Biodiversity Assessment - Proposed Kalabasfontein Coal Mining Extension Project

Mpumalanga Province, South Africa

September 2019 (Revised)

CLIENT

Prepared for:

EIMS Environmental (Pty) Ltd

+27 11 789 7170

+27 82 688 9850

www.eims.co.za

Prepared by:

The Biodiversity Company

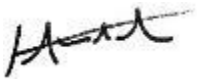
420 Vale Ave. Ferndale, 2194

Cell: +27 81 319 1225

Fax: +27 86 527 1965

info@thebiodiversitycompany.com

www.thebiodiversitycompany

Report Name	**Biodiversity Assessment - Proposed Kalabasfontein Coal Mining Extension Project**	
Submitted to	**EIMS Environmental (Pty) Ltd**	
Report Reviewer	**Andrew Husted**	
	Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field. Andrew has completed numerous wetland training courses, and is an accredited wetland practitioner, recognised by the DWS, and also the Mondi Wetlands programme as a competent wetland consultant.	
Report Writer & Reviewer (Herpetofauna)	**Michael Adams**	
	Michael Adams is Cert Sci Nat registered (118544) and is an experienced natural scientist with a specialisation in herpetofauna. He has over 10 years of experience working with reptiles and amphibians as a consultant and through various conservation initiatives.	
Report Writer (Botany & Fauna)	**Martinus Erasmus**	
	Martinus Erasmus obtained his B-Tech degree in Nature Conservation in 2016 at the Tshwane University of Technology. Martinus has been conducting basic assessments and assisting specialists in field during his studies since 2015.	
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Ecological Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.	

EXECUTIVE SUMMARY

GNR 982	Appendix 6 (n): Specialist Opinion

Considering the above-mentioned conclusions, it is the opinion of the specialist that the Kalabasfontein project area, with the current proposed underground mine expansion and infrastructures layout areas (ventilation shafts and powerline), may be favourably considered. The Kalabasfontein project area, although predominantly classed as a Heavily Modified Areas (HMA), also intersects with a large Critical Biodiversity Areas (CBA) and this area has proven to be a sensitive ecological area. Also, according to the Mining and Biodiversity Guidelines (2013) Kalabasfontein is classed as an area which is considered the high risk for mining and of high biodiversity importance.

The main Kalabasfontein project areas are situated close to sensitive critical biodiversity areas as well as close to wetland areas and ridges where Species of Conservation Concern (SCC) occur. The presence of some of these species was confirmed during field surveys. Due to the sensitivities of the project environment, and should authorisation be approved for this project, all mitigation measures and recommendations must be strictly adhered to.

The completion of a comprehensive desktop study, in conjunction with the detailed results from the surveys mean that there is a high confidence in the information provided. The survey which were completed, and the corresponding studies resulted in good site coverage, assessing the major habitats and ecosystems, obtaining a general species (fauna and flora) overview and observing the major current impacts.

It is clear from the regional ecological overview, as well as the baseline data collected to date that the project area has been somewhat altered (historically and currently) predominantly by agricultural land use and nearby mining activities. It is further evident that the remaining natural habitats have been impacted on as a result of poor grazing practices and agricultural land use.

However, despite these impacts the remaining natural habitats (including grassland and wetland habitats) exhibited a healthy balance between various common grassland species and associated herbaceous plants.

The ecological integrity, importance and functioning of the natural grassland and wetland systems within the larger project area is furthermore reflected in the diverse community structures. This diversity is indicative of the importance of these systems to collectively provide refugia, food and corridors for dispersal in and through the project area. The preservation of these systems, albeit the majority are modified to some extent, is the most important aspect to consider for the consideration of the proposed mining project.

According to the Mining and Biodiversity Guidelines (2013), the proposed project area Kalabasfontein falls within an area which is considered ‘high risk for mining’ and of ‘high biodiversity importance’.

Consideration must be afforded each of the recommendations provided in this report. In the event that environmental authorisation is issued for this project, proven ecological (or environmental) controls and mitigation measures must be entrenched in the management framework.

The following further conclusions were reached based on the results of this assessment:

- Much of the project area is identified as either Heavily Modified Areas (HMAs) or Other Natural Areas (ONAs), while a smaller percentage are classified as Ecological Support

Areas (ESAs) and as Critical Biodiversity Areas (CBAs). Both proposed ventilation shaft areas intersect predominantly with HMAs and ONAs. A large CBA bisects the southern portion of the main project area.;

  - According to the Mpumalanga Protected Area Expansion Strategy (MPAES, 2013) this CBA area is also a provincially protected area and part of the 'provincial protected area expansion strategy';

- The Kalabasfontein project area does overlap with areas that represent a biodiversity risk to mining according to the Mining and Biodiversity Guidelines (2013);
- The project area was superimposed on the terrestrial ecosystem threat status. According to this, the overall project area, overlaps entirely with ecosystems that are listed as Vulnerable (VU);
- The Kalabasfontein project area was superimposed on the ecosystem protection level map to assess the protection status of terrestrial ecosystems associated with the development. Based on this the majority of the terrestrial ecosystems associated with the development are rated as *not protected* and small pockets in both the portions of the project area are rated as *poorly protected*;
- Based on the South African National Biodiversity Institute (SANBI, 2010) Protected Areas Map and the National Protected Areas Development Strategy (NPAES) the project area does not overlap with, nor will the proposed development impact upon, any formally or informally protected area;
- The project area does overlap with certain wetland areas and two significant perennial rivers. One of these rivers, occurs along the southern boundary of the main project area and is classified as a National Freshwater Ecosystem Priority Areas (NFEPA) river. This river is classed as 'D', which means it is considered to be heavily modified;
- The proposed powerline crosses one NFEPA wetland and one Non-FEPA wetland;
- The Kalabasfontein project area in relation to the MBSP Freshwater Assessment overlaps with the following areas: Ecological Support Areas (ESAs), Heavily Modified Areas (HMAs) and Other Natural Areas (ONAs);
- The project area is situated entirely within one vegetation type; namely the Eastern Highveld Grassland (GM12). This vegetation type is listed as Endangered according to Mucina & Rutherford (2006);
- Based on the Plants of Southern Africa (BODATSA-POSA, 2016) database, 445 plant species are expected to occur in the area. Of these, four (4) species are listed as being Species of Conservation Concern (SCC);
- A total of 52 plant species were recorded during fieldwork. Two (2) plant species which are protected in terms of the Mpumalanga Nature Conservation Act, 1998 (No. 10 of 1998) were recorded;
  - Nine (9) alien and/or invasive plants were recorded during the field survey within the project area.

- Based on the South African Bird Atlas Project, Version 2 (SABAP2) database and records from the Animal Demography Unit (2018), 239 bird species are expected to occur in the vicinity of the project area;
    - Of the expected bird species, twenty-three (23) species (9.1%) are listed as SCC either on a regional (21) or global scale (13).
- The International Union for Conservation of Nature Red List Spatial Data (IUCN, 2017) lists 84 mammal species that could be expected to occur within the project area. Of these, fourteen (14) (15.8%) are listed as being of conservation concern on a regional or global basis;
- One bird SCC was recorded during the survey, namely Secretary bird (*Sagittarius serpentarius*) during the October 2018 survey;
- Overall, mammal diversity in the project area was moderate to high, with fifteen (15) mammal species being recorded during the October 2018 survey. Three (3) mammal species of conservation concern were recorded; and
- Six (6) reptile species were recorded in the project area during the October 2018 surveys. One near-endemic and one endemic snake species were recorded in the project area.
- With regard to the shafts, the shaft on Portion 7 is expected to have a higher impact whereas with the powerlines the first alternative is expected to have the highest impact between the powerline alternatives.

DOCUMENT GUIDE

The table below provides the NEMA (2014) Requirements for Ecological Assessments, and also the relevant sections in the reports where these requirements are addressed:

GNR 982	Description	Section in the Report
Specialist Report		
Appendix 6 (a)	A specialist report prepared in terms of these Regulations must contain— details of— i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Page ii
Appendix 6 (b)	A declaration that the specialist is independent in a form as may be specified by the competent authority;	Page vii
Appendix 6 (c)	An indication of the scope of, and the purpose for which, the report was prepared;	Section 3
Appendix 6 (cA)	An indication of the quality and age of base data used for the specialist report;	Section 7
Appendix 6 (cB)	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 11
Appendix 6 (d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 10
Appendix 6 (e)	A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 5
Appendix 6 (f)	Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a, site plan identifying site alternatives;	Section 10
Appendix 6 (g)	An identification of any areas to be avoided, including buffers;	Section 10
Appendix 6 (h)	A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 10
Appendix 6 (i)	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 4
Appendix 6 (j)	A description of the findings and potential implications of such findings on the impact of the proposed activity **[including identified alternatives on the environment]** or activities;	Section 10
Appendix 6 (k)	Any mitigation measures for inclusion in the EMPr;	Section 13
Appendix 6 (l)	Any conditions for inclusion in the environmental authorisation;	Section 13
Appendix 6 (m)	Any monitoring requirements for inclusion in the EMPr or environmental authorisation;	None
Appendix 6 (n)	A reasoned opinion— i. **[as to]** whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 14.1
Appendix 6 (o)	A description of any consultation process that was undertaken during the course of preparing the specialist report;	None
Appendix 6 (p)	A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
Appendix 6 (q)	Any other information requested by the competent authority.	None

DECLARATION

I, Martinus Erasmus, 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 Acts, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Acts, 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.

Martinus Erasmus

Terrestrial Ecologist

The Biodiversity Company

September 2019

DECLARATION

I, Michael Adams, 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.

Michael Adams

Terrestrial Ecologist

The Biodiversity Company

15th November 2018

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1 Introduction & Background

Forzando Coal Mines (Pty) Ltd. applied to the Department of Mineral Resources (DMR) for the conversion of Old Order Mining Rights to New Order Mining Rights for its mining operations at the Forzando North Shaft and Forzando South Shaft. These conversions were granted in November 2011 and executed on 28 June 2013.

This application is for the extension of the current mining areas (under Section 102 of MPRDA (Act No. 28 of 2002)) by inclusion of contiguous areas which are held under Prospecting Rights 1035PR & 1170PR. Through an intensive drilling exercise on these areas, economically viable blocks of coal have been defined. The plan is to access these newly defined blocks of coal from the existing Forzando South incline. Underground mining has been selected as the appropriate mining method for the Kalabasfontein project.

Annexation of these Prospecting Rights into the existing Forzando South Mining Right is motivated by subsequent reduction of Reserves at Forzando North Shaft. This diminution is as a result of unexpected poor ground conditions as well as burnt coal (Forzando Coal Mines (Pty) Ltd. 2018).

The Kalabasfontein project area is situated in Mpumalanga, 20 kilometres north of Bethal. It is located to the east and south of the existing Forzando South 380MR and Forzando North 381MR respectively which fall within the Msukaligwa Local Municipality. The project area comprises two Prospecting Rights, 1035PR & 1170PR, which covers a total area of ~1 547.8296ha over portions 7, 8, Remaining Extent (RE), 11 and 13 of the farm Kalabasfontein 232 IS.

As part of the Kalabasfontein project, two alternative sites have been proposed for a new ventilation shaft, namely Portion 7 of the farm Uitgedacht 229 IS and Portion 22 of the farm Uitgedacht 229 IS. Initial granting of both Prospecting Rights was in 2006 to Forzando Coal Mines (Pty) Ltd. Subsequent to this, in respect of 1035PR and before the right could lapse on the 2nd of November 2009, a Prospecting Rights renewal was applied for in October 2009. In respect of PR 1170 the renewal was applied for on 12 January 2011 before the right could expire on 9 April 2011. Both renewals were granted on the 31st July 2015 with execution finalised on the 27th October 2015, extending the validity of both Prospecting Rights to the 30th of July 2018. The proposed extension of the current mining area will require minimal new surface infrastructure as the mining method to be employed is underground mining and existing surface infrastructure from the Forzando South mine will be used.

Forzando Coal Mines (Pty) Ltd has appointed Environmental Impact Management Services (Pty) Ltd (EIMS) to act as the independent Environmental Assessment Practitioner (EAP) to undertake the Environmental Impact Assessment for the proposed Kalabasfontein project. An application for the amendment to the existing Mine Works Programme (MWP) and EMPR, through an MPRDA Section 102 Application, and a full Environmental Impact Assessment (EIA) for the proposed new mining area is, therefore, required to support an application for environmental authorisation (EA). A water use licence application (WULA) for the relevant water use triggers associated with the proposed project will also be undertaken. The Biodiversity Company (TBC) was appointed by EIMS to conduct the terrestrial biodiversity survey and impact assessment for the proposed project.

One wet-season terrestrial biodiversity survey was conducted in October 2018 and again on the 14th of June 2019 to assess the second alternative powerline. The survey was conducted by terrestrial ecologists over a total period of three days. The surveys focused primarily on those areas which were most likely to be impacted upon by the proposed development at Kalabasfontein and specifically where surface infrastructure was due to be developed.

Furthermore, identification and description of any sensitive receptors were recorded across the entire project area, and the manner in which these sensitive receptors may be affected by the activity was also investigated. The purpose of the specialist study is to provide relevant input into the EIA process and to provide a report for the proposed activities associated with mining and ancillary activities proposed to take place on site.

This report, after taking into consideration the findings and recommendations provided by the specialist herein, 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.

1.1 Project Area

Kalabasfontein project area is situated in Mpumalanga, 20 kilometres north of Bethal. It is located to the east and south of the existing Forzando South 380MR and Forzando North 381MR respectively which fall within the Msukaligwa Local Municipality (Figure 1).

As part of the Kalabasfontein project, two alternative sites have been proposed for a new ventilation shaft, namely Portion 7 of the farm Uitgedacht 229 IS and Portion 22 of the farm Uitgedacht 229 IS. Land use in the considered catchments consists predominantly of grassland areas, wetlands, farmsteads and irrigated agriculture as well as the urban footprint of the town of Bethal.

The project area covers a total area of approximately 1 547.83 hectares in separate blocks over a number of properties and farm portions. The abovementioned properties will be mined sequentially, commencing with portions 7, 8, remaining Extent (RE), 11 and 13 on the farm Kalabasfontein 232 IS. The two alternative shaft sites are located on portion 7 of the farm Uitgedacht 229 IS and portion 22 of the farm Uitgedacht 229 IS.

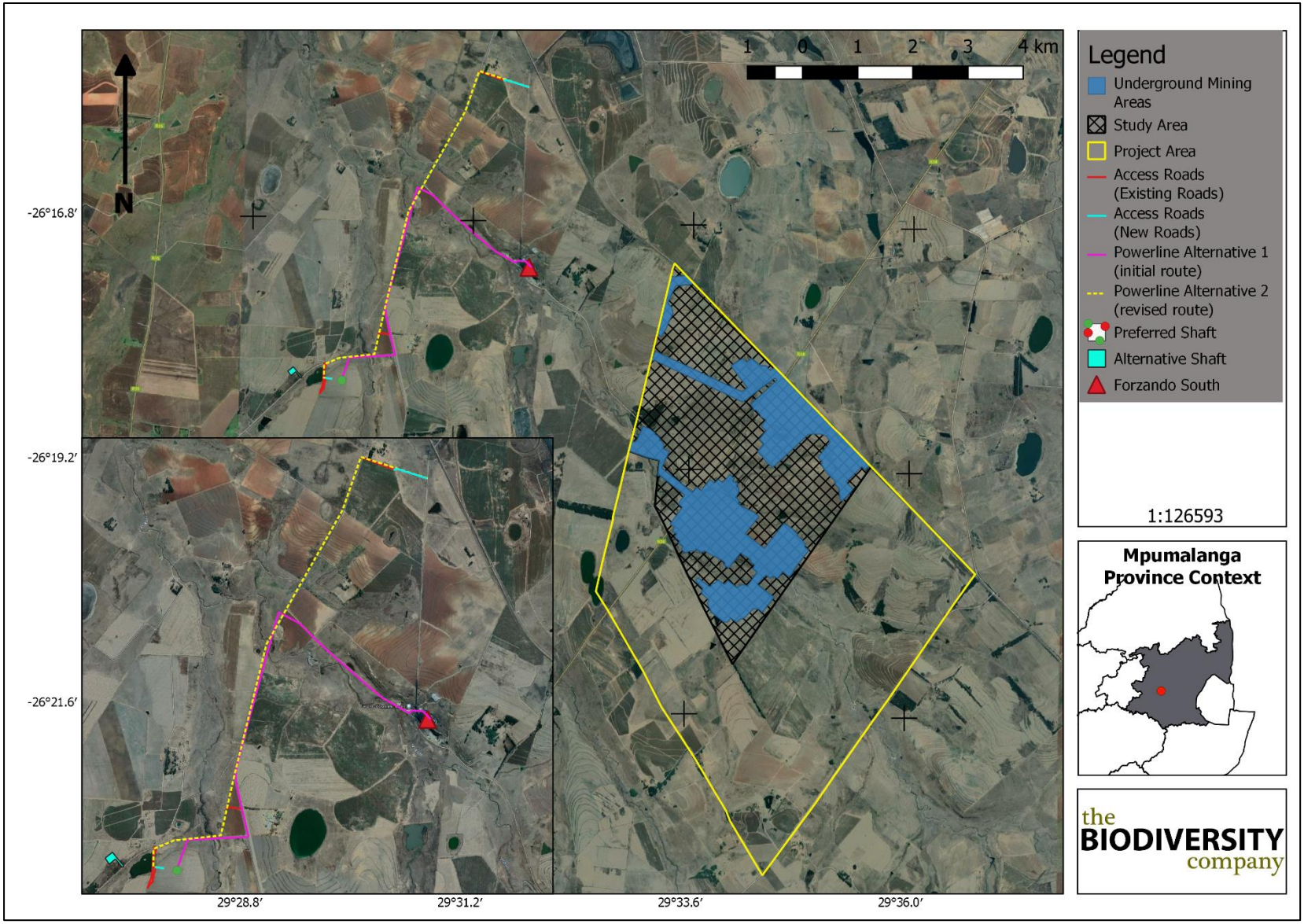

Figure 1: The proposed Kalabasfontein project area

2 Project Description

The aim of the project description is to indicate the activities that are planned to take place at the Forzando South operations as well as the proposed Kalabasfontein project area and amendments that are being applied for in this application. Furthermore, the detailed mine/project description is presented to facilitate the understanding of the project related activities which result in the impacts identified and assessed and for which management measures have been proposed.

2.1 Mining Operations Overview

Although Kalabasfontein annexation is intended to extend the Life of Mine (LOM) of Forzando South Coal Mine, it will come into production a year after the annexation is granted by the DMR. The Kalabasfontein project has an estimated LOM of 17 years with the project schedule and timeframe being based on the Forzando South equipment availabilities, efficiencies and both skilled and unskilled labour force. Mining in the Kalabasfontein project area is based on two Continuous Miner (CM) sections.

The access corridor to Kalabasfontein Reserves was identified during exploration drilling. Reserves will be mined through access from one of Forzando South Reserves block. This will eliminate intense preparation work of developing a new incline, as there will be infrastructure available at the face.

Currently, Forzando South mine is scheduled until 2037. However, the Kalabasfontein portion will be mined as soon as permission is granted, in order to ensure sustained production volumes and quantities from the 5 CM sections that are currently being mined. The mine will maintain its production rate of 2.2 Million tonnes (Mt) per annum. Commissioning of Kalabasfontein will not add to the production of Forzando South but will provide relocation areas for existing Forzando South sections. Since the Kalabasfontein project will be mined concurrently with Forzando South, production decline will be due to depletion of Reserves. In the second quarter of year 17 (2037), the first section will pull out and leave the one section to deplete the remaining Reserves.

2.1.1 Current Authorisations

The following rights, authorisations and approvals are currently in place and have been considered in the compilation of the report:

- Mining Right (MP380MR) dated 28 June 2013;
- Mining Right (MP381MR) dated 28 June 2013;
- Prospecting Rights (MP 30/5/1/1/2/1035PR) dated 31 July 2015;
- Prospecting Rights (MP 30/5/1/1/2/1170PR) dated 31 July 2015;
- Water Use Licence (04/B11A/A/ACGIJ/521) dated 19 July 2011;
- Amended Water Use Licence (04/B11A/A/ACGIJ/521) dated 15 June 2017; and
- Waste Licence (12/9/11/L180/6) dated 22 February 2010.

2.1.2 Infrastructure Requirements

As the Kalabasfontein project will use the existing Forzando South and Forzando North infrastructure, additional infrastructure requirements will be minimal. Anticipated demand for water, power and the on-site infrastructure requirements is detailed in the mine works programme (MWP). These requirements are based on staff required over the production period for permanent employees and contractors. Water and electricity requirements for the construction of mine access (ventilation shaft) and surface infrastructure are temporary, lasting for approximately 12 months.

