, 1998 (No. 107 of 1998) (NEMA), as identified by the EIA Regulations, 2014 (as amended) and Listing Notices 1-3.6.

The screening tool report indicated the environmental sensitivities that intersect with the proposed development footprint as defined by the Grammatikos, as well as the relevant protocols that the applicant would need to adhere to (Terrestrial Plant and Animal and Biodiversity).

Based on the selected classification, and the environmental sensitivities of the proposed development footprint, the screening tool report indicated that the Vogelfontein MRA project area must incorporate the Terrestrial Plant and Animal Protocols as well as the Biodiversity Protocol for inclusion in this assessment report.

The screening tool report provided a list of all confirmed occurring and potentially occurring mammal, bird and invertebrate SCC within the proposed development footprint/PAOI.

2.2 Literature Review and Desktop Study

In addition to the screening tool information, baseline and background information was further researched and used to understand the area prior to fieldwork and to complete the assessment. A local and regional understanding of the project area is gained through this process which enables a more accurate ecological assessment to be done. During the undertaking of the desktop study relevant information was collected from the following sources:

- Mucina and Rutherford (2012), expected vegetation type and community structure;

- Botanical Database of Southern Africa (NEWPOSA);

- Global Biodiversity Information Facility (GBIF);

- Atlas of African Orchids (OrchidMAP);

- Virtual Museum of African Mammals (MammalMAP, 2020);

- Atlas of African Lepidoptera (LepiMAP, 2020);

- Atlas of Dung Beetles in southern Africa (DungBeetle-Map, 2020);

- Atlas of African Spiders (SpiderMap, 2020);

- Mpumalanga Provincial legislation, potential Red Data Listed species and their current status;

- Hockey et al. (2005), Roberts Birds of Southern Africa (seventh end.). Primary source for species identification, geographic range and life history information;

- Sinclair and Ryan (2010), Birds of Africa. Secondary source for identification;

- South African Bird Atlas Project (SABAP 2). Full protocol atlassing data from relevant pentads used to construct expected species list; and

- Taylor et al. (2015), Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. Used for conservation status, nomenclature and taxonomical ordering.

2.2.1 Mucina and Rutherford Vegetation Map of South Africa, Swaziland and Lesotho

The vegetation of South Africa was extensively mapped in the 2006 publication by Mucina and Rutherford. This publication provides relatively detailed descriptions of the various vegetation habitats that are found in South Africa detailing expected species, conservation importance and more. The expected species lists supplied by Mucina and Rutherford (2012) for each vegetation type found in the study area were used to add to the list of expected species for the study area.

2.2.2 National Protected Area Expansion Strategy

The National Protected Area Expansion Strategy (NPAES) has designated areas for future incorporation into existing protected areas (both National and Informal protected areas). These areas are large, mostly intact areas required to meet biodiversity targets, and suitable for

protection. They may not necessarily be proclaimed as protected areas in the future and are a broad scale planning tool allowing for better development and conservation planning.

2.2.3 Mpumalanga Biodiversity Sector Plan (2014)

The Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) is the custodian for the sustainable use of resources and environmental protection in the Mpumalanga Province. This department is responsible for the implementation of the Mpumalanga Biodiversity Sector Plan (MBSP) which is a spatial tool with associated land-use guidelines to inform permissible land-uses that support biodiversity and ecological processes. The main purpose of a biodiversity sector plan is to ensure that the most recent and best quality spatial biodiversity information can be accessed and used to inform land-use and development planning, environmental assessments and authorisations, and natural resource management.

The CBA maps show the following five broad map categories, some of which are further divided into sub-categories as follows:

- Protected Areas;
- Critical Biodiversity Areas (CBAs);
- Ecological Support Areas (ESAs);
- Other Natural Areas (ONAs); and
- Moderately or Heavily Modified Areas (sometimes called 'transformed').

The MBSP Terrestrial database (2014) indicates the presence of areas within three categories that are categorised as CBA Irreplaceable, CBA Optimal and Ecological Support Areas within the project area.

2.3 Field Investigations and Seasonal Influence

The site visit and detailed infield flora and fauna assessments took place from the 8th to the 14th of February 2021. Representations of the flora sampling points are indicated in Figure 2-1 for the entire project area footprint and in Figure 2-2 for the PAOI.
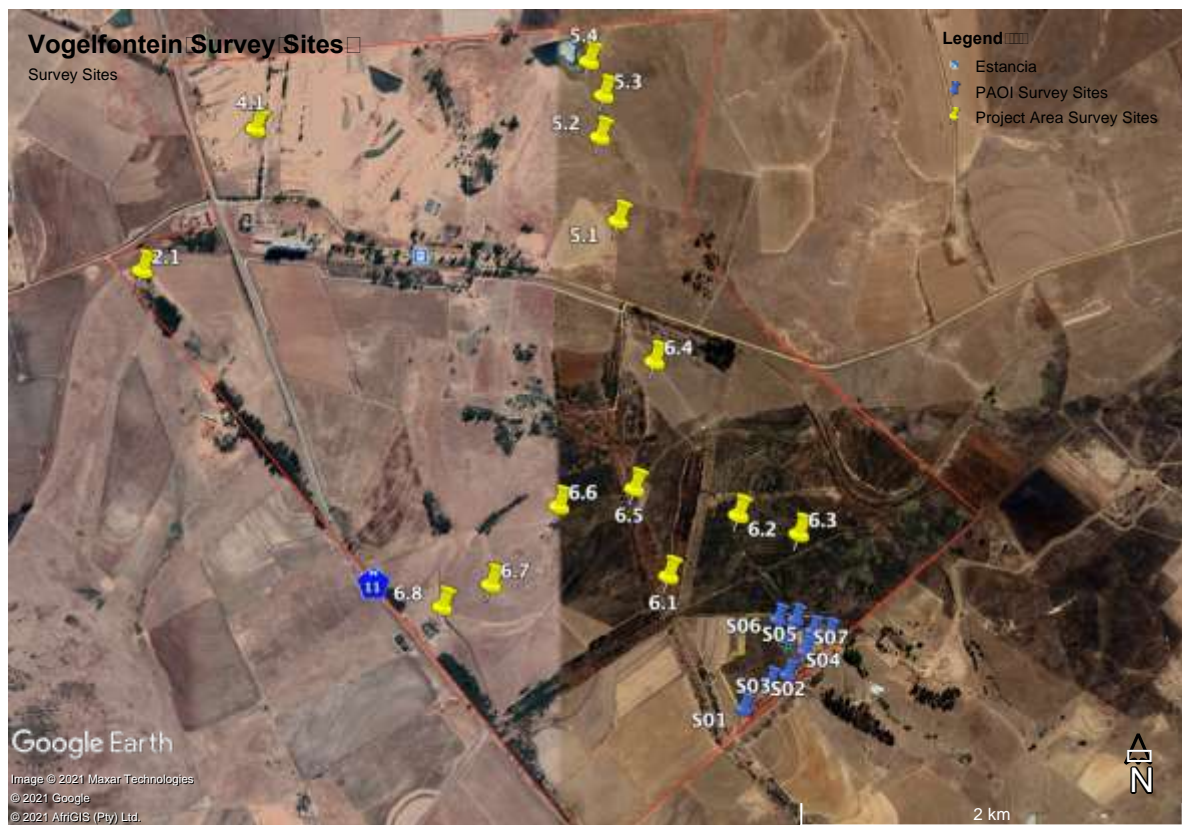
Figure 2-1: Project Area Survey Site Locations

Figure 2-2: PAOI Location

2.3.1 Botanical Assessment

The botanical study encompassed an assessment of all the vegetation units and habitat types within the project area, including the PAOI. The focus was on an ecological assessment of habitat types as well as identification of any Red Data species within the known distribution in the project area. The South African National Biodiversity Institute (SANBI) provides an electronic database system, namely the Botanical Database of Southern Africa (BODATSA), to access distribution records on southern African plants. The NEWPOSA database provided distribution data of flora at the quarter degree square (QDS) resolution. The Red List of South African Plants website (SANBI, 2017) was utilized to provide the most current account of the national status of flora. Relevant field guides and texts consulted for identification purposes in the field during the surveys.

2.3.2 Flora

As the sampling of the entire study area is not possible, representative samples of the vegetation were assessed through Timed Meander Searches (TMS). Aerial imagery was utilized to identify and stratify homogenous vegetation units. Through scoping and desktop assessments sampling routes were selected within representative areas of this homogenous vegetation units and then groundtruthed by means of an infield assessment.

A floristic inventory is compiled while walking slowly through a particular vegetation community, recording all taxa encountered, including those that cannot be immediately identified. The start and end times of the TMS are recorded, as well as a GPS track of the route walked, which is useful for quantifying search effort on each TMS. The TMS duration

and length is determined by the rate at which species are being discovered; once no or very few species are being added the specialist ends the TMS and moves on to another site where a new TMS is started; once TMSs are not producing new species for a particular vegetation community then that community can be considered sufficiently sampled.

2.3.2.1 *Species of Conservation Concern (SCC)*

From the overall species list compiled through field work, a list of SCC is compiled. The comprehensive SCC species list was compiled by taking the following Red Data Lists into consideration:

- International Union for the Conservation of Nature (IUCN) Red Data List (2019);

- The South African National Biodiversity Institute (SANBI) Red Data list version 2019.1;

- The South African Red Data lists for mammals (2004), birds (2016), butterflies and Herpetafauna;

- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) Threatened or Protected Species Regulations, and

- The Convention on International Trade in Endangered Species of Flora and Fauna (CITES) list (2019).

The South African Red Data List uses the same criteria as that defined by the IUCN. According to the IUCN all species are classified in nine groups, set through criteria such as rate of decline, population size, area of geographic distribution, and degree of population and distribution fragmentation (IUCN, 2021). The categories are described in Table 2-1 below.

Table 2-1: Red Data Categories (taken from SANBI 2018)

CATEGORY		DESCRIPTION
Extinct	(EX)	No known individuals remaining.
Extinct in the Wild	(EW)	Known only to survive in captivity.
Critically Endangered	(CR)	Extremely high risk of extinction in the wild.
Endangered	(EN)	High risk of extinction in the wild..
Vulnerable	(VU)	High risk of endangerment in the wild.
Near Threatened	(NT)	Likely to become endangered in the near future.
Least Concern	(LC)	Lowest risk. Does not qualify for a more at risk category. Widespread and abundant taxa are included in this category.
Data Deficient	(DD)	Not enough data to make an assessment of its risk of extinction.
Not Evaluated	(NE)	Has not yet been evaluated against the criteria.

CATEGORY		DESCRIPTION
	Extinct	Threatened species are species that are facing a high risk of extinction. Any species classified in the IUCN categories CR, EN or VU is a threatened species. Species of conservation concern are species that have a high conservation importance in terms of preserving South Africa's high floristic diversity and include not only threatened species, but also those classified in the categories, **NT, LC** and **DD**
	Threatened	
	Other categories of conservation concern	
	Other categories	

2.3.3 Alien Invasive Species

Alien plant species in South Africa are categorised according to the Alien and Invasive Species Lists, 2014 (GN R864 in GG 40166 of 29 July 2016) of the NEMBA (Act 10 of 2004). The national list of invasive plant species listed in NEMBA represents the following categories:

- Category 1a: Species requiring compulsory control;
- Category 1b: Invasive species controlled by an invasive species management programme;
- Category 2: Invasive species controlled by area, and
- Category 3: Invasive species controlled by activity.

The species recorded on site are categorised according to NEMBA, and management measures designed according to requirements of the act.

2.3.4 Fauna

A desktop analysis combined with a wet-season survey was undertaken to determine the species that occur in the study area, compared against historical records and survey results. Fauna occurring on site include assemblages within terrestrial and riparian ecosystems: mammals, birds, and invertebrates. Each of these assemblages occurs within unique habitats, the ecological state of these habitats directly relates to the number of species found within them. The main habitats occurring in the project area are highveld grassland, rocky grassland, wetland and riparian areas. As the general area is used primarily for agricultural purposes such as cattle and maize farming, there are large numbers of cattle, utilising the natural grasslands for grazing.

2.3.4.1 *Mammals*

A variety of methods were used to record small and medium sized mammal species that could be present within the project area, medium sized herbivores were of specific concern due to the preferred habitat of the *Ourebia ourebi* having been extrapolated and expected to occur

on site by the screening tool. The species has not previously been confirmed to occur in the project area.

In addition the visual sightings and ecological indicators (spoor and signs) were used to identify the mammal species present in the study area; this includes scats, tracks and nesting sites such as burrows and dens. Scats found were collected (if required), photographed on scale and along with any tracks found, were identified. Camera trapping was employed as a method in optimal camera trap locations such as mammal walkways/areas of frequent use, drainage lines, burrowing systems, termitaria, isolated burrows and drinking areas (water holes).

For identification purposes a field guide, Smithers Mammals of Southern Africa (2000), was used. Camera trapping was employed in order to determine the presence of medium sized herbivores

The following were recorded:

- All mammals encountered, noted or captured during the survey (rare, endangered and other);

- Mammal species listed by landowners;

- A list of the most prominent mammal species; and

- A list of rare and endangered species encountered during the survey.

Small mammal trapping was applied by using non-fatal Sherman traps located within the various vegetation types. Sherman traps are collapsible traps (23 cm x 9 cm x 7.5 cm) which were baited and laid along transects in the representative vegetation of the study areas. Areas where clear small mammal activity could be seen such as the presence of burrows were also used as sites for trapping and baited. The traps were checked every morning due to the fact that the small mammals are predominantly active at night.

Trapping was undertaken for four consecutive nights at the predetermined sites. Captured animals were photographed and identified. Species of conservation concern and provincially, nationally or internationally listed as protected and endemic within the study area, took priority and the Red Data status was identified and recorded.

2.3.4.2   Birds

Sampling consisted of standardized point counts as well as incidental observations. Standardized point counts (following Buckland et al. 1993) were conducted to gather data on the species composition and relative abundance of species within the various habitats within the project area. Each point count run over a 5 min period. The horizontal detection limit was set a 200 m. At each point the observer documented the date, start time and end time, habitat, numbers of each species, detection method (seen or heard), behavior (perched or flying) and flight direction and general notes on habitat and nesting suitability for conservation important species. To supplement the species inventory with cryptic and illusive species that may not have been detected within the rigid point count protocol, diurnal incidental searches were

conducted. This involved the opportunistic sampling of species between point count periods, river scanning, spotlighting, road cruising and looking for nests of SCC.

Data analysis

Point count data was arranged into a matrix with point count samples in rows and species in columns. The table formed the basis of the various subsequent statistical analyses. This data was first used to generate a species accumulation curve to assess sampling adequacy. Random accumulation was assumed over 100 permutations. To distinguish similarities / differences in the species composition between the four identified avifaunal habitats the matrix was converted into a Bray-Curtis dissimilarity matrix and used to generate a two-axis non-metric multidimensional scaling (NMDS) ordination. Thirdly raw count data converted to relative abundance values and used to establish dominant species and calculate the diversity of each habitat. Shannon's Diversity Index H was the metric used to estimate diversity. All statistical analyses were performed in the R statistical environment.

2.3.4.3   *Invertebrates (Spiders, Scorpions, Beetles and Butterflies)*

During the summer (wet) season, butterflies were identified when observed and transects were walked both within the various vegetation types and into the surrounding vegetation where necessary (approximately 50m at selected points) to identify any scorpion or spider nests. The focus of this assessment was on protected species as this would narrow the field considerably. Assessment of the conservation status of species recorded focused on the various categories of Globally Threatened Species (IUCN 2021) and invertebrates listed by the NEMBA.

2.3.4.4   *Red Data Faunal Assessment*

The IUCN Red Data categories are defined as follow and it is used for the status identification of mammals, birds, reptiles and amphibians globally:

- Critically Endangered (CR): A taxon is Critically Endangered when it is considered to be facing an extremely high risk of extinction in the wild (IUCN, 2021).

- Endangered (EN): A taxon is Endangered when it is considered to be facing a very high risk of extinction in the wild (IUCN, 2021).

- Vulnerable (VU): A taxon is Vulnerable when the best available evidence indicates it to be facing a high risk of extinction in the wild (IUCN, 2021).

- Near Threatened (NT): A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future (IUCN, 2021).

Faunal sampling locations are represented in Figure 2-1 and Figure 2-2 respectively.

2.4   Project Description

It is planned to access the underground reserves by means of a 9-degree decline shaft system entering the shallower B seam at a depth of approximately 70m below surface. Both seams

will be mined by means of continuous miners (CM) supported by mechanical ancillary equipment. The coal will be cut by CM, loaded onto shuttle cars and transported and deposited into mechanical feeder breakers for size reduction purposes. From here the coal will be transported on conveyor belts towards the surface stockpile area where a secondary crushing and screening operation will be conducted. Activities that require authorization is listed in Table 2-2: Applicable Listing .

Table 2-2: Applicable Listing Notices

NAME OF ACTIVITY (All activities including not listed)	Aerial extent of the Activity Ha or m2	LISTED ACTIVITY	APPLICABLE LISTING NOTICE
Development of the access shaft.	0.28 ha	Yes	Listing Notice 1, Activities: 27 Listing Notice 2, Activities: 6, 15, 17, 21
Underground mining	384.9 ha	Yes	Listing Notice 2, Activities: 6, 15, 17, 21
Construction of water management facilities.	0.4 ha - PCD 0.7 ha – Berms and drains. All estimates	Yes	Listing Notice 1, Activities: 9, 10, 12, 13 Listing Notice 2, Activities: 6, 15
Overburden and ROM Stockpiles	0.051 ha – ROM 0.18 ha - Product 0.293 – Overburden 0.116 ha - Topsoil	Yes	Listing Notice 2, Activities: 6, 15, 17, 21 Waste Act, residue deposits and residue stockpiles (1)
Storage, and or handling of a dangerous good, such as diesel.	0.02 ha more than 80 but less than 500 m3	Yes	Listing Notice 1, Activity 14

Offices, change house and workshops	0.2 ha	Yes	Listing Notice 1 GNR 983, Activities: 27
Fans and electricity	0.9 ha	Yes	Listing Notice 1, Activity 11
Waste management	0.010 ha	No	Not triggered
Rehabilitation of the surface	81 ha	Yes	Listing Notice 1, Activity 22

2.4.1 Historical background information

A significant portion of the mining are was mined previously as indicated in Figure 2-3. To date the area where the shaft complex is planned has been farmed by Mr. D Steyn. All the other areas where the underground mine is planned is being used for agriculture by various farmers as depicted. Wetland and grassland areas were recorded in these areas, and are discussed in this document.

2.4.2 Estimated reserves

The estimated reserves within the planned mining area amount to 35 million tons and it extends over an area of 380 ha. Refer to Figure 2-3.
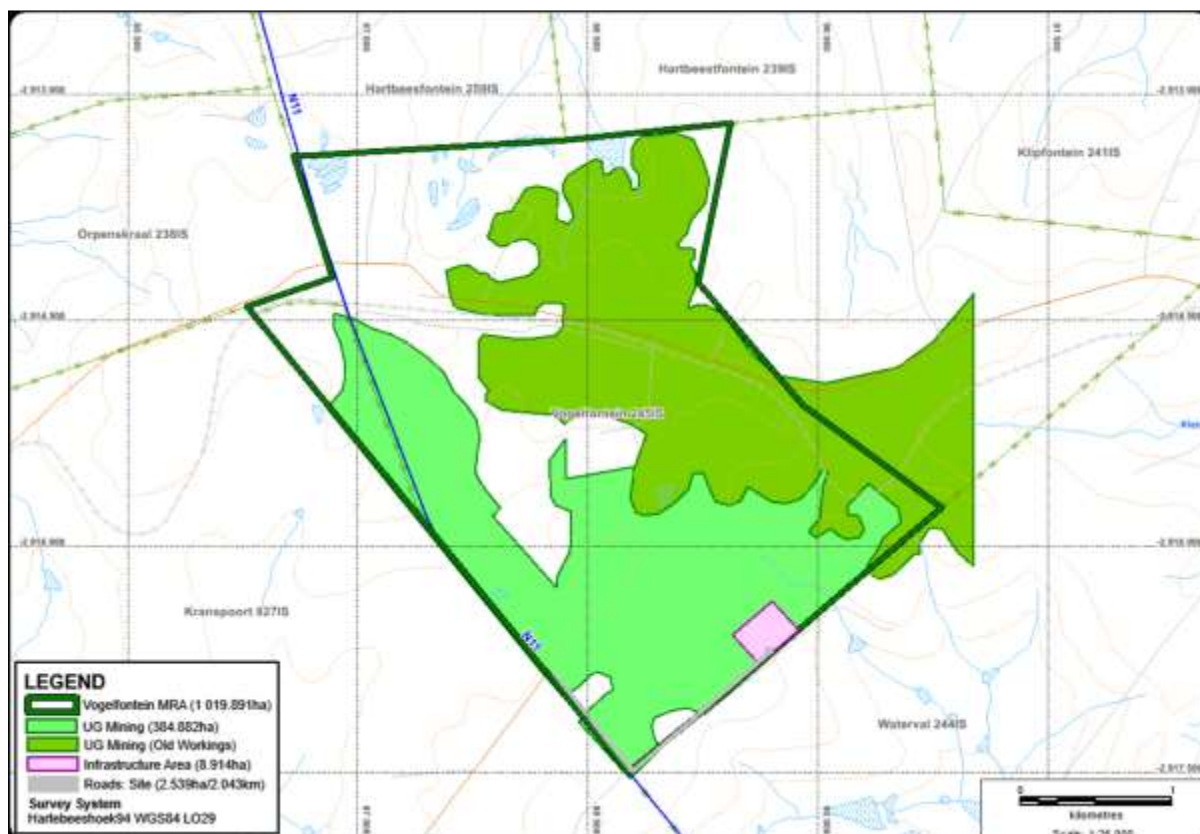
Figure 2-3: Vogelfontein underground mining layout and old workings

3   Study Area

3.1   Locality

The project area is located in the Msukaligwa local municipality within the Gert Sibande district municipality within the Mpumalanga Province. The closest towns are Bethal which is approximately 16 km from the proposed project area and Ermelo which is approximately 22 km from the project area.

3.2   Topography and Climate

The Mpumalanga Province is characterised by diverse landscape topography, from undulating plains, to the rolling hills and rocky outcrops, to the many pan depressions and valleys. This type of landscape not only gives rise to differing climatic profiles but vegetation profiles owing to the climates.

The climatic data quoted in this section are from the weather stations at Ermelo (Nooitgedacht Agricultural) and Carolina, which are the closest stations to Vogelfontein.

Data from rainfall gauge C1E002 between 1951 and 2009 was used. The majority of rainfall occurs between October and March, with a mean annual precipitation for the site to be 734

mm/a. The Highveld has a cooler climate and very dry and cold winters. The rainfall season, much like the rest of South Africa, falls in the summer season (Mucina and Rutherford, 2006).

3.3   Soils

The major soils classified of the project area according to the soil and terrain database SOTER include:

Plinticacrisols (ACp) (Majority of project Area): Acrisols are soils that have a higher clay content in the subsoil than in the topsoil as a result of pedogenetic processes (especially clay migration) leading to an argic subsoil horizon. Plinthic indicates a subsurface horizon consisting of an iron-rich, humus-poor mixture of kaolinitic clay with quartz and other constituents, and which changes irreversibly to a hardpan or to irregular aggregates on exposure to repeated wetting and drying with free access of oxygen. Acrisols have in certain depths a low base saturation and low-activity clays;

Haptic Phaeozems (PHh): Phaeozems accommodate soils of relatively wet grassland and forest regions in warm to cool (e.g. tropical highlands) moderately continental climates, humid enough that there is, in most years, some percolation through the soil, but also with periods in which the soil dries out; flat to undulating land; the natural vegetation is grassland and/or forest. They have dark, humus-rich surface. Phaeozems may or may not have secondary carbonates but have a high base saturation in the upper meter of the soil. Phaeozems are dark soils rich in organic matter from parent material Aeolian (loess), glacial till and other unconsolidated, predominantly basic materials.

3.4   Pre-mining Land Capability

The pre-mining land capability based on current information is arable and grazing, this will however be expanded upon during in this report.