The Forzando North plant is designed to treat Run of Mine (ROM) of approximately 2.2 Million tons per annum (Mtpa). This will include coal from the proposed Kalabasfontein Project. The plant will be manned for operations on a 24 hour/day, 7 days/week basis, with the exclusion of statutory public holidays.

Below are plant design parameters used:

- A production of 10,000t per day;
- A production of 3,300t per shift;
- Feed to ROM bin (peak) of 3,600t per hour at 50mm Top Size;
- ROM material top size (mm): 350mm;
- Primary crusher feed: 1,200t per hour (peak);
- ROM stockpile surge capacity 10,000t (max): 4,500t (live);
- Overland conveyor design maximum and average of 1,125t/hr and 750t/hr respectively;
- Conveyor operation: 2 shifts per day for 5 days a week.

2.1.3 Mining Method to be Employed: Underground Mining

Bord and pillar mining using continuous miner (CM's) was selected as the primary extraction method. In bord and pillar mining, parallel roads are developed in the development direction. Perpendicular roads, called splits, are developed at predetermined intervals to the parallel roads (see Figure 4). These roads interlink, creating pillars. The roads mined concurrently are determined by the size of the pillars required to support the overburden above the coal seam and the length of the production equipment trailing cables.

Pillar size is determined by the safety factor formula; which is the pillar strength divided by the pillar load (mass of the overburden carried by the pillar). Panel design will be based on either the Probability of Failure (PoF) or the safety factor design criterion. A PoF of 0.1% or SF of 2.0 will be used for main development, whereas a PoF of 1% or SF of 1.6 will be used for production panels depending on the stability and rock engineering characteristics that will be determined by a Rock/Geotechnical Engineer. The dimensions of the roads and the support requirements are determined by a Geotechnical Engineer and documented in a code of practice for the prevention of roof falls.

2.1.4 Surface Infrastructure

As the Kalabasfontein project will use the existing Forzando South and Forzando North infrastructure, additional infrastructure requirements will be minimal. A ventilation shaft will be required, which will be located outside the Kalabasfontein project area, either on portion 7 or portion 22 of the farm Uitgedacht 229 IS, approximately 6km away. Existing access roads will be used and they will not be expanded upon.

2.1.5 Administration Buildings, Engineering Bays, Workshops and Other Buildings

As the Kalabasfontein project will be an extension of the Forzando South operations, it is anticipated that the existing infrastructure will be utilized during all phases of the project. The existing surface infrastructure related to Forzando North can be summarised as follows:

- Coal beneficiation plant;
- Coal discard dumps;
- Rail line of about 1,6 km to the Richards Bay Coal Terminal railway line;
- Rail loop of about 400 m diameter;
- Coal product load-out stockpile located to the west of the discard dump;
- ROM coal stockpile;
- Water pollution control dams;
- Metallurgical coal stockpiles; and
- Administration, workshops, change house and related buildings.

At present the existing surface infrastructure related to Forzando South can be summarised as follows:

- Power lines;
- Ventilation shafts (one upcast & one downcast);
- ROM coal stockpile;
- Overland conveyor from boxcut to Forzando North plant;
- Water pollution control dams; and
- Administration, workshops, change house and related buildings.

3 Scope of Work

TBC was commissioned by EIMS to conduct a biodiversity baseline and impact assessment for the proposed Kalabasfontein project. The Terms of Reference (ToR) for this study included the following:

- Desktop description of the baseline receiving environment specific to the field of expertise (general surrounding as well as site-specific environment);

- Identification and description of any sensitive receptors in terms of relevant specialist disciplines (biodiversity, wetlands and soils) that occur in the study area, and the manner in which these sensitive receptors may be affected by the activity;
- Site visit to verify desktop information;
- Screening to identify any critical issues (potential fatal flaws) that may result in project delays or rejection of the application;
- Provide a map identifying sensitive receptors in the study area, based on available maps, database information & site visit verification; and
- Compile summary specialist inputs to feed into the overall report, including the following:
    - Botany;
    - Fauna (mammals and avifauna); and
    - Herpetology (reptiles and amphibians).

4 Limitations

The following limitations should be noted for the study:

- As per the scope of work, the fieldwork component of the assessment comprised one assessment only, that was conducted during the early wet season. Minimal rainfall had occurred prior to the survey. This study has not assessed any temporal trends for the respective seasons;
- The assessments were conducted on those portions of the project area as originally defined by the client, any changes in the project boundary subsequent to this may negatively impact the robustness of this report;
- The impact assessment was completed for the proposed mining areas and supporting infrastructure for the project area. The impact assessment has considered these layouts to be final, and have not considered the No Go alternative; and
- Despite these limitations, a comprehensive desktop study was conducted, in conjunction with the detailed results from the surveys, and as such there is a high confidence in the information provided.

5 Methodologies

5.1 Geographic Information Systems (GIS) Mapping

A National Aeronautics and Space Administration (NASA) Shuttle Radar Topography Mission (SRTM) (V3.0, 1 arcsec resolution) Digital Elevation Model (DEM) was obtained from the United States Geological Survey (USGS) Earth Explorer website. Basic terrain analysis was performed on this DEM using the SAGA GIS software that encompassed a slope, landforms and channel network analyses in order to detect ridges, potential landscape depressions and drainage lines respectively.

Additional existing data layers were incorporated into a GIS to establish how the proposed the mining operation interact with these important entities. Emphasis was placed around the following spatial datasets:

- Vegetation Map of South Africa, Lesotho and Swaziland (Mucina et al., 2007);
- Mpumalanga Biodiversity Sector Plan (MBSP) Terrestrial Assessment 2014 (MTPA, 2014);
- MBSP Landcover 2010 (MTPA, 2010);
- Department of Environmental Affairs (DEA) National Landcover 2015 (DEA, 2015); and
- Mining and Biodiversity Guideline (SANBI & SAMBF 2012).

Field surveys were conducted to confirm the presence of species identified in the desktop assessment. The specialist disciplines were completed for this study:

- Botanical;
- Fauna (mammals and avifauna); and
- Herpetology (reptiles and amphibians).

Brief descriptions of the standardised methodologies applied in each of the specialist disciplines are provided below. More detailed descriptions of survey methodologies are available upon request.

5.2 Botanical Assessment

The botanical study encompassed an assessment of all the vegetation units and habitat types within the project area. The focus was on a full assessment of habitat types as well as identification for any red-data species within the known distribution of the project area. The methodology included the following survey techniques:

- Timed meanders;
- Sensitivity analysis based on structural and species diversity; and
- Identification of floral red-data species.

5.3 Literature study

A literature review was conducted as part of the desktop study to identify the potential habitats present within 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[1]. This is a new database which replaces the old Plants of Southern Africa (POSA) database. The POSA database provided distribution data of flora at the quarter degree square (QDS) resolution. However, the BODATSA database provides distribution data as point coordinates. The literature study therefore, focussed on querying the database to generate species lists for the extent seen in

1 Data is obtained from the National Herbarium in Pretoria (PRE), the Compton Herbarium in Cape Town (NBG & SAM) and the KwaZulu-Natal Herbarium in Durban (NH)

Figure 15) in order to increase the likelihood of obtaining a representative species list for the Project Area. The Red List of South African Plants website (SANBI, 2016) 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 included the following:

- Field Guide to the Wild Flowers of the Highveld (Van Wyk & Malan, 1997);
- A field guide to Wild flowers (Pooley, 1998);
- Guide to Grasses of Southern Africa (Van Oudtshoorn, 1999);
- Orchids of South Africa (Johnson & Bytebier, 2015)
- Guide to the Aloes of South Africa (Van Wyk & Smith, Guide to the Aloes of South Africa, 2014)
- Mesembs of the World (Smith, et al., 1998)
- Medicinal Plants of South Africa (Van Wyk, Van Oudtshoorn, & Gericke, Medicinal Plants of South Africa, 2013)
- Freshwater Life: A field guide to the plants and animals of southern Africa (Griffiths & Day, 2016); and
- Identification guide to southern African grasses. An identification manual with keys, descriptions and distributions. (Fish, Mashau, Moeaha, & Nembudani, 2015).

Additional information regarding ecosystems, vegetation types, and species of conservation concern (SCC) included the following sources:

- The Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2011);
- Grassland Ecosystem Guidelines: landscape interpretation for planners and managers (SANBI, 2013); and
- Red List of South African Plants (Raimondo, et al., 2009; SANBI, 2016).

5.4 Wet Season Fieldwork

5.4.1 Floristic Analysis

The wet season fieldwork and sample sites were placed within targeted areas (i.e. target sites) perceived as ecologically sensitive based on the preliminary interpretation of satellite imagery (Google Corporation) and GIS analysis (which included the latest applicable biodiversity datasets) available prior to the fieldwork. The focus of the fieldwork was therefore to maximise coverage and navigate to each target site in the field in order to perform a rapid vegetation and ecological assessment at each sample site. Emphasis was placed on sensitive habitats, especially those overlapping with proposed infrastructure development areas.

Homogenous vegetation units were subjectively identified using satelite imagery and existing land cover maps. The floristic diversity and search for flora SCC were conducted through timed meanders within representative habitat units delineated during the scoping fieldwork. Emphasis was placed mostly on sensitive habitats overlapping with the proposed infrastructure areas.

The timed random meander method is a highly efficient method for conducting floristic analysis, specifically in detecting flora SCC and maximising floristic coverage. In addition, the method is time and cost effective and highly suited for compiling flora species lists and therefore gives a rapid indication of flora diversity. The timed meander search was performed based on the original technique described by Goff *et al.* (1982). Suitable habitat for SCC were identified according to Raimondo *et al.* (2009) and targeted as part of the timed meanders.

At each sample site notes were made regarding current impacts (e.g. livestock grazing, erosion etc.), subjective recording of dominant vegetation species and any sensitive features (e.g. wetlands, outcrops etc.). In addition, opportunistic observations were made while navigating through the project area. Effort was made to cover all the different habitat types within the limits of time and access. The geographic location of sample sites and site coverage are shown under the Results section.

5.4.2 Faunal Assessment (Mammals & Avifauna)

The faunal desktop assessment included the following:

- Compilation of expected species lists;
- Compilation of identified species lists;
- Identification of any Red Data or species of conservation concern (SCC) present or potentially occurring in the area (especially relating to avifauna); and
- Emphasis was placed on the probability of occurrence of species of provincial, national and international conservation importance.

The field survey component of the study utilised a variety of sampling techniques including, but not limited to, the following:

- Camera trapping (Figure 2);
- Visual observations;
- Small mammal trapping (Figure 2);
- Identification of tracks and signs; and
- Utilization of local knowledge.

Site selection for trapping focussed on the representative habitats within the project area. Sites were selected on the basis of GIS mapping and Google Earth imagery and then final selection was confirmed through ground truthing during the surveys. Habitat types sampled included pristine, disturbed and semi-disturbed zones, drainage lines, wetlands and rocky ridges.

Figure 2: A) Hand Searches, B) Active Searching, C & D) Camera Traps and E) Photography for Avifauna Assessments

5.4.3 Herpetology (Reptiles & Amphibians)

A herpetofauna assessment of the project area was conducted, including in-depth, site-specific research and focused searching. Ideally, surveys for herpetofauna should be conducted at those times when the target species or communities are known to be active because these periods of activity are more likely to lead to capture success (for most species). In South Africa this is during the summer months and ideally after or during periods when rainfall is most likely or has recently occurred.

Surveys were conducted in each habitat or vegetation type within the project area, as identified from the desktop study, with a focus on those areas which will be most impacted by the proposed development (i.e. the infrastructure development and waste dumping areas).

The herpetological field survey comprised the following techniques:

- Diurnal hand searches - are used for reptile species that shelter in or under particular microhabitats (typically rocks, exfoliating rock outcrops, fallen timber, leaf litter, bark etc.);
- Visual searches - typically undertaken for species whose behaviour involves surface activity or for species that are difficult to detect by hand-searches or pitfall trapping. may include walking transects or using binoculars to view species from a distance without them being disturbed;
- Amphibians – many of the survey techniques listed above will be able to detect species of amphibians. Over and above these techniques, vocalisation sampling techniques are often the best to detect the presence of amphibians as each species has a distinct call; and
- Opportunistic sampling - Reptiles, especially snakes, are incredibly illusive and difficult to observe. Consequently, all possible opportunities to observe reptiles are taken, in order to augment the standard sampling procedures described above. This will include

talking to local people and staff at the site and reviewing photographs of reptiles and amphibians that the other biodiversity specialists may come across while on site.

6 Key Legislative Requirements

The legislation, policies and guidelines listed below are applicable to the current project in terms of biodiversity and ecological support systems. The list below, although extensive, may not be complete and other legislation, policies and guidelines may apply in addition to those listed below.

Explanation of certain documents or organisations is provided where these have a high degree of relevance to the project and/or are referred to in this assessment.

6.1 International Legislation and Policy

- Convention on Biological Diversity (Rio de Janeiro, 1992);
- The Ramsar Convention (on wetlands of international importance);
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival; and
- The IUCN (World Conservation Union). The IUCN's mission is to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

6.2 National Level

- Constitution of the Republic of South Africa (Act 108 of 1996). The Bill of Rights, in the Constitution of South Africa states that everyone has a right to a nonthreatening environment and requires that reasonable measures be applied to protect the environment. This protection encompasses preventing pollution and promoting conservation and environmentally sustainable development;
- The National Environmental Management Act (NEMA) No. 107 of 1198): Ecological Assessment Regulations, 2014. Specifically, the requirements of the specialist report as per the requirements of Appendix 6;
- The National Environmental Management: Biodiversity Act (NEM:BA) No. 10 of 2004: specifically, the management and conservation of biological diversity within the RSA and of the components of such biological diversity;
- National Environmental Management: Biodiversity Act, 2004: Threatened and Protected Species Regulations;
- National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003);
- National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
- National Water Act, 1998 (Act 36 of 1998);
- National Veld and Forest Fire Act (101 of 1998);

- Environmental Conservation Act, 1989 (ECA), (Act no. 73 of 1989);
- National Forests Act, 1998 (Act 84 of 1998), specifically with reference to Protected Tree species;
- National Heritage Resources Act, 1999 (Act 25 of 1999);
- Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983); and
- Sustainable Utilisation of Agricultural Resources (Draft Legislation).

6.3 National Policy and Guidelines

- South Africa's National Biodiversity Strategy and Action Plan (NBSAP);
- National Spatial Ecological Assessment (NSBA); and
- National Freshwater Ecosystem Priority Areas (NFEPA's).

6.4 Provincial and Municipal Level

In addition to national legislation, South Africa's nine provinces have their own provincial biodiversity legislation, as nature conservation is a concurrent function of national and provincial government in terms of the Constitution (Act 108 of 1996).

The Provincial Department responsible for environmental matters in Mpumalanga is the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET). Relevant provincial legislation includes, but is not limited to:

6.4.1 Mpumalanga Parks Board Act 6 of 1995

- The Mpumalanga Parks Board was established in terms of the Mpumalanga Parks Board Act 6 of 1995 as amended. The objectives of this Act are inter alia as follows:
    - To provide effective conservation management of natural resources of the Mpumalanga Province;
    - To promote the creation of economic and employment opportunities in pursuit of nature conservation and biodiversity;
    - To ensure that natural systems, biodiversity and ecological functions and processes in the Mpumalanga Province are maintained;
    - To determine and enforce limits to sustainable utilization of natural resources;
    - To contribute to the advancement of scientific knowledge, and facilitate technology transfer in respect of conservation; and
    - Provide information and extension services to the public on conservation management, problem species, legal aspects of conservation and other conservation matters.

Mpumalanga Conservation Act, 1998 (Act 10 of 1998)

The aim of this Act is to consolidate and amend the laws relating to nature conservation within the Province and to provide for matters connected therewith.

Mpumalanga Tourism and Parks Agency Act, No 5 of 2005

This act provides for the establishment of the Mpumalanga Tourism and Parks Agency (MTPA) and for the management thereof by a Board; to provide for the sustainable development and improvement of the tourism industry in Mpumalanga; to provide for conservation management of the natural resources of Mpumalanga; to confer powers and functions upon the Agency; to provide for the registration of certain persons and entities directly involved in tourism; to provide for transitional arrangements; and to provide for matters incidental thereto.

Mpumalanga Conservation Plan

Mpumalanga's Conservation Plan Version 2 (C-Plan 2) database (MPSB, 2006), is intended to guide conservation and land-use decisions in support of sustainable development at a strategic level, have been identified. The C-Plan 2 maps the distribution of the Province's known biodiversity into categories according to ecological and biodiversity importance and their contribution to meeting the quantitative targets set for each biodiversity feature.

Mpumalanga Biodiversity Sector Plan (MBSP)

In 2006 the MTPA and the Department of Agriculture and Land Administration (DALA) initiated the development of the Mpumalanga Biodiversity Conservation Plan (MBCP). As the first such plan produced for the Province, it was intended to guide conservation and land-use decisions in support of sustainable development. The MBCP provided a spatial framework that supported land-use planning and helped to streamline and monitor environmental decision-making (Ferrar & Lotter, 2007).

Since 2007 several technical advances and land use changes necessitated the need for an update of the MBCP. The updated product is called the Mpumalanga Biodiversity Sector Plan (MBSP) and builds on the successes of the MBCP but incorporates improvements in science, technology and data, to provide a more comprehensive assessment of the biodiversity of the terrestrial and freshwater environment in Mpumalanga (MTPA, 2014).

National Ecological Assessment (NBA)

The National Ecological Assessment (NBA) was completed as a collaboration between the South African National Biodiversity Institute (SANBI), the Department of Environmental Affairs (DEA) and other stakeholders, including scientists and biodiversity management experts throughout the country over a three-year period (Driver at al., 2012).

The purpose of the NBA is to assess the state of South Africa's biodiversity with a view to understanding trends over time and informing policy and decision-making across a range of sectors (Driver at al., 2012).

MTPA Guidelines for Ecological Assessment

To promote national uniform standards in Environmental Management Plans (EMP's) the Mpumalanga Tourism and Parks Agency (MTPA) have set minimum standards that need to be conformed to in terms of Ecological Assessments for development applications. These guidelines cover flora, fauna, aquatic and wetland systems.

7 Study Approach

This EIA report has been compiled in accordance with the accepted Plan of Study and incorporates the findings and recommendations from other specialist studies conducted for the project.

In addition, this EIA is being compiled according to the guidelines provided in GNR 982 of the EIA Regulations (2017).

All specialist studies were initiated on the basis of the conceptual layout plan indicating the proposed mining areas and mine infrastructure associated with the Kalabasfontein project, as provided by EIMS.

8 Project Area

8.1 General Land Use

The dominant land use of the surrounding area is cultivated land/agriculture, predominately maize and to a lesser extent other crop plants such as Soya. Natural vegetation is utilized for livestock grazing, predominately by cattle. Subsistence farming also occurs on site, with cattle grazing across various portions of the project area, including wetland areas. Other land uses nearby include other coal mining operations as well as the urban footprint of the town of Bethal.

The following infrastructure exists in the project area and surrounds:

- Agricultural properties and cultivated fields;
- Various secondary farm roads, minor tar roads (R35 and R38), and a national highway (N17) south of the project area;
- Many farm dams and at least three notably large man-made dams;
- Wetland areas;
- Rocky ridges and caves;
- Power lines – especially large Eskom powerlines transecting multiple farm portions;
- Telephone lines;
- Agricultural homesteads and fields; and
- Urban dwellings.

8.2 Description of the Project Area

Kalabasfontein project area is situated in Mpumalanga, 20 kilometres north of Bethal. It is located to the east and south of the existing Forzando South 380MR and Forzando North 381MR respectively which fall within the Msukaligwa Local Municipality. The project area comprises two prospecting rights, 1035PR & 1170PR, which covers a total of approximately 1 547.83 ha over portions 7, 8, RE, 11 and 13 of the farm Kalabasfontein 232 IS. A new ventilation shaft will be located either on Portion 7 of the farm Uitgedacht 229 IS or on Portion 22 of the farm Uitgedacht 229 IS as part of the Kalabasfontein project.

8.3 The Mpumalanga Biodiversity Sector Plan (MBSP)

The key output of a systematic biodiversity plan is a map of biodiversity priority areas (MTPA, 2014). The MBSP CBA map delineates Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs), Other Natural Areas (ONAs), Protected Areas (PAs), and areas that have been irreversibly modified from their natural state (MTPA, 2014). The MBSP uses the following terms to categorise the various land used types according to their biodiversity and environmental importance:

- Critical Biodiversity Area – Irreplaceable (CBA: Irreplaceable);
- Critical Biodiversity Area – Optimal (CBA: Optimal);
- Ecological Support Area (ESA);
- Other Natural Area (ONA);
- Protected Area (PA); and
- Moderately or Heavily Modified Areas (MMA's or HMA's).

Critical Biodiversity Areas (CBAs) are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. CBAs are areas of high biodiversity value and need to be kept in a natural state, with no further loss of habitat or species (MTPA, 2014). Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (SANBI-BGIS, 2017).

Critical Biodiversity Areas (CBAs) are areas of high biodiversity value and need to be kept in a natural state, with no further loss of habitat or species (MTPA, 2014). These areas are therefore incompatible with mining developments.

The Mpumalanga Biodiversity Sector Plan (MBSP) specifies two different CBA areas, Irreplaceable CBA's and Optimal CBA's. Irreplaceable CBA's include: (1) areas required to meet targets and with irreplaceability biodiversity values of more than 80%; (2) critical linkages or pinch-points in the landscape that must remain natural; or (3) critically Endangered ecosystems (MTPA, 2014).

Ecological Support Areas (ESAs) are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services. Critical Biodiversity Areas and Ecological Support Areas may be terrestrial or aquatic (SANBI-BGIS, 2017).

Other Natural Areas (ONAs) consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs. A biodiversity sector plan or bioregional plan must not specify the desired state/management objectives for ONAs or provide land-use guidelines for ONAs (SANBI-BGIS, 2017).

Moderately or Heavily Modified Areas (sometimes called 'transformed' areas) are areas that have been heavily modified by human activity so that they are by-and-large no longer natural, and do not contribute to biodiversity targets (MTPA, 2014). Some of these areas may still

provide limited biodiversity and ecological infrastructural functions but, their biodiversity value has been significantly, and in many cases irreversibly, compromised.

8.4 The Project Area in Relation to the MBSP

Figure 3 shows the Kalabasfontein project area superimposed on the MBSP Terrestrial CBA map. Based on this, the proposed mining areas will overlap with the following:

- Critical Biodiversity Areas (CBAs);
- Ecological Support Areas (ESAs);
- Heavily or Moderately Modified Areas (HMAs); and
- Other Natural Areas (ONAs).

Based on this desktop information, much of the project area is identified as either HMAs (Figure 3). However, a continuous and significant CBA exists across north-western and southern portions of the project area. This CBA accounts for approximately 20% of the total survey area.

Both of the proposed ventilation shaft localities are situated in areas that are HMAs or ONAs. The associated powerlines are also situated predominantly within HMAs, however this proposed infrastructure will also cross habitats which are listed as CBAs and ESAs.

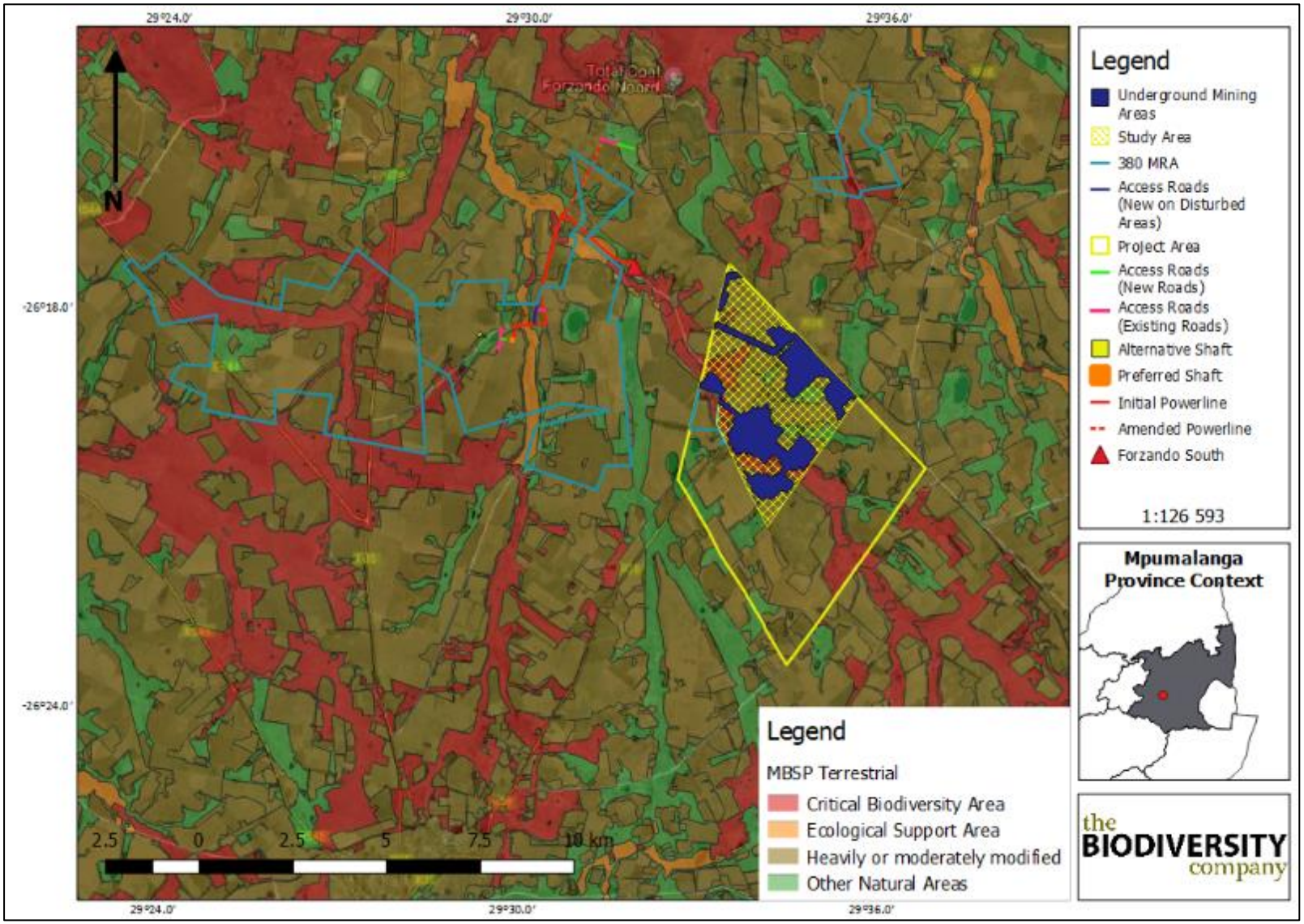

Figure 3: Kalabasfontein project area superimposed on the MBSP Terrestrial Critical Biodiversity Areas (CBA) map (MBSP, 2014)

8.5 The Mpumalanga Protected Area Expansion Strategy (MPAES) in Relation to the Project Area

The Mpumalanga Protected Area Expansion Strategy (MPAES, 2013), commissioned by the MTPA, serves to function as a provincial framework for an integrated, co-ordinated and uniform approach in the expansion and consolidation of the Provincial PAS, in line with the requirements of the NPAES.

The priority areas for PA Expansion within Mpumalanga were spatially established based on the premise that the primary goal of these areas is to protect biodiversity targets. Several biodiversity data sources were used for the assessment, namely the: Threatened Ecosystems, MBCP Terrestrial Assessment, MBCP Aquatic Assessment, MBCP Irreplaceability, C-plan Irreplaceability, and the National Spatial Biodiversity Assessment Priority areas. A combination of all these were used, together with the spatial priorities established within the NPAES, to establish the spatial priority areas that will guide the MPAES over the next 20 years.

The project area in relation to the MPAES is shown in Figure 4. As can be seen in this figure, the southern and south-western portions of the project area intersect with portions of the provincial protected area expansion priority.

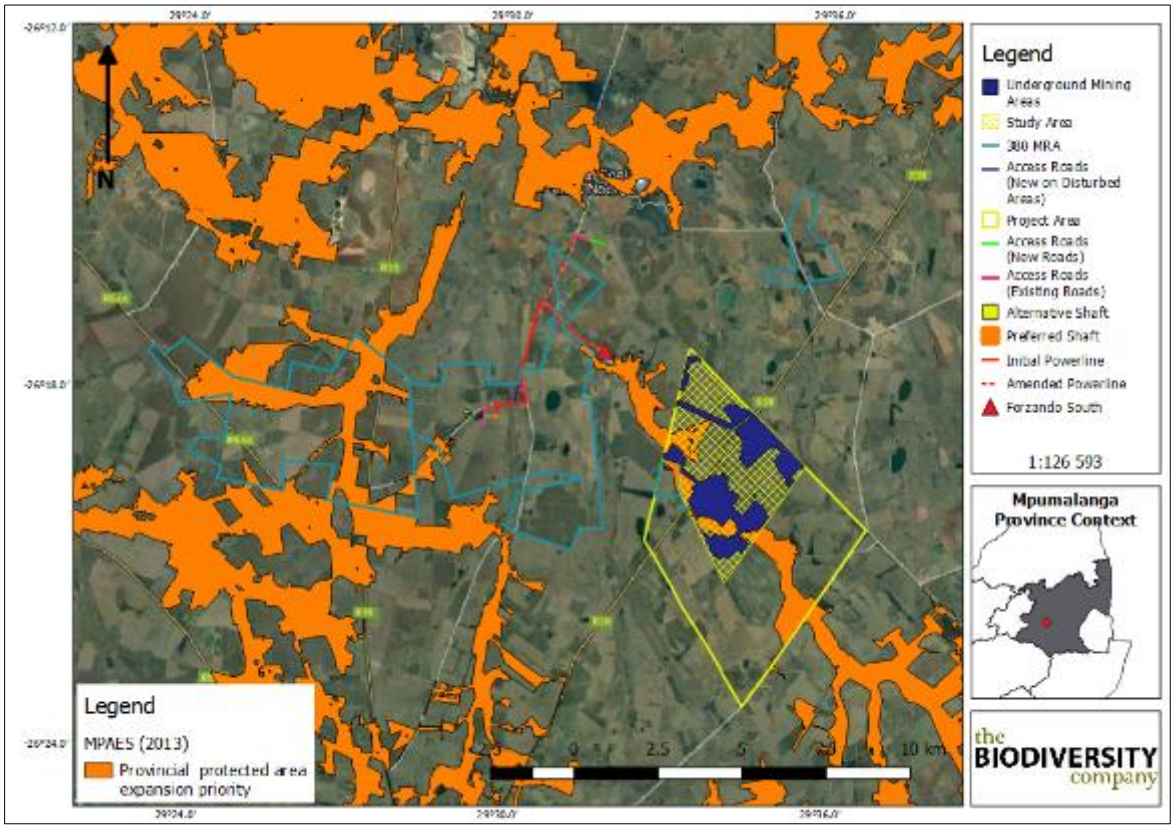

Figure 4: The project area in relation to the MPAES (MPAES, 2009)

8.6 Project Area in Relation to the NBA

The purpose of the NBA is to assess the state of South Africa's biodiversity based on best available science, with a view to understanding trends over time and informing policy and decision-making across a range of sectors. The NBA is central to fulfilling SANBI's mandate to monitor and report regularly on the status of the country's biodiversity, in terms of the National

Environmental Management: Biodiversity Act (NEMBA, Act 10 of 2004). The NBA endeavours to capture the challenges and opportunities embedded in South Africa's rich natural heritage by looking at biodiversity in the context of social and economic change and recognising the relationship between people and their environment. The NBA deals with all three components of biodiversity: genes, species and ecosystems; and assesses biodiversity and ecosystems across terrestrial, freshwater, estuarine and marine environments.

The two headline indicators assessed in the NBA are ecosystem threat status and ecosystem protection level (Driver at al., 2012).

8.6.1 Ecosystem Threat Status

Ecosystem threat status outlines the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function and composition, on which their ability to provide ecosystem services ultimately depends (Driver et al., 2011).

Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Threatened (LT), based on the proportion of each ecosystem type that remains in good ecological condition (Driver et al., 2011).

The project area was superimposed on the terrestrial ecosystem threat status (Figure 5). As seen in Figure 5 the infrastructure development portions, as well as the overall project area, overlap entirely with ecosystems that are listed as Vulnerable (VU).

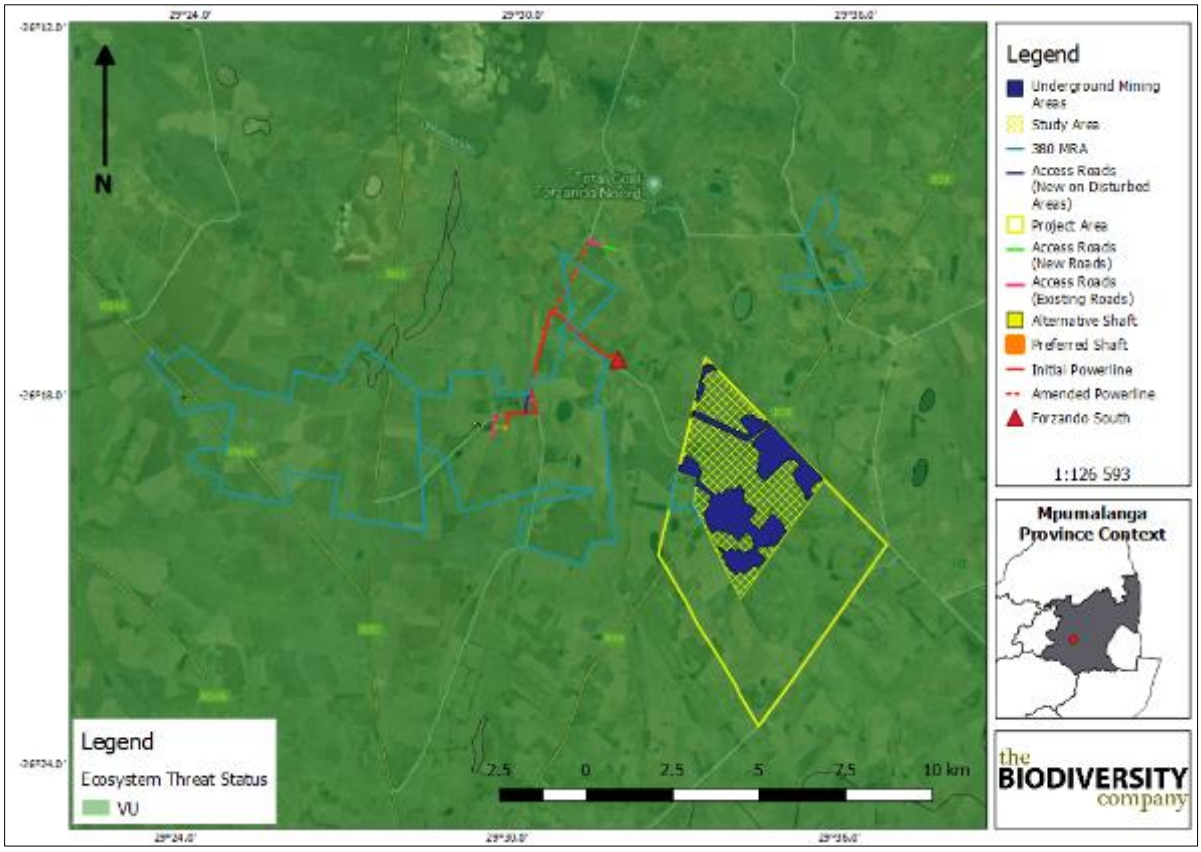

Figure 5: Kalabasfontein project area showing the ecosystem threat status of the associated terrestrial ecosystems (NBA, 2012)

8.6.2 Ecosystem Protection Level

Ecosystem protection level tells us whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as not protected, poorly protected, moderately protected or well protected, based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act (Driver et al., 2012).

The Kalabasfontein project area was superimposed on the ecosystem protection level map to assess the protection status of terrestrial ecosystems associated with the development (Figure 6). Based on this the majority of the terrestrial ecosystems associated with the development are rated as *not protected.* Areas that are designated as *not protected* are ecosystems that are not adequately protected in formally protected areas, such as national parks.

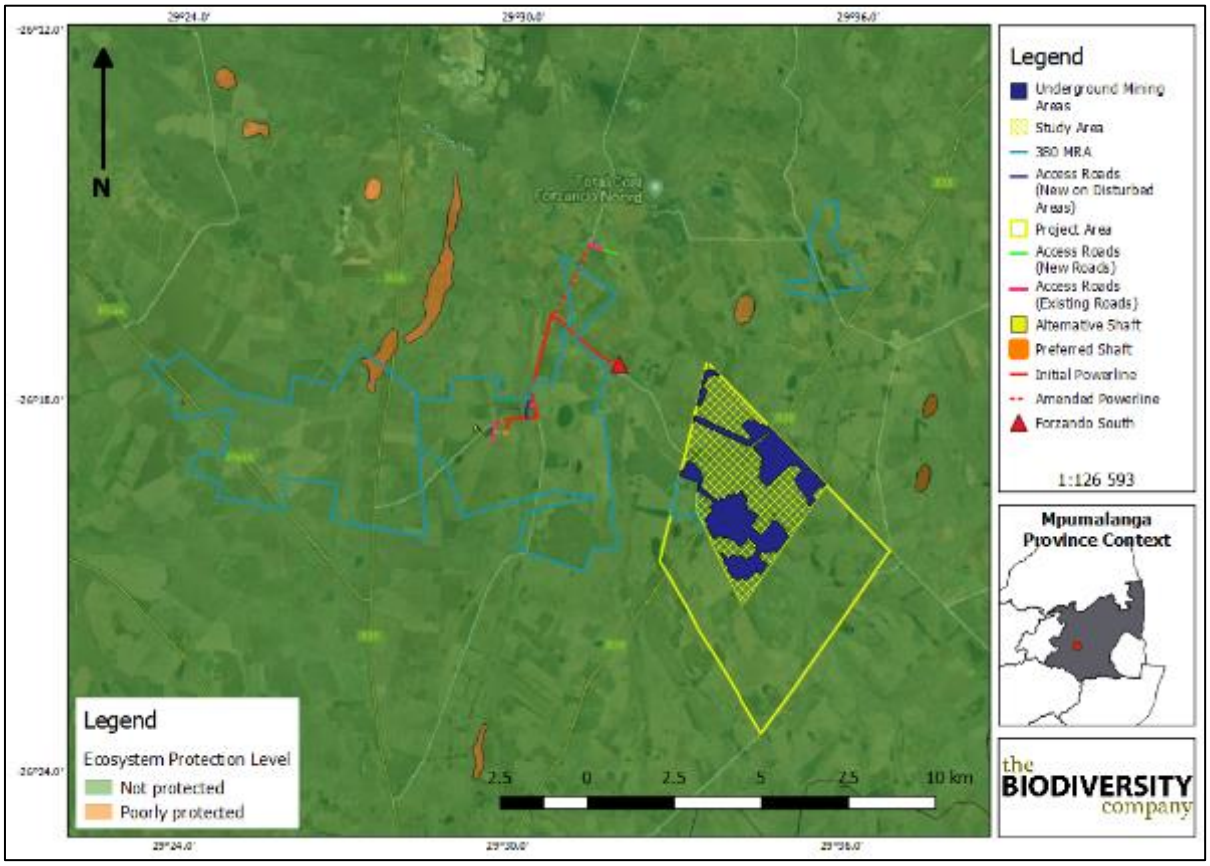

Figure 6: The Kalabasfontein project area showing the level of protection of terrestrial ecosystems (NBA, 2012)

8.6.3 Project Area in Relation to Protected Areas

Figure 7 shows the location of formally protected areas in relation to the Kalabasfontein project area. Formally protected areas refer to areas protected either by national or provincial legislation.

Based on the SANBI (2010) Protected Areas Map and the National Protected Areas Development Strategy (NPAES) the project area does not overlap with any formally or informally

protected area (Figure 7). The closest protected area is the Nooitgedacht Dam Nature Reserve which is situated approximately 62 km north-east of the project area (Figure 7).

Based on the above information and the location of the proposed development is not expected to have an impact on any formally or informally protected areas.