3.5   Surface Water

The site topography consists of a general slope from north to south, with the highest elevations (1825 mamsl) in the north to lows in the south (1755 mamsl). Surface water drainage occurs from north to south via a non – perennial tributary of the Klein Spruit. The site is located over three quaternary catchments, with the majority of the site located within quaternary catchment C11F. Refer to Figure 3-1 for a visual display of the different Quaternary Catchments.
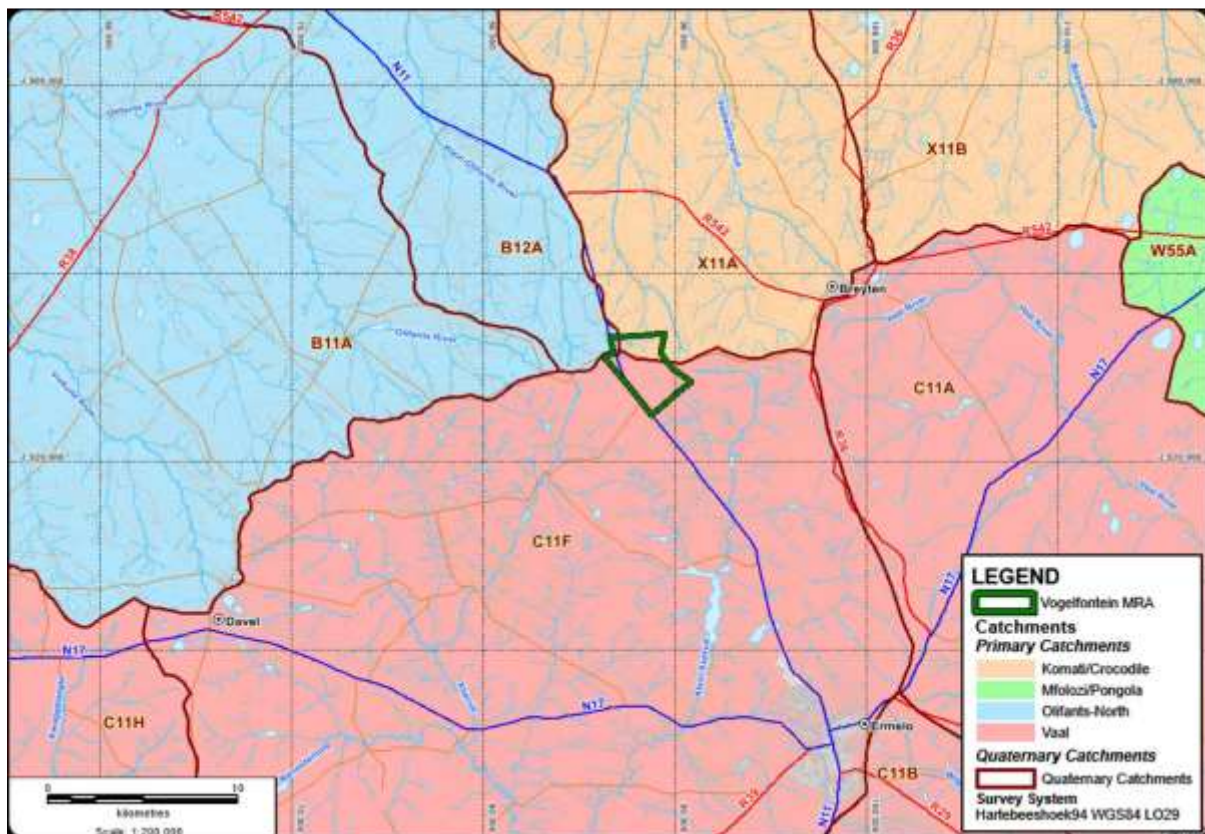
Figure 3-1: Quaternary Catchments

3.6   Wetlands

With reference to Figure 3-2 below, it can be seen that according to SANBI Mpumalanga Highveld Wetlands Classification there are some sensitive areas in terms of wetlands located within the proposed mining area. Due to the fact that this will be an underground mine, the impact on surface water features such as wetlands is expected to be minimal. The magnitude and sensitivity of the area cannot be accurately confirmed at present and a detailed assessment will be conducted as part of the specialist study that is planned. It will be reported in the environmental impact report.
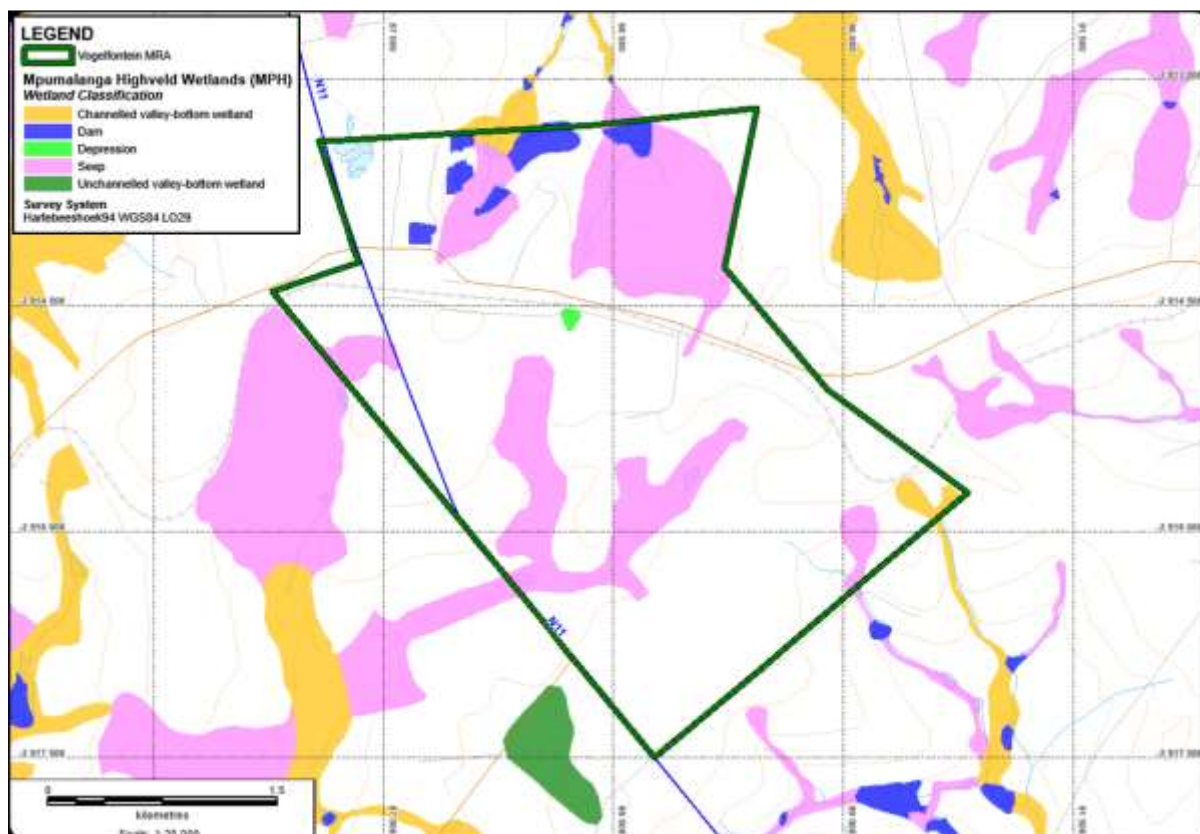
Figure 3-2: SANBI Wetland Classification

3.7   Regional Vegetation (Reference State)

The project area falls within the Eastern Highveld Grassland and Soweto Highveld Grassland as described by Mucina and Rutherford (2006) in the Grassland Biome (Table 3-1) The Grassland Biome covers roughly a third of the country. It occurs across six provinces and is the second largest of South Africa's nine biomes, covering an area of 339 237.68 km^2 (SANBI, 2012).

The term 'grassland' creates the impression that the biome consists only of grass species. In fact, it is a complex ecosystem, including rivers and wetlands, where only one in six plant species are grasses. These vegetation types occur within Mpumalanga Province at an altitude of 1520 to 1780 mamsl.

Thirty percent of the biome has been irreversibly transformed and only 1,9% is formally conserved. As a result, the National Biodiversity Strategy and Action Plan has identified the grasslands biome as one of the spatial priorities for conservation action (SANBI, 2012). The important biodiversity contained within the grasslands, which underpins life, is being eroded to such an extent that human wellbeing is threatened. Common and characteristic plant species of the Eastern Highveld and Soweto Highveld Grasslands are listed in Table 3-1 and Table 3-2.

Table 3-1: Common and Characteristic Plant Species of the Eastern Highveld Grassland

Plant form	Species
Graminoids (grasses and sedges)	*Heteropogon contortus, Aristida aequigluims, A. junciformis subsp. Galpini, Brachiaria serrata, Cynodon dactylon, Digitaria monodactyla, D. tricholaenoides, Elionurus muticus, Eragrostis chloromelas, E. curvula, E. plana, E. racemosa, E. sclerantha, Heteropogon contortus, Loudetia simplex, Microchloa caffra, Monocymbium cereiiforme, Setaria sphacelata, Sporobolus africanus, S. pectinatus, Themeda triandra, Trachypogon spicatus, Tristachya leucothrix, T. rhmanni, Alloteropsis semialata subsp. eckloniana, Andrpogon appendiculatus, A. schirensi, Bewsia biflora, Ctenuim concinnum, Diheteropogon amplectens, Eragrostis capensis, E. dummiflua, E. patentissima, Harpochloa falx, Panicum natalense, Rendlia altera, Schizachyruim sanguineum, Setaria nigrirostris, Urelytrum agropyroides*
Herbs	*Berkheya setifera, Haplocarpha scaposa, Euryops gifillani, Justicia anagalloides, Acalyha angusta, Cahmaecrista mimosoides, Dicoma anomala, E. transvalensis subsp. setilobus, Helichrysum aureonitens, H. caespititium, H. callicomum, H. oreophilum, H. caespititium, H. oerophilum, H. rugulosum, Ipomoea crassipes, Pentanisia prunelloides subsp. latifolia, Selago densiflora, Senecio coronatus, Hilliardiella oligocephala, Wahlenbergia undulata*
Geophytic herbs	*Gladiolus crassifolius, Haemanthus humilis subsp. hirsutus, Hypoxis rigidulua var. pilosissima, Ledebouria ovatifolia*
Succulent herb	*Aloe ecklonis*
Low shrubs	*Anthospermum rigidum subsp. pumilum, Seriphium plumosa*

Table 3-2: Common and Characteristic Plant Species of the Soweto Highveld Grassland

Plant Forms	Species
Graminoids (grasses)	*Andropogon appendiculatus, Brachiaria serrata, Cymbopogon pospischillii, Cynodon dactylon, Elionurus muticus, Eragrostis capensis, E. chloromelas, E.curvula, E. plana, E. planiculmis, E. racemosa, Heteropogon contortus,Hyparrhenia hirta, Setaria nigrirostris, S. sphacelata, Themeda triandra, Tristachya leucothrix, Andropogon schirensis, Aristida adscensionis, A. bipartita, A. congesta, A. junciformis subsp. galpinii, Cymbopogon caesius, Digitaria diagonalis, Diheteropogon amplectens, Eragrostis micrantha, E. superba, Harpochloa falx, Microchloa caffra,*

	Paspalum dilatatum	
Herbs	*Hermannia depressa, Acalypha angustata, Berkheya setifera, Dicoma anomala, Euryops gilfillanii, Geigeria aspera var. aspera, Graderia subintergra, Haplocarpha scaposa, Helichrysum miconiifolium, H. nudifolium var. nudifolium, H. rugulosum, Hibuscus pusillus, Justicia anagalloides, Lippia scaberrima, Rhynchosia effusa, Schistostephium crataegifolium, Selago densiflora, Senecio coronatus, Hilliardiella oligocephala, Wahlenbergia undulata*	
Geophytic herbs	*Haemanthus humilis subsp. hirsutus, Haemanthus montanus*	
Herbaceuos climber	*Rhynchosia totta*	
Low shrubs	*Anthospermum hispidulum, A. rigidum subsp. pumilum, Berkheya annectens, Felicia muricata, Ziziphus zeyheriana*	

4 Results

4.1 Flora

Vegetation reflects the complex interaction between the abiotic and biotic environmental drivers of ecosystems. The heterogeneity of ecosystem processes is therefore often expressed by variation in vegetation patterns. In order to understand and manage the processes of southern Africa's rich and diverse ecosystems, it is important to describe and interpret vegetation patterns in an ecologically sensible manner. Plant communities derived from vegetation classification, are often considered to represent the basic ecological units useful for management purposes. These plant communities therefore provide the basic building blocks for the development and implementation of management units and systems. There is a growing interest in applying phytosociological knowledge in nature conservation and natural resource management (Schamineé & Stortelder 1996).

Vegetation communities were therefore delineated based on similarity of species composition and dominant habitat features present.

Portions of the study area had been altered from its natural state due to current and historical land use, and these variations were used as a basis of stratification. Owing to the effects of fragmentation, as well as the impacts of grazing livestock, primarily cattle, especially close to homesteads, much of the remaining natural vegetation on site had been altered and modified with alien plant species.

The proliferation of Black Wattle (*Acacia mearnsii*) in many if not all the banks of streams flowing through the study area was evident and a primary threat to the riparian areas and the native species dependant on these landscapes.

Further to this, heavy grazing results in a loss of palatable species and an increase in non-palatable ones. This decreases the carrying capacity of the veld and increases the likelihood of alien vegetation dominating the landscape.

The majority of the study area had undergone transformation due to cultivation for maize and soybeans. Livestock were also observed throughout most of the site and evidence of overgrazing was recorded in multiple grassland areas, showing a dominance of increaser species and some erosion. Despite these impacts, areas that were left intact showed a high diversity of grasses and forbs, particularly members of the Asteraceae family and the *Helichrysum* genus.

A total of 137 plant species were recorded on site (Appendix B), of 187 listed (recorded by SANBI in the relevant grid in the past in the regional list (Appendix C), however more may occur that was not recorded and identified by SANBI and therefore not on the PRECIS List. The natural areas associated with the project area are discussed in more detail in the sections to follow and is depicted in Figure 4-1. The primary land use and vegetation habitats identified as well as their respective sizes within the project area are listed in Table 4-1.

Table 4-1: Vegetation Habitats (and other land use) and Approximate Areas

Terrestrial Biodiversity Assessment

Vogelfontein MRA

Vegetation/Land Use Unit	Area (ha)	Proportion affected by project infrastructure (ha)
Dam/Depressions	7.11	-
Infrastructure	7.05	-
Secondary Grassland	168	-
Pastures	158	-
Alien Invasive Trees	129	1.53
Gnidia - Diospyros Rocky Grassland	0.64	-
Crinum - Cymbopogon Riparian Habitat	32.8	-
Rehabilitated	22.2	-
Eragrostis Grassland	193	-
Cultivation (maize and soybean)	213.8	6.01
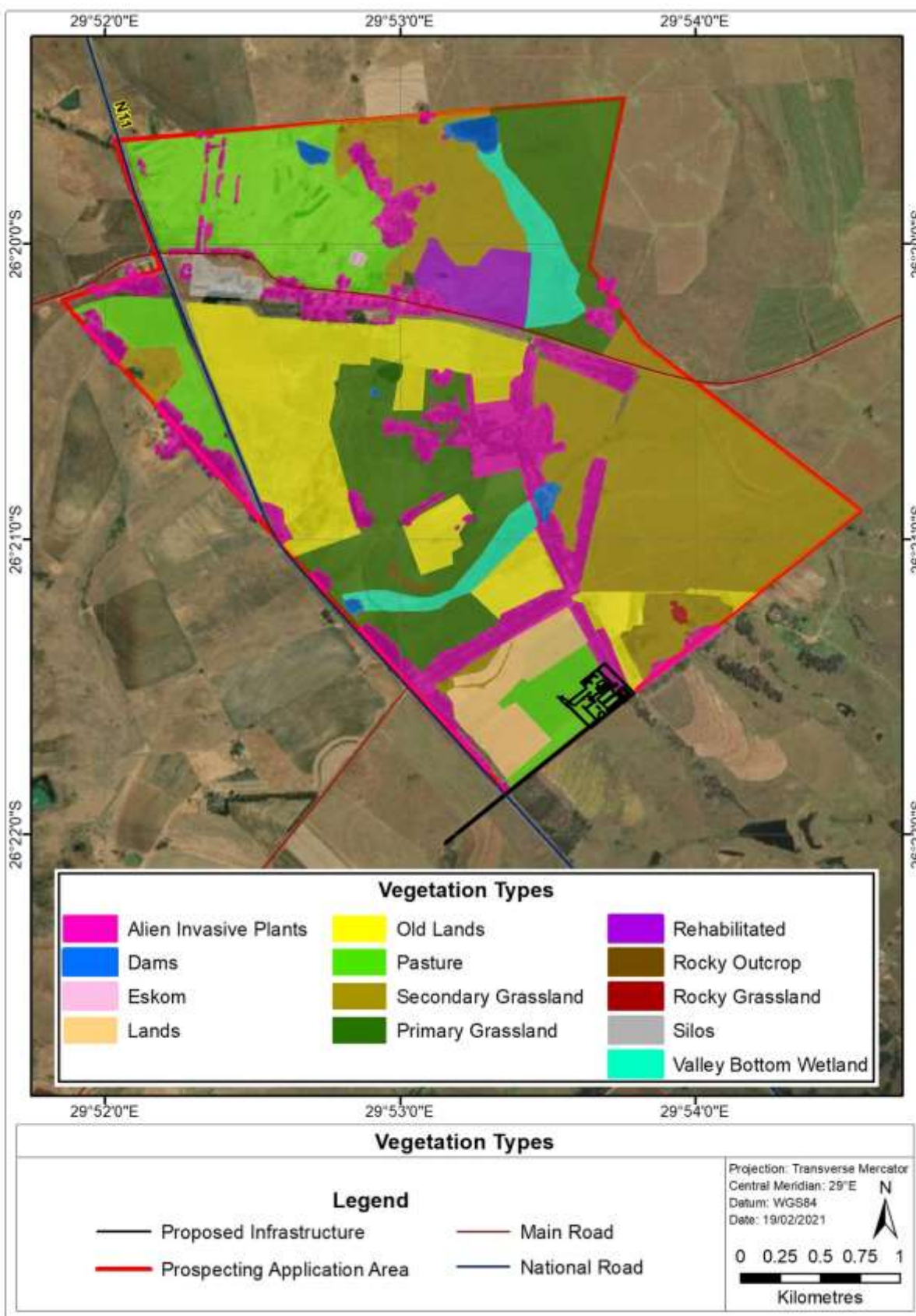
Figure 4-1: Delineated Vegetation types

4.1.1 *Crinum –Arundinella* Riparian Habitat

The riparian habitat is associated with lower lying areas and un-channelled valley bottom wetlands that run through the central portion of the site. The wetland delineation is represented in the Wetland Assessment Report. Where standing water was present; *Typha capensis* (Common Bulrush), *Imperata cylindrica* (Cottonwool Grass) and *Arundinella nepalensis* (River Grass) had colonised (examples in Figure 4-3). Terrestrial species typical of the *Eragrostis-*dominated Grassland (description to follow in section 4.1.3) were found outside but adjacent of the wetland areas. A single listed plant species was recorded in this habitat, namely: *Eucomis autumnalis* (Pineapple Flower), listed as Least Concern. In addition, *Crinum bulbispermum* (River Lily), which is dominant in this vegetation unit, is provincially protected (according to Mpumalanga Nature Conservation Act, 1998 (Act No. 10 of 1998): Schedule 11). Alien plant species that had colonised this vegetation unit included: *Acacia mearnsii* (Black Wattle), *Salix babylonica* (Babylon Willow) and *Cirsium vulgare* (Scotch Thistle).

Figure 4-2: Examples of Riparian Habitat

Figure 4-3: Examples of Plant Species Characteristic of the Riparian Habitat (A: *Typha capensis* **(Common Bulrush) and B:** *Arundinella nepalensis* **(River Grass))**

4.1.2 *Gnidia - Diospyros* Rocky Grassland

The rocky grassland was comprised of relatively short grass (<1.8cm) and a high diversity of epilithic (growing on rock surface) forb species, within the PAOI the rocky outcrops were sandstone outcrops. Rocky outcrops represented a type of ecological niche, characterised by shallow soils over sandstone outcrops. Rocky outcrops occurred primarily along riparian zones, located north of the central wetland in the larger project area and centrally within the infrastructure zone.

Figure 4-4: Rocky Outcrops habitat type

This vegetate type was typified by shrubs such as: *Diospyros lycioides* (Bluebush); *Berkheya speciosa* and *Searsia dentata* (Nana Berry); and characteristic species such as*: Leonotis*

leonurus (Lion's Ear), *Psammotropha myriantha* and *Haemanthus humilis* (Rabbit's Ear). A large colony of *Boophone disticha* (Poison Bulb) was also recorded in the central rocky area, this species is provincially protected. Examples of common plant species identified in the *Gnidia – Diospyros* Rocky Grassland are represented in Figure 4-5.

Alien plant invasion was limited in this habitat, which represented the most intact vegetation of all units delineated for the study area. Alien plants included: *Tagetes minuta* (Khakibos) and *Bidens pilosa* (Blackjacks). Two protected plants were recorded on site, namely: *Haemanthus humilis* (Rabbit's Ear) and *Boophone disticha* (Poison Bulb), both provincially protected plant species.
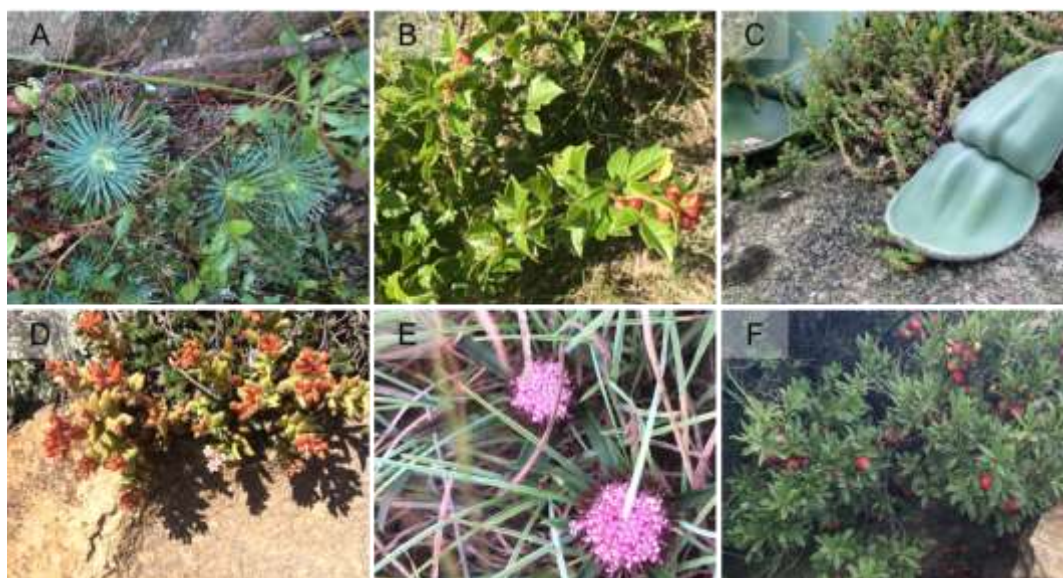
Figure 4-5: Examples of Plant Species found in Rocky Outrops (A: *Psammotropha myriantha*; B: *Searsia dentata*; C: *Haemanthus humulis*; D: *Crassula* sp.; E: *Dicoma anomala*; F: *Diospyros lycioides* in flower)

4.1.3 *Eragrostis* - dominated Primary Grassland

This *Eragrostis*-dominated Grassland covered the majority of the natural areas associated with the study site and can further be subdivided into wetland and terrestrial habitats. The substrate of the wetland areas was composed of moist clays and rocky outcrops which formed the top of hillslope seeps (discussed in detail under the Wetlands assessment). *Eragrostis gummiflua* (Gum Grass), unfavoured by cattle, was dominant and additional *Eragrostis* species were prevalent, including: *Eragrostis curvula* (Lovegrass) and *Eragrostis chloromelas* (Curly Leaf). Additional grass species included *Aristida congesta* subsp. *congesta* (Spreading Three-awn), *Hyparrhenia hirta* (Common Thatching Grass), *Themeda triandra* (Red Grass), *Agrostis lachnantha* (Bent Grass) and *Imperata cylindrica* (Cottonwool Grass) along hillslope seeps.

Figure 4-6: Grasslands Habitat type

Common and characteristic forbs and succulents included: *Aloe ecklonis* (Grass Aloe), *Chironia palustris* (Transvaal Chironia), *Haplocarpha scaposa* (False Gerbera), *Helichrysum oligocephala*, *Wahlenbergia* spp., and *Verbena brasiliensis* (Brazilian Vervain). Examples of the landscape and characteristic features are represented in Figure 4-7. Alien plant invasion was moderate in certain areas adjacent to cultivated fields and along roadsides, including species such as: *Datura stramonium* (Downy Thorn Apple)*, Solanum sysimbriifolium* (Sticky Nightshade) and *Verbena brasiliensis* (Brazilian Vervain). A single plant SCC was recorded on site, namely: *Aloe ecklonis* (Grass Aloe); provincially protected (Mpumalanga Nature Conservation Act no. 10 of 1998 – Schedule 12).
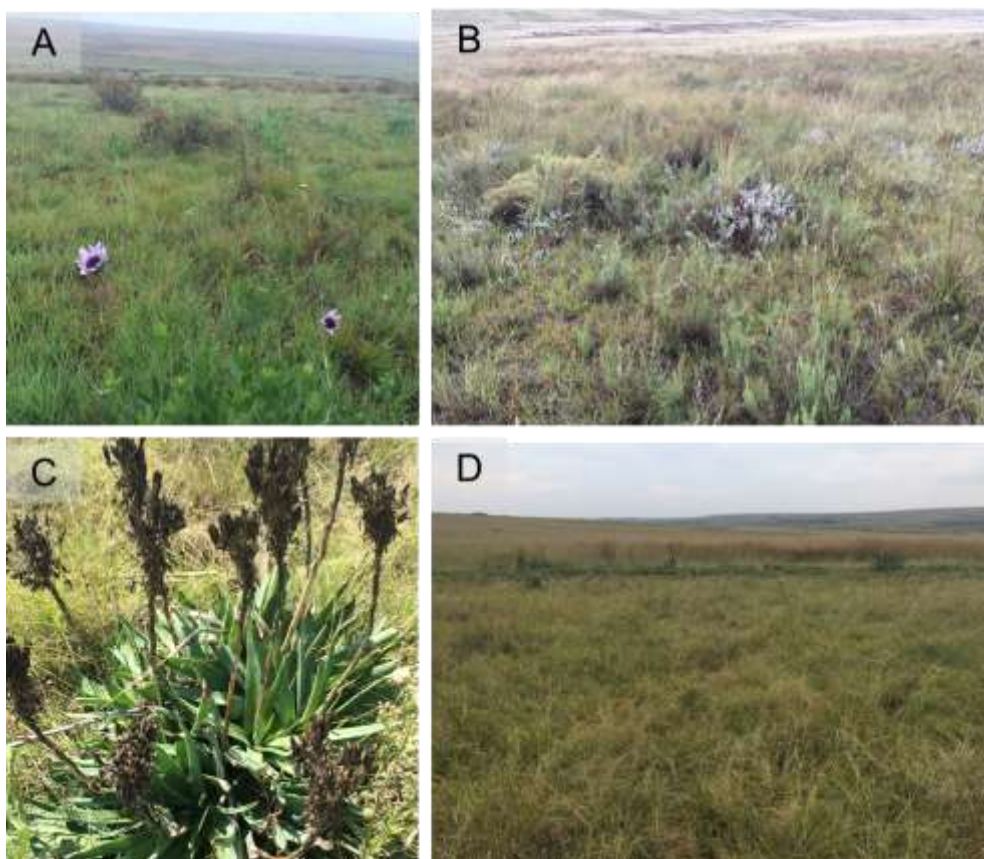
Figure 4-7: Examples of the Landscape and Common Features of the *Eragrostis*-dominated Grassland (A: intact grassland: grassland dominated by *Helichrysum aureonitens*; C: *Aloe ecklonis*; D: typical *Eragrostis*-dominated grassland adjacent to maize fields).

4.1.4 Secondary Grassland

The secondary grassland vegetation type is composed of original grassland vegetation, which has been largely impacted on/transformed previously by agricultural activities (specifically grazing). The grass layer is dominated by Weeping Love Grass (*Eragrostis curvula)* and Tough Love Grass (*Eragrostis plana*). Forbs present include *Pelargonium luridium* and possibly *Monopsis decipiens.* Alien and invasive vegetation includes White Flower Mexican Poppy (*Argemone ochroleuca),* Yellow Nut Sedge *(Cyperus esculentus),* and Sticky Nightshade *(Solanum sisimbriifolium).*

Much of the Secondary Grasslands have been impacted upon by grazing, however in consideration of the broader landscape matrix, this vegetation type provides valuable natural grassland habitat for both plants and animals. The ecological integrity of this vegetation community varies according to the specific disturbance. No Red Data flora species were recorded in this vegetation type, provincially protected species were however encountered, (*Gladiolus crassifolius).* The suitability of the Secondary Grassland vegetation community as habitat for other Red Data and/or protected species of both flora and fauna is regarded as moderate and accordingly, the conservation importance of these areas is regarded to be moderate.

Alien Tree Stands

Stands of Alien/Exotic Trees including Red River Gum (*Eucalyptus camaldulensis)* and Black Wattle (*Acacia mearnsii*) are found extensively within the study area. The Black Wattle infestation was evident in the riparian areas and on property boundaries. The Eucalyptus tree stands are believed to have been historically planted to provide timber or screening. This is regarded to be a highly disturbed vegetation community. Little vegetation is supported below the tree canopy. No Red Data protected, or medicinal species were recorded in this community and the probability of occurrence of such species is considered low. The conservation importance of these areas is therefore considered low. A full assessment of the alien invasive species encountered on the study area is provided in Section 4.1.8 below.

Figure 4-8: Alien Tree Habitat type

4.1.5 Pastures

Pastures were encountered in various areas within the general project area, this land use resulted in a uniform grassland which consisted of preferred grazing grass species, such as *Eragrostis curvula* (weeping lovegrass/oulandsgras) and *Digitaria eriantha* (Smut's finger grass). These grass species were mowed and bailed for hay regularly, which promotes the growth of these grasses.

Figure 4-9: Pastures Habitat type

4.1.6 Dams

Dams represented unique environments on site and were found to be important drivers in the ecological functioning of the wetlands systems. Dams were constructed in the channels of the wetland areas to provide water for livestock. The proliferation of alien tree stands around certain dams is a function of the dispersion method of these trees, as well as the readily available water source. Common and characteristic plant species found to colonise Dam edges included: *Cyperus semitrifidus*; *Juncus effusus* (Common Rush), *Persicaria lapatholia* and *Agrostis lachnantha* (Bent Grass). No Red Data or any protected plant species were recorded in this habitat.

Figure 4-10: Examples of Dam Habitat on Site

4.1.7 Plant Species of Conservation Concern

The project area lies within QDS grid 2629BD. After uploading the project area onto the Screening Tool, a list of potential and confirmed SCC was produced. In addition the NEWPOSA database was also consulted, as well as data obtained through personnel communication with Mr. M. Lotter.

According to the NEWPOSA, two SCC are expected to occur for the QDS's for the project area (both VU). A detailed list of plant species previously recorded according to the NEWPOSA database for the above-mentioned grid is included in Appendix B. These species could be expected to be present within undisturbed areas with suitable habitat, within the proposed development footprint area.

From the field assessment data collections seven species identified are listed by the Mpumalanga Nature Conservation Act, 1998 (Act No 10 of 1998) as Schedule 11 (Protected) species, as well as the South African Red Data List and the CITES list.

Table 4-2 lists the plant SCC that were recorded in the regional lists, as well as those recorded on site and examples of these are represented in Figure 4-11. The Extent of Occurrence (EOO) as well as the preferred habitat of each of these species is discussed below, and mention is made if these were recorded on site.

Seven plant SCC were recorded, all of which are provincially protected; including two declining species (Table 4-2).

Table 4-2: Plant Species of Special Concern

Species	SA Red List	Provincial List	CITES	Recorded on site
Aloe ecklonis	LC	x	II	x
Aspidoglossum xanthosphaerum	VU, SA Endemic	-		
Crinum bulbispermum	Declining	x		x
Boophone disticha	LC	x		x
Gladiolus crassifolius	LC	x	-	x
Gladiolus robertsoniae	NT	x	-	
Eucomis autumnalis	Declining	x		x
Haemanthus humilis subsp. hirsutus	-	x	-	x
Hypoxis hemerocallidea	Declining	-		
Pachycarpus suaveolens	VU	-		
Satyrium spp.	-	x		x
Zantedeschia pentlandii	VU	-		
Sensitive species 1252	VU			
Khadia carolinensis	VU			
Sensitive species 1200	EN			
Miraglossum davyi	VU			
Sensitive species 41	VU			
Sensitive species 691	VU			
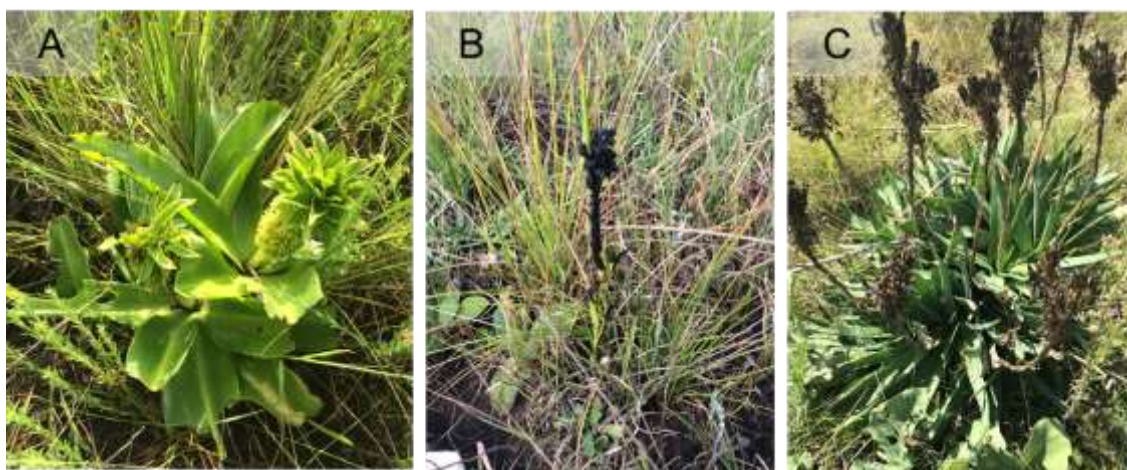
Figure 4-11: Examples of Protected Plant species recorded on Site (A: *Eucomus autumnalis***; B:** *Satyrium* **sp. and** *Aloe ecklonis***)**

Aspidoglossum xanthosphaerum:

Recorded from four locations from a restricted range (EOO<500 km²). Potentially threatened by wetland drainage for crop cultivation and by livestock trampling and grazing. Expected to occur in selected areas within Soweto Highveld Grassland such as marshy sites. (Nicholas and Victor 2006). Wetlands and Marshy areas are located on site, however this species was not recorded during the infield assessment.

Gladiolus robertsoniae:

EOO 12 783 km², between 10 and 20 locations continue to decline due to ongoing habitat degradation as a result of mining and overgrazing by livestock. Subpopulations are large and not severely fragmented. It is expected to occur within Moist highveld grasslands, in wet, rocky sites, mostly dolerite outcrops, wedged in rock crevices. Lötter. *et al* (2013). This species was not recorded during the site visit.

Pachycarpus suaveolens:

This plant is known from eight historical locations and probably extremely rare. One location, last collected in Gauteng in 1929 has subsequently been lost to urban expansion and this species is likely to be locally extinct in Gauteng. The grasslands habitat across its range (EOO 19 900 km²) is extensively transformed by urban development, crop cultivation, mining and invasive alien plants. Mining is causing a continuing decline in habitat between Witbank and Carolina. It favours short or annually burnt grasslands, 1400-2000 m. Lötter, et al. 2007. This species was not recorded during the site visit.

Nerine gracilis:

EOO between 445 and 11 158 km² and suspected to occur at fewer than 10 locations. It has lost habitat to crop cultivation in the past. It is currently threatened by ongoing degradation and habitat loss due to overgrazing and urban development. It can be found in Undulating

grasslands in damp areas (Raimondo. 2013). This species was not recorded during the site visit.

Zantedeschia pentlandii:

EOO 12 000 km², subpopulations are small and severely fragmented and there is a continuing decline as a result of mining and harvesting for horticultural purposes. Rocky hillsides are its preferred habitat (Victor and Siebert. 2006). This species was not recorded during the site visit.

Sensitive species 1252:

There was a large population decline from 1955-1960 as a result of indiscriminate commercial harvesting. Exploitation of tubers for the local medicinal plant trade is ongoing and is preventing recovery. The overall decline is estimated to be >30% over the past 90 years (generation length estimated to be 30 years). It can be found in wooded and relatively mesic places, such as the moister bushveld areas, coastal bush and wooded mountain kloofs (Williams, *et a*l. 2008). This species was not recorded during the site visit.

Khadia carolinensis:

Coal reserves are found underneath the sandstones on which this species is found. Coal mining has had a small impact to date, but within the last five years many new applications for coal mining has been received. Should these applications be granted (and many more are likely to come in within the next few years), the habitat will be severely impacted by open cast mining. It is estimated that up to 45% of the range (EOO) of this species could be destroyed within the next 10-20 years should the current applications go ahead. This species prefers well-drained, sandy loam soils among rocky outcrops, or at the edges of sandstone sheets, Highveld Grassland, 1700 m (Lötter, et al. (2007). This species was not recorded during the site visit.

Sensitive species 1200:

A population reduction of at least 50% is suspected based on 55.6% habitat loss within the known range of this species in the past 60-75 years (generation length 20-25 years). It remains under severe pressure, with development and mining applications on 78% of its remaining habitat, and this species is expected to continue to decline. This species prefers Grassland, Karoo Sandstone, above 1600 m. Possibly associated with edges of pans (von Staden. 2009). This species was not recorded during the site visit.

Miraglossum davyi:

EOO<15 000 km², known from five locations but suspected to occur at one or two more. Declining as a result of habitat loss to coal mining and urban expansion. This species prefers terrestrial grassland (Lötter, *et al.* 2005). This species was not recorded during the site visit.

Sensitive species 41:

A widespread (EOO <19 940 km²), but rare (AOO <2000 km²) habitat specialist, estimated to remain at between six and ten locations and declining due to severe ongoing habitat loss and degradation. This species prefers Wetlands or marshes in high altitude grassland that remain

wet throughout the year or dry out for only a short period (von Staden, et al. 2013). This species was not recorded during the site visit.

Sensitive species 691:

EOO between 445 and 11 158 km² and suspected to occur at fewer than 10 locations. It has lost habitat to crop cultivation in the past. It is currently threatened by ongoing degradation and habitat loss due to overgrazing and urban development. This species prefers Undulating grasslands in damp areas (Raimondo, 2013). This species was not recorded during the site visit.

4.1.8 Alien Plant Species

Alien plant species have also been classified according to National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA), as published in August 2014 (GN R599 in *GG* 37886 of 1 August 2014) into the following categories:

- Category 1a: Species requiring compulsory control;
- Category 1b: Invasive species controlled by an invasive species management programme;
- Category 2: Invasive species controlled by area, and;
- Category 3: Invasive species controlled by activity.

A total of 17 alien plant species (AIP) were recorded on site (Table 4-3); seven of these have been assigned alien plant categories according to CARA and NEMBA. These species have established due to disturbance of the soil, largely due to cultivation in the area, as well as trampling by livestock. Large Alien bush clumps have been delineated in Figure 4-1.

Table 4-3: Alien Plant Species recorded on Site

Family	Species	Category (CARA/NEMBA)
Amaranthaceae	*Guilleminea densa*	No category
	Gomphrena celesioides	No category
Asteraceae	*Bidens pilosa*	No category
	Cirsium vulgare	1; 1b
	Conyza albida	No category
	Cosmos bippinatus	No category
	Tagetes minuta	No category
	Taraxacum offininale	No category

Family	Species	Category (CARA/NEMBA)
	Xanthium strumarium	1; 1b
Cactaceae	*Opuntia ficus-indica*	1; 1b
Fabaceae	*Acacia mearnsii*	2; 2
Myrtaceae	*Eucalyptus camuldulensis*	2; 1b
Salicaceae	*Salix babylonica*	No category
Solanaceae	*Datura ferox*	1; 1b
	Solanum sp.	/
	Solanum sysimbriifolium	1; 1b
Verbenaceae	*Verbena brasiliensis*	No category

4.2   Fauna

4.2.1   Mammals

Actual sightings, spoor, calls, dung and nesting sites, as well as active sampling by means of motion detection cameras and Sherman traps, were used to establish the presence of mammals on the proposed project site. The evidence of dung and spoor suggests that animals were present in the area although relatively few were recorded during the surveys. Table 4-4 lists mammals that were recorded in the Vogelfontein project area during this survey, this data includes personal communication with farmers. The mammals recorded were found within a variety of the vegetation communities present a full list can be seen in Table 4-4.

Appendix D lists the expected mammal species for the site, based on the results of a desktop assessment.

Table 4-4: Mammal Species Recorded

Scientific Name	English Name	IUCN (2021.1)	NEMBA TOPS List (2007)	Mpumalanga Protected (1998)
Atilax paludinosus	Water Mongoose	Not Listed	Not Listed	Not Listed
Galerella sanguinea	Slender Mongoose*	Not Listed	Not Listed	Not Listed

Scientific Name	English Name	IUCN (2021.1)	NEMBA TOPS List (2007)	Mpumalanga Protected (1998)
Hystrix africaeaustralis	Porcupine	Least Concern	Not Listed	Not Listed
Lepus saxatilis	Scrub Hare	Least Concern	Not Listed	Not Listed
Canis mesomelas	Black-backed Jackal	Not Listed	Not Listed	Not Listed
Cryptomys hottentotus	Common Mole Rat*	Least Concern	Not Listed	Not Listed
Crocidura cyanea	Reddish-grey Musk Shrew	Least Concern	Not Listed	Not Listed
Cynictis penicillata	Yellow Mongoose	Least Concern	Not Listed	Not Listed
Ichneumia albicauda	White-tailed Mongoose	Least Concern	Not Listed	Not Listed
Mastomys coucha	Multimammate Mouse	Least Concern	Not Listed	Not Listed
Rhabdomys pumilio	Striped Mouse	Least Concern	Not Listed	Not Listed
Sylvicapra grimmia	Common Duiker**	Least Concern	Not Listed	Not Listed
Tatera leucogaster	Bushveld Gerbil*	Least Concern	Not Listed	Not Listed
Potamochoerus larvatus	Bushpig**	Least Concern	Not Listed	Not Listed

* - Recorded previously

** - Recorded via personal communication with farmers

4.2.2 Avifauna

4.2.2.1 Expected Species Diversity

At a more local scale, avifaunal habitat within the AOI is dominated by perennial pastures, croplands, scattered woody alien bushclumps and fallow lands. However, some natural wetland and associated hydromorphic grassland still remain, particularly in the far north-eastern and south-western corners. The AOI does, however lack a number of habitats present with the much larger QDS such as shortly cropped grassland, pans, rocky outcrops and narrow, wooded (typically Leucosidea, Buddleja and Rhamnus) ravines. This limits the number of species likely to be encountered on a regular basis (likelihood of occurrence or LO of 2) to just over 170 species. However, when considering seasonal variation in species assemblages and local movements the actual number of species likely to be encountered on any one day in the AOI is likely to be < 80 species.

4.2.2.2 Observed Site Diversity

During the brief size visit, a total of 60 bird species were recorded within the AOI. Of these, 47 were recorded during the standardised point counts (n=34) while the remaining 13 species were detected incidentally (while moving between point counts). Images of some of these species, as taken on site, are shown in Figure 4-12.
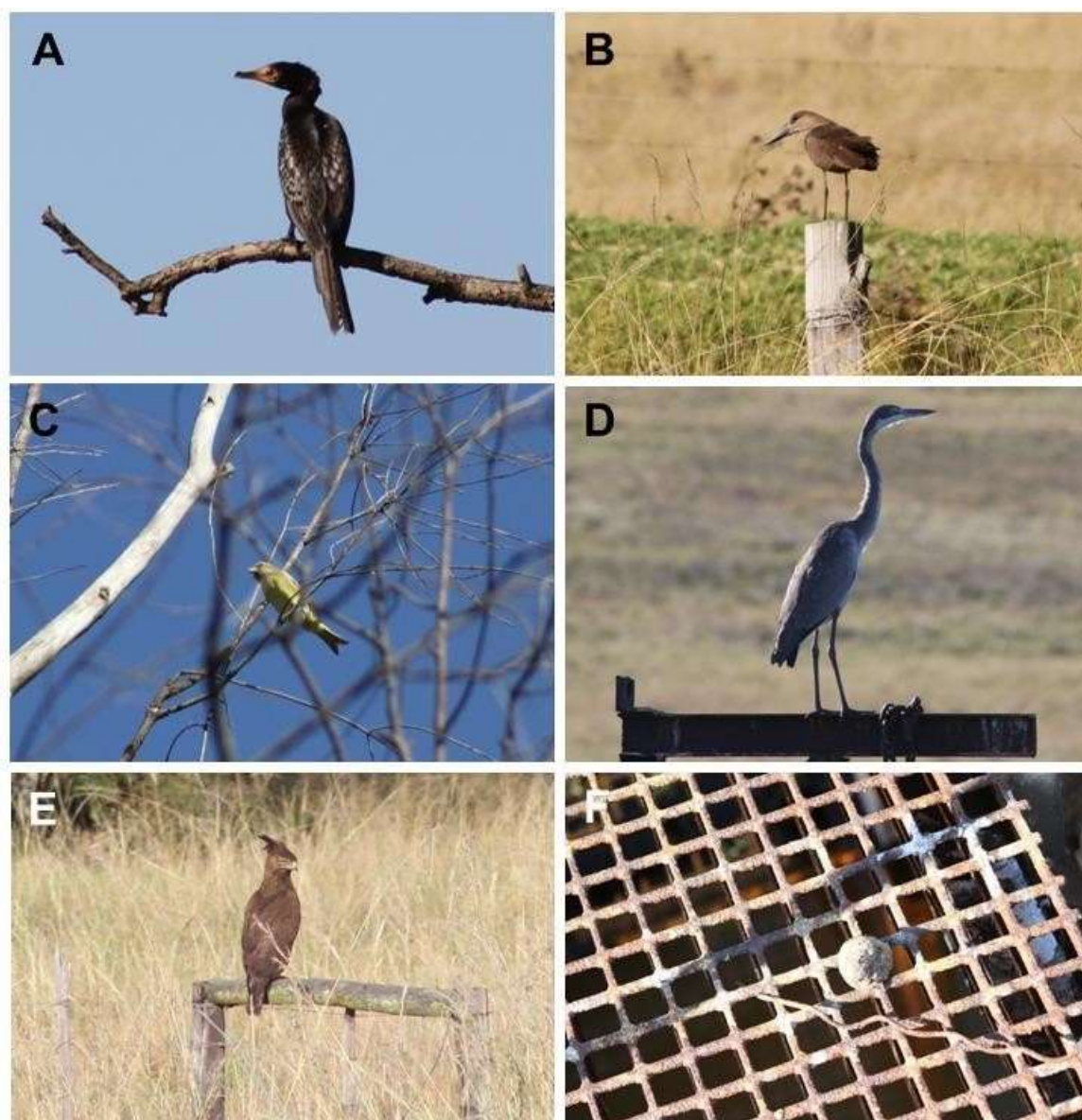
Figure 4-12: Some of the birds observed within the project area, A) Reed Cormorant, B) Hamerkop, C) Cape Canary, D) Black-headed Heron, E) Long-crested Eagle, F) owl pellet likely Spotted Eagle-owl.

4.2.2.3   Sampling Accuracy

A species accumulation curve (Figure 4-13) generated for the point counts within the AOI suggests adequate sampling effort. The curve reached an asymptote (as defined by a straight-line tangent to the curve with a gradient of one) at 19 point count samples. This means that after 19 samples, less than one bird would be observed for every subsequent sample thereafter
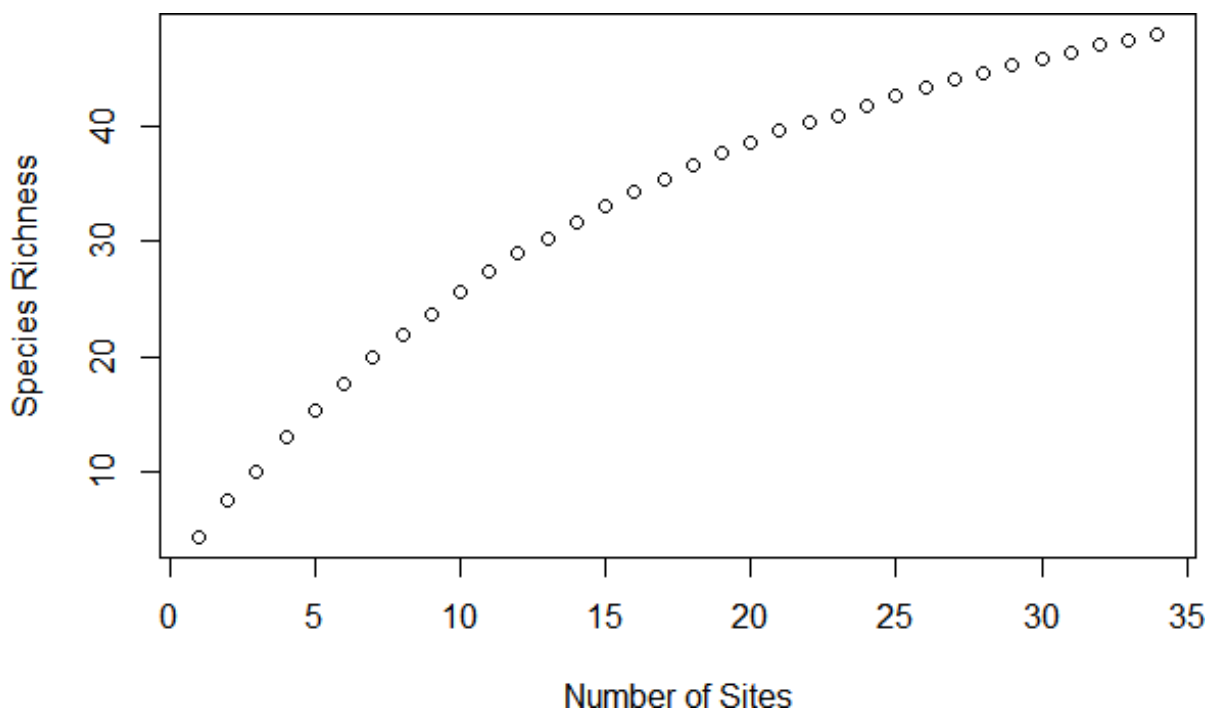
Figure 4-13: Species accumulation curve for the point counts within the project area.