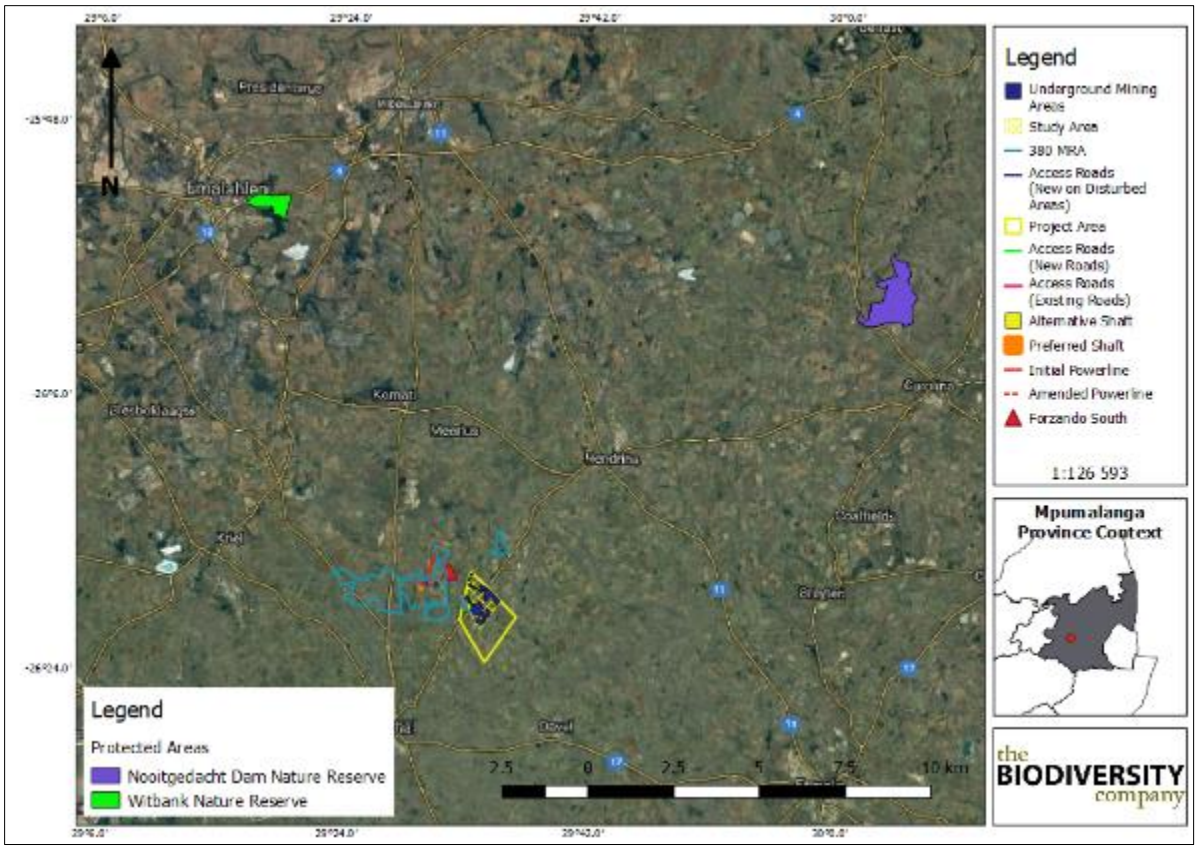

Figure 7: Formally protected areas in relation to the project area (BGIS,2017)

8.7 The MBSP Freshwater Assessment

The MBSP Freshwater Assessment outlines priority areas for freshwater biodiversity in Mpumalanga. The resulting features are predominantly derived from the NFEPA products, layers include CBA Rivers (based on FEPA and free-flowing rivers), CBA Wetlands (based on FEPA wetlands), CBA Aquatic species (Odonata & crab taxa of conservation concern only), ESA Wetland Clusters (FEPA wetland clusters), and ESA Wetlands (all other non-FEPA wetlands). The MTPA created an updated land-cover using SPOT 2010 imagery. This data, together with high-resolution aerial imagery, was used to update and clean some of the features (MTPA et al., Freshwater Assessment, 2011).

The Kalabasfontein project area in relation to the MBSP Freshwater Assessment overlaps with the following areas: Ecological Support Areas (ESAs), Heavily Modified Areas (HMAs) and Other Natural Areas (ONAs) (Figure 8).

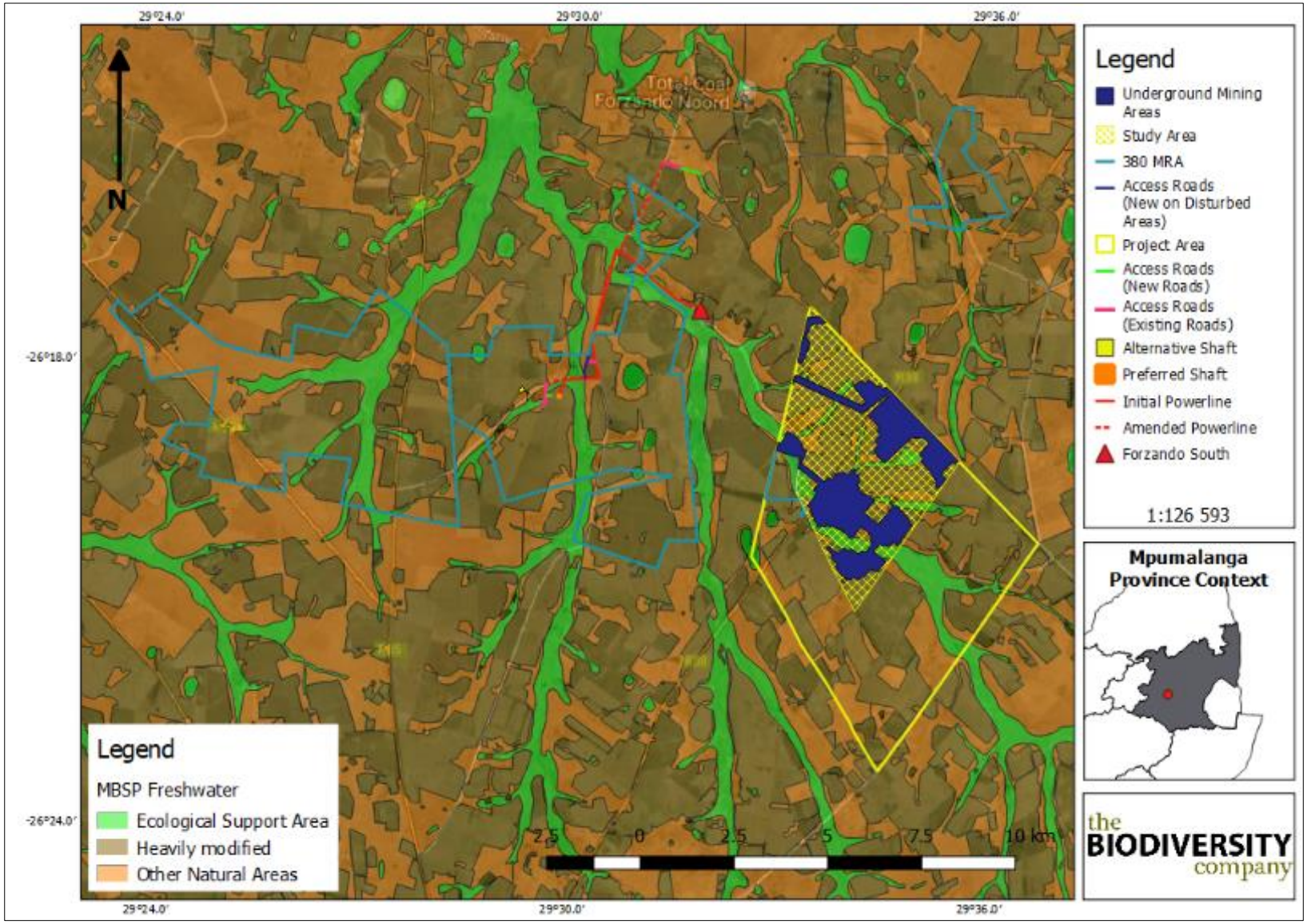

Figure 8: The Kalabasfontein project area in relation to the MBSP Freshwater Assessment

8.8 Mpumalanga Highveld Wetlands

The purpose of the Mpumalanga Highveld Wetlands project was to:

- Ground-truth and refine the current data layers of the extent, distribution, condition and type of freshwater ecosystems in the Mpumalanga Highveld coal belt, to support informed and consistent decision-making by regulators in relation to the water-biodiversity-energy nexus;
- To incorporate these revised data layers into the atlas of high-risk freshwater ecosystems and guidelines for wetland offsets, currently being developed by SANBI, to improve the scientific robustness of these tools; and
- To support the uptake, and development of the necessary capacity to apply the data, atlas and guidelines by regulators and the coal mining industry in their planning and decision-making processes'' (SANBI, 2012).

The Mpumalanga Highveld Wetlands data also classifies NFEPA land cover based on the defined condition of each area. These are known as the NFEPA wetland conditions categories. The categories are listed in Figure 9 and are represented in relation to the project area in Figure 10.

Description of NFEPA wetland conditions categories.
PES equivalent provides a description of the condition category that is broadly equivalent to that used by the Department of Water Affairs to describe Present Ecological State. Percentage of total area in each condition category is also provided.

PES equivalent	NFEPA condition	Description	% of total wetland area*
Natural or Good	AB	Percentage natural land cover ≥ 75%	47
Moderately modified	C	Percentage natural land cover 25-75%	18
Heavily to critically modified	DEF	Riverine wetland associated with a D, E, F or Z ecological category river	2
	Z1	Wetland overlaps with a 1:50,000 "artificial" inland water body from the Department of Land Affairs: Chief Directorate of Surveys and Mapping (2005-2007)	7
	Z2	Majority of the wetland unit is classified as "artificial" in the wetland delineation GIS layer	4
	Z3	Percentage natural land cover < 25%	20

** This percentage excludes the unmapped wetlands that have been irreversibly lost due to draining, ploughing and concreting*

Figure 9: A breakdown of the NFEPA wetland condition categories as defined by the Mpumalanga Highveld dataset

Figure 10 shows the project area in relation to the Mpumalanga Highveld Wetlands data as provided by SANBI. The Kalabasfontein project area intersects with wetland areas classified as FEPA wetlands. The majority of these wetlands are classified as Class D wetlands (Figure 11). This means that these areas have been classified as heavily to critically modified.

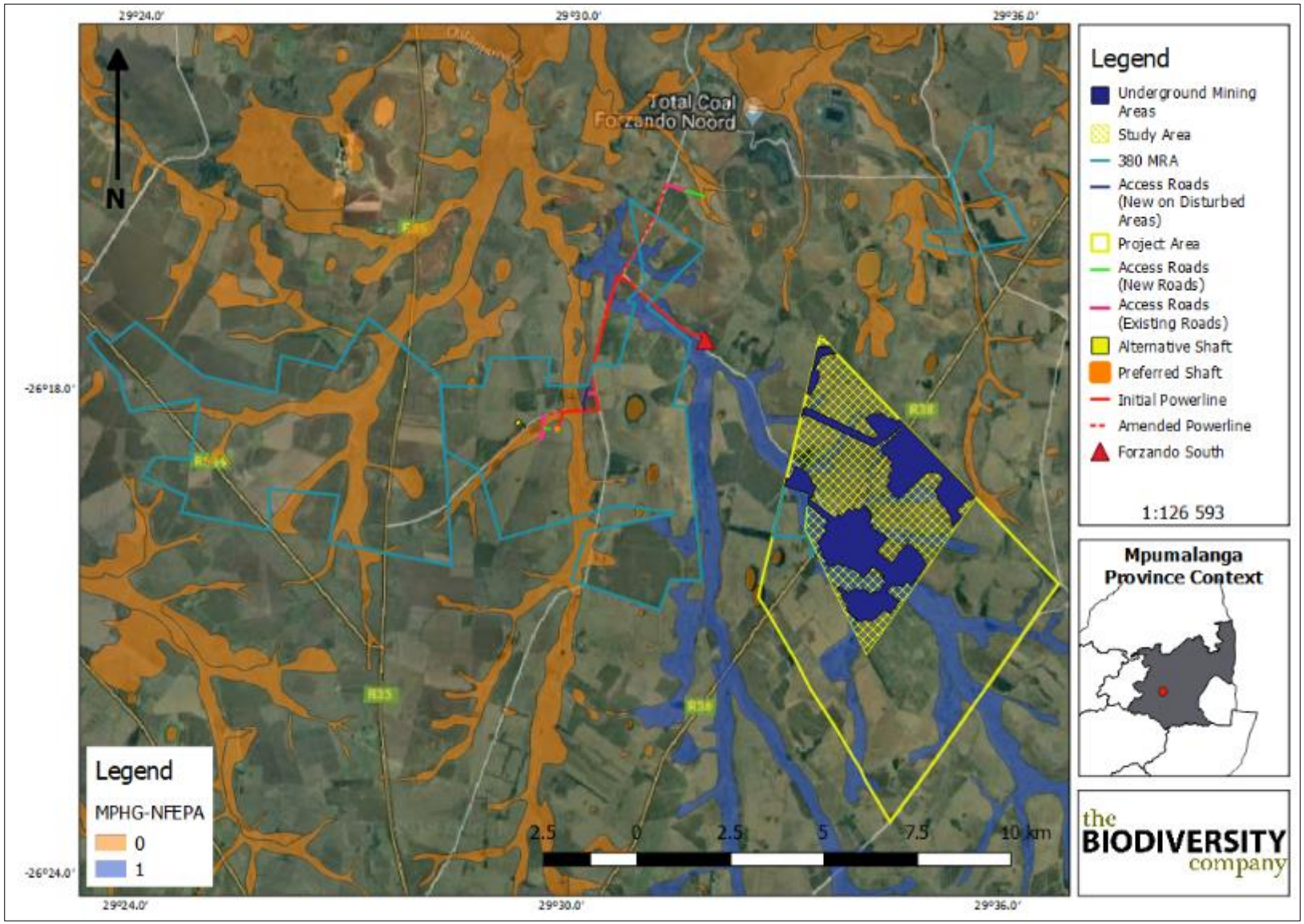

Figure 10: Shows the overall project area in relation to the Mpumalanga Highveld Wetlands (SANBI, 2012)

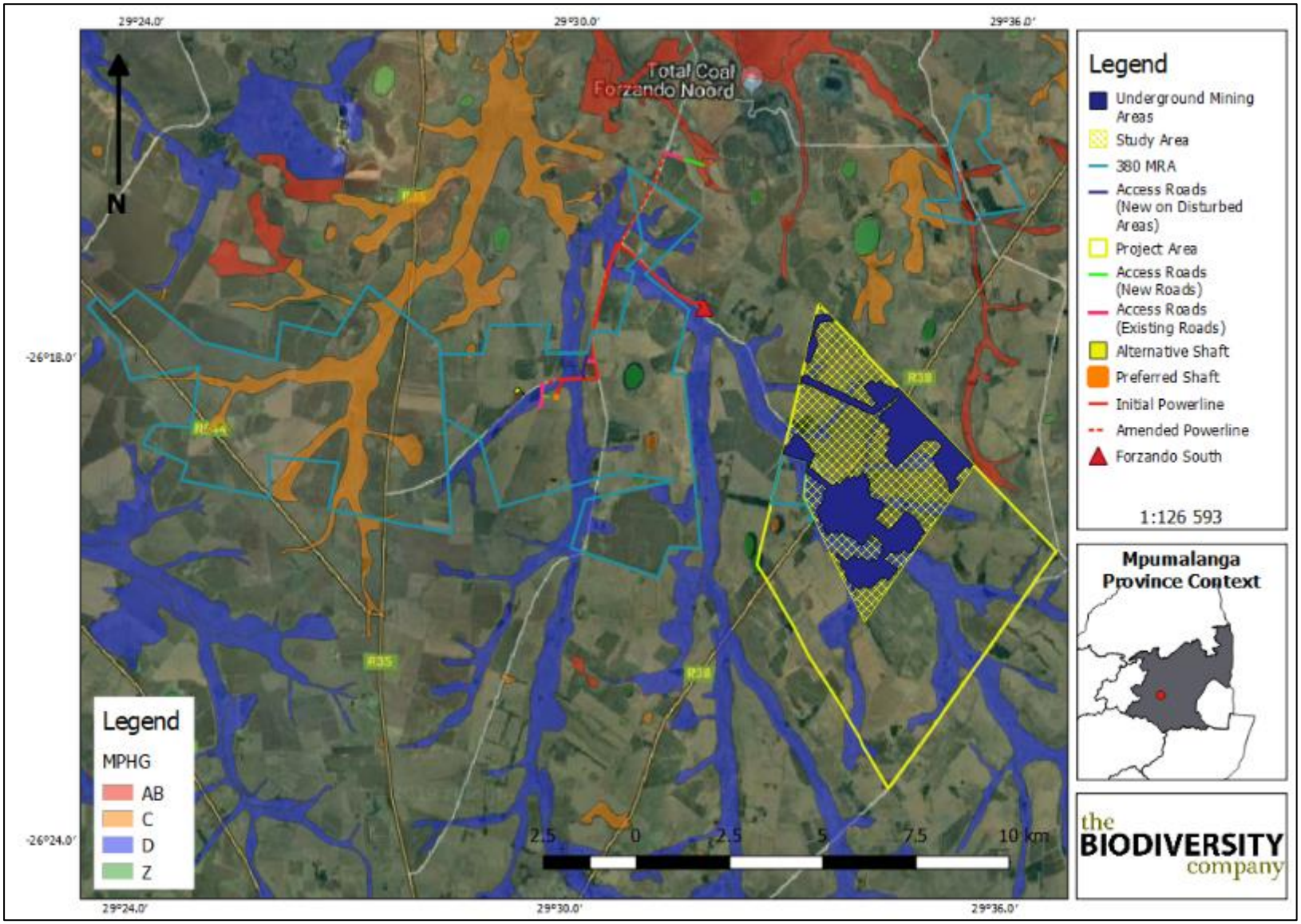

Figure 11: Shows the overall project area in relation to the Mpumalanga Highveld Wetlands in relation the wetland conditions

8.9 Important Bird & Biodiversity Areas (IBA)

Important Bird & Biodiversity Areas (IBAs) are the sites of international significance for the conservation of the world's birds and other nature as identified by BirdLife International. These sites are also all Key Biodiversity Areas; sites that contribute significantly to the global persistence of biodiversity (Birdlife, 2017).

According to Birdlife International (2017), the selection of Important Bird and Biodiversity Areas (IBAs) is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge of the sizes and trends of bird populations. The criteria ensure that the sites selected as IBAs have true significance for the international conservation of bird populations and provide a common currency that all IBAs adhere to, thus creating consistency among, and enabling comparability between, sites at national, continental and global levels.

The Kalabasfontein project area is bisected by the Amersfoort-Bethal-Carolina IBA (Figure 12). This IBA was established in 2014 due to the presence of a number of species of conservation concern. The IBA is bounded by the main roads connecting Ermelo, Amersfoort, Bethal, Hendrina and Carolina, this area consists mostly of flat to undulating farmland. In the patches of natural vegetation remaining in this agricultural sea there are important elements of Mesic Highveld Grassland growing on black vertic clays. This highly fragmented grassland holds several streams and pans. Rocky slopes, gullies and ravines favour the development of thicket, while secondary forest occasionally develops in the deeper, fire-protected gullies.