4.2.2.4   *Habitat Diversity*

A summary the point count data for each of the main avifaunal habitats within each area is given in Table 7-1 together with their respective diversity as indicated by Shannon's H. From this table it is apparent that the highest avian diversity was observed in the Wetlands habitat followed by Transformed Habitat (comprised of alien bush clumps together with fallow and active croplands) and Natural Grassland while the Pasture lands recorded the lowest diversity. The high diversity in the wetlands habitat is expected given that it represents some of the most productive natural habitat within the AOI supporting aide range of both wetland and terrestrial species. Perhaps counterintuitive is that the Transformed Grassland yielded a higher diversity than the natural grassland. This is likely due in part to the higher microhabitat structural complexity afforded by the alien bush clumps as well as the higher food availability for seedeaters in the croplands. However, it may also be an artefact of the exceptionally high abundances of seedeaters. The equation takes into account both species abundance and species evenness. It may be that the species evenness has been "out shadowed" by species abundance in this instance.
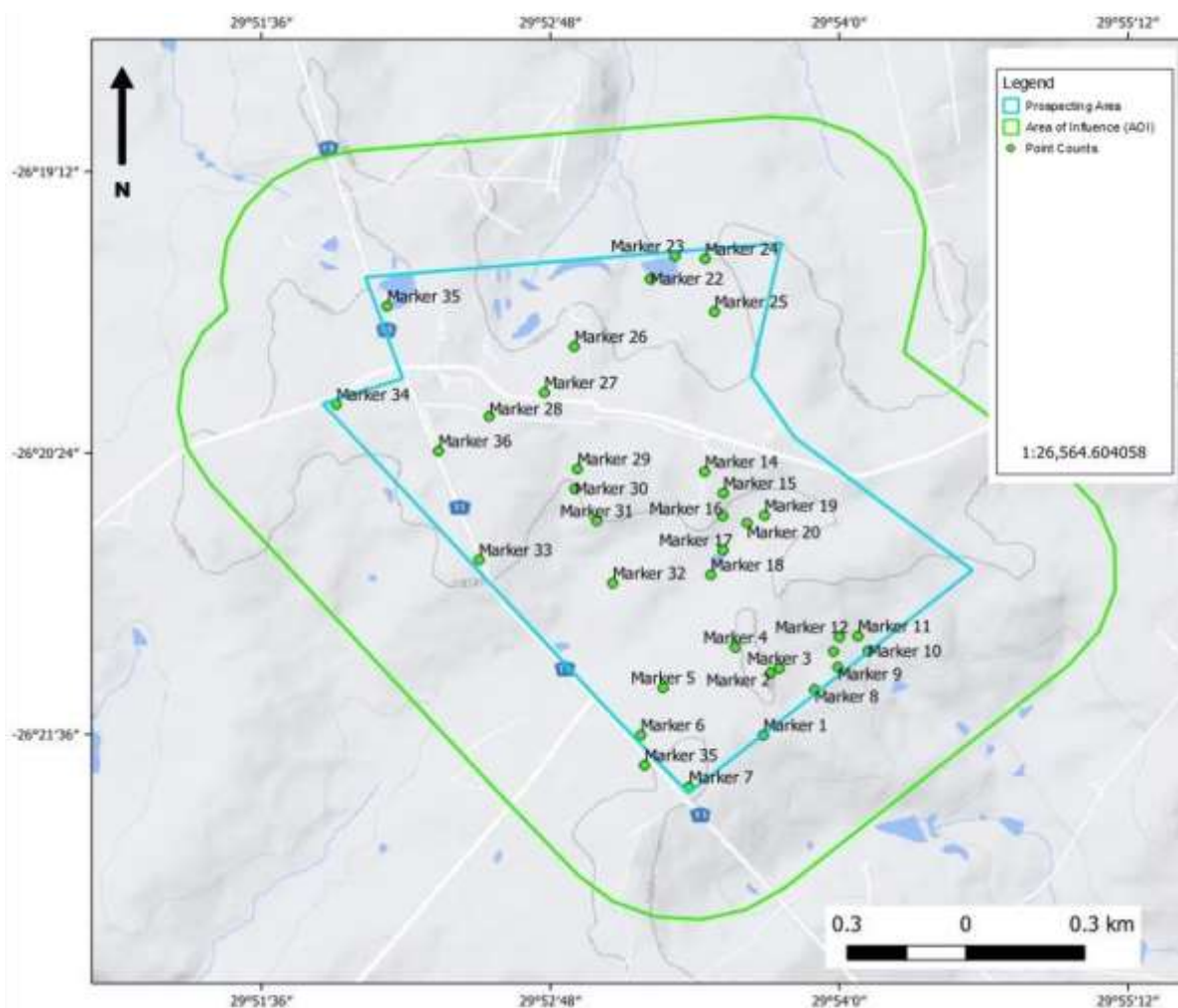
Figure 4-14: Avifauna point count localities

Table 4-5: Comparison of the diversity between the main habitats

Habitat	Shannon's H
Wetlands	2.854
Degraded	2.299
Grassland	2.018
Pasture	1.699

4.2.2.5   Habitat Uniqueness

The non-metric multidimensional scaling (NMDS) ordination shown in Figure 4-15 provides a visual representation of the difference / similarity in the species composition between the four habitat types. Mostly readily discernible from this ordination is that the species assemblages characterising Natural Grassland (green ellipse) and Transformed Grassland (red ellipse) are most the most different from one another. The Pasture (blue ellipse) and Wetland (purple ellipse) habitats support a species assemblage that is intermediary to these habitats (i.e. it is comprised of an equal mix of species found in both Natural and Transformed grassland) with

a few exceptions. Although the Natural Grassland was found to support a lower species diversity than the Transformed Grassland, this ordination reveals that the natural grassland supports amore unique species assemblage characterised by non- commensal species.
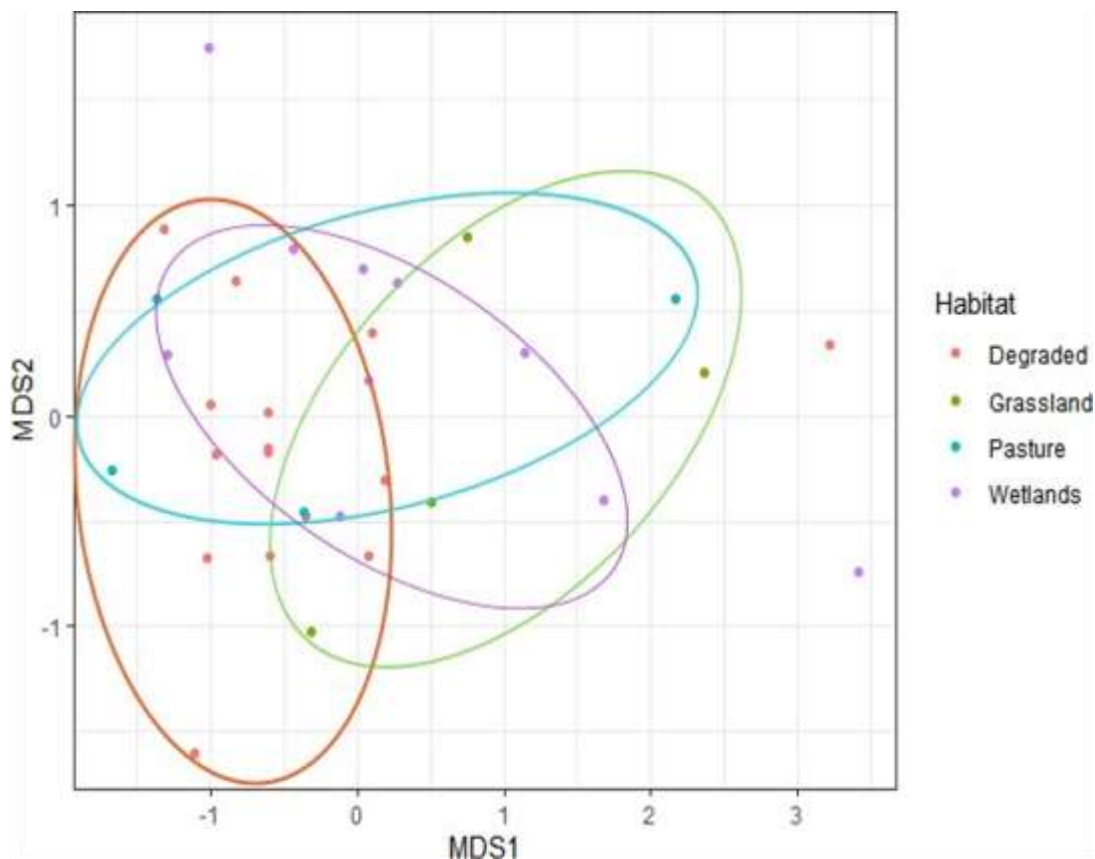
Figure 4-15: Non-metric multidimensional scaling ordination contrasting the avifaunal species assemblages within the project area.

4.2.2.6   Habitat Assemblages

provides a summary of the relative abundance and frequency of each species within each habitat. The table is sorted from highest to lowest overall frequency. Overall the most frequently observed birds were seedeaters, namely Cape Turtle Dove, Cape Canary, Black-throated Canary and Red-billed Qualia. The latter was the most abundant species on site. The Transformed Grassland habitat supported mainly widespread, common and adaptable species. Species exclusively associated with the Transformed Grassland habitat included Laughing Dove (*Spilopelia senegalensis*), Black-shouldered Kite (*Elanus caeruleus*), African Quailfinch (*Ortygospiza atricollis*), Cape Sparrow (*Passer melanurus*) and Swainson's Spurfowl (*Pternistis swainsonii*). The Pasture habitat supported a mix of disturbance tolerant and non-tolerant species. Species characterising this habitat included Common (Southern) Fiscal (*Lanius collaris*), Hadeda Ibis (*Bostrychia hagedash*), African Stonechat (*Saxicola torquatus*), Spike-heeled Lark (*Chersomanes albofasciata*) and Southern Bald Ibis (Geronticus calvus). The wetland habitat supported a similar species assemblage to these habitats but with the addition of water birds. This habitat was characterised by Egyptian Goose (*Alopochen aegyptiaca*), Yellow-billed Duck (*Anas undulata*), Cape Shoveler (*Spatula smithii*),

Black-headed Heron (*Ardea melanocephala*),), Little Grebe (*Tachybaptus ruficollis*), Hamerkop (*Scopus umbretta*), Cape Wagtail (*Motacilla capensis*), Southern Grey-headed Sparrow (*Passer diffusus*), Reed Cormorant (*Microcarbo africanus*), African Sacred Ibis (*Threskiornis aethiopicus*), Blue Korhaan (*Eupodotis caerulescens*), Blacksmith Lapwing (*Vanellus armatus*), Southern Red Bishop (*Euplectes orix*). The Natural Grasslands, in contrast, supported mainly species that are less tolerant of anthropogenic disturbance. Species characteristic of this habitat included African Pipit (*Anthus cinnamomeus*), Cape Longclaw (*Macronyx capensis*), Bokmakierie (*Telophorus zeylonus*) and Cape Robin-chat (*Cossypha caffra*).

Table 4-6: Summary of the relative abundance (RA) and frequency (F) of avifauna in each habitat

Common Name	Species	Degraded		Grasslands		Pastures		Wetlands		Total	
		RA	F	RA	F	RA	F	RA	F	RA	F
Cape Turtle-dove	*Streptopelia capicola*	26	13	5	2	4	1	10	5	**45**	**21**
Cape Canary	*Serinus canicollis*	47	7			10	1	7	2	**64**	**10**
Black-throated Canary	*Crithagra atrogularis*	10	1			1	1	10	4	**21**	**6**
Red-billed Quelea	*Quelea quelea*	5	1	20	1			69	4	**94**	**6**
Southern Masked-weaver	*Ploceus velatus*	15	3					8	2	**23**	**5**
Levaillant's Cisticola	*Cisticola tinniens*	3	1	2	1			8	2	**13**	**4**
Red-eyed Dove	*Streptopelia semitorquata*	1	1	1	1			2	2	**4**	**4**
Hadeda Ibis	*Bostrychia hagedash*			10	2	4	1	2	1	**16**	**4**
Egyptian Goose	*Alopochen aegyptiaca*							9	3	**9**	**3**
Black-headed Heron	*Ardea melanocephala*							3	3	**3**	**3**
Black-shouldered Kite	*Elanus caeruleus*	3	3							**3**	**3**
Banded Martin	*Riparia cincta*	5	1					4	2	**9**	**3**
Black-chested Prinia	*Prinia flavicans*	6	2					1	1	**7**	**3**
African Stonechat	*Saxicola torquatus*			3	2	1	1			**4**	**3**
Barn Swallow	*Hirundo rustica*	1	1					2	2	**3**	**3**
Cape Wagtail	*Motacilla capensis*							5	3	**5**	**3**
Common Waxbill	*Estrilda astrild*	10	1					9	2	**19**	**3**
Laughing Dove	*Spilopelia senegalensis*	5	2							**5**	**2**
Yellow-billed Duck	*Anas undulata*							14	2	**14**	**2**
Common (Southern) Fiscal	*Lanius collaris*	2	1			1	1			**3**	**2**

Common Name	Scientific Name										
Little Grebe	*Tachybaptus ruficollis*							6	2	**6**	**2**
Spike-heeled Lark	*Chersomanes albofasciata*					1	1	1	1	**2**	**2**
Cape Longclaw	*Macronyx capensis*			3	1			3	1	**6**	**2**
Brown-throated Martin	*Riparia paludicola*	1	1					2	1	**3**	**2**
African Pipit	*Anthus cinnamomeus*			2	2					**2**	**2**
Cape Robin-chat	*Cossypha caffra*	1	1	1	1					**2**	**2**
Southern Grey-headed Sparrow	*Passer diffusus*							4	2	**4**	**2**
Greater Striped Swallow	*Cecropis cucullata*			2	1			5	1	**7**	**2**
Cape White-eye	*Zosterops virens*	2	1					4	1	**6**	**2**
Bokmakierie	*Telophorus zeylonus*			2	1			1	1	**3**	**2**
Dark-capped Bulbul	*Pycnonotus tricolor*							1	1	**1**	**1**
Yellow Canary	*Crithagra flaviventris*							2	1	**2**	**1**
South African Cliff-swallow	*Petrochelidon spilodera*							1	1	**1**	**1**
Reed Cormorant	*Microcarbo africanus*							3	1	**3**	**1**
Spur-winged Goose	*Plectropterus gambensis*			3	1					**3**	**1**
African Sacred Ibis	*Threskiornis aethiopicus*							1	1	**1**	**1**
Southern Bald Ibis	*Geronticus calvus*					2	1			**2**	**1**
Blue Korhaan	*Eupodotis caerulescens*							2	1	**2**	**1**
Blacksmith Lapwing	*Vanellus armatus*							2	1	**2**	**1**
Crowned Lapwing	*Vanellus coronatus*							2	1	**2**	**1**
African Quailfinch	*Ortygospiza atricollis*	2	1							**2**	**1**
Cape Shoveler	*Spatula smithii*							2	1	**2**	**1**
Cape Sparrow	*Passer melanurus*	2	1							**2**	**1**
Swainson's Spurfowl	*Pternistis swainsonii*	1	1							**1**	**1**
Spotted Eagle-owl	*Bubo africanus*							1	1	**1**	**1**
Hamerkop	*Scopus umbretta*							2	1	**2**	**1**
Southern Red Bishop	*Euplectes orix*							15	1	**15**	**1**

4.2.3 Macro-Invertebrates

The project area was identified as being of Medium sensitivity for the butterfly species *Lepidochrysops procera*. Medium sensitivity indicates the presence of a model-derived suitable habitat areas for threatened and/or rare species are included in the medium sensitivity level.

This taxon is endemic to a large area in South Africa (EOO 93 799 km^2). However, it occupies a very small portion of this area. The taxon is a rare habitat specialist with relatively few known locations, several of which are under some degree of threat. The taxon thus qualifies globally under the IUCN criteria as Least Concern and is nationally classified as Rare (Habitat Specialist).

The taxon is Endemic to the Gauteng, KwaZulu-Natal, Mpumalanga, North West and Eastern Cape provinces in South Africa, from Kokstad in the south to Komatipoort in the north-east and Potchefstroom in the west.

The southern Gauteng/Highveld habitat of this species is threatened by residential developments and overgrazing by cattle. Elsewhere the taxon appears to thrive in grassland subjected to annual winter fires. Fire suppression, or fires during the butterfly's flight period of late September/October may be significant threats. The influence of drought is unknown, but observations from the southern Gauteng localities during the drought of the last three years appear to indicate that numbers have declined dramatically.

During the wet season survey, butterflies were recorded through opportunistic observations and photographed where possible. In addition, transects were walked along the roads, rehabilitated areas, exotic plantations and grassland area to identify any scorpion or spider nests. Butterflies are a good indication of the habitats available in a specific area (Woodhall 2005). Although many species are eurytropes (able to use a wide range of habitats) and are widespread and common, South Africa has many stenotrope (specific habitat requirements with populations concentrated in a small area) species which may be very specialised (Woodhall 2005). Butterflies are useful indicators as they are relatively easy to locate and catch, and to identify. It is for this reason that Lepidoptera were used as the primary focus for the invertebrate survey. Five butterfly species were observed within the Vogelfontein project area, these included the, Spotted Jonker *(Byblia ilythia)*, African Monarch *(Danaus chrysippus)*, Brown-veined White *(Belenois aurota),* Broad Bordered Grass Yellow *(Eurema brigitta)* and the Citrus Swallowtail *(Papilio demodocus).* All the species were located within grassland or the wetland areas of the project area. No butterfly species observed were considered to be Species of Special Concern.

Wasp robber flies *(Philodicus sp)* were located in the secondary grasslands within the project area. The name "robber flies" reflects their notoriously aggressive predatory habits; they feed mainly or exclusively on other insects where they generally catch their prey in flight (Weaving, 2004). Adults are generally medium to large in size, with an average body length of 1 to 1.5 cm but with a range of 3 cm to more than 5 cm in length. The shape is generally elongated, due to the conformation of the long tapering abdomen; however, there are also compact species with broad abdomens (Picker and Griffiths, 2004).

Dung beetles *(Scarabeus sp)* were located throughout the property and wherever cattle faeces were evident. These beetles eat dung excreted by herbivores and omnivores and prefer that produced by the former. Many of them also feed on mushrooms and decaying leaves and fruits. All the species belong to the superfamily *Scarabaeoidea*, most of them to the subfamilies Scarabaeinae and Aphodiinae of the family Scarabaeidae (scarab beetles).

The diversity and density of the invertebrates was relatively high for the proposed Vogelfontein project area and surroundings, and this in general could assist in providing an indication of the health of the regional ecology. Although existing agricultural activities has modified the immediate area, there is sufficient habitat within the surrounding unaffected areas to sustain moderate populations of the typical highveld grassland species of fauna. It would however be recommended that the management of any encroachment of alien invasive plant species is strictly enforced in order to retain the preferred faunal species types that currently dominate the grassland biome of Mpumalanga Province. Examples of invertebrate species recorded on site are represented in Figure 4-16.

Figure 4-16: Examples of Invertebrates recorded on site (A: Reduviidae; B: *Ectrichodia crux* **(Millipede Assassin); C: Coreidae. D: Gastrimargus E:** *Argiope australis* **F:** *Astylus atromaculatus* **(Spotted Maize Beetle); G:** *Belenois aurota* **(Brown-veined White); H:** *Cynthia carui* **(Painted Lady) and I:** *Junonia hierta* **(Yellow Pansy))**

4.2.4 Animal Species of Conservation Concern

The animal species theme retrieved the sensitivity data for Mammals, Birds and Invertebrates, therefore these three themes were the focus from a terrestrial fauna perspective. The themes are discussed below according to the sensitivity rating assigned to them.

4.2.4.1 *Medium Sensitivity*

Model-derived suitable habitat areas for threatened and/or rare species are included in the medium sensitivity level. In other words, these species have NOT been confirmed in the project area, however suitable habitat for them does exist here.

Oribi (*Ourebia ourebi*) (Mammal feature)

The Oribi, is widely distributed through Africa stretching from Senegal in the west to Ethiopia in the east and down to the Eastern Cape in South Africa in the south. In South Africa they occur along the eastern parts of Mpumalanga, KwaZulu-Natal and the Eastern Cape, with a small population extending into the Free State. Their global status is Least Concern (IUCN) but in South Africa they are considered Endangered. This species was not recorded during field work, and personnel communication with landowners indicated that they have not seen tis species in the past.

Lepidochrysops procera (Insecta feature)

Medium sensitivity also relates to the Insecta feature, specifically, the Potchefstroom blue (*Lepidochrysops procera*), this is a butterfly of the family Lycaenidae. It is found in South Africa, where it is known from KwaZulu-Natal midlands to Mpumalanga, Gauteng, Limpopo Province and North West. According to SANBI's NSSL, this species' population is not vulnerable: size is > 2500 mature individuals, AND the number of known subpopulations is > 5 AND range > 100km2 (Mecenero et al. 2013). This species was not recorded during field work.

4.2.4.2 *Avifauna*

A total of 11 SCC (Table 4-7) have been recorded during SABAP2 surveys within the nine pentads covering QDS 2629BD (SABAP2, 2021). With the exception of Greater Flamingo (Phoenicopterus roseus), Lesser Flamingo (*Phoeniconaias minor*) and Sentinel Rock Thrush (*Monticola explorator*) suitable habitat exists for most of these species within the AOI. The presence of the flamingos and rock thrush is likely precluded by the lack of pan and rocky outcrop habitat respectively within the AOI. Other SCC that are known to occur in the region, but which are not accounted for in the SABAP2 data for the nine pentads in QDS 2629BD include the Near-Threatened Black-winged Pratincole (*Glareola nordmanni*), Botha's Lark (*Spizocorys fringillaris*) and Vulnerable Blue Crane (*Anthropoides paradiseus*) and Denham's Bustard (*Neotis denhami*).

During the site visit two SCC were detected within the AOI namely Southern Bald Ibis (*Geronticus calvus*) and Blue Korhaan (*Eupodotis caerulescens*). The former was detected as a pair foraging within a short (recently harvested) Eragrostis pasture field west adjacent

to the south-western boundary of the project area. The latter species was observed, again as a pair, flying into land in the natural wetland / hydromorphic grassland habitat in the north-western corner of the project area.

Figure 4-17: SCC avifauna observed within the AOI; A) Southern Bald Ibis and B) Blue Korhaan.

The remaining natural wetland and hydromorphic grassland within the project area is likely to support all of the SCC considered highly likely to occur in Table 4-7 . However, only Blue Korhaan is likely to breed within the project area. The other species are only likely to utilise the project area from a foraging perspective. Lack of suitable nesting trees precludes breeding by Martial Eagle (*Polemaetus bellicosus*) and Secretarybird (*Sagittarius serpentarius*) while high levels of human activity in the area preclude breeding by any of the crane species. A lack of suitable rocky outcrop / cliff habitat precludes breeding by Southern Bald Ibis, Sentinel Rock Thrush and Lanner Falcon (*Falco biarmicus*). The remaining species are not known to breed in the region.

Table 4-7: List of avifauna present and potentially occurring avifauna

Common species	Species Name	LO	Status
Grey Crowned Crane	*Balearica regulorum*	2	EN, EN
Martial Eagle	*Polemaetus bellicosus*	2	EN, VU
Secretarybird	*Sagittarius serpentarius*	2	VU, VU
Southern Bald Ibis	*Geronticus calvus*	1	VU, VU
Lanner Falcon	*Falco biarmicus*	2	VU, LC
Abdim's Stork	*Ciconia abdimii*	2	NT, LC
Greater Flamingo	*Phoenicopterus roseus*	3	NT, LC
Lesser Flamingo	*Phoeniconaias minor*	3	NT, NT
Blue Korhaan	*Eupodotis caerulescens*	1	LC, NT
Curlew Sandpiper	*Calidris ferruginea*	2	LC, NT

Sentinel Rock Thrush	*Monticola explorator*	4	LC, NT

4.2.4.3 Species Congregations and flyways

The AOI was not found to support any globally significant congregations of water birds or other birdlife, nor is considered likely to, based on the available habitat. The AOI is not situated in any globally recognised avifaunal flyway.

5 Regional Sensitivity Analysis and No-go Areas

There are several assessments for South Africa as a whole, as well as on provincial levels that allow for detailed conservation planning as well as meeting biodiversity targets for the country's variety of ecosystems. These guides are essential to consult for development projects and will form an important part of the sensitivity analysis.

Areas earmarked for conservation in the future, or that are essential to meet biodiversity and conservation targets should not be developed and have a high sensitivity as they are necessary for overall ecological functioning. Further to this, details of the field investigation are used to inform and determine the site-specific sensitivity, as per Site Ecological Importance (SEI) criteria.

5.1 Mpumalanga Biodiversity Sector Plan (MBSP) (MTPA; 2014)

The main purpose of a biodiversity sector plan is to ensure that the most recent and best quality spatial biodiversity information can be accessed and used to inform land-use and development planning, environmental assessments and authorisations, and natural resource management. A biodiversity sector plan achieves this by providing a map (or maps) of terrestrial and freshwater areas that are important for conserving biodiversity pattern and ecological processes – these areas are called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). The maps are provided together with contextual information on biodiversity, and land-use guidelines that can be incorporated into the policies and decisions of a wide range of sectors.

The sector plan is a living document that is constantly reviewed and updated and documents the distribution of conservation important areas for biodiversity. According to the Mpumalanga Sector Plan, the Vogelfontein project area contains CBA Irreplaceable areas (wetlands mostly), CBA optimal areas, other natural areas (areas not under agriculture), moderately modified old land (grazing areas across the project site), and heavily modified areas (occurring across the project area, and location of the PAOI) (Figure 5-1). All these demarcations were taken into account during the field work studies planning and execution, as the Sector Plan's delineations were refined where applicable.
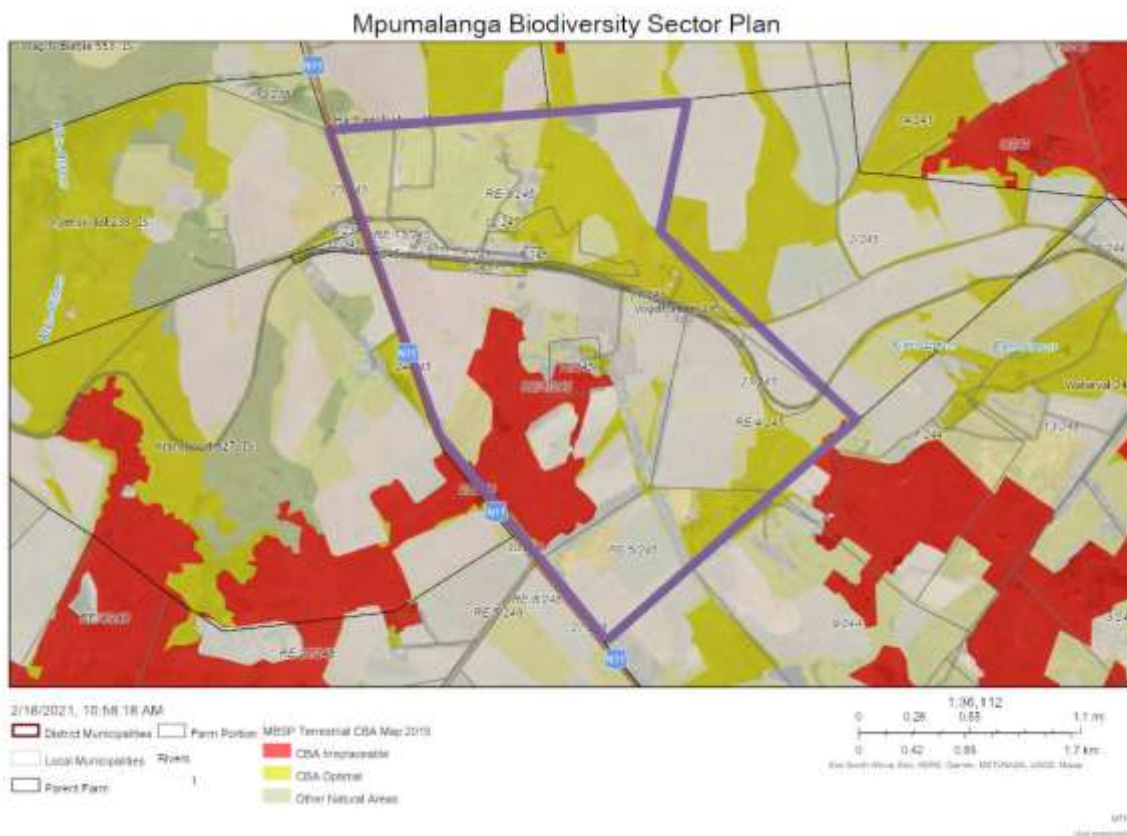
Figure 5-1: The MBSP in relation to the project site

5.2   Protected Areas

Formerly protected areas, either provincially or nationally, that occur within proximity to the project site could have consequences as far as impact on these areas are concerned. For the project area however, there are no protected areas in close proximity.

5.3   Important Bird Areas (Birdlife SA, 2013)

An Important Bird Area (IBA) is an area recognised as being a globally important habitat for the conservation of bird populations. Currently there are about 10,000 IBAs worldwide. At present, South Africa has 124 IBA's, covering over 14 million hectares of habitat for threatened, endemic and congregatory birds. Yet only one million hectares of the total land surface covered by our IBA's are legally protected. BirdLife South Africa continues an IBA programme of stewardship which will ultimately achieve formal protection (BirdlifeSA, 2013).

The study area falls within the Amersfoort Bethal-Carolina IBA. According to Barnes (1998), this IBA holds a large proportion (>10%) of the global population of the endangered Botha's Lark (*Spizocorys fringillaris)*, although confirmation is required as to whether this is still the case. This lark generally avoids rocky areas, tall grass in bottomlands, vleis, croplands and planted pastures, but its preferred habitat consist of short, dense, natural grassland found on plateaus and upper hill slopes and are occurring within the IBA, and on site.

Data regarding the IBA's current species composition is limited, but the grassland areas occasionally hold Denham's Bustard (*Neotis denhami)*, White-bellied Korhaan *(Eupodotis senegalensis)*, Blue Korhaan (*E. caerulescens)*, African Grass Owl (*Tyto capensis*), Buff-streaked Chat (*Campicoloides bifasciata*), Southern Bald Ibis (*Geronticus calvus*), Black-winged Pratincole (*Glareola nordmanni*) and Secretarybird *(Sagittarius serpentarius*). Blue Crane (*Anthropoides paradiseus)* and Whattled Crane (*Bugeranus carunculatus)* species can possible be found within the project area according to SABAP2.

5.4 Nationally Threatened Ecosystems

The list of nationally threatened ecosystems has been gazetted (NEM:BA, Act 10 of 2004: National list of ecosystems that are threatened and in need of protection) and results in several implications in terms of development within these areas. Four basic principles were established for the identification of threatened ecosystems.

Areas were delineated based on as fine a scale as possible and are defined by one of several assessments:

■ The South African Vegetation Map (Mucina and Rutherford 2006);

■ National forest types recognised by the Department of Water Affairs and Forestry (DWAF), now Department of Water and Sanitation (DWS);

■ Priority areas identified in a provincial systematic biodiversity plan; and

■ High irreplaceability forest patches or clusters identified by DWAF (DWS).

The criteria for identifying threatened terrestrial ecosystems include six criteria overall, two of which are dormant due to lack of data (criteria B and E). The criteria are presented Table 5-1 below shows that the Eastern Highveld Grassland and Soweto Highveld Grassland (referred to in section 5) are listed as threatened ecosystems. Cumulative loss of these areas should be avoided.

Table 5-1: Criteria for the Listing of National Threatened Ecosystems

Criterion	Details
A1	Irreversible loss of natural habitat
A2	Ecosystem degradation and loss of integrity
B	Rate of loss of natural habitat
C	Limited extent and imminent threat
D1	Threatened plant species associations
D2	Threatened animal species associations
E	Fragmentation
F	Priority areas for meeting explicit biodiversity targets as defined in a systematic biodiversity plan

5.5 Nationally Protected Areas Expansion Strategy

The National Protected Areas Expansion Strategy (NPAES) shows areas designated for future incorporation into existing protected areas (both national and informal protected areas). These areas are large, mostly intact areas required to meet biodiversity targets, and suitable for protection. They may not necessarily be proclaimed as protected areas in the future and are a broad scale planning tool allowing for better development and conservation planning. There are no areas earmarked for conservation within 50 km of the proposed development. The closest area is approximately 60 km away, the Mpumalanga Mesic Grassland area.

6 Site Ecological Importance

The ecological sensitivity map for the site is represented in Figure 6-1 for the entire project area and Figure 6-2 for the POAI, overlayed with the infrastructure plan. The *Crinum – Arundinella* Riparian vegetation units were allocated a high sensitivity since wetlands are regarded as an important habitat that should be conserved due to the likely presence of plant SCC and habitat diversity and functionality. Further to this, the Primary Grassland was assigned high ecological sensitivity due to the suitable habitat for SCC and high species diversity. High sensitivity was assigned to the *Gnidia – Diospyros* Rocky Grassland and moderate sensitivity was assigned to the remaining natural areas such as secondary grassland. SCC could occur here, and provincially protected plant species were recorded here. Areas that were cultivated, disturbed or built up were allocated a low ecological sensitivity (Table 6-1).

Table 6-1: Evaluation of SEI of vegetation communities and habitats in the project footprint and the PAOI

Habitat	Conservation Importance	Functional Integrity	Receptor Resilience	Site Ecological Importance
Riparian Habitat (Wetlands) Occurring in the general project area, not present in the PAOI.	**Medium** Vulnerable Ecosystem, which may contain VU species, as identified during desktop assessments. Provincially protected plant species were recorded within this vegetation type.	**High** Wetlands are integral in the habitat functionality and connectivity in the region. Some invasion by alien plants at wetland edges, but no signs of major past disturbance.	**Very low** Wetlands are not easily restored without significant intervention. Wetland habitat specialist flora are unlikely to survive in any other habitat in the development area and are thus highly dependent on functional wetland habitat.	**High** BI= Medium RR= Very Low

Rocky Grassland	**Medium** Vulnerable Ecosystem, which may contain VU species, as identified during desktop assessments. Provincially protected plant species were recorded within this vegetation type.	**Medium** Mostly minor current negative ecological impacts, with some major impacts (established population of alien and invasive flora and grazing) and a few signs of minor past disturbance. Has moderate rehabilitation potential.	**Very Low** Rocky Grassland cannot recover from major disturbance without significant intervention, over an extended period.	**High** BI= Medium RR= Very Low
Primary Grassland Occurring in the general project area, not present tin the PAOI.	**Medium** Vulnerable Ecosystem, which may contain VU species, as identified during desktop assessments. Field assessments did not confirm presence of SCC, but habitat is present and likelihood of these being present is high. Provincially protected plant species were recorded within this vegetation type.	**Medium** Mostly minor current negative ecological impacts, with some major impacts (established population of alien and invasive flora and grazing) and a few signs of minor past disturbance. Such as un-controlled burning). Has moderate rehabilitation potential.	**Low** Primary Grassland are unlikely to recover fully after a relatively long period, original species composition, will be very slow to return Diagnostic species has a low likelihood of returning to a site once the disturbance or impact has been removed.	**Medium** BI= Medium RR= Low
Secondary Grassland	**Low** No confirmed or highly likely populations of SCC.	**Medium** Only narrow corridors of good habitat connectivity.	**Medium** Degraded Grassland has the potential to be restored over time, particularly	**Low** BI= Low RR= Medium

	No confirmed or highly likely populations of range-restricted species.	Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential.	the areas that have been invaded by alien trees, and the areas under grazing pressure.	
Pastures Occurring in the general project area, not present tin the PAOI.	**Very Low** No confirmed and highly unlikely populations of SCC. No confirmed and highly unlikely populations of range-restricted species. No natural habitat remaining	**Medium** Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches. Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential	**High** Because these are not fully natural systems (have been excavated and managed in the past), their ability to recover is good because they would not need to recover to a fully natural state.	**Very Low** BI= Very Low RR= High
Alien Trees	**Very Low** No confirmed and highly unlikely	**Low** Almost no habitat connectivity but	**Very High** Habitat that can recover rapidly (~	**Very Low** BI= Very Low

| | populations of SCC.

No confirmed and highly unlikely populations of range-restricted species.

No natural habitat remaining | migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential.

Several minor and major current negative ecological impacts. | less than 5 years) to restore > 75% of the original species composition and functionality. | RR= Ver High |
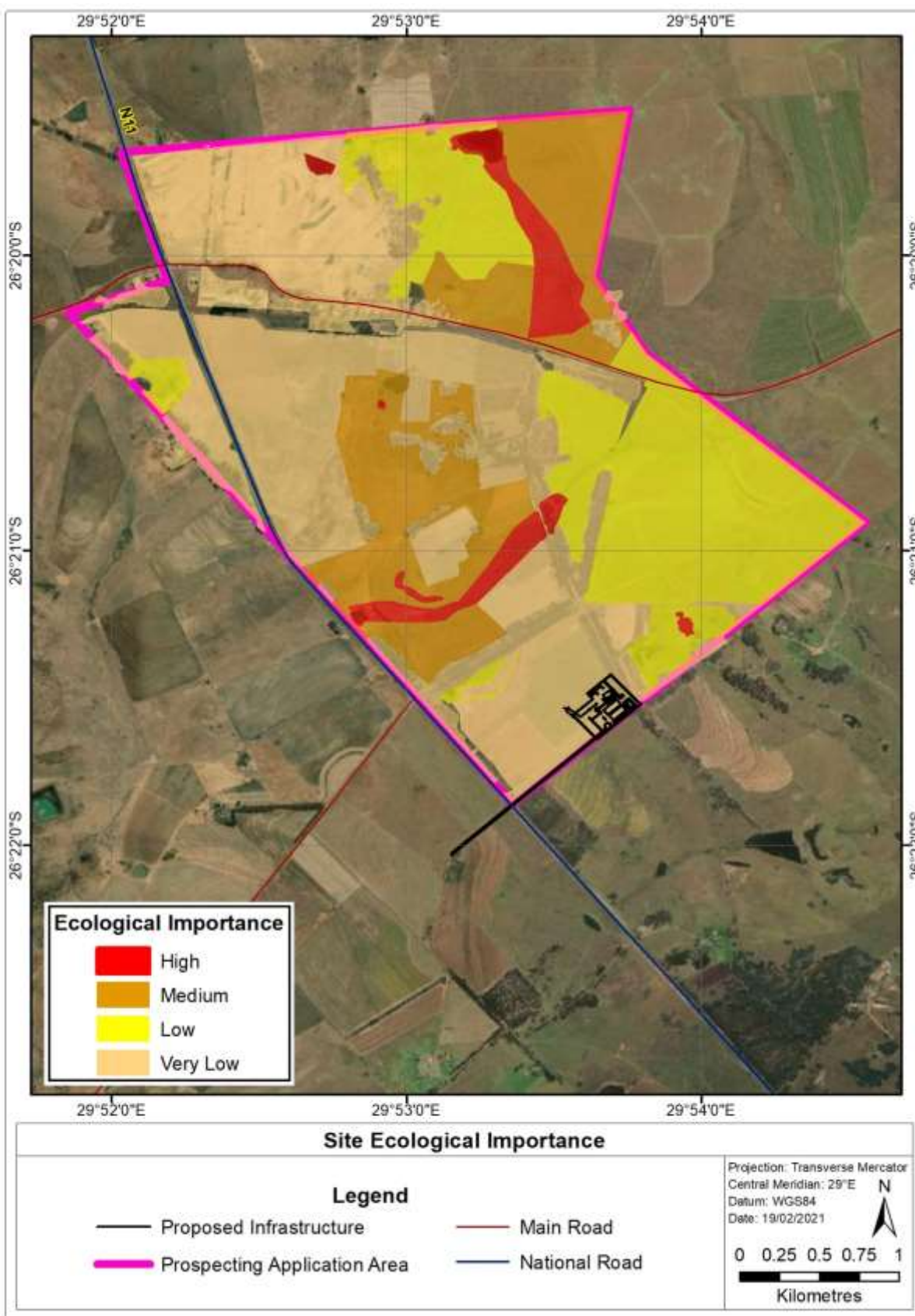
Figure 6-1: Project Area SEI
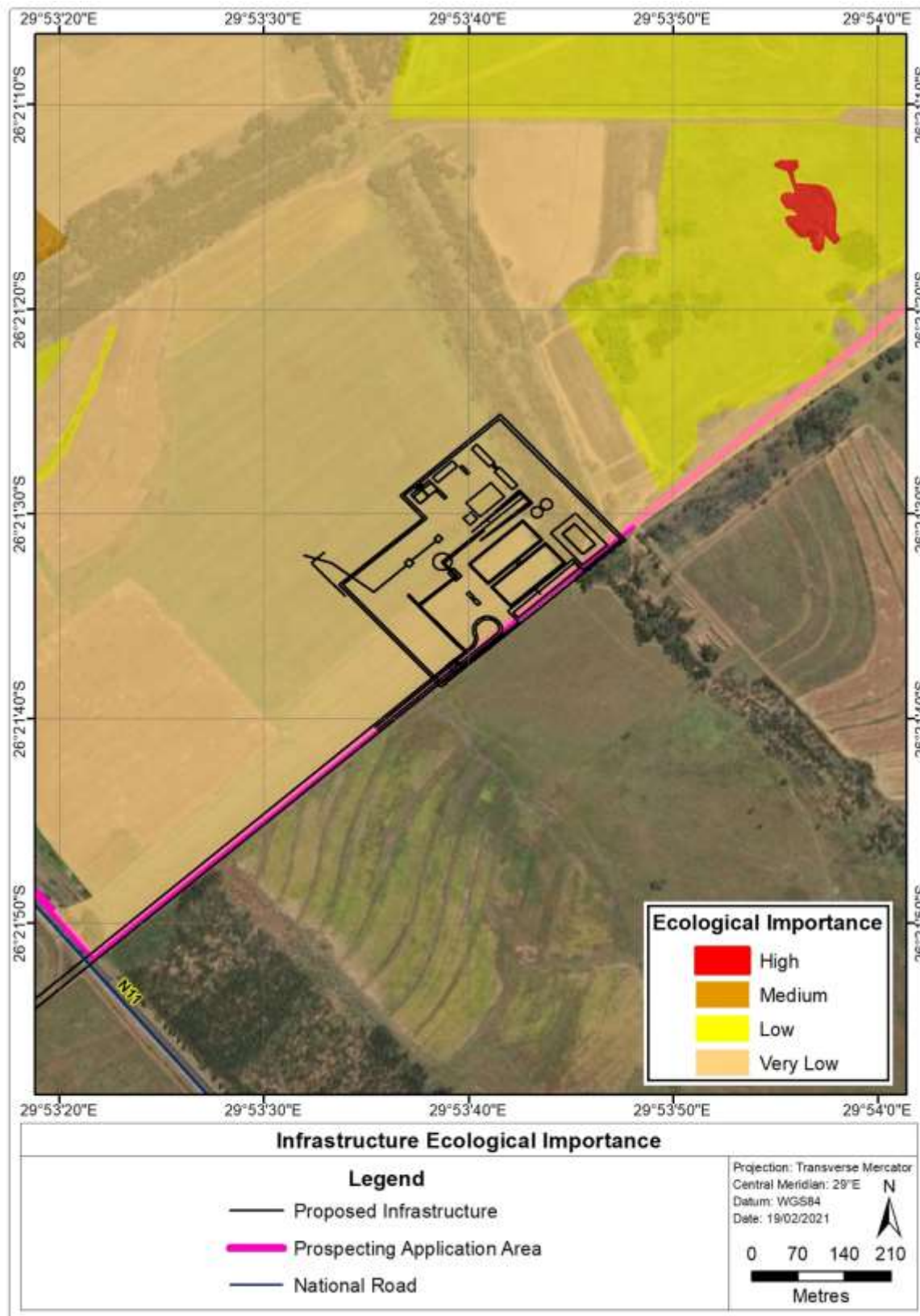
Figure 6-2: PAOI SEI

Figure 6-3 provides an illustration of the habitat sensitivity as applicable to avifauna identified within the PAOI. The assessment highlights the importance of all remaining Natural Grassland and Wetland habitat which was assigned a sensitivity of Very High. All well-established Degraded Grassland and some Pastures are assigned a Moderate sensitivity while all Croplands and other areas include infrastructure are assigned a Low sensitivity

It is important to note that this map does not replace any local, provincial or government legislation relating to these areas or the land use capabilities or sensitivities of these environments but is done in relation to the legislation.
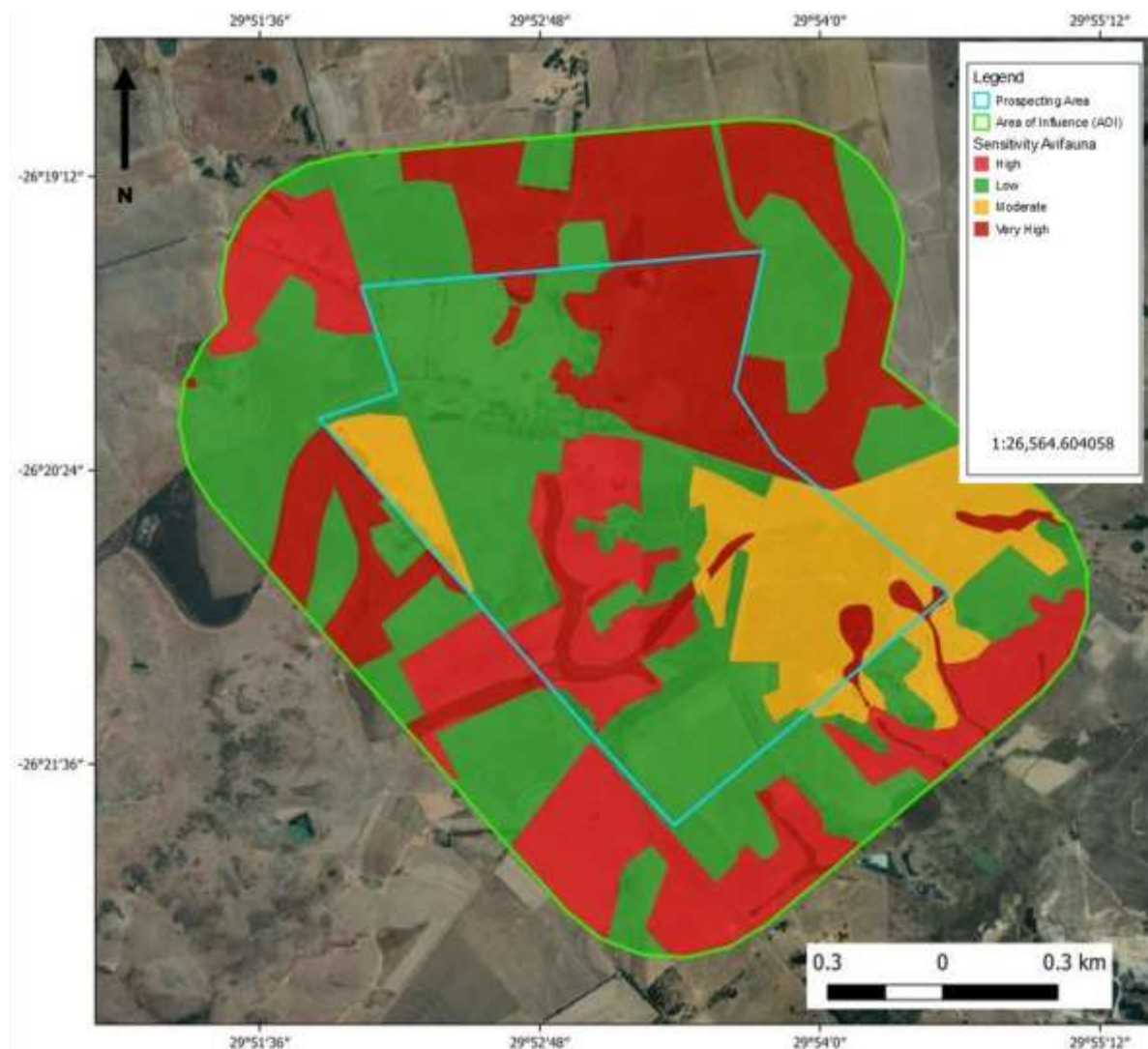
Figure 6-3: Avifaunal sensitivity relevant to the project area.

7 Impact Assessment

The Methodology used in determining and ranking impacts and risks identified including the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks

The assessment of impacts is largely based on the Department of Environmental Affairs and Tourism's (1998) Guideline Document: Environmental Impact Assessment Regulations. The assessment will consider the impacts arising from the proposed activities of the project both before and after the implementation of appropriate mitigation measures.

The impacts are assessed according to the criteria outlined in this section. The identified issues are ranked according to the extent, duration, magnitude (intensity), and probability. From these criteria, a significance rating is obtained, the method and formula are described below. Where possible, mitigation recommendations have been made and are presented in tabular form.

In order to spatially identify the different areas of importance for a species for the proposed development site and to facilitate transparent and comparable reporting of the potential impacts of development, a standardized metric for identifying site-based ecological importance for species, in relation to a proposed project with a specific footprint/PAOI and suite of anticipated activities, is used in this section, as per guidelines. It allows for rapid spatial inspection and evaluation of impacts of the project within the context of on-site habitats and SCC, and also facilitates integration of inputs from different specialist studies.

This Impact Assessment aims to identify and rate all potential direct (primary) influence and areas of potential indirect (secondary and tertiary) influences, as these relate to the PAOI.

7.1 Construction Phase

The construction phase activities that will have an impact on the fauna and flora are summarised below. Subsidence is not regarded as an impact that is likely to occur or have any surface impact, and is therefore not rated below. The impacts are rated according to the effect they will have on the SEI ratings of the vegetation/habitat types. The SCC listed by the screening tool were not encountered on site and therefore a separate impact assessment is not completed for each of these taxa.

7.1.1 Fauna and Flora Impact Description

The proposed infrastructure plan for the preferred site coincides with agricultural areas and alien invasive trees. No animal or plant SCC were recorded within the PAOI. Provincially protected species were however encountered.

During the impact of site clearing, none of the habitats that have been rated as high will be impacted on (see SEI), the impact will occur within Low or Very Low sensitivity vegetation and habitat types. Further to this, the extent of the impact (PAOI) is limited to a small area (8 ha) and will not have any direct negative impacts on overarching biodiversity of the project area.

The proposed development will result in a loss of approximately 7.5 ha of low to very low sensitivity habitat, 6.0 ha of which is of Low ecological sensitivity, and 1.5 of very low and, before mitigation. Table 7-1 illustrates the total area (in ha) of each habitat type that will be lost to the development.

Table 7-1: Vegetation habitat loss

Name	Hectares	Percentage of Mining Infrastructure Footprint Covered
Alien Invasive Trees	1.53	18.6
Primary Grassland	0	0
Secondary Grassland	0	0
Wetland	0	0
Rocky Outcrops	0	0
Agricultural Land	6.01	73.3
TOTAL	**8.19**	**100.0**

7.1.2 Avifauna Impact Description

Development of the mine will inevitably result in the loss of avifaunal habitat. The underground nature of the mine will, however, have a considerably smaller impact than would an opencast mine. The significance of habitat loss is largely contingent on the type of mine and planned surface infrastructure. This impacting rating assumes (1) that the mine is a board and pillar, underground coal mine, (2) that the surface infrastructure will be contained within the surface infrastructure polygon as presented in the scoping report and (3) that underground mining will be restricted to the south-western half of the site. It is very important to note that although the scoping report compiled by Jaco-K Consulting (2020) suggests that a groundwater study has been commissioned to investigate the potential effects of mine dewatering on surface water resources. Until such time as this information becomes available the potential effect of mine dewatering on the wetlands / hydromorphic grasslands and associated SCC avifauna remains tentative and a precautionary approach should be adopted by DEA in this regard in the interim. This application should be considered flawed from an avifaunal perspective, if the risk of wetland dewatering or contamination due to mine draw down or decant respectively is deemed likely as indicated by the geohydrological report. If these impacts are found to be of Low significance, then the project is only likely to have a Medium to Low residual risk rating provided all mitigation stipulated in the table below is adhered to.

7.1.3 Management Objectives

The objectives of management actions and mitigation measures are to avoid and reduce impacts to flora and fauna species and habitat on site and to mitigate any impacts that cannot be avoided. Management objectives will ensure that impacts from clearing and site establishment are limited and sensitive vegetation, plants and habitats are avoided during this process. To this end, no sensitive landscapes may be disturbed therefore the infrastructure placement needs to be updated in order to avoid the high sensitivity rocky grassland, and no fauna or fauna SCC may be disturbed without the correct permitting procedure in place.

7.1.4 Management Actions and Targets

Infrastructure associated with the mine must be contained in a single area (rather than being spread out) occupying as little footprint area as possible. It is recommended that the current infrastructure layout, represented Figure 6-2, be limited to the current location, and limited to its current footprint.