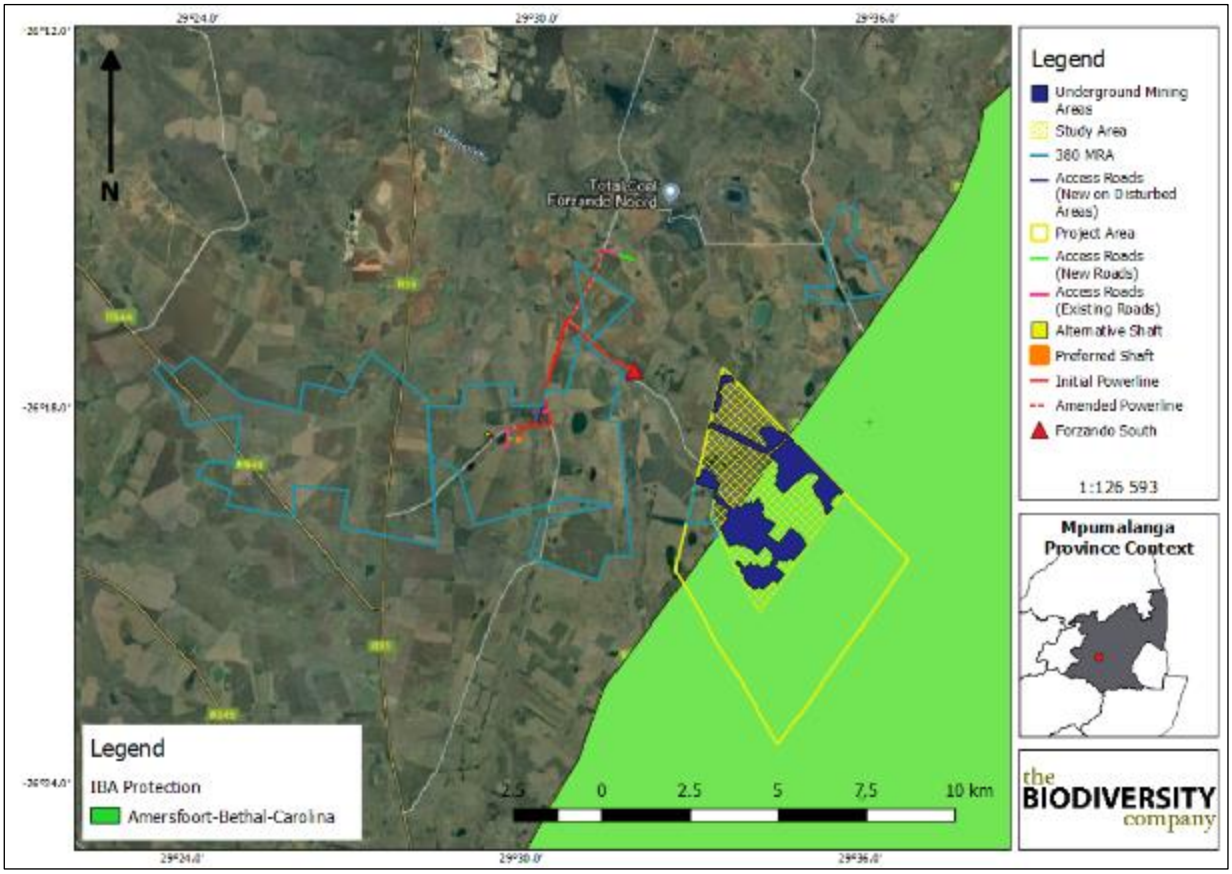

Figure 12: Proximity of the Kalabasfontein project area to the Amersfoort-Bethal-Carolina Important Bird and Biodiversity Area

Amersfoort-Bethal-Carolina IBA was declared for its importance in supporting globally threatened bird species. The key species within this IBA is the globally threatened Botha's Lark with this IBA holding more than 10% of the total global population of this species. Other globally threatened species are Blue Crane Anthropoides paradiseus, Southern Bald Ibis, Black Harrier, Blue Korhaan, Black-winged Pratincole, Secretarybird, Martial Eagle and Denham's Bustard. Regionally threatened species are African Grass Owl, White-bellied Korhaan and Lanner Falcon. Biome- and range-restricted species are Botha's Lark, Kurrichane Thrush and Buff-streaked Chat.

Based on the initial desktop analysis there appears to be extensive habitat within the proposed project area that may be important for some of these bird species. Even semi-disturbed areas can provide suitable foraging areas for many of the species that occur within and adjacent to this IBA.

8.10 The Mining and Biodiversity Guidelines

The Mining and Biodiversity Guidelines (2013) was developed by the Department of Mineral Resources, the Chamber of Mines, the South African National Biodiversity Institute and the South African Mining and Biodiversity Forum, with the intention to find a balance between economic growth and environmental sustainability. The Guideline is envisioned as a tool to "foster a strong relationship between biodiversity and mining which will eventually translate into best practice within the mining sector. In identifying biodiversity priority areas which have different levels of risk against mining, the Guideline categorises biodiversity priority areas into four categories of biodiversity priority areas in relation to their importance from a biodiversity and ecosystem service point of view as well as the implications for mining in these areas:

A) Legally protected areas, where mining is prohibited;

B) Areas of highest biodiversity importance, which are at the highest risk for mining;

C) Areas of high biodiversity importance, which are at a high risk for mining; and

D) Areas of moderate biodiversity importance, which are at a moderate risk for mining.

Table 1 shows the four different categories and the implications for mining within each of these categories.

The Guideline provides a tool to facilitate the sustainable development of South Africa's mineral resources in a way that enables regulators, industry and practitioners to minimise the impact of mining on the country's biodiversity and ecosystem services. It provides the mining sector with a practical, user- friendly manual for integrating biodiversity considerations into the planning processes and managing biodiversity during the operational phases of a mine, from exploration through to closure. The Guideline provides explicit direction in terms of where mining-related impacts are legally prohibited, where biodiversity priority areas may present high risks for mining projects, and where biodiversity may limit the potential for mining.

Overall, proponents of a mining activity in biodiversity priority areas should demonstrate that:

- There is significant cause to undertake mining – by commenting on whether the biodiversity priority area coincides with mineral or petroleum reserves that are strategically in the national interest to exploit. Reference should also be made to whether alternative deposits or reserves exist that could be exploited in areas that are not biodiversity priority areas or are less environmentally sensitive areas.

- Through the process of a rigorous EIA and associated specialist biodiversity studies the impacts of the proposed mining are properly assessed following good practice. It is critical that sufficient time and resources are budgeted to do so early in the planning and impact assessment process, including appointing appropriate team of people with the relevant skills and knowledge as required by legislation.
- Cumulative impacts have been taken into account.
- The mitigation hierarchy has been systematically applied and alternatives have been rigorously considered.
- The issues related to biodiversity priority areas have been incorporated into a robust EMP as the main tool for describing how the mining or prospecting operation's environmental impacts are to be mitigated and managed.
- Good practice environmental management is followed, and monitoring and compliance enforcement is ensured.

According to these guidelines, the proposed Kalabasfontein project area falls within an area which is considered to be 'high risk for mining' and of 'high biodiversity importance' (Figure 13). As can be seen in Table 1 and according to the guidelines, mining options may be limited in these areas, and limitations for mining projects are possible. Furthermore, authorisations may set limits and specify biodiversity offsets that would be written into license agreements and/or authorisation.

Table 1: The mining and biodiversity guidelines categories

Category	Biodiversity priority areas	Risk for mining	Implications for mining
A. Legally protected	• Protected areas (including National Parks, Nature Reserves, World Heritage Sites, Protected Environments, Nature Reserves) Areas declared under Section 49 of the Mineral and Petroleum Resources Development Act (No. 28 of 2002)	**Mining prohibited**	Mining projects cannot commence as mining is legally prohibited. Although mining is prohibited in Protected Areas, it may be allowed in Protected Environments if both the Minister of Mineral Resources and Minister of Environmental Affairs approve it. In cases where mining activities were conducted lawfully in protected areas before Section 48 of the Protected Areas Act (No. 57 of 2003) came into effect, the Minister of Environmental Affairs may, after consulting with the Minister of Mineral Resources, allow such mining activities to continue, subject to prescribed conditions that reduce environmental impacts.
B. Highest biodiversity importance	• Critically endangered and endangered ecosystems • Critical Biodiversity Areas (or equivalent areas) from provincial spatial biodiversity plans • River and wetland Freshwater Ecosystem Priority Areas (FEPAs) and a 1km buffer around these FEPAs • Ramsar Sites	**Highest risk for mining**	Environmental screening, environmental impact assessment (EIA) and their associated specialist studies should focus on confirming the presence and significance of these biodiversity features, and to provide site-specific basis on which to apply the mitigation hierarchy to inform regulatory decision-making for mining, water use licenses, and environmental authorisations. If they are confirmed, the likelihood of a fatal flaw for new mining projects is very high because of the significance of the biodiversity features in these areas and the associated ecosystem services. These areas are viewed as necessary to ensure protection of biodiversity, environmental sustainability, and human well-being. An EIA should include the strategic assessment of optimum, sustainable land use for a particular area and will determine the significance of the impact on biodiversity. This assessment should fully take into account the environmental sensitivity of the area, the overall environmental and socio-economic costs and benefits of mining, as well as the potential strategic importance of the minerals to the country. Authorisations may well not be granted. If granted, the authorisation may set limits on allowed activities and impacts and may specify biodiversity offsets that would be written into license agreements and/or authorisations.
C. High biodiversity importance	• Protected area buffers (including buffers around National Parks, World Heritage Sites* and Nature Reserves) • Transfrontier Conservation Areas (remaining areas outside of formally proclaimed protected areas) • Other identified priorities from provincial spatial biodiversity plans • High water yield areas	**High risk for mining**	These areas are important for conserving biodiversity, for supporting or buffering other biodiversity priority areas, and for maintaining important ecosystem services for particular communities or the country as a whole. An EIA should include an assessment of optimum, sustainable land use for a particular area and will determine the significance of the impact on biodiversity. Mining options may be limited in these areas, and limitations for mining projects are possible. Authorisations may set limits and specify biodiversity offsets that would be written into license agreements and/or authorisations.

	• Coastal Protection Zone • Estuarine functional zone		
D. Moderate biodiversity importance	• Ecological support areas • Vulnerable ecosystems • Focus areas for protected area expansion (land-based and offshore protection)	**Moderate risk for mining**	These areas are of moderate biodiversity value. EIAs and their associated specialist studies should focus on confirming the presence and significance of these biodiversity features, identifying features (e.g. threatened species) not included in the existing datasets, and on providing site-specific information to guide the application of the mitigation hierarchy. Authorisations may set limits and specify biodiversity offsets that would be written into license agreements and/or authorisations.

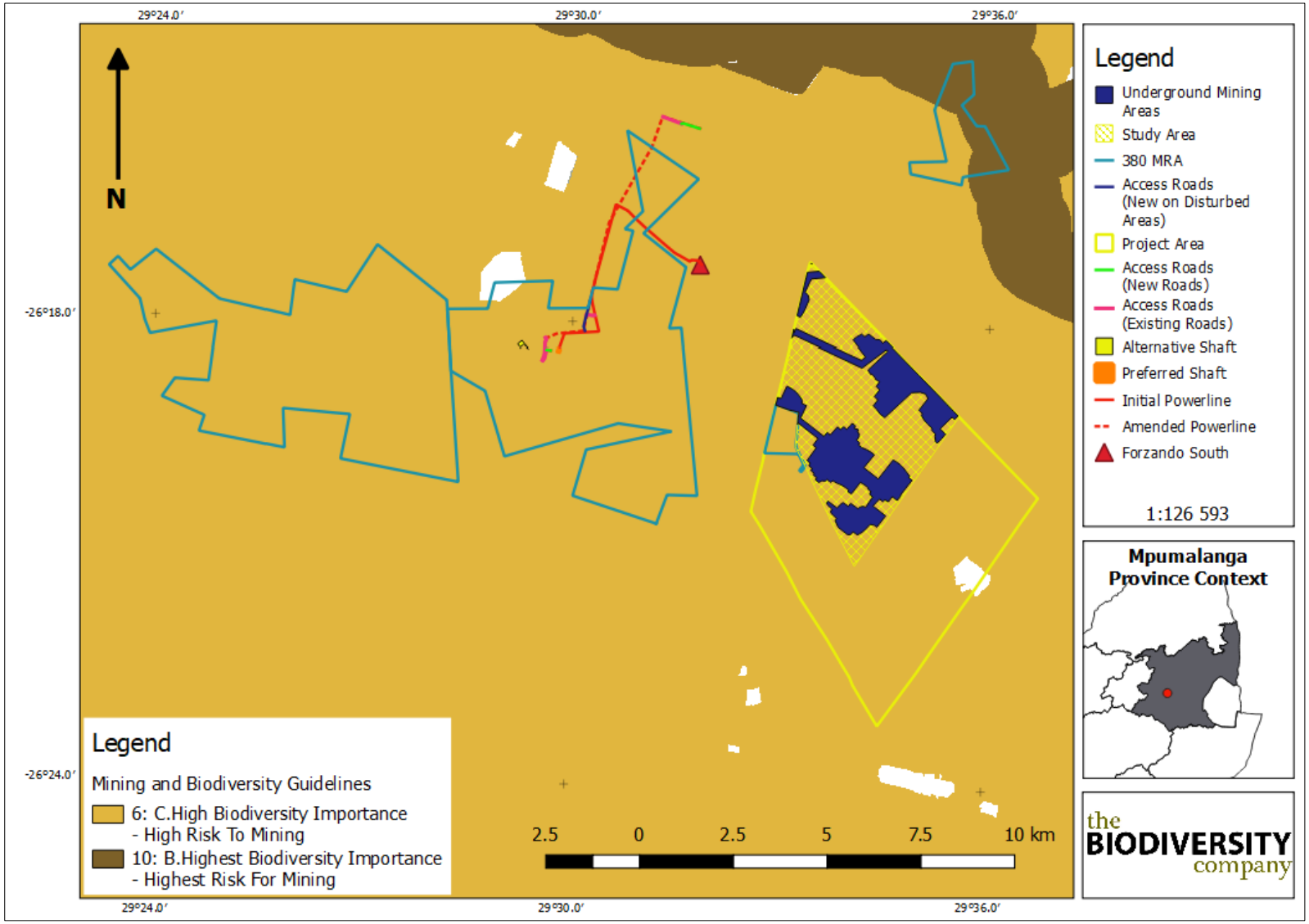

Figure 13: The project area superimposed on the Mining and Biodiversity Guidelines spatial dataset (2013)

8.11 Buffer Assessment

The DWS buffer tool recommends at a desktop level that the required buffer for open cast mining be 180 m. A minimum buffer zone of 175 m is recommended for the wetlands with regards to a mining operation (Macfarlane DM, *et.al,* 2009). These minimum buffer widths (to protect core wetland habitat and aquatic functioning) are calculated based on a simple classification of wetland types and land use categories, broadly grouped as riverine and palustrine systems. Ecological and landscape characteristic are then assessed to establish the need to increase the buffer width, if at all.

The MBSP has been used to identify biodiversity/environmentally sensitive areas (indicated above). In accordance with the National Biodiversity Act, the MBSP translates the FEPAs into freshwater Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs).

- In terms of the MBSP and NFEPA implementation guidelines, no mining should occur within 1 km of any FEPA (CBA) wetland or river.

9 Results & Discussion

9.1 Desktop Assessment

9.1.1 Vegetation Assessment

The Kalabasfontein project area is situated within the grassland biome. This biome is centrally located in southern Africa, and adjoins all except the desert, fynbos and succulent Karoo biomes (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the grassland biome include:

a) Seasonal precipitation; and

b) The minimum temperatures in winter (Mucina & Rutherford, 2006).

The grassland biome is found chiefly on the high central plateau of South Africa, and the inland areas of KwaZulu-Natal and the Eastern Cape. The topography is mainly flat and rolling but includes the escarpment itself. Altitude varies from near sea level to 2 850 m above sea level.

Grasslands are dominated by a single layer of grasses. The amount of cover depends on rainfall and the degree of grazing. The grassland biome experiences summer rainfall and dry winters with frost (and fire), which are unfavourable for tree growth. Thus, trees are typically absent, except in a few localized habitats. Geophytes (bulbs) are often abundant. Frosts, fire and grazing maintain the grass dominance and prevent the establishment of trees.

Vegetation Types

The grassland biome comprises many different vegetation types. The project area is situated within one vegetation type; namely the Eastern Highveld Grassland (GM12) according to Mucina & Rutherford (2006) (Figure 14).

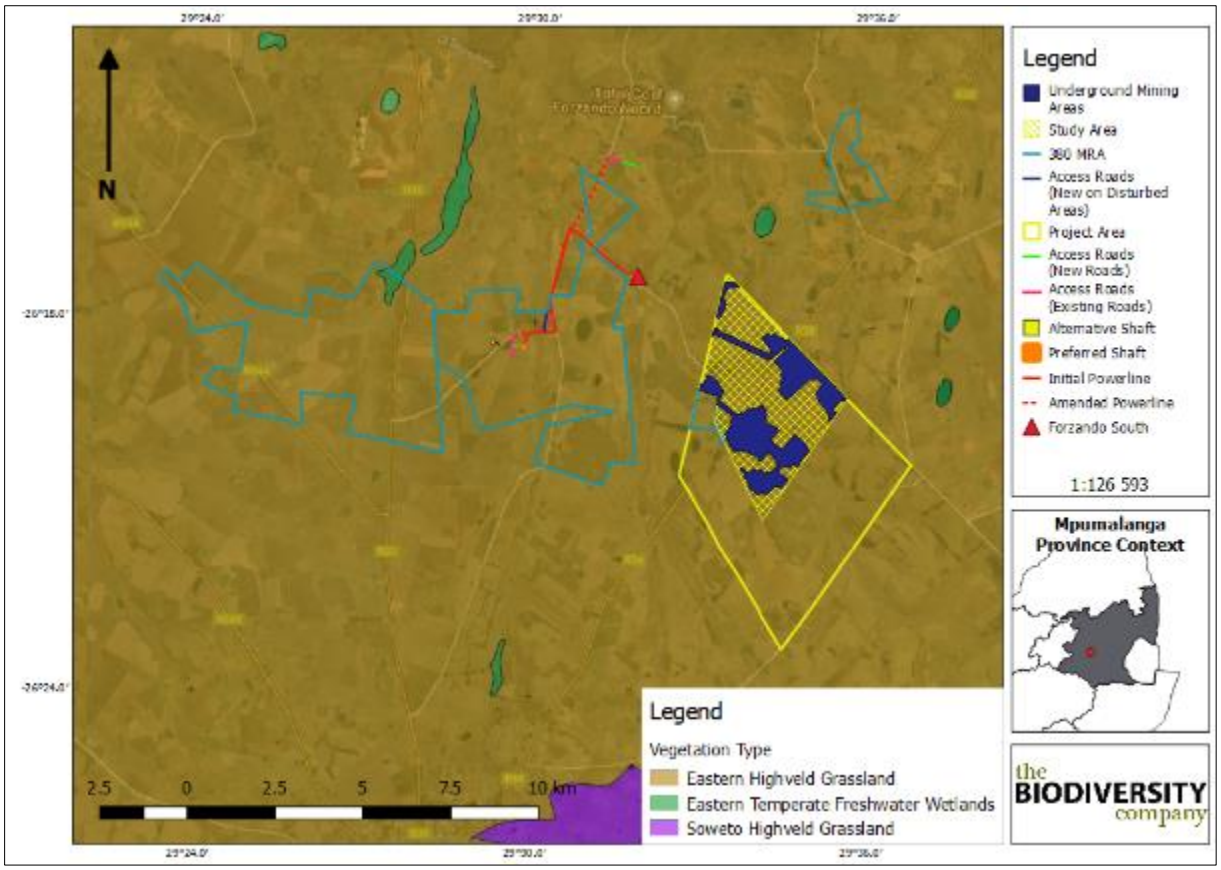

Figure 14: The project area showing the vegetation types based on the Vegetation Map of South Africa, Lesotho & Swaziland (BGIS,2017)

Eastern Highveld Grassland

This vegetation type occurs on slightly to moderately undulating planes, including some low hills and pan depressions. The vegetation is a short dense grass land dominated by the usual highveld grass composition (Aristida, Digitaria, Eragrostis, Themeda, Tristachya etc.) with small scattered rocky outcrops with, wiry sour grasses and some woody species. Some 44% transformed primarily by cultivation, plantations, mines, urbanisation and by building of dams. No serious alien invasions are reported (Mucina & Rutherford, 2006).

The following species are important in the **Eastern Highveld Grassland** vegetation type:

Graminoids: *Aristida aequiglumis, A. congesta, A. junciformis subsp. Galpinii, 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 ceresiiforme, Setaria sphacelata, Sporobolus africanus, S. pectinatus, Themeda triandra, Trachypogon spicatus, Tristachya leucothrix, T. rehmanni, Alloteropsis semialata subsp. eckloniana, Andropogon appendiculatus, A schirensis, Bewsia biflora, Ctenium concinnum, Diheteropogon amplectens, Eragrostis capensis, E. gummiflua, E. patentissima, Harpochloa falx, Panicum natalense, Rendlia altera, Schizachyrium sanguineum, Setaria nigrirostris, Urelytrum agropyroides;*

Herbs: *Berkheya setifera, Haplocarpha scaposa, Justicia anagalloides, Acalypha angusta, Chamaecrista mimosoides, Dicoma anomala, Euryops gilfillanii, E. transvalensis subsp. setilobus, Helichrysum aureonitens, H caespititium, H. callicomum, H. oreophilum, H.*

caespititium, H. oreophilum, H rugulosum, ipomoea crassipes, Pentanisia prunelloides subsp. latifolia, Selago densiflora, Senecio coronatus, Vernonia oligocephala, Wahlenbergia undulata;

Geophytic herbs: *Gladiolus crassifolius, Haemanthus humilis subsp. hirsutus, Hypoxis rigidula var. pilosissima, Ledebouria ovatifolia;*

Succulent herb: *Aloe ecklonis*; and

Low shrubs: *Anthospermum rigidum subsp. pumilum, Stoebe plumosa.*

Conservation Status

According to Mucina & Rutherford (2006), this vegetation type is classified as Endangered. The national target for conservation protection for both these vegetation types is 24%, but only a few patches are statutorily conserved in Nooitgedacht Dam and Jericho Dam Nature Reserves and in private reserves (Holkranse, Kransbank, Morgenstond).