Areas that are not directly affected by development should be conserved. This entails restricting access and controlling any alien invasive species as well as keeping vegetation clearing to a minimum. To this end an alien invasive plant management plan must be implemented in order for the establishment of these species to be halted. Rehabilitation of small areas disturbed during construction and not needed for operation should occur concurrent to mining activity.

In the unlikely case where SCC are present during construction these must be managed according to a sensitive species management plan.

Under no circumstances can construction or disturbance of High Sensitive Areas be allowed.

The Primary grassland vegetation type as well as the Riparian and Sandstone rocky outcrops should be actively excluded from future mine plans to prevent deterioration or destruction of these sensitive landscapes. During the construction of the project related infrastructure, general mitigation and management actions provided in the following studies completed by Nsovo Environmental Consultants as part of this project, should be used to guide the effective management of the ecological resources affected by the proposed project:

- Aquatic Ecology Report;
- Wetland Report;
- Rehabilitation Plan; and
- Surface Water Report.

7.1.5 Impact Ratings

7.1.5.1 *Loss of vegetation and habitat and fragmentation of habitat*

The impact of the loss of the vegetation and habitat areas on site is rated in Table 7-2. The impact on Avifauna specifically Habitat loss, degradation and fragmentation, is rated in Table 7-3).

Table 7-2: Fauna and Flora Impacts, loss of vegetation and habitat types

Aspect	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Fauna	No	Negative	2 (Local)	4 (Long-Term)	2 (Minor)	4 (High)	32 (Medium)
	Yes	Negative	1 (Site only)	4 (Long-Term)	0 (None	3 (Medium)	15 (Low)
Flora	No	Negative	2 (Local)	4 (Long-Term)	2 (Minor)	4 (High)	32 (Medium)
	Yes	Negative	1 (Site only)	4 (Long-Term)	0 (None	3 (Medium)	15 (Low)
Corrective Actions	- No construction activities, staff, vehicles or activities, dumping or clearing is permitted in high sensitivity area, thus declared a "No-Go" area. - Access to these areas should be limited and delegated. - A management plan to maintain the ecological integrity of remaining property is required and implementation is the responsibility of the developer. - Develop, budget for and implement a mine decommissioning rehabilitation plan to re-instate grassland with locally indigenous Highveld species. - The footprint of disturbance area should be kept as small as possible and only existing access roads should be used to reach the site for clearing and vehicles should not be allowed to traverse natural areas or leave the demarcated road. - An AIP management plan must be implemented, whereby existing AIP's within the project area are eradicated as well as the disturbed site is monitored quarterly for at least two years to ensure that alien invasion does not take place.						

Table 7-3: Avifauna specific Impact of Habitat loss, degradation and fragmentation

Aspect	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	

Avifauna	No	Negative	3 (Regional)	5 (Permanent)	10 (Very High)	4 (High Probability)	72 (High)
	Yes	Negative	2 (Local)	4 (Long Term)	6 (Moderate)	3 (Medium Probability)	36 (Medium)
Corrective Actions		• Strictly avoid placing surface infrastructure within the areas demarcated as being of Very High and High avifaunal sensitivity. • Restrict the surface infrastructure to the southern quarter of the project area. • Minimise the extent of the surface infrastructure as much as possible (to within the surface infrastructure footprint provided in the scoping report). • Rehabilitate all areas that were redundantly disturbed by the construction of the mine immediately after construction. • Develop and implement an Alien and Invasive Plant Control Plan. • Commission a geohydrological assessment aimed at establishing the any mine dewatering may have on surface water resources. This study needs to establish how hydraulically connected the wetlands are with the aquifers associated with the underground mine and what the impact would be from mine dewatering. • Commission bi-annual avifaunal survey to monitor avifaunal assemblages with key focus on SCC.					

7.1.5.2   Direct Loss of avifauna nests

No nests of SCC avifauna were detected within the project area. The only potentially occurring SCC that may breed within the project area, in its current state, based on available habitat, are Blue Korhaan and potentially White-bellied Korhaan. However, these species are unlikely to breed in the area earmarked for the surface infrastructure. Therefore, this impact is afforded a Low pre and post mitigation significance rating (Table 7-4).

Table 7-4: Avifauna Impact of Direct loss of Avifaunal nests

Aspect	Impact rating criteria	Significance

	Corrective measures	Nature	Extent	Duration	Magnitude	Probability	
Avifauna	No	Negative	2 (Local)	4 (Long Term)	8 (High)	2 (Low Probability)	28 (Low)
	Yes	Negative	2 (Local)	2 (Short Term)	2 (Minor)	1 (Improbable)	6 (Low)
Corrective Actions	• If nests of any overlooked nests of raptors or large terrestrial birds are found during construction halt construction activities and call an avifaunal specialist immediately for advice on the way forward. • Avoid all areas of Very High and High avifaunal sensitivity.						

7.1.5.3   Sensory disturbance and extirpation of SCC

Another unavoidable consequence of establishing a mine in this area would be the increased sensory disturbances on local avifauna caused by the increased noise, dust and human presence. Unmitigated this impact is considered to have a High significance. However, with the implementation of the below-listed mitigation the significance of this impact can be reduced to Medium. Two SCC avifauna species were observed utilising the AOI for foraging during the field survey and it is likely that the construction and operation of the mine will have a local extirpation effect on these species. This impact is however likely to be temporary if the mitigation is adhered to (Table 7-5).

Table 7-5: Sensory disturbance and extirpation of SCC

Aspect	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Avifauna	No	Negative	3 (Regional)	4 (Long Term)	10 (Very High)	4 (High Probability)	68 (High)
	Yes	Negative	2 (Local)	4 (Long Term)	6 (Moderate)	3 (Medium Probability)	36 (Medium)
Corrective Actions							

- Attempt as far as possible to conduct the majority of the high intensity construction activities (e.g. blasting and major earthworks) during winter to minimize disturbance of avifauna during sensitive life stages such as lekking, courting, nesting and fledging).
- Screen off the surface infrastructure footprint and access road with a tightly planted boundary of tall (ensure no NEMBA category 1a or 1b alien and invasive species) to lessen sensory disturbances from visual, noise and dust impacts.
- Keep lighting to a minimum and fit external lighting with downward facing hoods.
- Suppress dust along roads and onsite.
- Demarcate natural areas beyond the surface infrastructure footprint and restrict access of personnel into these areas through education and signposting.

7.1.5.4   _Direct Mortality_

The possibility remains that avifauna may be directly killed or injured during the construction phase and thereafter during the operational phase through increased road mortality. However, by appropriately timing the site clearing and the bulk of the earthmoving activities during winter as well as by enforcing speed control measures; this impact can be reduced to a Low residual significance (Table 7-6).

Table 7-6: Avifaunal Impact of Direct Mortality

Aspect	Corrective measures	Impact rating criteria					Significance
		Nature	**Extent**	**Duration**	**Magnitude**	**Probability**	
Avifauna	No	Negative	3 (Regional)	4 (Long Term)	8 (High)	4 (High Probability)	60 (Medium)
	Yes	Negative	2 (Local)	4 (Long Term)	4 (Low)	2 (Low Probability)	20 (Low)
Corrective Actions	- Clear the site and conduct most of the initial heavy earth moving activities during winter. - During operation, introduce a speed limit of 40 km per hour. - Avoid transporting coal out of site by truck at night to minimise mortality of owls and other nocturnal species.						

7.1.5.5 The following measures are applicable under general development for both construction and operational phases where applicable:

■ All construction activities and access must make use of the existing roads;

■ All laydown, storage and temporary infrastructure areas must be within the existing transformed habitat as per the sensitivity map, and not within the adjacent degraded and semi-natural habitats;

- o Staff and construction worker movements must be restricted to the transformed areas during the life of the operation;

■ It is recommended that areas to be developed be specifically demarcated so that during the construction phase, only the demarcated areas be impacted upon and preventing movement of workers into surrounding environments;

■ The storage of the construction material to be built is not to be stored for extended periods of time and storage areas must be placed in low sensitivity areas and should be removed from the site once the construction phase has been concluded;

■ Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events. This will also reduce the likelihood of encroachment by alien invasive plant species;

■ If any *Protected species* are noticed within the planned development area, this protected species must be relocated, relocation onto the same property can be done without a permit application;

- o A permit of destruction needs to be applied for any individuals that may need to be destroyed;

■ Compilation of and implementation of an alien vegetation management plan for the entire site, due to the large number of aliens already present;

- o By law, control and removal of NEMBA Category 1b alien species onsite. Category 2 species that remain on site requires a permit;

- o Monitoring of alien invasive plant species and their presence, in conjunction with the alien invasive plant management plan for the life of the project;

■ During the construction phase, noise must be kept to an absolute minimum during the evenings and at night to minimise all possible disturbances to amphibian species and nocturnal mammals;

■ Leaking equipment and vehicles must be repaired immediately or be removed from site to facilitate repair;

■ The intentional killing of any animals including snakes, insects, lizards, birds or other animals should be strictly prohibited. No trapping, killing or poisoning of any wildlife is to be allowed;

- o Signs must be put up to enforce this;

- If any indigenous faunal species are recorded during construction, activities should temporarily cease, and an appropriate specialist should be consulted to identify the correct course of action;

- The duration of the construction should be minimized to as short term as possible, in order to reduce the period of disturbance on fauna;

- A method statement is required from the Contractor(s) that includes the layout of the prospecting camp, management of facilities and wastewater management during construction;

  - Waste management must be a priority and all waste must be collected and stored adequately.

    - It is recommended that all waste be removed from site on a weekly basis;

    - The Contractor should inform all site staff to the use of supplied ablution facilities and under no circumstances shall indiscriminate excretion and urinating be allowed other than in supplied facilities;

    - The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility;

    - Where a registered disposal facility is not available close to the project area, the Contractor shall provide a method statement with regard to waste management. Under no circumstances may domestic waste be burned on site;

    - Refuse bins will be emptied and secured;

    - Temporary storage of domestic waste shall be in covered waste skips, maximum domestic waste storage period will be 10 days

    - A minimum of one toilet must be provided per 10 persons

- All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof;

  - The avoidance and protection of the wetland areas must be included into a site induction. Contractors and employees must all undergo the induction and made aware of the "no-go" to be avoided; and

  - Staff should be educated about the sensitivity of faunal species and measures should be put in place to deal with any species that are encountered during the construction process.

- A stormwater management plan must be put in place and implemented to reduce the likelihood of erosion;

- Speed limits and speed bumps must be implemented in the area to lower the risk of road killings and dust generated in the area;

  o Signs must be put up to enforce this;

- All livestock must be kept out of the Semi-Natural Grassland;

- The contractors used for the construction should have spill kits available prior to construction to ensure that any fuel, oil or hazardous substance spills are cleaned-up and discarded correctly;

- Any possible contamination of topsoil by hydrocarbons, concrete or concrete water must be avoided;

  o Materials must be stored in leak-proof, sealable containers or packaging

- Appropriately rehabilitate the project area by filling, landscaping and re-vegetating with locally indigenous species;

  o All bare areas must be revegetated with indigenous vegetation to decrease the possibility of erosion.

7.2 Operations Phase

7.2.1 Project Activities Assessed

During the operational phase of the development, underground mining will take place with incline shafts at a depth of 75m. No planned loss of habitat or flora and fauna species is expected. The only activity that is considered at this time is increased vehicular movement and associated human activities on the site.

7.2.2 Impact Description

Due to increased vehicular movement on site, fauna may be disturbed due to noise and dust. Further to this, road collisions with smaller fauna and birds may take place.

7.2.3 Management Objectives

The objective of management measures is to ensure that road collisions do not take place and faunal disturbance is kept to a minimum.

7.2.4 Management Actions and Targets

Signage should be erected to indicate a minimum speed limit of 30 km/hr on access roads on site. Signage should also warn drivers of the risk of animal kills on the road. Further to this, driving of vehicles should be restricted to daylight hours.

7.2.5 Impact Ratings

The impacts of the operational phase are rated in the Table 7-7 below.

Table 7-7: Potential Risks of the Operational Phase – Increased Vehicular Movement on Site

Aspect	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Fauna	No	Negative	2 (Local)	4 (Long-Term)	4 (Low)	4 (High)	40 (Medium)
	Yes	Negative	1 (Site only)	4 (Long-Term)	2 (Minor)	3 (Medium)	24 (Low)
Corrective Actions	- Erect signage on site; - Adhere to speed limits; - Avoid vehicle movement at night.						

7.3   Closure and Rehabilitation Phase

7.3.1 Project Activities Assessed

Decommissioning will take place after mining has commenced in 9 years. The dismantling of surface infrastructure will involve increased activity on site and minor disturbance of the soil. This may promote the establishment of alien plant species if seeds persist in the seedbank. The impact of this will be minor.

7.3.2 Impact Description

When the soil is disturbed, alien plants in the seedbank will establish and spread.

7.3.3 Management Objectives

The objective of the management actions is to ensure that alien plant species do not establish and erode the natural capital of the area, and that natural areas are not disturbed.

7.3.4 Management Actions and Targets

An alien plant management plan should be implemented. Adherence to no go areas must be enforced.

7.3.5 Impact Ratings

The impact ratings for the decommissioning phase are listed in the Table 7-8 below. Recommendations for the rehabilitation phase are included in the relevant Rehabilitation Plan Report.

Table 7-8: Potential Impacts of the Decommissioning Phase – Establishment of Alien Plant Species

Aspect	Corrective measures	Impact rating criteria					Significance
		Nature	**Extent**	**Duration**	**Magnitude**	**Probability**	
Fauna	No	Negative	2 (Local)	4 (Long-Term)	4 (Low)	4 (High)	40 (Medium)
	Yes	Negative	1 (Site only)	4 (Long-Term)	2 (Minor)	3 (Medium)	21 (Low)
Corrective Actions	• An alien plant species management plan should be implemented for two years						

8 Cumulative Impacts

The cumulative impacts that are considered from a perspective of terrestrial biodiversity include the following:

- Loss of habitat on a national scale – the threatened ecosystems programme (described in section 5.4) outlines the most significant habitats that are important for conserving on a national scale. No loss of the Eastern Highveld Grassland (correlating to the secondary grassland in this report) is expected as the impacted area consists of Agricultural land and alien invasive trees.

- Loss of diversity on a regional scale – No loss of diversity is expected on a regional scale.

It is important to note that the project area falls within the Amersfoort - Bethal - Carolina District Important Bird Area (IBA ZA014) an area recognised for supporting some of the last remnants of Highveld Clay Grassland, being a stronghold for Botha's Lark and providing important habitat for a population of approximately 200 resident Bald Ibis. Although the area is not completely devoid of mines with the nearest being situated 2.2 km and 2.4 km north- east and south-east of the project respectively, it certainly isn't the dominant land use in the local area. The text account for this IBA lists mining as one of the main threats to the trigger species supported by this IBA and mentions that one of the most valuable lands use practices, even greater than reserve proclamation, is simply to promote the sustainable farming of livestock in this area, particularly sheep. This promotes the type of shortly cropped grassland frequented by Botha's Lark and the other regionally occurring SCC avifauna. With mitigation this impact is assigned a Medium residual impact significance.

9 Unplanned Events and Low Risks

A summary of ecologically significant risks are listed in Table 9-1 below.

Table 9-1: Unplanned Events, Low Risks and their Management Measures

Unplanned event	Potential impact	Mitigation/ Management/ Monitoring
Subsidence due to underground mining	Loss of flora and fauna habitat. Loss of Red Data species.	Appropriate safety factors should be used, as determined by suitably qualified rock engineers.
Hydrocarbon spillage in/near wetlands	Contamination of waterbodies utilised by terrestrial fauna.	Vehicles must only be serviced within designated service bays. Procedures should be put in place to clean-up spillages in the event that they should occur. Spill kits need to be obtained and should be available on site to clean up any leaks or spills. Spillages of magnitude should also be reported to the authorities within 24 hours and an internal incident reporting system implemented. Construction will take place in the dry-season.
Poaching of animal species on site due to increase activity on site. Plant SCC collecting	Small mammals and reptiles may be at risk due to increased human activity on site. SCC on site are know as collectable.	Ensure continuous environmental awareness training takes place. This needs to be monitored and reported on and the appropriate actions should take place dependant on the results.

10 Consultation Undertaken

No comments directly related to flora and fauna have been received.

11 Discussion and Conclusions

The study area is located within the threatened ecosystems: Eastern Highveld Grassland and Soweto Highveld Grassland. However, the PAOI falls within areas that have been demarcated as transformed, according to the Mpumalanga Sector Plan. The results of the field investigations confirm that the irreplaceable areas that are present in the larger project footprint, are intact natural systems and should be conserved.

The surface infrastructure does not coincide within any of the irreplaceable designated areas according to the Mpumalanga Sector Plan; clearing will result in a no loss of habitat of conservation value. The impact of the loss of habitat due to the surface infrastructure will be low but none with mitigation. The impact of habitat fragmentation will be minor and the impact

of disturbance to fauna will be low. The residual impact of the proposed development on flora and fauna is expected to be none, after mitigation.

From an avifauna perspective this assessment provides a quantitative, succinct, baseline description of the avifaunal community within the proposed Vogelfontein Colliery mining rights area. It confirms the validity of the avifaunal sensitivity as alluded to by the Environmental Screening Tool (and expands upon it), details the avifaunal communities within each main habitat and rates the anticipated impacts to them while providing mitigation to reduce these impacts. Just over 170 species have the potential to occur within the project area. During the brief site visit a total of 60 species were observed within the project area. Of the four main habitats identified the wetlands habitat supported by far the highest diversity followed by Degraded Grassland, and Natural Grassland while Pasture grasslands supported the lowest diversity. Although the Natural Grasslands supported a slightly lower diversity than the Degraded Grasslands they supported a unique assemblage of less common and adaptable species including more conservation important species.

During the site visit two species of conservation concern were detected namely the Vulnerable Southern Bald Ibis and Near-Threatened Blue Korhaan. These findings highlight the importance of the wetlands and associated Natural Grassland habitat within the project area. These habitats were assigned a sensitivity rating of Very High on account of their potential to support most of the region's SCC (exceptions include Sentinal Rock Thrush and both flamingo species for which suitable habitat is lacking). However, of the various potentially occurring SCC only Blue Korhaan is considered likely to breed on site with the others utilising the site exclusively from a foraging perspective.

Avifauna impacts were assigned a residual impact significance of Moderate. The above mentioned ratings are based on the surface and underground mining layouts as provided in the scoping report (Jaco-K Consulting, 2020). These impact ratings are tentatively assigned in lieu of a much-needed geohydrological report to better understand the degree of association between the ground and surface water aquifers. It is imperative that all surface infrastructures remain outside of the areas designated as High or Very High sensitivity. It is recommended that Bi annual surveys be conducted in a similar approach as adopted here to monitor the avifaunal community, particularly with regards to the present and potentially occurring SCC.

The following recommendations have been made specifically with regards to SCC for this study, which must be seen in conjunction with mitigation measures listed in the IA:

■ The site should be screened prior to construction, preferably between the months of November to March, for any plant SCC;

■ If any plant SCC are recorded, these should be translocated with the involvement of a qualified botanist. The donor habitat should resemble the receiving habitat and the species/populations should be monitored monthly after translocation for up to one year;

■ If any important fauna species (SCC) are identified (as listed in the expected species lists) that have not been included in the site-specific species lists, this should be reported to the Environmental Control Officer on site and the provincial authority (MPTA) for their reference. Further to this, measures should be undertaken to ensure

that negative impacts to the species in question are not imposed due to the development; and

■ The mine has an opportunity to reduce their overall liability in terms of spread of alien plant species. It is recommended that all alien plant species are controlled throughout the site as far as possible.

12 Impact Statement

An impact statement is required as per the NEMA regulations with regards to the proposed development.

Considering the above-mentioned conclusions, it is the opinion of the specialists that no fatal flaws were identified at this stage, and the project can be cautiously considered if the mitigation measures and recommendations are strictly adhered to and enforced. Importantly, this means that the question of subsidence must be addressed in the geohydrological specialist report and that areas marked as highly sensitive according to the results from the SEI must be not be impacted upon during, or post, development. The habitats that were marked as highly sensitive were assigned these values due to the natural state of the vegetation, the function and role of the habitat on a regional scale.

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Appendix A: CV

Mr. Rudolph Greffrath

Terrestrial Ecology Specialist

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Experience

Rudolph's current role is that of a senior terrestrial ecologist, with specific reference to fauna and flora biodiversity management. In this capacity he is responsible for the execution management of terrestrial ecological studies and the management of numerous specialists who perform this function under his leadership.

He has completed numerous standalone reports where the sole focus was terrestrial ecology as well as integrated projects such as EIA reports and ESIA reports. With regards to the latter he has extensive experience in the interrelationship of the various biotic and abiotic specialist components and the concepts that can have an impact and must be discussed across the board. These reports are used for environmental authorisations or are focused specialist studies which meet local and international standards.

He is well versed in the demands of inter disciplinary cooperation and has executed projects where a combination of qualified specialists have reported to him. He has experience in stakeholder engagement where the relationships with NGO's and other interested and affected parties must be established for the completion of projects to an acceptable international standard.

Rudolph has extensive experience in the application of the International Finance Corporation Performance standards, specifically performance standard 6. In this field he has worked within the extractive and energy sectors across Africa to ensure their compliance to IFC PS6. In applying international best practice, he has gained experience in applying the No Net Loss and Net Positive Impact approaches for Biodiversity in a business context. He has experience in applying leading practice according to the Equator Principles, Business and Biodiversity Of-set Program, the Cross Sectoral Biodiversity Initiative, the Energy and Biodiversity Initiative, Fauna and Flora International, the International Petroleum Industry Environmental Conservation Association's guidance documents, the Economics of Ecosystems and Biodiversity and World Bank criteria, specifically Criteria 7.

Rudolph is responsible for off set design after a mitigation hierarchy is applied, in this regard he compiles Biodiversity Land Management Programs/Biodiversity Action Plans, where various specialist studies are collated into a working document for clients in order to aid in pre or post mining management and achieving the No Net Loss and Net Positive Impacts.

Further to this he is also involved in rehabilitation design studies which entail the planning, implementation and monitoring of vegetative rehabilitation. He is responsible for the planning of post mine land use and the various methods utilised to achieve this.

Rudolph also fulfils the role of project manager. Here he manages national and international projects across Africa, specifically west, central and southern Africa, managing a multi-disciplinary team of specialists.

Rudolph is also involved in the acquisition of regulatory permits for clients, this includes the planning of relocation strategies for protected and endangered plant species in areas where mines are to be established. This involves the planning and execution of data gathering surveys. Thereafter he manages the process involving relevant provincial and National authorities in order to obtain the specific permit that allows for a development to continue.

Information pertaining to the technical expertise of Rudolph includes knowledge and working experience in the following:

- Environmental Impact Assessments (EIAs), Basic Assessments and Environmental Management Plans (EMPs) for environmental authorisations in terms of the South African National Environmental Management Act (NEMA), 1998 (Act 107 of 1998);

- Implementation of Government Notice 320 (dated 20 March 2020) and Government Notice 1150 (dated 30 October 2020) in terms of NEMA: "Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation;

- Environmental pre-feasibility studies for gold tailings reclamation and iron ore and coal mining projects;

- Convention on Biological Diversity, Strategic Planning for Biodiversity, Mechanisms for implementation, Cooperation and Partnerships;

- Business and Biodiversity Off Sets program, standards on biodiversity off sets;

- International Finance Corporation (IFC) related projects across central and west Africa, applying performance standards and Equator Principles on the Environmental Health and Safety Guidelines set down by the IFC;

- International Council for Mining and Metals, Conservation of Biodiversity and Integrated approaches to land use planning;

- European Investment Bank; application of sustainability principles, such as those of the International Finance Corporation (part of the World Bank Group), in particular on biodiversity. Standard 3 on Biodiversity and Ecosystems, as part of the EIB Environmental and Social Standards;

- Environmental and Social Impact Assessments (ESIA) for Environmental Authorisation;

- Environmental off-Set studies, determining off-set liability, applying the Mitigation hierarchy and best practice in the form of IFC performance standard 6.

- Large Mammal Monitoring Projects;

- Biodiversity Assessments including Mammalia, Avifauna, Herpetofauna and Arthropoda;

- Environmental Impact Assessments (EIA) based Impacts to the terrestrial Ecological environment;

- Geographic Information Systems (GIS), frequent use of ArcGIS, QGIS.

- Biodiversity Action Plan, design and Implementation;

- Biodiversity and Land Management Programs;

- Protected plant species management strategies planning and implementation;

- Monitoring of rehabilitation success by means of vegetation establishment;

- Rehabilitation planning;

- Environmental auditing of rehabilitated areas;

- Project management of ecological specialist studies;

- Planning and design of Rehabilitation off-set strategies.

Tertiary Education

- 2005-2006: B-tech Degree in Nature Conservation, Nelson Mandela Metropolitan University (NMMU).

- 2001- 2004: National Diploma in Nature Conservation, Nelson Mandela Metropolitan University (NMMU).

Skills

- Project management and leadership skills;

- Sound organizational, good people skills;

- Good verbal presentation, written communication, language skills and excellent report writing skills;

- Researching, analysing and integrating data;

- Working experience in Environmental Impact Assessment processes and knowledge of the Environmental Impact Assessment Regulations 2010 & 2014;

- Understanding of the Municipal Land Use application processes;

- Knowledge and experience in the National Environmental Management Act, (No. 107 of 1998), as amended;

- Knowledge and working experience of the National Environmental Management: Biodiversity (Act no, 10 of 2004) and the National Management Protected Areas (Act no. 57 of 2003);

- Experience in working with multi-stakeholder groups, organizations;

- Working experience in Geographical Information Systems;

- Advanced computer skills (Microsoft (MS) word, MS excel, MS PowerPoint, Internet & Email, GIS and Remote Sensing), QGIS;

- Ecostatus classification, specifically Riparian Vegetation Response Index.