Some 44% of this vegetation type has already been transformed primarily by cultivation, plantations, mines, urbanisation and by building of dams. Cultivation may have had a more extensive impact, indicated by land-cover data. No serious alien invasions are reported, but *Acacia mearnsii* can become dominant in disturbed sites.

Plant Species of Conservation Concern

Based on the Plants of Southern Africa (BODATSA-POSA, 2016) database, 445 plant species are expected to occur in the area (Figure 15).

Of the 455-plant species, four (4) species are listed as being Species of Conservation Concern (SCC) (Table 2).

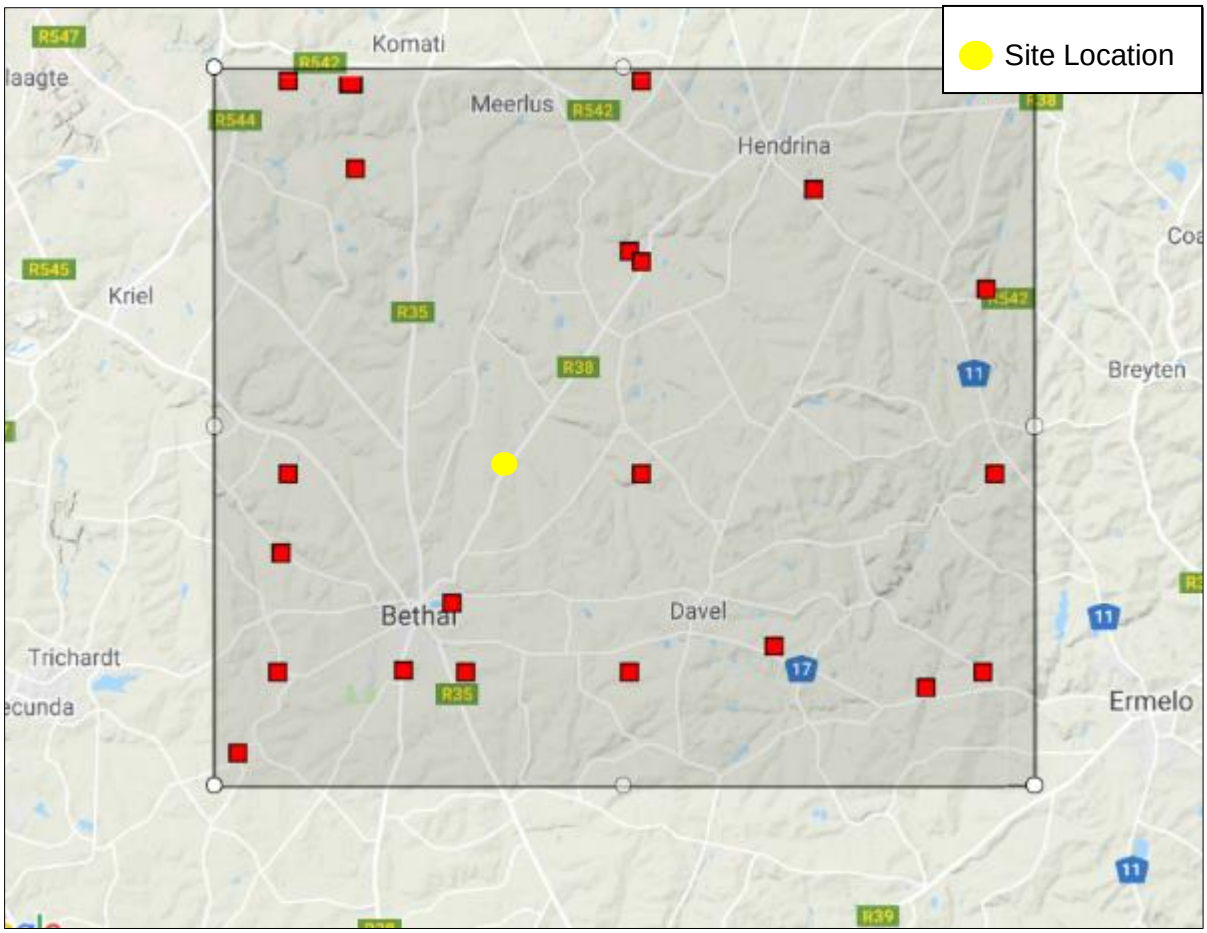

Figure 15: Map showing the grid drawn in order to compile an expected species list (BODATSA-POSA, 2016)

Table 2: Plant Species of Conservation Concern (SCC) expected to occur in the project area (BODATSA-POSA, 2016)

Family	Taxon	Author	IUCN status	Status	Likelihood of Occurrence
Iridaceae	*Gladiolus paludosus*	Baker	VU	Indigenous	Moderate
Iridaceae	*Gladiolus robertsoniae*	F.Bolus	NT	Indigenous; Endemic	Moderate
Asphodelaceae	*Kniphofia typhoides*	Codd	NT	Indigenous; Endemic	Moderate
Amaryllidaceae	*Nerine gracilis*	R.A.Dyer	VU	Indigenous; Endemic	Moderate

Although care was taken to traverse as much of the suitable habitat during the fieldwork in search for these SCC, the effort failed to record most of these species. The fieldwork did however, reveal the disturbed nature of most of the habitats on the project area, largely due to overgrazing.

Based on the field observations, the likelihood of occurrence of any of the Red and Orange List plant species outlined in Table 2 is moderate and repeated field surveys throughout the phenological cycles of these plant SCC may yield observations of this species within the project

area. However, two (2) plant species which are protected in terms of the Mpumalanga Nature Conservation Act, 1998 (No. 10 of 1998) were recorded and are shown in Table 3.

Table 3: Recorded Mpumalanga Protected plant species for the project area

Family	Taxon	Mpumalanga Schedule 11
Amaryllidaceae	*Crinum bulbispermum (Burm.f.) Milne-Redh. & Schweick.*	Yes
Amaryllidaceae	*Cyrtanthus tuckii Baker var. transvaalensis I.Verd*	Yes

9.1.2 Faunal Assessment

Avifauna

Based on the South African Bird Atlas Project, Version 2 (SABAP2) database and records from the Animal Demography Unit (2018), 239 bird species are expected to occur in the vicinity of the project area (pentads 2615_2925; 2615_2930; 2615_2935; 2620_2925; 2620_2930; 2620_2935; 2625_2925; 2625_2930; 2625_2935). The full list of potential bird species is provided in Appendix B.

Of the expected bird species, twenty-three (23) species (9.1%) are listed as SCC either on a regional (21) or global scale (13) (Table 4).

The SCC include the following:

- Five (5) species that are listed as Endangered (EN) on a regional basis;
- Five (5) species that are listed as Vulnerable (VU) on a regional basis; and
- Eleven (11) species that are listed as Near Threatened (NT) on a regional basis;

On a global scale, one (1) species is listed as EN, five (5) species are listed as VU and ten (10) species as NT (Table 4).

Table 4: List of bird species of regional or global conservation importance that are expected to occur in pentads 2615_2850, 2615_2855, 2615_2900, 2620_2850, 2620_2855, 2620_2855, 2625_2850, 2625_2855, 2625_2900 (SABAP2, 2018, ESKOM, 2014; IUCN, 2018)

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2018)	
Alcedo semitorquata	Kingfisher, Half-collared	NT	LC	Moderate
Anthropoides paradiseus	Crane, Blue	NT	VU	High
Balearica regulorum	Crane, Grey Crowned	EN	EN	High
Calidris ferruginea	Sandpiper, Curlew	LC	NT	High
Ciconia abdimii	Stork, Abdim's	NT	LC	High
Ciconia nigra	Stork, Black	VU	LC	High
Circus macrourus	Harrier, Pallid	NT	NT	Moderate

Circus maurus	Harrier, Black	EN	VU	Moderate
Coracias garrulus	Roller, European	NT	LC	High
Ephippiorhynchus senegalensis	Stork, Saddle-billed	EN	LC	Moderate
Eupodotis caerulescens	Korhaan, Blue	LC	NT	High
Falco biarmicus	Falcon, Lanner	VU	LC	High
Falco vespertinus	Falcon, Red-footed	NT	NT	High
Geronticus calvus	Ibis, Southern Bald	VU	VU	High
Glareola nordmanni	Pratincole, Black-winged	NT	NT	High
Mycteria ibis	Stork, Yellow-billed	EN	LC	Moderate
Oxyura maccoa	Duck, Maccoa	NT	NT	Moderate
Phoeniconaias minor	Flamingo, Lesser	NT	NT	High
Phoenicopterus ruber	Flamingo, Greater	NT	LC	High
Polemaetus bellicosus	Eagle, Martial	EN	VU	Moderate
Rostratula benghalensis	Painted-snipe, Greater	NT	LC	High
Sagittarius serpentarius	Secretarybird	VU	VU	High
Tyto capensis	Grass-owl, African	VU	LC	High

Alcedo semitorquata (Half-collared Kingfisher) is listed as Near Threatened (NT) on a regional scale and occurs across a large range. This species generally prefers narrow rivers, streams, and estuaries with dense vegetation onshore, but it may also move into coastal lagoons and lakes. It mainly feeds on fish (IUCN, 2017). The possibility of occurrence is rated as moderate due to the fact that there are many large farm dams and natural wetlands in the project area, and there are various river systems throughout, both of which could provide suitable habitat for this species.

Anthropoides paradiseus (Blue Crane) is listed as Near Threatened (NT) on a regional scale. The species is near-endemic to South Africa and although populations have increased in the south and south-western Western Cape and KwaZulu-Natal Provinces, the national population has decreased by half since the 1970s, with dramatic declines in many former strongholds (IUCN, 2017). Grey Crowned Cranes are listed as Endangered (EN) and there are records of this species occurring in the nearby IBA. Populations of all three-crane species in South Africa have declined, largely owing to direct poisoning, power-line collisions and loss of their grassland breeding habitats owing to afforestation, mining, agriculture and development (IUCN, 2017). These species breed in natural grass and sedge-dominated habitats, preferring secluded grasslands at high elevations where the vegetation is thick and short. Based on the presence of extensive suitable habitat, especially open grasslands and wetlands, existing records of these species in the area, as well as the proximity of maize fields in which these species often forage, the likelihood of occurrence was rated as high for both species.

Calidris ferruginea (Curlew Sandpiper) is migratory species which breeds on slightly elevated areas in the lowlands of the high Arctic and may be seen in parts of South Africa during winter. During winter, the species occurs at the coast, but also inland on the muddy edges of marshes, large rivers and lakes (both saline and freshwater), irrigated land, flooded areas, dams and saltpans (IUCN, 2017). Due to the presence of many of these habitat types within the project area the likelihood of occurrence of this species was rated as high.

Ciconia abdimii (Abdim's Stork) is listed as NT on a local scale and the species is known to be found in open grassland and savanna woodland often near water but also in semi-arid areas, gathering beside pools and water-holes. They tend to roost in trees or cliffs (IUCN, 2017). The existence of multiple wet areas and open grasslands creates the potential for this species to occur in the area and the likelihood of occurrence was rated as high.

Circus macrourus (Pallid Harrier) is listed as NT on a regional and global scale, and overwinters in semi-desert, scrub, savanna and wetlands. The species is migratory, with most birds wintering in sub-Saharan Africa or south-east Asia (IUCN, 2017). The species is most likely only to use the project area as a migratory route or a temporary overwintering location from August to May and as such the likelihood of occurrence is moderate.

Circus maurus (Black Harrier) is listed as Endangered (EN) on a local basis and is restricted to southern Africa, where it is mainly found in the fynbos and Karoo of the Western and Eastern Cape. It is also found in the grasslands of Free State, Lesotho and KwaZulu-Natal. Harriers breed close to coastal and upland marshes, damp sites, near vleis or streams with tall shrubs or reeds. South-facing slopes are preferred in mountain areas where temperatures are cooler, and vegetation is taller (IUCN, 2017). During the non-breeding season, they will also be found in dry grassland areas further north and they also visit coastal river floodplains in Namibia. Due to the presence of some suitable habitat in the project area but the lack of any true mountainous areas, the likelihood of occurrence is rated as moderate.

Circus ranivorus (African Marsh Harrier) is listed as EN in South Africa (ESKOM, 2014). This species has an extremely large distributional range in sub-equatorial Africa. South African populations of this species are declining due to the degradation of wetland habitats, loss of habitat through over-grazing and human disturbance and possibly, poisoning owing to over-use of pesticides (IUCN, 2017). This species breeds in wetlands and forages primarily over reeds and lake margins. There are extensive wetlands and marsh areas within the project area and the occurrence of *C. ranivorus* in the project area is therefore considered to be high.

Coracias garrulous (European Roller) is a winter migrant from most of South-central Europe and Asia occurring throughout sub-Saharan Africa (IUCN, 2017). The European Roller has a preference for bushy plains and dry savannah areas (IUCN, 2017). There is a moderate chance of this species occurring in the project area as they prefer to forage in bushy savanna areas.

Eupodotis caerulescens (Blue Korhaan) is Near-endemic to South Africa, occurring from the Limpopo Province and adjacent provinces, south through Swaziland to KwaZulu-Natal and the Eastern Cape (Hockey et al, 2005). It generally prefers tall, dense sour or mixed grassland, either open or lightly wooded, occasionally moving into cultivated or burnt land, which are present in the project area thus likelihood of occurrence was rated as high.

Falco biarmicus (Lanner Falcon) is native to South Africa and inhabits a wide variety of habitats, from lowland deserts to forested mountains (IUCN, 2017). They may occur in groups up to 20 individuals but have also been observed solitary. Their diet is mainly composed of small birds such as pigeons and francolins. The likelihood of occurrence for this species in the project area is rated as high due to the presence of good habitat for this species and the presence of many bird species on which Lanner Falcons may predate.

Falco vespertinus (Red-footed Falcon) is known to breed from eastern Europe and northern Asia to north-western China, heading south in the non-breeding season to southern Angola and southern Africa. Within southern Africa it is locally uncommon to common in Botswana, northern

Namibia, central Zimbabwe and the area in and around Gauteng, South Africa (Hockey et al, 2005). The habitat it generally prefers is open areas with scattered trees, such as open grassy woodland, wetlands, forest fringes and croplands. Many of these habitats are present in the project area and thus the likelihood of occurrence is rated as high.

Glareola nordmanni (Black-winged Pratincole) is a migratory species which is listed as NT both globally and regionally. This species has a very large range, breeding mostly in Europe and Russia, before migrating to southern Africa. Overall population declines of approximately 20% for this species are suspected (IUCN, 2017). This species generally occurs near water and damp meadows, or marshes overgrown with dense grass. Due to its migratory nature, this species will only be present in South Africa for a few months during the year and will not breed locally. There is a large amount of suitable habitat within the project area and adjacent to it for this species and as such the likelihood of occurrence is rated as moderate.

Geronticus calvus (Southern Bald Ibis) is listed as Vulnerable (VU) on a regional basis and prefers high rainfall (>700 mm p.a.), sour and alpine grasslands, with an absence of trees and a short, dense grass sward and also occurs in lightly wooded and relatively arid country. It forages on recently burned ground, also using unburnt natural grassland, cultivated pastures, reaped maize fields and ploughed areas. It has a varied diet, mainly consisting of insects and other terrestrial invertebrates (IUCN, 2017). It has high nesting success on safe, undisturbed cliffs. The likelihood of the species foraging within the project area is high due to plentiful suitable habitat. The likelihood of occurrence is rated as high.

Mycteria ibis (Yellow-billed Stork) is listed as EN on a regional scale and Least Concern (LC) on a global scale. This species is migratory and has a large distributional range which includes much of sub-Saharan Africa. It is typically associated with freshwater ecosystems, especially wetlands and the margins of lakes and dams (IUCN, 2017). The presence of extensive water bodies within the project area creates a high possibility that this species may occur there.

Neotis denhami (Denhams Bustard) is listed as VU on a regional scale and NT on a global scale. It occurs in flat, arid, mostly open country such as grassland, Karoo, bushveld, thornveld, scrubland and savanna but also including modified habitats such as wheat fields and firebreaks Collisions with power lines may be a significant threat in parts of the range, particularly South Africa (IUCN, 2007). The habitat at the project area does provide suitable habitat for this species and therefore it's likelihood of occurrence is rated as high.

Oxyura maccoa (Maccoa Duck) has a large northern and southern range, South Africa is part of its southern distribution. During the species' breeding season, it inhabits small temporary and permanent inland freshwater lakes, preferring those that are shallow and nutrient-rich with extensive emergent vegetation such as reeds (*Phragmites spp*.) and cattails (*Typha spp*.) on which it relies for nesting (IUCN, 2017). The likelihood of occurrence of this species in the project area was rated as high due to the wetland systems present as well as some vegetated dams which this species prefers.

Phoeniconaias minor (Lesser Flamingo) is listed as NT on a global and regional scale whereas *Phoenicopterus roseus* (Greater Flamingo) is listed as NT on a regional scale only. Both species have similar habitat requirements and the species breed on large undisturbed alkaline and saline lakes, salt pans or coastal lagoons, usually far out from the shore after seasonal rains have provided the flooding necessary to isolate remote breeding sites from terrestrial predators and the soft muddy material for nest building (IUCN, 2017). Due to the presence of its preferred

habitat within the project area, combined with previous occurrence records, the likelihood of occurrence is high for both species.

Sagittarius serpentarius (Secretarybird) occurs in sub-Saharan Africa and inhabits grasslands, open plains, and lightly wooded savanna. It is also found in agricultural areas and sub-desert (IUCN, 2017). The likelihood of occurrence is rated as high due to the extensive grasslands and wetland areas present in the project area, as well as the agricultural areas present in which this species may forage.

Tyto capensis (African Grass-owl) is rated as Vulnerable (VU) on a regional basis. The distribution of the species includes the eastern parts of South Africa. The species is generally solitary, but it does also occur in pairs, in moist grasslands where it roosts (IUCN, 2017). The species prefers thick grasses around wetlands and rivers which are present in the project area. Furthermore, this species specifically has a preference for nesting in dense stands of the grass species *Imperata cylindrica*. Extensive areas of this grass species are evident within the project area and as such the likelihood of occurrence is rated as high.

Mammals

The IUCN Red List Spatial Data (IUCN, 2017) lists 84 mammal species that could be expected to occur within the project area (Appendix C). Of these species, 12 are medium to large conservation dependant species, such as *Ceratotherium simum* (Southern White Rhinoceros) and *Tragelaphus oryx* (Common Eland) that, in South Africa, are generally restricted to protected areas such as game reserves. These species are not expected to occur in the project area and are removed from the expected SCC list. They are however still included (highlighted in red) in Appendix C.

Of the remaining 72 small to medium sized mammal species, fourteen (14) (15.8%) are listed as being of conservation concern on a regional or global basis (Table 5).

The list of potential species includes:

- Two (2) that are listed as Endangered (EN) on a regional basis;
- Five (5) that are listed as Vulnerable (VU) on a regional basis; and
- Seven (7) that are listed as Near Threatened (NT) on a regional scale (Table 5).

On a global scale, one (1) species is listed as EN, two (2) are listed as VU and four (4) as NT (Table 5).

Table 5: List of mammal species of conservation concern that may occur in the project area as well as their global and regional conservation statuses (IUCN, 2017; SANBI, 2016)

Species	Common name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Aonyx capensis	Cape Clawless Otter	NT	NT
Atelerix frontalis	South Africa Hedgehog	NT	LC
Cloeotis percivali	Short-eared Trident Bat	EN	LC
Crocidura mariquensis	Swamp Musk Shrew	NT	LC
Felis nigripes	Black-footed Cat	VU	VU
Leptailurus serval	Serval	NT	LC

Panthera pardus	Leopard	VU	VU
Parahyaena brunnea	Brown Hyaena	NT	NT
Pelea capreolus	Grey Rhebok	NT	LC
Poecilogale albinucha	African Striped Weasel	NT	LC
Redunca fulvorufula	Mountain Reedbuck	EN	LC
Smutsia temminckii	Temminck's Ground Pangolin	VU	VU

Aonyx capensis (Cape Clawless Otter) is the most widely distributed otter species in Africa (IUCN, 2017). This species is predominantly aquatic, and it is seldom found far from water. Based on the presence of various perennial streams within the project area and various dams, the likelihood of occurrence of this species occurring in the project area is considered to be high.