Training

- Measurements of Biodiversity at the University of the Free State, led by Prof. M. T. Seaman. September 2008.

- IFC performance standards implementation training, Lee-Ann Joubert, January 2013.

- Bird Identification course led by Ettiene Marais November 2009.

- Introduction to VEGRAI and Eco-classification led by Dr. James Mackenzie December 2009 and January 2018.

- Dangerous snake handling and snake bite treatment with Mike Perry 2011, 2015.

- Rehabilitation of Mine impacted areas, with Fritz van Oudshoorn, Dr Wayne Truter and Gustav le Roux 2011.

- First aid Level 2, School of Emergency and Critical Care, Netcare, 2013

- First aid Level 2, National First Aid Academy, 2017.

Projects

The following project list is indicative of Rudolph's experience, providing insight into the various projects, roles and locations he has worked in.

Project	Location	Client	Main project features	Positions held	Activities performed
Tongon Off-set project	Ivory Coast	Randgold Resources Limited	Applying IFC, BBOP and other best practice guidelines in designing an Off-set project for the residual Impact of the Tongon Gold Mine	Project Lead Technical Specialist	
Annual Large Mammal Monitoring in the Niokola Koba National Park.	Senegal	DPN Direction des Parcs Nationaux du Sénégal	Applying Aerial, Ground and vehicle, large mammal monitoring techniques in the National Park.	Aerial game counter, project specialist.	Training of field staff, recording of data in the vehicle and aerial surveys, Report reviews
Biodiversity Management for Massawa Gold Mine	Senegal	Barrick Gold	With the discovery of Western Chimpanzees in close proximity to the project area, detailed field work was conducted by world renowned experts. Leading to various mitigation measures.	Project Manager	Project design, Specialist Management. Producing Synthesis reports on results of specialists. Designing Monitoring Off sets and management plans
Mmamabula Energy Project (MEP).	Botswana	CIC energy	Construction of a railway, opencast mine, wellfield, conveyors, addits, housing.	Technical Specialist Ecologist	IFC level specialist studies, Fauna and Flora surveys for the project features, including impact assessments, management plans. Alien eradication plans.
Orlight Solar PV Power Project	South Africa	Orlight SA	Environmental Impact Assessment (EIA) process for five proposed Solar Photovoltaic (PV) Power Plants	Technical Specialist Ecologist	EIA Terrestrial Biodiversity studies, IFC level specialist studies

Twenty Nine Capitol	South Africa	CSIR	Photovoltaic Power stations	Technical Specialist Ecologist	EIA Terrestrial Biodiversity studies, in support of the EIA report, IFC level specialist studies
Tongan Biodiversity Land Management Plan	Ivory Coast	Randgold Resources Limited	Design, compilation and implementation of the BLMP	Technical Specialist Ecologist, Project Manager	Fauna and Flora surveys for the BLMP, compilation of BLMP. Alien eradication plans. IFC level specialist studies
Kibali Gold mine	DRC Congo	Randgold Resources Limited	Gold mine infrastructure	Technical Specialist Ecologist	Technical specialist, fauna and flora, for the Kibali ESIA. IFC level specialist studies
Kibali Gold mine	DRC Congo	Randgold Resources Limited	ESIA Update	Technical Specialist Ecologist	Technical specialist, fauna and flora, for the Kibali ESIA. IFC level specialist studies
Nzoro Hydroelectric station	DRC Congo	Randgold Resources Limited	Hydroelectric plant	Technical Specialist Ecologist	Technical specialist, fauna and flora, for the Nzoro ESIA. IFC level specialist studies.
Loulo Biodiversity Land Management Plan	Mali	Randgold Resources Limited	Design, compilation and implementation of the BLMP	Technical Specialist Ecologist, Project Manager	Fauna and Flora surveys for the project features, compilation of BLMP.
Koidu Diamond Mine	Sierra Leone	Koidu Resources	Construction of new open pit	Technical Specialist Ecologist	Technical specialist, fauna and flora, for the Koidu ESIA. IFC level specialist studies, terrestrial ecology management plans

Resource Generation	South Africa	Temo Coal	Coal mine/Railway Line	Technical Specialist Ecologist	Fauna and Flora surveys, Protected plant species management plans, Permitting and Rehabilitation design.
Impunzi Rehabilitation monitoring	South Africa	Glencore	Monitoring of rehabilitation success and suggested management measures	Technical Specialist Flora specialist, Project manager	Vegetation surveys, rehabilitation monitoring. Alien eradication plan.

Professional Registration

■ South African Council for Natural Scientific Professions, *Professional Natural Scientist* in the field of practice *Conservation Science,* registration number, *400018/17*;

■ IAIA, International Association for Impact assessments;

■ Botanical Society of South Africa;

■ The Land Rehabilitation Society of Southern Africa, LARSA (Membership No. 0085);

■ Grassland Society of Southern Africa.

Employment

■ 2021- current: Founder, Owner, RJG Consulting, Johannesburg.

■ 2020-2021: Senior Biodiversity Specialist ERM, Johannesburg

■ 2016-2019: Digby Wells Environmental, Johannesburg, International. Manager: Group Biodiversity.

■ 2011-2016: Digby Wells Environmental, Johannesburg, International. Unit Manager: Fauna, Flora and Wetlands.

■ 2009-2011: Digby Wells and Associates, Johannesburg, South Africa. Senior Consultant.

■ 2006 – 2009: Digby Wells and Associates, Johannesburg, South Africa. Consultant.

■ 2002 - 2003: Shamwari Game Reserve, Eastern Cape, South Africa.

■ 2001: Kop-Kop Geotechnical instrumentation specialists, Johannesburg, South Africa.

Publications

■ Biodiversity Action Plans for faunal habitat maintenance and expansion in mining. Poster presented at the 48th Annual Grassland Society of Southern Africa (GSSA) conference.

■ Limpopo Province South Africa – the Biodiversity perspective Paper presentation, presented at the Limpopo Minerals Conference and Trade show, hosted by the fossil fuel foundation and LEDET, 2015/11/11.

- Sustainability and Biodiversity Strategic Planning, Randgold Resources, 2018.
- Niokola Koba National Park, Senegal. Annual Census of Large Mammals, contributing author, 2018

Appendix B: Expected Plant Species

Family	Genus	Sp1	SA Status	IUCN
Acanthaceae	*Dyschoriste*	*burchellii*	Indigenous	LC
Acanthaceae	*Justicia*	*anagalloides*	Indigenous	LC
Acanthaceae	*Thunbergia*	*atriplicifolia*	Indigenous	LC
Achariaceae	*Kiggelaria*	*africana*	Indigenous	LC
Agavaceae	*Chlorophytum*	*cooperi*	Indigenous	LC
Agavaceae	*Chlorophytum*	*fasciculatum*	Indigenous	LC
Amaryllidaceae	*Haemanthus*	*humilis*	Indigenous	LC
Anacardiaceae	*Ozoroa*	*engleri*	Indigenous	LC
Anacardiaceae	*Searsia*	*dentata*	Indigenous	LC
Anacardiaceae	*Searsia*	*rigida*	Indigenous; Endemic	LC
Anacardiaceae	*Searsia*	*discolor*	Indigenous	LC
Anacardiaceae	*Searsia*	*dregeana*	Indigenous	LC
Apocynaceae	*Asclepias*	*stellifera*	Indigenous	LC
Apocynaceae	*Asclepias*	*sp.*		LC
Apocynaceae	*Asclepias*	*cultriformis*	Indigenous	LC
Apocynaceae	*Asclepias*	*multicaulis*	Indigenous	LC
Apocynaceae	*Asclepias*	*gibba*	Indigenous	LC
Apocynaceae	*Asclepias*	*eminens*	Indigenous	LC
Apocynaceae	*Aspidoglossum*	*xanthosphaerum*	Indigenous; Endemic	VU
Apocynaceae	*Aspidoglossum*	*biflorum*	Indigenous	LC
Apocynaceae	*Brachystelma*	*foetidum*	Indigenous	LC
Apocynaceae	*Raphionacme*	*hirsuta*	Indigenous	LC
Apocynaceae	*Schizoglossum*	*nitidum*	Indigenous	LC
Apocynaceae	*Xysmalobium*	*parviflorum*	Indigenous	LC
Asparagaceae	*Asparagus*	*virgatus*	Indigenous	LC
Asparagaceae	*Asparagus*	*laricinus*	Indigenous	LC

Asphodelaceae	*Kniphofia*	*porphyrantha*	Indigenous	LC
Asphodelaceae	*Kniphofia*	*albescens*	Indigenous; Endemic	LC
Asteraceae	*Afroaster*	*hispidus*	Indigenous	LC
Asteraceae	*Athrixia*	*elata*	Indigenous	LC
Asteraceae	*Berkheya*	*zeyheri*	Indigenous	LC
Asteraceae	*Berkheya*	*insignis*	Indigenous	LC
Asteraceae	*Dicoma*	*sp.*		LC
Asteraceae	*Euryops*	*laxus*	Indigenous	LC
Asteraceae	*Felicia*	*filifolia*	Indigenous	LC
Asteraceae	*Geigeria*	*burkei*	Indigenous; Endemic	LC
Asteraceae	*Haplocarpha*	*scaposa*	Indigenous	LC
Asteraceae	*Helichrysum*	*rugulosum*	Indigenous	LC
Asteraceae	*Helichrysum*	*caespititium*	Indigenous	LC
Asteraceae	*Helichrysum*	*cephaloideum*	Indigenous	LC
Asteraceae	*Helichrysum*	*oreophilum*	Indigenous	LC
Asteraceae	*Helichrysum*	*nudifolium*	Indigenous	LC
Asteraceae	*Hilliardiella*	*hirsuta*	Indigenous	LC
Asteraceae	*Hilliardiella*	*aristata*	Indigenous	LC
Asteraceae	*Lactuca*	*inermis*	Indigenous	LC
Asteraceae	*Nidorella*	*anomala*	Indigenous	LC
Asteraceae	*Othonna*	*natalensis*	Indigenous	LC
Asteraceae	*Pseudopegolettia*	*tenella*	Indigenous	LC
Asteraceae	*Senecio*	*laevigatus*	Indigenous; Endemic	LC
Asteraceae	*Senecio*	*laevigatus*	Indigenous; Endemic	LC
Asteraceae	*Senecio*	*latifolius*	Indigenous	LC
Asteraceae	*Senecio*	*sp.*		LC
Asteraceae	*Senecio*	*subcoriaceus*	Indigenous	LC
Asteraceae	*Ursinia*	*tenuiloba*	Indigenous	LC
Boraginaceae	*Myosotis*	*graminifolia*	Indigenous	LC

Campanulaceae	*Wahlenbergia*	*virgata*	Indigenous	LC
Commelinaceae	*Commelina*	*africana*	Indigenous	LC
Commelinaceae	*Commelina*	*africana*	Indigenous	LC
Convolvulaceae	*Convolvulus*	*sagittatus*	Indigenous	LC
Convolvulaceae	*Ipomoea*	*simplex*	Indigenous	LC
Convolvulaceae	*Ipomoea*	*crassipes*	Indigenous	LC
Crassulaceae	*Crassula*	*setulosa*	Indigenous	NE
Cyperaceae	*Ascolepis*	*capensis*	Indigenous	LC
Cyperaceae	*Carex*	*rhodesiaca*	Indigenous	LC
Cyperaceae	*Cyperus*	*rigidifolius*	Indigenous	LC
Cyperaceae	*Isolepis*	*sepulcralis*	Indigenous	LC
Cyperaceae	*Scirpoides*	*burkei*	Indigenous	LC
Dipsacaceae	*Scabiosa*	*columbaria*	Indigenous	LC
Ebenaceae	*Euclea*	*sp.*		LC
Euphorbiaceae	*Acalypha*	*angustata*	Indigenous	LC
Euphorbiaceae	*Acalypha*	*caperonioides*	Indigenous	DD
Euphorbiaceae	*Acalypha*	*wilmsii*	Indigenous	DD
Euphorbiaceae	*Acalypha*	*sp.*		
Euphorbiaceae	*Euphorbia*	*natalensis*	Indigenous	LC
Euphorbiaceae	*Euphorbia*	*gueinzii*	Indigenous	LC
Euphorbiaceae	*Euphorbia*	*sp.*		LC
Fabaceae	*Aeschynomene*	*rehmannii*	Indigenous	LC
Fabaceae	*Alysicarpus*	*zeyheri*	Indigenous	LC
Fabaceae	*Argyrolobium*	*tuberosum*	Indigenous	LC
Fabaceae	*Argyrolobium*	*transvaalense*	Indigenous	LC
Fabaceae	*Argyrolobium*	*rupestre*	Indigenous	LC
Fabaceae	*Argyrolobium*	*humile*	Indigenous; Endemic	LC
Fabaceae	*Argyrolobium*	*harveyanum*	Indigenous	LC
Fabaceae	*Crotalaria*	*eremicola*	Indigenous	LC

Fabaceae	*Crotalaria*	*sp.*		LC
Fabaceae	*Dolichos*	*angustifolius*	Indigenous	LC
Fabaceae	*Elephantorrhiza*	*elephantina*	Indigenous	LC
Fabaceae	*Eriosema*	*cordatum*	Indigenous	LC
Fabaceae	*Eriosema*	*salignum*	Indigenous	LC
Fabaceae	*Erythrina*	*zeyheri*	Indigenous	LC
Fabaceae	*Indigofera*	*hilaris*	Indigenous	LC
Fabaceae	*Indigofera*	*frondosa*	Indigenous	LC
Fabaceae	*Indigofera*	*tristoides*	Indigenous	LC
Fabaceae	*Indigofera*	*sanguinea*	Indigenous	LC
Fabaceae	*Leobordea*	*foliosa*	Indigenous	LC
Fabaceae	*Leobordea*	*adpressa*	Indigenous	LC
Fabaceae	*Lotus*	*discolor*	Indigenous	LC
Fabaceae	*Medicago*	*laciniata*	Not indigenous; Naturalised	NE
Fabaceae	*Melolobium*	*wilmsii*	Indigenous; Endemic	LC
Fabaceae	*Vigna*	*unguiculata*	Indigenous	NE
Fabaceae	*Zornia*	*milneana*	Indigenous	LC
Geraniaceae	*Pelargonium*	*luridum*	Indigenous	LC
Hyacinthaceae	*Dipcadi*	*marlothii*	Indigenous	LC
Hyacinthaceae	*Drimia*	*multisetosa*	Indigenous	LC
Hyacinthaceae	*Ledebouria*	*leptophylla*	Indigenous	LC
Hyacinthaceae	*Ledebouria*	*cooperi*	Indigenous	LC
Hyacinthaceae	*Schizocarphus*	*nervosus*	Indigenous	LC
Hypericaceae	*Hypericum*	*lalandii*	Indigenous	LC
Hypoxidaceae	*Hypoxis*	*filiformis*	Indigenous	LC
Iridaceae	*Dierama*	*mossii*	Indigenous	LC
Iridaceae	*Dierama*	*insigne*	Indigenous	LC
Iridaceae	*Gladiolus*	*paludosus*	Indigenous	VU
Iridaceae	*Gladiolus*	*dalenii*	Indigenous	LC

Iridaceae	*Gladiolus*	*sericeovillosus*	Indigenous	LC
Iridaceae	*Gladiolus*	*vinosomaculatus*	Indigenous; Endemic	LC
Iridaceae	*Gladiolus*	*longicollis*	Indigenous	LC
Iridaceae	*Hesperantha*	*coccinea*	Indigenous	LC
Iridaceae	*Moraea*	*elliotii*	Indigenous	LC
Juncaceae	*Juncus*	*oxycarpus*	Indigenous	LC
Juncaceae	*Juncus*	*punctorius*	Indigenous	LC
Lamiaceae	*Salvia*	*repens*	Indigenous	LC
Lobeliaceae	*Lobelia*	*flaccida*	Indigenous	LC
Lobeliaceae	*Monopsis*	*decipiens*	Indigenous	LC
Lythraceae	*Nesaea*	*sagittifolia*	Indigenous	LC
Malvaceae	*Hermannia*	*sp.*		LC
Malvaceae	*Hermannia*	*cristata*	Indigenous	LC
Malvaceae	*Hibiscus*	*aethiopicus*	Indigenous	LC
Malvaceae	*Pavonia*	*columella*	Indigenous	LC
Onagraceae	*Oenothera*	*tetraptera*	Naturalised; Invasive	LC
Onagraceae	*Oenothera*	*stricta*	Naturalised; Invasive	LC
Orchidaceae	*Brachycorythis*	*pubescens*	Indigenous	LC
Orchidaceae	*Eulophia*	*hians*	Indigenous	LC
Orchidaceae	*Eulophia*	*cooperi*	Indigenous; Endemic	LC
Orchidaceae	*Eulophia*	*hians*	Indigenous	LC
Orchidaceae	*Eulophia*	*sp.*		LC
Orchidaceae	*Habenaria*	*falcicornis*	Indigenous	LC
Orchidaceae	*Orthochilus*	*sp.*		LC
Orchidaceae	*Orthochilus*	*vinosus*	Indigenous; Endemic	LC
Orchidaceae	*Pterygodium*	*dracomontanum*	Indigenous	LC
Orchidaceae	*Satyrium*	*parviflorum*	Indigenous	LC
Orchidaceae	*Satyrium*	*hallackii*	Indigenous	LC
Orchidaceae	*Satyrium*	*longicauda*	Indigenous	NE

Orchidaceae	*Satyrium*	*neglectum*	Indigenous	LC
Orchidaceae	*Satyrium*	*trinerve*	Indigenous	LC
Orchidaceae	*Schizochilus*	*zeyheri*	Indigenous	LC
Orobanchaceae	*Harveya*	*speciosa*	Indigenous	LC
Orobanchaceae	*Melasma*	*scabrum*	Indigenous	LC
Orobanchaceae	*Sopubia*	*cana*	Indigenous	LC
Orobanchaceae	*Striga*	*elegans*	Indigenous	LC
Orthotrichaceae	*Orthotrichum*	*diaphanum*	Indigenous	LC
Peraceae	*Clutia*	*sp.*		LC
Phrymaceae	*Mimulus*	*gracilis*	Indigenous	LC
Poaceae	*Digitaria*	*tricholaenoides*	Indigenous	LC
Poaceae	*Eragrostis*	*curvula*	Indigenous	LC
Poaceae	*Harpochloa*	*falx*	Indigenous	LC
Poaceae	*Holcus*	*lanatus*	Naturalised; Invasive	NE
Poaceae	*Koeleria*	*capensis*	Indigenous	LC
Poaceae	*Melinis*	*nerviglumis*	Indigenous	LC
Poaceae	*Schizachyrium*	*sanguineum*	Indigenous	LC
Poaceae	*Trisetopsis*	*imberbis*	Indigenous	LC
Polygalaceae	*Polygala*	*gracilenta*	Indigenous	LC
Polygalaceae	*Polygala*	*uncinata*	Indigenous	LC
Polygonaceae	*Oxygonum*	*dregeanum*	Indigenous	NE
Polygonaceae	*Persicaria*	*decipiens*	Indigenous	LC
Polygonaceae	*Rumex*	*crispus*	Naturalised; Invasive	LC
Polygonaceae	*Rumex*	*acetosella*	Naturalised	LC
Polygonaceae	*Rumex*	*lanceolatus*	Indigenous	LC
Pteridaceae	*Pellaea*	*calomelanos*	Indigenous	LC
Pteridaceae	*Pityrogramma*	*argentea*	Indigenous	LC
Rosaceae	*Alchemilla*	*capensis*	Indigenous; Endemic	LC
Rosaceae	*Rubus*	*ludwigii*	Indigenous	LC

Rubiaceae	*Kohautia*	*amatymbica*	Indigenous	LC
Rubiaceae	*Pentanisia*	*prunelloides*	Indigenous	LC
Ruscaceae	*Eriospermum*	*cooperi*	Indigenous	LC
Santalaceae	*Thesium*	*costatum*	Indigenous	LC
Scrophulariaceae	*Diclis*	*rotundifolia*	Indigenous	LC
Scrophulariaceae	*Melanospermum*	*rupestre*	Indigenous; Endemic	LC
Scrophulariaceae	*Nemesia*	*fruticans*	Indigenous	LC
Scrophulariaceae	*Selago*	*sp.*		LC
Scrophulariaceae	*Zaluzianskya*	*rubrostellata*	Indigenous	LC
Solanaceae	*Solanum*	*lichtensteinii*	Indigenous	LC
Thymelaeaceae	*Gnidia*	*fastigiata*	Indigenous	LC
Thymelaeaceae	*Lasiosiphon*	*burchellii*	Indigenous	LC
Thymelaeaceae	*Lasiosiphon*	*microcephalus*	Indigenous	LC
Thymelaeaceae	*Lasiosiphon*	*caffer*	Indigenous	LC
Thymelaeaceae	*Lasiosiphon*	*kraussianus*	Indigenous	LC
Verbenaceae	*Verbena*	*rigida*	Naturalised; Invasive	LC

Appendix C: Site Plant Species Recorded

Family	Species	Threat Status	Riparian	Rocky	Eragrostis	Disturbed	Dans
Acanthaceae	*Blepharis acuminata*	LC		x			
Acanthaceae	*Crabbea acaulis*	LC		x	x		
Alliaceae	*Tulbagia violacea*	LC			x		
Amaranthaceae	*Guilleminea densa*	Alien	x		x	x	
Amaranthaceae	*Amaranthus hybridus*	LC					

Family	Species	Threat Status	Riparian	Rocky	Eragrostis	Disturbed	Dans
Amaranthaceae	*Gomphrena celesioides*	Alien				x	
Amaryllidaceae	*Haemanthus humilis*	LC		x			
Apiaceae	*Centella asiatica*	No status	x	x			
Apocynaceae	*Raphionacme sp.*				x		
Asclepiadaceae	*Gomphocarpus fruticosus*	LC			x		
Asparagaceae	*Asparagus sp.*					x	
Asphodelaceae	*Aloe ecklonis*	LC		x			
Asphodelaceae	***Crinum bulbispermum***	**Declining**	x				
Asphodelaceae	*Trachyandra cooperi*	LC		x	x		
Asteraceae	*Berkheya erysithales*	LC	x		x	x	
Asteraceae	*Berkheya setifera*	LC	x			x	
Asteraceae	*Bidens pilosa*	Alien				x	
Asteraceae	*Cirsium vulgare*	Alien	x		x	x	
Asteraceae	*Conyza albida*	Alien				x	
Asteraceae	*Cosmos bippinatu*	Alien				x	
Asteraceae	*Dicoma anomala*	LC		x	x		
Asteraceae	*Geigeria burkei*	LC	x		x		
Asteraceae	*Gerbera galpinii*	LC			x		
Asteraceae	*Haplocarpha scaposa*	LC		x	x		
Asteraceae	*Helichrysum aureonitens*	LC		x	x		
Asteraceae	*Helichrysum inornatum*	LC		x	x		
Asteraceae	*Hilliardella oligocephala*	LC			x		

Family	Species	Threat Status	Riparian	Rocky	Eragrostis	Disturbed	Dans
Asteraceae	*Hypochaeris radicata*	LC			x		
Asteraceae	*Senecio inaequidens*	LC			x		
Asteraceae	*Senecio inornatus*	LC			x		
Asteraceae	*Senecio sp.*				x		
Asteraceae	*Seriphium plumosum*	LC			x	x	
Asteraceae	*Tagetes minuta*	Alien				x	
Asteraceae	*Taraxacum offininale*	Alien				x	
Asteraceae	*Vernonia centaureoides*	LC		x	x		
Asteraceae	*Xanthium strumarium*	Alien					
Cactaceae	*Opuntia ficus-indica*	Alien					
Campanulaceae	*Wahlenbergia sp.*			x	x		
Capparaceae	*Cleome maculata*	LC		x			
Caryophyllaceae	*Silene burchellii*	LC			x		
Chrysobalanaceae	*Parinari capensis*	LC		x			
Commelinaceae	*Commelina africana*	LC	x		x		
Commelinaceae	*Commelina bengalensis*	LC					
Commelinaceae	*Commelina subulata*	LC		x			
Convolvulaceae	*Ipomoea crassipes*	LC		x	x		
Convolvulaceae	*Ipomoea sp.*						
Crassulaceae	*Crassula alba*	LC		x			
Crassulaceae	*Crassula pellucida*	LC		x			
Cyperaceae	*Cyperus congestus*	LC	x				
Cyperaceae	*Cyperus esculentus*	LC	x				
Cyperaceae	*Cyperus semitrifidus*	LC	x				x

Family	Species	Threat Status	Riparian	Rocky	Eragrostis	Disturbed	Dans
Cyperaceae	*Schoenoplectus brachyceras*	LC	x				
Cyperaceae	*Schoenoplectus corymbosus*	LC	x				
Cyperaceae	*Schoenoplectus decipiens*	LC	x				
Ebenaceae	*Diospyros lycioides*	LC		x			
Ebenaceae	*Searsia dentata*	LC		x			
Euphorbiaceae	*Acalypha angustata*	LC		x	x		
Euphorbiaceae	*Euphorbia clavarioides*	LC		x			
Fabaceae	*Acacia mearnsii*	Alien					
Fabaceae	*Erythrina zeyheria*	LC			x		
Fabaceae	*Polygala hottentotta*	LC		x			
Fabaceae	*Tephrosia sp.*				x		
Fabaceae	*Trifolium africanum*	LC		x	x	x	
Fabaceae	*Vigna vexillata*	LC				x	
Gentianaceae	*Chironia palustris*	LC			x		
Gentianaceae	*Sebaea grandis*	LC			x		
Geraniaceae	*Dianthus mooiensis*	LC		x	x		
Geraniaceae	*Monsonia grandifolia*	LC			x		
Geraniaceae	*Pelargonium luridum*	LC	x		x		
Hyacinthaceae	***Eucomus autumnalis***	**Declining**	x				
Hyacinthaceae	*Ledebouria sp.*		x				
Juncaceae	*Juncus effusus*	LC	x			x	
Juncaceae	*Juncus exsertus*	LC	x				
Lamiaceae	*Acrotome hispida*	LC			x		
Lamiaceae	*Leonotis leonurus*	LC		x			

Family	Species	Threat Status	Riparian	Rocky	Eragrostis	Disturbed	Dans
Lobeliaceae	*Monopsis decipiens*	LC	x				
Lythraceae	*Nesaea radicans*	LC	x				
Malvaceae	*Hermannia depressa*	LC			x		
Malvaceae	*Hermannia transvaalensis*	LC			x		
Malvaceae	*Hibiscus pusilis*				x	x	
Malvaceae	*Hibiscus trionum*				x		
Mesembreanthemaceae	*Delosperma cooperi*	LC		x			
Mesembreanthemaceae	*Khadia sp.*			x			
Molluginaceae	*Psammotropha myriantha*	LC		x			
Molluginaceae	*Psammotropha sp.*			x			
Myrtaceae	*Eucalyptus camuldulensis*	Alien					
Onagraceae	*Oenothera rosea*	LC				x	
Orchidaceae	***Satyrium sp.***	**Protected**		x			
Orobanchaceae	*Alectra capensis*	LC	x				
Orobanchaceae	*Cynium tubulosum*	LC					
Oxalaceae	*Oxalis sp.*		x		x	x	
Oxalidaceae	*Oxalis corniculata*	LC			x		
Plantaginaceae	*Plantago minor*	LC		x	x		
Poaceae	*Agrostis lachnantha*	LC	x		x		x
Poaceae	*Andropogon appendiculatus*	LC			x	x	
Poaceae	*Andropogon eucomus*	LC			x		x
Poaceae	*Andropogon huillensis*	LC			x		

Family	Species	Threat Status	Riparian	Rocky	Eragrostis	Disturbed	Dans
Poaceae	*Aristida congesta subsp. barbicollis*	LC		x	x	x	x
Poaceae	*Arundinella nepalensis*	LC	x				
Poaceae	*Bromus catharticus*	LC			x		
Poaceae	*Ctenium concinnum*	LC		x			
Poaceae	*Cynodon dactylon*	LC	x	x	x	x	
Poaceae	*Eragrostis capensis*	LC			x	x	
Poaceae	*Eragrostis curvula*	LC	x		x	x	
Poaceae	*Eragrostis gummiflua*	LC	x	x	x		x
Poaceae	*Eragrostis racemosa*	LC		x	x		
Poaceae	*Fingerhuthia africana*	LC			x		
Poaceae	*Hyparrhenia hirta*	LC	x	x	x	x	
Poaceae	*Hyparrhenia tamba*	LC			x		
Poaceae	*Imperata cylindrica*	LC	x		x		
Poaceae	*Leersia hexandra*	LC	x				
Poaceae	*Melinis nerviglumis*	LC		x			
Poaceae	*Melinis repens*	LC		x			
Poaceae	*Panicum coloratum*	LC			x		
Poaceae	*Paspalum dilatatum*	LC					
Poaceae	*Paspalum notatum*	Alien	x			x	
Poaceae	*Setaria sphacelata*	LC	x				
Poaceae	*Sporobolus africanus*	LC			x	x	
Poaceae	*Sporobolus pyramidalis*	LC		x	x	x	
Poaceae	*Themeda triandra*	LC		x	x		
Poaceae	*Trichoneura grandiglumis*	Alien		x			

Family	Species	Threat Status	Riparian	Rocky	Eragrostis	Disturbed	Dans
Poaceae	*Tristachya leucothrix*	LC		x			
Polygonaceae	*Persicaria lapathifolia*	LC					x
Polygonaceae	*Persicaria senegalensis*	LC					x
Rubiaceae	*Pentanisia prunelloides*	LC		x	x		
Salicaceae	*Salix babylonica*	Alien	x				
Scrophulariaceae	*Chaenostoma leve*	No status			x		
Scrophulariaceae	*Nemesia fruticans*	LC		x			
Scrophulariaceae	*Selago densiflora*	LC		x			
Sellaginellaceae	*Selaginella dregei*	LC		x			
Sinopteridaceae	*Pellaea calemelanos*	LC		x			
Solanaceae	*Datura ferox*	Alien					
Solanaceae	*Solanum sp.*	Alien					
Solanaceae	*Solanum sysimbriifolium*	Alien			x		
Thymeleaceae	*Gnidia kraussiana*	LC		x			
Typhaceae	*Typha capensis*	LC	x				
Verbenaceae	*Verbena brasiliensis*	Alien	x	x	x	x	x

Appendix D: Expected Mammal Species

Family	Species	Common Name	P.o.O.
Bathyergidae	*Cryptomys hottentotus*	African Mole Rat	Medium
Bovidae	*Damaliscus pygargus*	Blesbok	Recorded
Bovidae	*Raphicerus campestris*	Steenbok	Recorded

Bovidae	*Sylvicapra grimmia*	Common Duiker	Recorded
Chrysochloridae	*Amblysomus septentrionalis*	Highveld Golden Mole	High
Erinaceidae	*Atelerix frontalis*	Southern African hedgehog	Medium
Felidae	*Leptailurus serval*	Serval	High
Herpestidae	*Atilax paludinosus*	Water Mongoose	Medium
Herpestidae	*Cynictis penicillata*	Yellow Mongoose	High
Herpestidae	*Suricata suricatta*	Meerkat	Medium
Hyaenidae	*Proteles cristata*	Aardwolf	Low
Mustelidae	*Aonyx capensis*	Cape Clawless Otter	Low
Mustelidae	*Poecilogale albinucha*	African Striped Weasel	High
Nesomyidae	*Mystromys albicaudatus*	White-tailed Mouse	Medium
Orycteropodidae	*Orycteropus afer*	Aardvark	Low
Procaviidae	*Procavia capensis*	Rock Hyrax	High
Soricidae	*Crocidura cyanea*	Reddish-Gray Musk Shrew	Low
Soricidae	*Crocidura mariquensis*	Swamp musk Shrew	Low
Soricidae	*Crocidura silacea*	Lesser Gray-brown Musk Shrew	Low
Soricidae	*Myosorex varius*	Forest Shrew	Low
Soricidae	*Suncus infinitesimus*	Least Dwarf Shrew	Low
Soricidae	*Suncus varilla*	Lesser Dwarf Shrew	Low

PoO= Probability of Occurrence

Appendix E: Expected and Confirmed Bird Species

Common Name	Species Name	LO	Status	Rank	Residence	Endemicity	2615_2950	2620_2950	2615_2945	2615_2955	2620_2945	2620_2955	2625_2945	2625_2950	2625_2955
Common Ostrich	*Struthio camelus*	2	0	1	0	0									40
Great Crested Grebe	*Podiceps cristatus*	2	0	415	0	0	25								10
Black-necked Grebe	*Podiceps nigricollis*	2	0	416	0	0							50		
Little Grebe	*Tachybaptus ruficollis*	1	0	414	0	0	75	40	33.3	100	75	25	50	50	50
White-breasted Cormorant	*Phalacrocorax lucidus*	2	0	427	0	0	25	40	33.3	25	25			25	20
Reed Cormorant	*Microcarbo africanus*	1	0	425	0	0	75	40	66.7	75	100		50	75	90
African Darter	*Anhinga rufa*	2	0	424	0	0	25				25			25	30
Grey Heron	*Ardea cinerea*	2	0	438	0	0			66.7		75	25			40
Black-headed Heron	*Ardea melanocephala*	1	0	439	0	0	100	60	66.7	25	50	25		25	30
Purple Heron	*Ardea purpurea*	1	0	441	0	0									40
Great Egret	*Ardea alba*	2	0	435	0	0	25						50		50
Little Egret	*Egretta garzetta*	2	0	432	0	0	25			25	25	25			50
Yellow-billed Egret	*Ardea intermedia*	2	0	434	0	0	50	20			25				10
Cattle Egret	*Bubulcus ibis*	1	0	442	0	0	50	40	66.7	75	50	75	100	25	70
Green-backed Heron	*Butorides striata*	2	0	446	0	0								25	10
Black-crowned Night-Heron	*Nycticorax nycticorax*	2	0	447	0	0									10

Common name	Scientific name														
Hamerkop Hamerkop	*Scopus umbretta*	1	0	452	0	0									10
Abdim's Stork	*Ciconia abdimii*	2	NT, LC	465	0	0								25	
White Stork	*Ciconia ciconia*	2	0	467	0	0								25	
African Sacred Ibis	*Threskiornis aethiopicus*	1	0	458	0	0	50	20	66.7		50		50	25	60
Southern Bald Ibis	*Geronticus calvus*	1	VU, VU	457	0	SLS	75	20						25	0
Glossy Ibis	*Plegadis falcinellus*	2	0	455	0	0		20			25		50		40
Hadeda Ibis	*Bostrychia hagedash*	1	0	456	0	0	75	80	66.7	75	75	50	100	75	70
African Spoonbill	*Platalea alba*	1	0	459	0	0	50				50		50		50
Greater Flamingo	*Phoenicopterus roseus*	2	NT, LC	453	0	0				0				75	10
Lesser Flamingo	*Phoeniconaias minor*	3	NT, NT	454	0	0	0							25	
Spur-winged Goose	*Plectropterus gambensis*	1	0	27	0	0	50	40		25	25	0		25	40
Egyptian Goose	*Alopochen aegyptiaca*	1	0	25	0	0	25	100	66.7	50	100	75	100	50	80
South African Shelduck	*Tadorna cana*	3	0	26	0	0		40	33.3		25				20
Cape Shoveler	*Spatula smithii*	1	0	34	0	0	25				25	25	50		30
African Black Duck	*Anas sparsa*	3	0	31	0	0									30
Yellow-billed Duck	*Anas undulata*	1	0	33	0	0	100		66.7	75	50	50	50	75	100
Red-billed Teal	*Anas erythrorhyncha*	1	0	36	0	0	25		33.3	25	25				60
Cape Teal	*Anas capensis*	2	0	30	0	0		20							
White-faced Duck	*Dendrocygna viduata*	2	0	22	0	0									10
Southern Pochard	*Netta erythrophthalma*	2	0	40	0	0	25						50		40

White-backed Duck	*Thalassornis leuconotus*	2	0	23	0	0									10
Secretarybird Secretarybird	*Sagittarius serpentarius*	2	VU, VU	397	0	0		20	0		25				10
Lanner Falcon	*Falco biarmicus*	2	VU, LC	411	0	0			33.3	25					
Amur Falcon	*Falco amurensis*	2	0	406	0	0	50		33.3		25		50	25	50
Greater Kestrel	*Falco rupicoloides*	2	0	401	0	0								25	
Rock Kestrel	*Falco rupicolus*	2	0	400	0	0	25		33.3						
Black-shouldered Kite	*Elanus caeruleus*	1	0	348	0	0	75	100	100	100	100	75	100	75	40
Martial Eagle	*Polemaetus bellicosus*	2	EN, VU	394	0	0					25				
Brown Snake-eagle	*Circaetus cinereus*	3	0	361	0	0	25								
African Fish-eagle	*Haliaeetus vocifer*	1	0	350	0	0	25				25				
Jackal Buzzard	*Buteo rufofuscus*	2	0	385	0	NE			33.3			25			
Steppe Buzzard	*Buteo buteo*	2	0	381	0	0	25		66.7		25	25	50		40
Black Sparrowhawk	*Accipiter melanoleucus*	2	0	380	0	0	25								
African Harrier-Hawk	*Polyboroides typus*	3	0	370	0	0					50	25			
Grey-winged Francolin	*Scleroptila afra*	4	0	5	0	SLS		40	66.7		75		100		
Red-winged Francolin	*Scleroptila levaillantii*	2	0	6	0	0	25	20	33.3			25		50	20
Swainson's Spurfowl	*Pternistis swainsonii*	1	0	14	0	0	50	40	66.7	75	100	50	50	75	50
Common Quail	*Coturnix coturnix*	2	0	15	0	0	50	20	66.7	25	50		50	25	
Helmeted Guineafowl	*Numida meleagris*	1	0	20	0	0	50	40	66.7		100	75		25	10
Kurrichane Buttonquail	*Turnix sylvaticus*	2	0	41	0	0				25					
Black Crake	*Amaurornis flavirostra*	2	0	217	0	0									10
Common Moorhen	*Gallinula chloropus*	1	0	224	0	0				75		25		25	40

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Red-knobbed Coot	*Fulica cristata*	1	0	226	0	0	100	60	100	100	100	50	50	50	100
Grey Crowned Crane	*Balearica regulorum*	2	EN, EN	205	0	0									10
Blue Korhaan	*Eupodotis caerulescens*	1	LC, NT	202	0	SLS	25	20	33.3	25	50				
African Jacana	*Actophilornis africanus*	2	0	268	0	0									10
Kittlitz's Plover	*Charadrius pecuarius*		0	282	0	0					25				40
Three-banded Plover	*Charadrius tricollaris*	2	0	283	0	0	25	40	0	25	25	25	50	50	70
Crowned Lapwing	*Vanellus coronatus*	1	0	297	0	0	50	40	66.7	50	100	50	100	100	30
Blacksmith Lapwing	*Vanellus armatus*	1	0	291	0	0	75	60	66.7		100	25	50	50	100
African Wattled Lapwing	*Vanellus senegallus*	1	0	294	0	0	25						50		
African Snipe	*Gallinago nigripennis*	2	0	232	0	0	75			50	25			25	30
Curlew Sandpiper	*Calidris ferruginea*	2	LC, NT	260	0	0									20
Little Stint	*Calidris minuta*	2	0	252	0	0					25				50
Ruff Ruff	*Calidris pugnax*	2	0	263	0	0					25				20
Common Sandpiper	*Actitis hypoleucos*	2	0	247	0	0									20
Marsh Sandpiper	*Tringa stagnatilis*	2	0	240	0	0							50		30
Common Greenshank	*Tringa nebularia*	2	0	241	0	0									30
Wood Sandpiper	*Tringa glareola*	2	0	245	0	0		20			25				20
Pied Avocet	*Recurvirostra avosetta*	2	0	276	0	0									10
Black-winged Stilt	*Himantopus himantopus*	2	0	275	0	0									50
Spotted Thick-knee	*Burhinus capensis*	2	0	272	0	0	25	20			25				
Bronze-winged Courser	*Rhinoptilus chalcopterus*	2	0	300	0	0				25					

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Grey-headed Gull	*Chroicocephalus cirrocephalus*	2	0	316	0	0				25					50
Whiskered Tern	*Chlidonias hybrida*	2	0	339	0	0	25		33.3	50					70
Speckled Pigeon	*Columba guinea*	1	0	180	0	0	75	80		100	75	25	100	100	60
Red-eyed Dove	*Streptopelia semitorquata*	1	0	188	0	0	50	80	66.7	75	75	50		50	60
Cape Turtle-dove	*Streptopelia capicola*	1	0	187	0	0	100	80	100	100	100	100	100	100	100
Laughing Dove	*Spilopelia senegalensis*	1	0	185	0	0	75	100	100	100	100	75	100	75	60
Namaqua Dove	*Oena capensis*	2	0	192	0	0	0								
Red-chested Cuckoo	*Cuculus solitarius*	2	0	116	0	0			33.3		25	50			
Diderick Cuckoo	*Chrysococcyx caprius*	2	0	125	0	0	25		33.3		25				60
Barn Owl	*Tyto alba*	2	0	160	0	0									10
Marsh Owl	*Asio capensis*	2	0	171	0	0				25					
Spotted Eagle-owl	*Bubo africanus*	1	0	165	0	0				25					
White-rumped Swift	*Apus caffer*	2	0	153	0	0	25			25	25	50			10
Horus Swift	*Apus horus*	2	0	152	0	0		20							
Little Swift	*Apus affinis*	2	0	151	0	0	25			25	25		50		20
African Palm-swift	*Cypsiurus parvus*	4	0	144	0	0				25		25			10
Speckled Mousebird	*Colius striatus*	2	0	110	0	0	50	80		25		25	50	25	20
Red-faced Mousebird	*Urocolius indicus*	2	0	111	0	0									10
Pied Kingfisher	*Ceryle rudis*	2	0	99	0	0					25				10
Giant Kingfisher	*Megaceryle maxima*	3	0	98	0	0				50					
Malachite Kingfisher	*Corythornis cristatus*	3	0	91	0	0					25				
African Hoopoe	*Upupa africana*	2	0	80	0	0			33.3						
Green Wood-hoopoe	*Phoeniculus purpureus*	2	0	81	0	0	25			25	25				

Black-collared Barbet	*Lybius torquatus*	2	0	68	0	0	25	20		25	50	25	50	25	20
Acacia Pied Barbet	*Tricholaema leucomelas*	3	0	67	0	0	25								
Crested Barbet	*Trachyphonus vaillantii*	2	0	69	0	0	50	20		25					
Lesser Honeyguide	*Indicator minor*	2	0	46	0	0	25								
Cardinal Woodpecker	*Dendropicos fuscescens*	2	0	57	0	0	25								
Red-throated Wryneck	*Jynx ruficollis*	2	0	50	0	0	25	40		25	50	75			10
Rufous-naped Lark	*Mirafra africana*	2	0	711	0	0						25			10
Spike-heeled Lark	*Chersomanes albofasciata*	1	0	724	0	0	25	40	100	25	50	25		50	10
Red-capped Lark	*Calandrella cinerea*	2	0	734	0	0	50	60	66.7	75	100	50	50	75	20
Barn Swallow	*Hirundo rustica*	1	0	597	0	0	75	20	66.7	50	50	50	50	25	60
White-throated Swallow	*Hirundo albigularis*	2	0	599	0	0	50	40	33.3	25	50	25	100	25	50
Greater Striped Swallow	*Cecropis cucullata*	1	0	603	0	0	50	20	66.7	75	50	25	50	25	70
South African Cliff-swallow	*Petrochelidon spilodera*	1	0	608	0	BSLS	75	20	33.3	25	75	25	50	75	20
Rock Martin	*Ptyonoprogne fuligula*	2	0	609	0	0	25	20		25					20
Common House-martin	*Delichon urbicum*	2	0	610	0	0		20							
Brown-throated Martin	*Riparia paludicola*	1	0	593	0	0	25	80		25	75	50	50		20
Banded Martin	*Riparia cincta*	1	0	594	0	0	75	20		25	25	25	50		10
Black-headed Oriole	*Oriolus larvatus*	2	0	537	0	0	25				25	25			
Pied Crow	*Corvus albus*	2	0	571	0	0	25							50	
Cape Crow	*Corvus capensis*	3	0	570	0	0									
Dark-capped Bulbul	*Pycnonotus tricolor*	1	0	614	0	0	50	60		50	50	25		25	10

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Kurrichane Thrush	*Turdus libonyana*	2	0	748	0	0									10
Sentinel Rock-thrush	*Monticola explorator*	4	LC, NT	742	0	SLS								25	
Mountain Wheatear	*Myrmecocichla monticola*	2	0	783	0	0		20		25					20
Capped Wheatear	*Oenanthe pileata*	2	0	786	0	0	25	40	66.7		25	25			
Mocking Cliff-chat	*Thamnolaea cinnamomeiventris*	4	0	794	0	0	25			25					10
Anteating Chat	*Myrmecocichla formicivora*	2	0	792	0	0	50	100	100	100	100	75	100	50	70
African Stonechat	*Saxicola torquatus*	1	0	781	0	0	100	100	100	75	75	100	100	75	90
Cape Robin-chat	*Cossypha caffra*	1	0	766	0	0	100	80	33.3	50	50	50		50	40
Willow Warbler	*Phylloscopus trochilus*	2	0	655	0	0	25								
Lesser Swamp-warbler	*Acrocephalus gracilirostris*	2	0	650	0	0				50				25	10
African Reed-warbler	*Acrocephalus baeticatus*	2	0	645	0	0	25				25				
Little Rush-warbler	*Bradypterus baboecala*	2	0	640	0	0								25	10
Bar-throated Apalis	*Apalis thoracica*	3	0	699	0	0	25								
Zitting Cisticola	*Cisticola juncidis*	2	0	686	0	0	50	40	66.7	75	50	50	50	50	70
Cloud Cisticola	*Cisticola textrix*	2	0	688	0	NE	25		66.7	25	25	25		25	
Wing-snapping Cisticola	*Cisticola ayresii*	2	0	690	0	0	75	20	66.7	75	25	75		25	10
Pale-crowned Cisticola	*Cisticola cinnamomeus*	3	0	689	0	0		20	33.3						
Neddicky Neddicky	*Cisticola fulvicapilla*	2	0	684	0	0	75		33.3			50	50	25	50
Wailing Cisticola	*Cisticola lais*	2	0	678	0	0	25								
Levaillant's Cisticola	*Cisticola tinniens*	1	0	682	0	0	75	80	100	100	75	100	100	75	40
Tawny-flanked Prinia	*Prinia subflava*	2	0	691	0	0		20			25	25			

Common name	Scientific name														
Black-chested Prinia	*Prinia flavicans*	1	0	692	0	0	75	20	66.7	75	50	25	0		10
Fiscal Flycatcher	*Melaenornis silens*	2	0	756	0	NE	25	40	33.3	25	25			25	10
African Paradise-flycatcher	*Terpsiphone viridis*	2	0	541	0	0	25								
Cape Wagtail	*Motacilla capensis*	1	0	907	0	0	100	80	66.7	75	50	50	50	75	90
African Pipit	*Anthus cinnamomeus*	1	0	919	0	0	100	40	100	75	100	75	50	100	70
Plain-backed Pipit	*Anthus leucophrys*	2	0	921	0	0		20							
Cape Longclaw	*Macronyx capensis*	1	0	914	0	0	100	100	66.7	100	100	75	100	75	80
Common (Southern) Fiscal	*Lanius collaris*	1	0	576	0	0	75	100	100	100	75	75	100	75	100
Bokmakierie Bokmakierie	*Telophorus zeylonus*	1	0	552	0	0	75	60		75	50	75	50	50	40
Common Myna	*Acridotheres tristis*	1	0	809	I	0		60		100					50
Red-winged Starling	*Onychognathus morio*	2	0	797	0	0	0								
Pied Starling	*Lamprotornis bicolor*	2	0	806	0	SLS	75	60	100	50	25	100	50	75	50
Malachite Sunbird	*Nectarinia famosa*	2	0	820	0	0	25			25					
Amethyst Sunbird	*Chalcomitra amethystina*	2	0	817	0	0	25								
House Sparrow	*Passer domesticus*	2	0	900	I	0	25	40		50	25	25		25	10
Cape Sparrow	*Passer melanurus*	1	0	902	0	0	75	80	66.7	100	75	75	100	50	80
Village Weaver	*Ploceus cucullatus*	2	0	846	0	0	0	20							10
Cape Weaver	*Ploceus capensis*	2	0	841	0	NE	25			25	25	25			
Southern Masked-weaver	*Ploceus velatus*	1	0	845	0	0	100	60	100	75	100	100	100	75	80
Red-billed Quelea	*Quelea quelea*	1	0	853	0	0		80	66.7		25	25	100	75	10
Southern Red Bishop	*Euplectes orix*	1	0	856	0	0	100	100	100	100	100	100	100	100	90
Yellow-crowned Bishop	*Euplectes afer*	2	0	854	0	0	75		66.7	75	25	50	50	50	40

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Red-collared Widowbird	*Euplectes ardens*	2	0	861	0	0	25								30
White-winged Widowbird	*Euplectes albonotatus*	2	0	860	0	0	25		33.3				50		
Fan-tailed Widowbird	*Euplectes axillaris*	2	0	858	0	0	50		66.7	50	50				20
Long-tailed Widowbird	*Euplectes progne*	2	0	862	0	0	100	60	100	75	75	100	100	100	70
Red-headed Finch	*Amadina erythrocephala*	2	0	867	0	0	25								
African Firefinch	*Lagonosticta rubricata*	2	0	886	0	0							50		
Orange-breasted Waxbill	*Amandava subflava*	1	0	865	0	0	25	20							
Common Waxbill	*Estrilda astrild*	1	0	876	0	0	75	60	100	25	75	50	100	100	
African Quailfinch	*Ortygospiza atricollis*	1	0	866	0	0	25	40	66.7	50	25	25		25	
Pin-tailed Whydah	*Vidua macroura*	2	0	891	0	0	50	60	66.7		50	25	50	50	30
Cape Canary	*Serinus canicollis*	1	0	932	0	0	75	40	100	25	25	50	50	25	30
Yellow-fronted Canary	*Crithagra mozambica*	2	0	934	0	0			33.3		25		50		
Black-throated Canary	*Crithagra atrogularis*	1	0	935	0	0	50	80	100	50	50	50	100	25	50
Yellow Canary	*Crithagra flaviventris*	1	0	938	0	0	25	20		25	50	50	50		
Streaky-headed Seedeater	*Crithagra gularis*	2	0	942	0	0				25					
Cinnamon-breasted Bunting	*Emberiza tahapisi*	2	0	947	0	0	25		33.3						
Cape Bunting	*Emberiza capensis*	2	0	948	0	0	25			25					
Rock Dove	*Columba livia*	2	0	179	0	0		20		50					
Drakensberg Prinia	*Prinia hypoxantha*	4	0	694	0	SLS				25					
Karoo Thrush	*Turdus smithi*	2	0	750	0	NE				25					10
Cape White-eye	*Zosterops virens*	1	0	670	0	NE	50	20		25	25	25			40

Eastern Clapper Lark	Mirafra fasciolata	2	0	714	0	0			33.3	25	25	25		25	10
Southern Grey-headed Sparrow	Passer diffusus	1	0	903	0	0	50	60	100		25	50	100	75	20
Domestic Goose	Anser anser	1	#N/A	#N/A	#N/A	#N/A	25								