Atelerix frontalis (South African Hedgehog) has a tolerance of a degree of habitat modification and occurs in a wide variety of semi-arid and sub-temperate habitats (IUCN, 2017). Based on the Red List of Mammals of South Africa, Lesotho and Swaziland (2016), *A. frontalis* populations are decreasing due to the threats of electrocution, veld fires, road collisions, predation from domestic pets and illegal harvesting. Although the species is cryptic and therefore not often seen, there is suitable habitat in the project area the likelihood of occurrence is rated as moderate.

Crocidura maquassiensis (Makwassie Musk Shrew) has very specific habitat requirements. It occurs in close proximity to open water with a distinct preference for marshy ponds, and riverine and semi-aquatic vegetation such as reed beds (IUCN, 2017). It is considered to be common in suitable habitats. Based on the proximity of rivers and various wetlands the likelihood of occurrence of this species was rated as moderate within the project area.

Felis nigripes (Black-footed cat) is endemic to the arid regions of southern Africa. This species is naturally rare, has cryptic colouring is small in size and is nocturnal. These factors have contributed to a lack of information on this species. Given that the highest densities of this species have been recorded in the more arid Karoo region of South Africa, the habitat in the project area can be considered to be sub-optimal for the species and the likelihood of occurrence is rated as moderate.

Leptailurus serval (Serval) occurs widely through sub-Saharan Africa and is commonly recorded from most major national parks and reserves (IUCN, 2017). The Serval's status outside reserves is not certain, but they are inconspicuous and may be common in suitable habitat as they are tolerant of farming practices provided there is cover and food available. In sub-Saharan Africa, they are found in habitat with well-watered savanna long-grass environments and are particularly associated with reedbeds and other riparian vegetation types. Due to the presence of various grassland and wetland areas in the project area the likelihood of occurrence for this species within the project area is rated as high.

Mystromys albicaudatus (White-tailed Rat) is listed as Vulnerable (VU) on a regional basis and Endangered (EN) on a global scale. It is relatively widespread across South Africa and Lesotho; the species is known to occur in shrubland and grassland areas. A major requirement of the species is black loam soils with good vegetation cover. Although the vegetation type is suitable, no black loam seems to be present on site, therefore the likelihood of occurrence of this species is rated as moderate.

Ourebia ourebi (Oribi) has a patchy distribution throughout Africa and is known to occur in South Africa. Populations are becoming more fragmented as it is gradually eliminated from moderately to densely settled areas (IUCN, 2017). Although suitable habitat exists within the project area, the likelihood of occurrence is rated as moderate due to the relatively small size of the patches of natural vegetation that remain within the project area.

Panthera pardus (Leopard) has a wide distributional range across Africa and Asia, but populations have become reduced and isolated, and they are now extirpated from large portions of their historic range (IUCN, 2017). Impacts that have contributed to the decline in populations of this species include continued persecution by farmers, habitat fragmentation, increased illegal wildlife trade, excessive harvesting for ceremonial use of skins, prey base declines and poorly managed trophy hunting (IUCN, 2017). Although known to occur and persist outside of formally protected areas, the densities in these areas are considered to be low and the likelihood of occurrence in an area in close proximity to various agricultural activities in the area, and where they are likely to be persecuted, is regarded as moderate.

Pelea capreolus (Grey Rhebok) is endemic to a small region in southern Africa, inhabiting montane and plateau grasslands of South Africa, Swaziland, and Lesotho. In South Africa, their distribution is irregular and patchy, and they no longer occur north of the Orange River in the Northern Cape, or in parts of the North-West Province (IUCN, 2017). Grey Rhebok can be found in suitable habitat which has rocky hills, grassy mountain slopes, and montane and plateau grasslands in southern Africa. They are predominantly browsers, and largely water independent, obtaining most of their water requirements from their food. Based on the lack of their favoured habitat within the project area, the likelihood of occurrence of this species is rated as moderate.

Herpetofauna (Reptiles & Amphibians)

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the ReptileMap database provided by the Animal Demography Unit (ADU, 2018) 39 reptile species are expected to occur in the project area (Appendix D). Of the expected reptile species, only one (1) is regarded as a SCC, namely *Crocodylus niloticus* (Nile Crocodile) which is listed as Near Threatened (NT) regionally (Table 6). Although this species is listed as expected to occur in the project area, the lack of very large water bodies or rivers which this species requires, as well as the lack of recent records for the surrounding area, suggest that the likelihood of occurrence is low (Table 6).

Table 6: List of reptile species of conservation concern that may occur in the project area as well as their global and regional conservation statuses (IUCN, 2017; Bates et al., 2014)

Species	Common name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
Crocodylus niloticus	Nile Crocodile	VU	LC	Low

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the AmphibianMap database provided by the Animal Demography Unit (ADU, 2018) 25 amphibian species are expected to occur in the project area (Appendix E). One (1) amphibian species of conservation concern (*Pyxicephalus adspersus* – Giant Bullfrog) may occur in the project area according to the above-mentioned sources (Table 7).

Table 7: List of amphibian species of conservation concern that may occur in the project area as well as their global and regional conservation statuses (IUCN, 2017; Bates et al., 2014)

Species	Common name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
Pyxicephalus adspersus	Giant Bullfrog	NT	LC	Low

The Giant Bull Frog (*Pyxicephalus adspersus*) is a species of conservation concern that will possibly occur in the project area. The Giant Bull Frog is listed as near threatened on a regional scale. It is a species of drier savannahs. It is fossorial for most of the year, remaining buried in cocoons. They emerge at the start of the rains, and breed in shallow, temporary waters in pools, pans and ditches (IUCN, 2017).

10 Field Survey

The field survey for the Kalabasfontein project (flora and fauna (mammals, avifauna, amphibians and reptiles)) was conducted from the 2nd – 5th October 2018 by terrestrial ecologists. During the surveys the floral and faunal communities in the project area were assessed. The project area was ground-truthed on foot, which included spot checks in pre-selected areas to validate desktop data. Photographs were recorded during the site visits and some are provided under the Results section in this report. All site photographs are available on request.

Field survey results from a previous scoping report (EIMS, 2018) and EIA (GCS, 2010) were considered. Relevant and important results from these reports are included in this section of the report.

10.1 Site Coverage

The wet season fieldwork was conducted at the beginning of the wet season for the *Mesic Highveld Grassland.* The project area had however received limited rainfall and as such identification of floral species was severely limited. The species recorded to date can by no means be regarded as comprehensive and successive surveys across entire seasons and phenological cycles will greatly supplement the baseline data gathered to date. The wet season site coverage by the specialists, as evaluated from their GPS tracks, is shown in Figure 16.

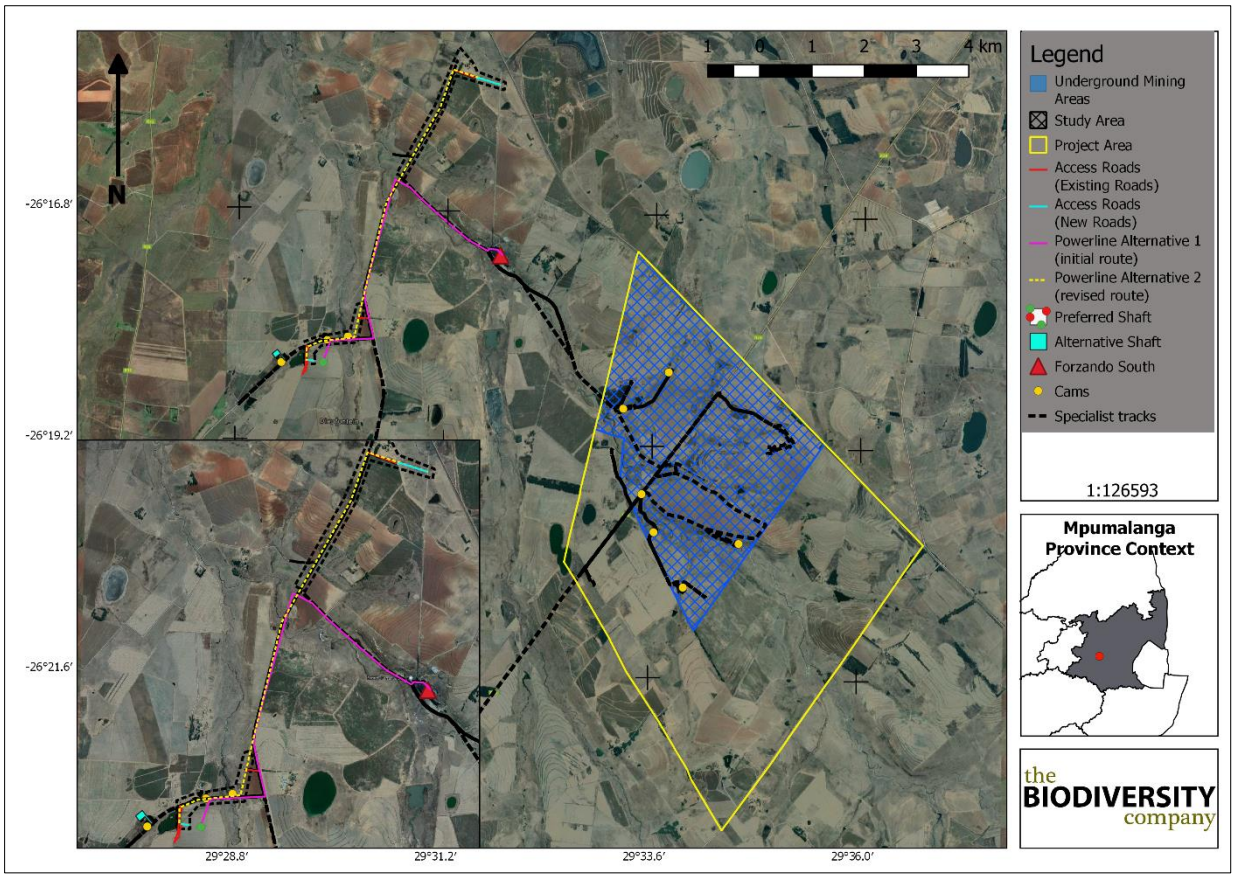

Figure 16: Specialist site coverage for the wet season fieldwork across the project area

10.2 **Vegetation Assessment**

The main habitat types identified across the project area were initially delineated largely based on aerial imagery. These main habitat types were refined based on the field coverage and data collected during the survey (Figure 17 and Figure 18). Emphasis was placed on limiting timed meander searches within the natural habitats and therefore habitats with a higher potential of hosting SCC. Timed meander searches were therefore limited to the Rocky grasslands and Riparian and Moist Grassland. The remaining habitats were surveyed briefly, and time was mostly spent looking for obvious variation and/or areas of interest within these habitats. Each of the habitats identified are discussed in the sub-sections below.

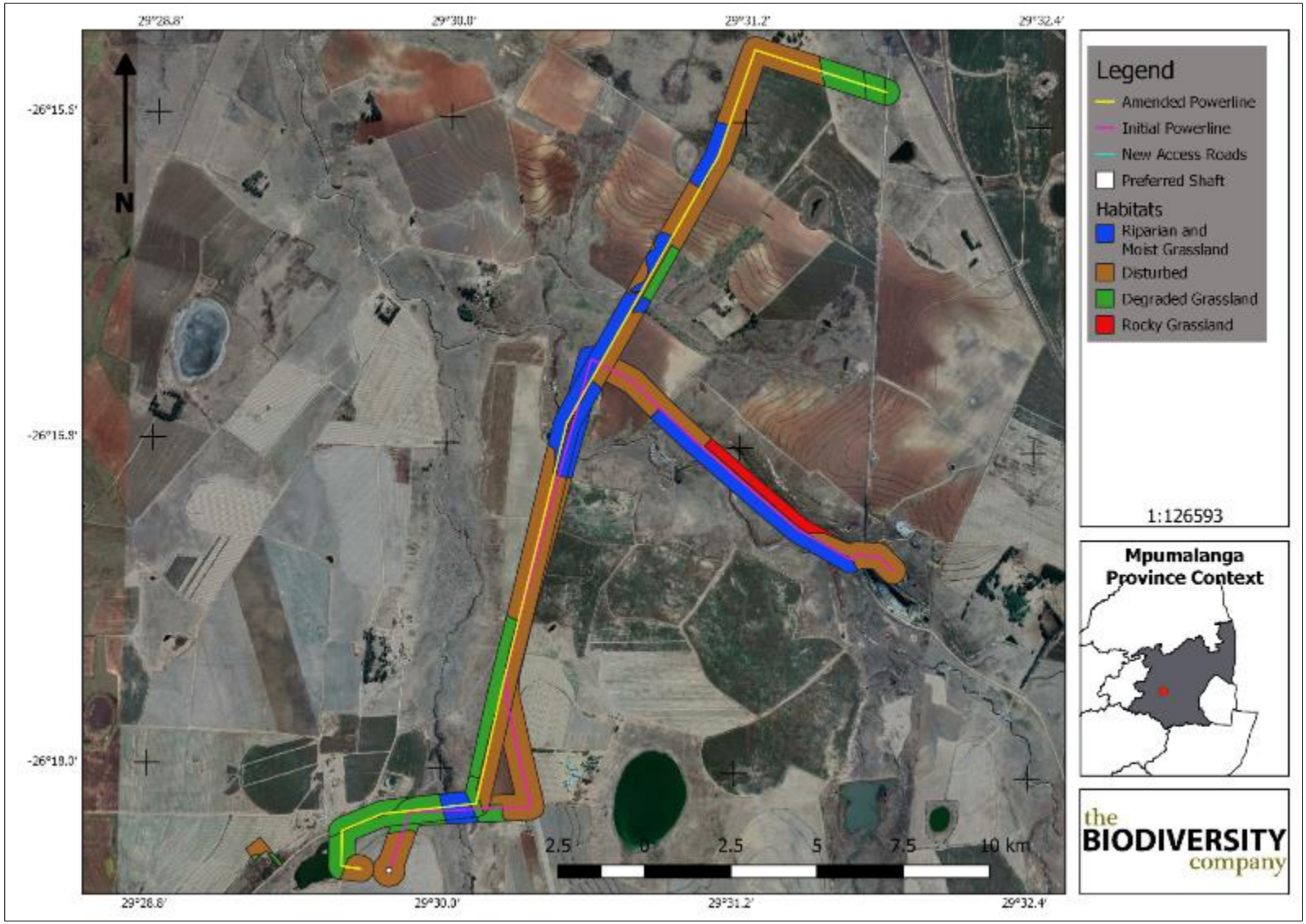

Figure 17: Habitat map for the Kalabasfontein proposed shafts and powerlines area

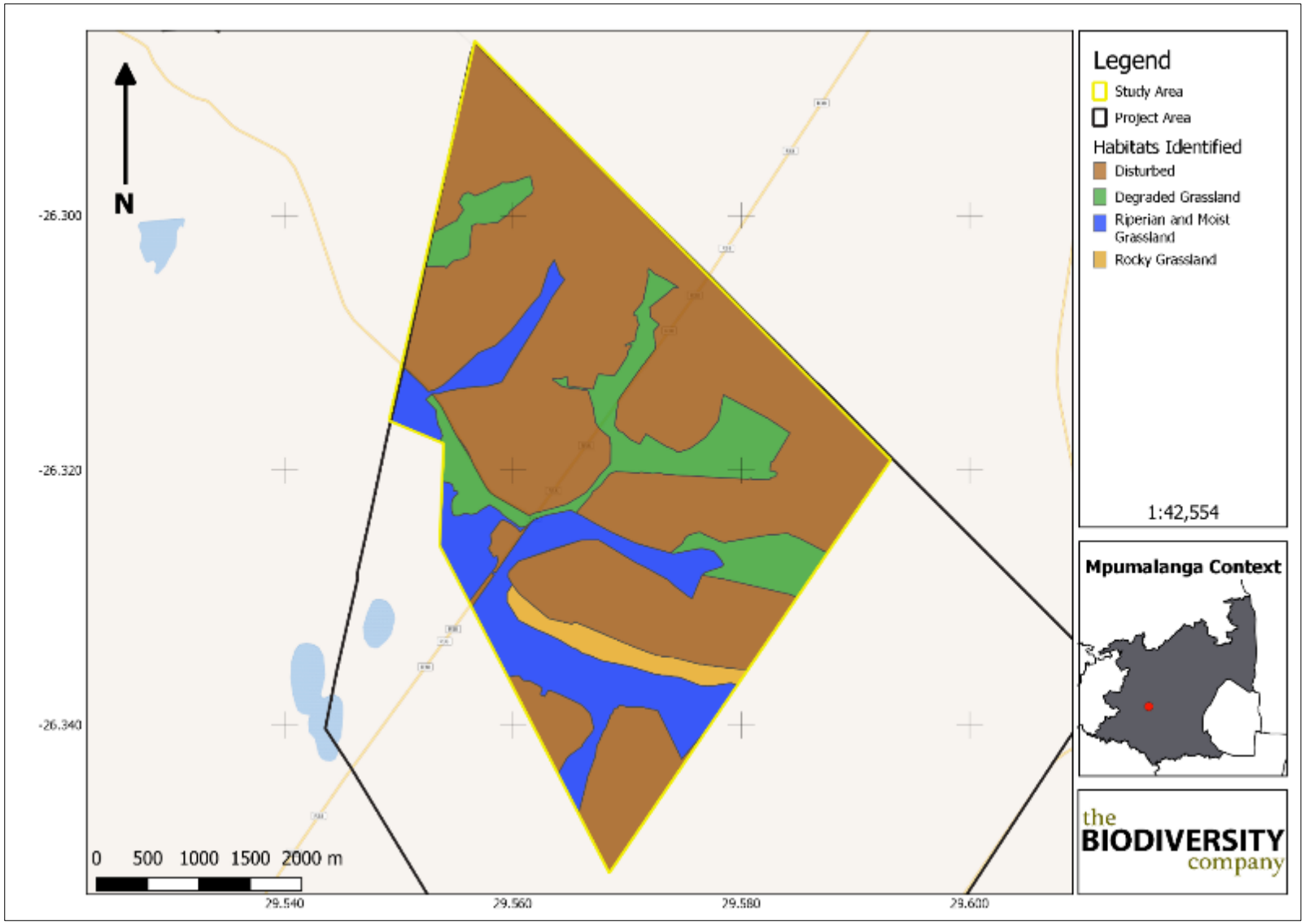

Figure 18: Habitat map for the Kalabasfontein project area

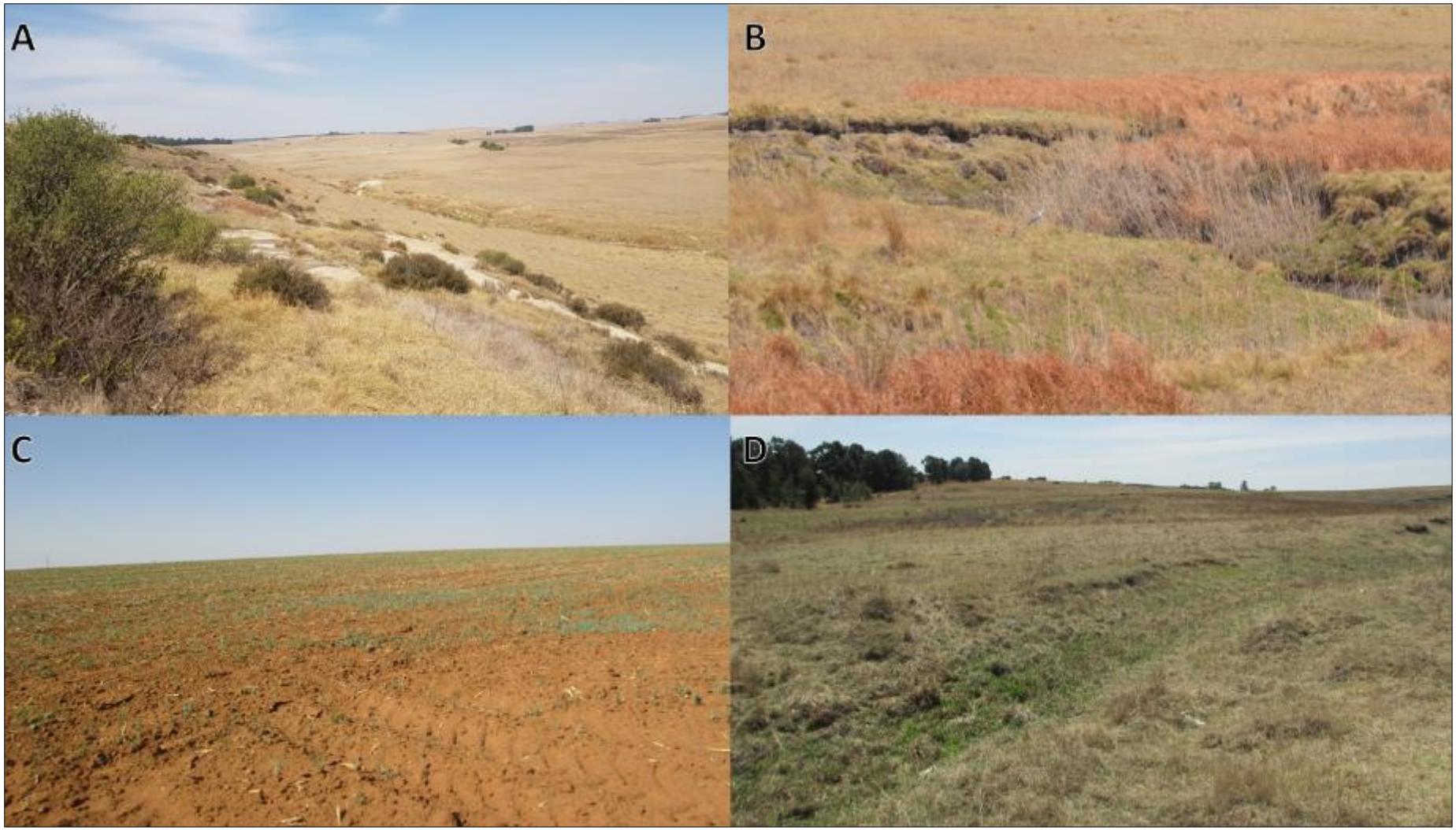

Figure 19: Photographs of the main habitat types identified: A) Rocky Grassland; B) Riparian and Moist Grassland; C) Disturbed; and D) Degraded Grassland

10.2.1 Rocky Grassland

This habitat unit includes inconspicuous rocky ridges interspersed with grassy and rocky slopes. This habitat type is regarded as intact grassland and therefore natural, but slightly disturbed due to grazing by livestock. Although care was taken to cover as much of this habitat during the timed meanders, none of the expected IUCN listed species were recorded within this habitat. This could be attributed to the phenological season of the sampling where these plants may have been dormant but is more likely due to the disturbance of this habitat due to grazing during the fieldwork. Despite this and due to its limited distribution in the landscape, this habitat is regarded as having a high sensitivity.

10.2.2 Degraded Grassland

The condition of these grassland's ranges from heavily disturbed (largely due to overgrazing) to semi-natural grassland. This habitat type is regarded as largely natural but disturbed primary grassland. This habitat is not limited in the landscape and is also linked to the aquatic habitats (i.e. wetlands and open water) found within the project area.

Although care was taken to cover as much of this habitat during the timed meander. Taking the ecosystem services of this habitat and its association with the aquatic habitats within the project area into account, this habitat is regarded as having a moderate sensitivity.

10.2.3 Disturbed

This habitat unit represents all areas of commercial agriculture farms and existing urban infrastructure and includes houses, barns, feedlots, camps, roads etc. Due to the transformed nature of this habitat, it is regarded as having a low sensitivity.

10.2.4 Riparian and Moist Grassland

This habitat unit represents the river and wetland areas with the adjacent moist grassland that it is connected to. This habitat type is regarded as intact grassland and therefore natural, but slightly disturbed due to grazing by livestock. Although care was taken to cover as much of this habitat during the timed meanders, none of the expected IUCN listed species were recorded within this habitat. This could be attributed to the phenological season of the sampling where these plants may have been dormant but is more likely due to the disturbance of this habitat due to grazing during the fieldwork. Despite this and due to its limited distribution in the landscape, this habitat is regarded as having a high sensitivity.

10.3 Floristic Analysis

As mentioned, the timed meander method is a highly efficient method for conducting floristic analysis specifically in detecting plant SCC and maximising floristic coverage. A total of 52 plant species were recorded during fieldwork (Table 8). Meanders were limited to the *Riparian* and *Moist grassland* and *Rocky Grassland* habitats as these appeared to have the highest potential to contain SCC (desktop habitat assessment and the judgement of the ecologists). In addition, timed meander searches were especially targeted where these habitats occur within the proposed infrastructure areas. In addition to the targeted timed meander searches, random meanders were conducted across the project area and spot observations of plant species not recorded during the targeted timed meanders were recorded *ad hoc*.

The list of plant species recorded to date is therefore by no means comprehensive, and repeated surveys during phenological periods not covered, may likely yield up to 40% additional flora species for the project area. However, floristic analysis conducted to date is however regarded as a sound representation of the local flora for the project area.

Table 8: Trees, shrubs and weeds recorded at the proposed project area.

Species	Threat status (SANBI, 2017)	SA Endemic	Alien Category
Agave americana			**Not Indigenous; Naturalised**
Aloe sp			
Argemone mexicana			**NEMBA Category 1b**
Aristida congesta subsp *barbicollis*	LC	No	
Berkheya pinnatifida	LC	Yes	
Bidens pilosa			**Not Indigenous; Naturalised**
Cirsium vulgare			**NEMBA Category 1b**
Conyza bonariensis			**Not Indigenous; Naturalised**
*Crinum bulbispermum**	LC	No	
Cymbopogon nardus	LC	No	
Cynodon dactylon			**NEMBA Category 2**
*Cyrtanthus tuckii**	LC	Yes	
Datura stramonium			**NEMBA Category 1b**
Dicoma anomala	LC	No	
Diospyros lycioides	LC	No	
Eragrostis curvula/chloromelas	LC	No	
Eragrostis lehmanniana	LC	No	
Erythrina zeyheri	LC	No	
Eucalyptus sp			**NEMBA Category 1b**
Euphorbia striata	LC	No	
Felicia muricata	LC	No	
Gazania krebsiana	LC	No	
Gomphocarpus fruticosus	LC	No	
Helichrysum rugulosum	LC	No	
Hermannia depressa	LC	No	
Homeria pallida	LC	No	
Hyparrhenia hirta	LC	No	
Hypoxis hemerocallidea	LC	No	

Imperata cylindrica	LC	No	
Lasiosiphon triplinervis	LC	Yes	
Ledebouria ovatifolia	LC	Yes	
Melinis repens	LC	No	
Monopsis decipiens	LC	No	
Moraea sp			
Nemesia fruticans	LC	No	
Paspalum dilatatum	LC	No	
Pennisetum clandestinum			**NEMBA Category 1b**
Phragmites australis	LC	No	
Populus alba			**NEMBA Category 2**
Pyracantha angustifolia			**NEMBA Category 1b**
Robinia pseudoacacia			**NEMBA Category 1b**
Salix mucronata	LC	No	
Schkuhria pinnata			**Not Indigenous; Naturalised**
Searsia pyroides	LC	No	
Searsia rigida	LC	Yes	
Solanum sisymbriifolium			**NEMBA Category 1b**
Sporobolus africanus	LC	No	
Stoebe plumosa	LC	No	
Tagetes minuta			**Not Indigenous; Naturalised**
Themeda triandra	LC	No	
Typha capensis	LC	No	
Verbena bonariensis			**NEMBA Category 1b**

Protected in Mpumalanga

10.3.1 Alien and Invasive Plants

Declared weeds and invader plant species have the tendency to dominate or replace the canopy or herbaceous layer of natural ecosystems, thereby transforming the structure, composition and function of these systems. Therefore, it is important that these plants are controlled and eradicated by means of an eradication and monitoring programme. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species.

The National Environmental Management: Biodiversity Act (NEMBA) is the most recent legislation pertaining to alien invasive plant species. In August 2014, the list of Alien Invasive Species was published in terms of the National Environmental Management: Biodiversity Act

(Act 10 of 2004) (Government Gazette No 78 of 2014). The Alien and Invasive Species Regulations were published in the Government Gazette No. 37886, 1 August 2014, and was amended in February 2018 in the Government Gazette No. 41445. The legislation calls for the removal and / or control of alien invasive plant species (Category 1 species). In addition, unless authorised thereto in terms of the National Water Act, 1998 (Act No. 36 of 1998), no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse.

Below is a brief explanation of the three categories in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA):

- Category 1a: Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
- Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.
- Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.
- Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

Note that according to the regulations, a person who has under his or her control a category 1b listed invasive species must immediately:

- Notify the competent authority in writing
- Take steps to manage the listed invasive species in compliance with:
    - Section 75 of the Act;
    - The relevant invasive species management programme developed in terms of regulation 4; and
    - Any directive issued in terms of section 73(3) of the Act.

Nine (9) alien and/or invasive plants were recorded during the field survey within the project area. It is recommended that an Alien Plant Species Management Plan be implemented.

10.4 Faunal Assessment

The faunal assessment was completed based on the desktop review and intensive biodiversity surveys which were conducted across the project area. Faunal surveys were conducted based on the following methodologies:

- Camera trapping;
- Active searching;
- Audio sampling for amphibians;
- Point count surveys; and
- Sherman-trap sampling for small mammals.

10.4.1 Avifauna

A total of sixty-eight (68) bird species were recorded in the project area during the October 2018 surveys based on either direct observations, or the presence of visual tracks & signs (Table 9) (Figure 20). A further thirty-nine (39) species are included that were recorded during previous field surveys (GCS, 2010).

One bird SCC was recorded during the survey, namely Secretarybird (*Sagittarius serpentarius*) during the October 2018 survey. Eight (8) SCC were recorded during previous field surveys (GCS, 2010) and are shown in Table 9.

Table 9: A list of avifaunal species recorded for the project area (species highlighted in red are bird SCC recorded)

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Acridotheres tristis	Myna, Common	Unlisted	LC
Acrocephalus arundinaceus	Reed-warbler, Great	Unlisted	LC
Acrocephalus baeticatus	Reed-warbler, African	Unlisted	Unlisted
Alcedo cristata	Kingfisher, Malachite	Unlisted	Unlisted
Alopochen aegyptiacus	Goose, Egyptian	Unlisted	LC
Anas erythrorhyncha	Teal, Red-billed	Unlisted	LC
Anas platyrhynchos	Duck, Mallard	Unlisted	LC
Anas undulata	Duck, Yellow-billed	Unlisted	LC
Anhinga rufa	Darter, African	Unlisted	LC
Anthus cinnamomeus	Pipit, African	Unlisted	LC
Apus caffer	Swift, White-rumped	Unlisted	LC
Ardea cinerea	Heron, Grey	Unlisted	LC
Ardea melanocephala	Heron, Black-headed	Unlisted	LC
Ardea purpurea	Heron, Purple	Unlisted	LC
Asio capensis	Owl, Marsh	Unlisted	LC
Bostrychia hagedash	Ibis, Hadeda	Unlisted	LC
Bubulcus ibis	Egret, Cattle	Unlisted	LC
Burhinus capensis	Thick-knee, Spotted	Unlisted	LC

Calandrella cinerea	Lark, Red-capped	Unlisted	LC
Calendulauda sabota	Lark, Sabota	Unlisted	LC
Cisticola chiniana	Cisticola, Rattling	Unlisted	LC
Cisticola chiniana	Cisticola, Rattling	Unlisted	LC
Cisticola lais	Cisticola, Wailing	Unlisted	LC
Cisticola tinniens	Cisticola, Levaillant's	Unlisted	LC
Columba livia	Dove, Rock	Unlisted	LC
Cossypha caffra	Robin-chat, Cape	Unlisted	LC
Elanus caeruleus	Kite, Black-shouldered	Unlisted	LC
Estrilda astrild	Waxbill, Common	Unlisted	LC
Euplectes progne	Widowbird, Long-tailed	Unlisted	LC
Fulica cristata	Coot, Red-knobbed	Unlisted	LC
Gallinula chloropus	Moorhen, Common	Unlisted	LC
Hirundo cucullata	Swallow, Greater Striped	Unlisted	LC
Hirundo spilodera	Cliff-swallow, South African	Unlisted	LC
Lanius collaris	Fiscal, Common (Southern)	Unlisted	LC
Macronyx capensis	Longclaw, Cape	Unlisted	LC
Motacilla aguimp	Wagtail, African Pied	Unlisted	LC
Motacilla capensis	Wagtail, Cape	Unlisted	LC
Myrmecocichla formicivora	Chat, Anteating	Unlisted	LC
Numida meleagris	Guineafowl, Helmeted	Unlisted	LC
Oenanthe monticola	Wheatear, Mountain	Unlisted	LC
Oenanthe pileata	Wheatear, Capped	Unlisted	LC
Passer domesticus	Sparrow, House	Unlisted	LC
Passer melanurus	Sparrow, Cape	Unlisted	LC
Petronia superciliaris	Petronia, Yellow-throated	Unlisted	LC
Phalacrocorax africanus	Cormorant, Reed	Unlisted	LC
Phalacrocorax carbo	Cormorant, White-breasted	LC	LC
Platalea alba	Spoonbill, African	Unlisted	LC
Plectropterus gambensis	Goose, Spur-winged	Unlisted	LC
Ploceus capensis	Weaver, Cape	Unlisted	LC
Ploceus velatus	Southern Masked-weaver, Southern	Unlisted	LC
Pternistis swainsonii	Spurfowl, Swainson's	Unlisted	LC
Quelea quelea	Quelea, Red-billed	Unlisted	LC
Sagittarius serpentarius	Secretarybird	VU	VU
Saxicola torquatus	Stonechat, African	Unlisted	LC
Scleroptila afra	Francolin, Grey-winged	Unlisted	LC
Spreo bicolor	Starling, Pied	Unlisted	LC
Streptopelia capicola	Turtle-dove, Cape	Unlisted	LC
Streptopelia semitorquata	Dove, Red-eyed	Unlisted	LC
Streptopelia senegalensis	Dove, Laughing	Unlisted	LC
Tachybaptus ruficollis	Grebe, Little	Unlisted	LC
Thalassornis leuconotus	Duck, White-backed	Unlisted	LC
Threskiornis aethiopicus	Ibis, African Sacred	Unlisted	LC
Turdus olivaceus	Thrush, Olive	Unlisted	LC

Vanellus armatus	Lapwing, Blacksmith	Unlisted	LC
Vanellus coronatus	Lapwing, Crowned	Unlisted	LC
Vanellus senegallus	Lapwing, African Wattled	Unlisted	LC
Vidua macroura	Whydah, Pin-tailed	Unlisted	LC
GCS (2010)			
Anas hottentota	Teal, Hottentot	Unlisted	LC
Anas smithii	Shoveler, Cape	Unlisted	LC
Anthropoides paradiseus	Crane, Blue	NT	VU
Anthus cinnamomeus	Pipit, African	Unlisted	LC
Anthus lineiventris	Pipit, Striped	Unlisted	LC
Apus caffer	Swift, White-rumped	Unlisted	LC
Apus horus	Swift, Horus	Unlisted	LC
Bugeranus carunculatus	Crane, Wattled	CR	VU
Buteo buteo	Buzzard, Common (Steppe)	Unlisted	LC
Ceryle rudis	Kingfisher, Pied	Unlisted	LC
Chlidonias hybrida	Tern, Whiskered	Unlisted	LC
Ciconia ciconia	Stork, White	Unlisted	LC
Circus ranivorus	Marsh-harrier, African	EN	LC
Cisticola juncidis	Cisticola, Zitting	Unlisted	LC
Crithagra atrogularis	Canary, Black-throated	Unlisted	LC
Egretta garzetta	Egret, Little	Unlisted	LC
Egretta intermedia	Egret, Yellow-billed	Unlisted	LC
Euplectes afer	Bishop, Yellow-crowned	Unlisted	LC
Euplectes albonotatus	Widowbird, White-winged	Unlisted	LC
Euplectes axillaris	Widowbird, Fan-tailed	Unlisted	LC
Euplectes progne	Widowbird, Long-tailed	Unlisted	LC
Eupodotis senegalensis	Korhaan, White-bellied	VU	LC
Falco naumanni	Kestrel, Lesser	Unlisted	LC
Geronticus calvus	Ibis, Southern Bald	VU	VU
Hirundo albigularis	Swallow, White-throated	Unlisted	LC
Hirundo cucullata	Swallow, Greater Striped	Unlisted	LC
Hirundo rustica	Swallow, Barn	Unlisted	LC
Hirundo spilodera	Cliff-swallow, South African	Unlisted	LC
Lanius collaris	Fiscal, Common (Southern)	Unlisted	LC
Phalacrocorax africanus	Cormorant, Reed	Unlisted	LC
Phalacrocorax lucidus	Cormorant, White-breasted	Unlisted	LC
Plegadis falcinellus	Ibis, Glossy	Unlisted	LC
Podiceps cristatus	Grebe, Great Crested	Unlisted	LC
Polemaetus bellicosus	Eagle, Martial	EN	VU
Riparia cincta	Martin, Banded	Unlisted	LC
Riparia paludicola	Martin, Brown-throated	Unlisted	LC
Scopus umbretta	Hamerkop	Unlisted	LC
Spizocorys fringillaris	Lark, Botha's	EN	EN
Tringa glareola	Sandpiper, Wood	Unlisted	LC
Tyto capensis	Grass-owl, African	VU	LC

Figure 20: Some of the avifaunal species recorded during the survey: A) Marsh Owl (Asio capensis), B) Malachite Kingfisher (Alcedo cristata), C) Spotted Thick-knee (Burhinus capensis), D) Blacksmith Lapwing (Vanellus armatus), E) Secretary bird (Sagittarius serpentarius), F) Red-knobbed Coot (Fulica cristata), G) Black-headed Heron (Ardea melanocephala), H) Cattle Egret (Bubulcus ibis), I) African Stone Chat (Saxicola torquatus), J) Red-billed Teal (Anas erythrorhyncha), K) Spur-winged Goose (Plectropterus gambensis) and L) Common Moorhen (Gallinula chloropus)

10.4.2 Mammals

Overall, mammal diversity in the project area was moderate to high, with fifteen (15) mammal species being recorded during the October 2018 surveys based on either direct observation, camera trap photographs or the presence of visual tracks & signs (Table 10). Results from previous studies (GCS, 2010) are included in Table 10.

Table 10: Mammal species recorded in the Kalabasfontein project area during the October 2018 surveys

Species	Common name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Aonyx capensis	Cape Clawless Otter	NT	NT
Atelerix frontalis	South Africa Hedgehog	NT	LC
Atilax paludinosus	Water Mongoose	LC	LC
Canis mesomelas	Black-backed Jackal	LC	LC
Cynictis penicillata	Yellow Mongoose	LC	LC
Herpestes sanguineus	Slender Mongoose	LC	LC
Hystrix africaeaustralis	Cape Porcupine	LC	LC
Leptailurus serval	Serval	NT	LC
Lepus saxatilis	Scrub Hare	LC	LC
Neoromicia capensis	Cape Serotine Bat	LC	LC
Otomys angoniensis	Angoni Vlei Rat	LC	LC
Redunca arundinum	Common Reedbuck	LC	LC
Rhabdomys pumilio	Xeric Four-striped Mouse	LC	LC
Suricata suricatta	Suricate	LC	LC
Sylvicapra grimmia	Common Duiker	LC	LC
GCS (2010)			
Chysospalax villosus	Rough-haired Golden Mole	VU	Unlisted
Civettictis civetta	African Civet	LC	LC
Felis silvestris	African Wildcat	LC	LC
Mystromys albicaudatus	White-tailed Rat	VU	EN
Orycteropus afer	Aardvark	LC	LC
Ourebia ourebi	Oribi	EN	LC
Parahyaena brunnea	Brown Hyaena	NT	NT
Poecilogale albinucha	African Striped Weasel	NT	LC
Proteles cristata	Aardwolf	LC	LC

Three (3) mammal SCC were recorded in the project area (Table 10). There appears to be healthy populations of Cape Clawless Otters (*Aonyx capensis*) along the wetland areas and in the dams within the project area and adjacent to it. Some of the observed and captured mammal species can be seen in Figure 21, Figure 22 and Figure 23.

A number of juvenile and sub-adult mammal species were recorded (notably Serval and Jackal), proving that these areas serve as important breeding sites for these species.

Figure 21: Some of the mammal species recorded during the survey: A) Cape Clawless Otter (Aonyx capensis) footprint, B) Water Mongoose (Atilax paludinosus) footprint, C) South African Hedgehog (Atelerix frontalis), D) Yellow Mongoose (Cynictis penicillata), E) Angoni Vlei Rat Otomys angoniensis), F) Common Duiker (Sylvicapra grimmia), G) Cape Porcupine (Hystrix africaeaustralis) quill and H) Suricate (Suricata suricatta)

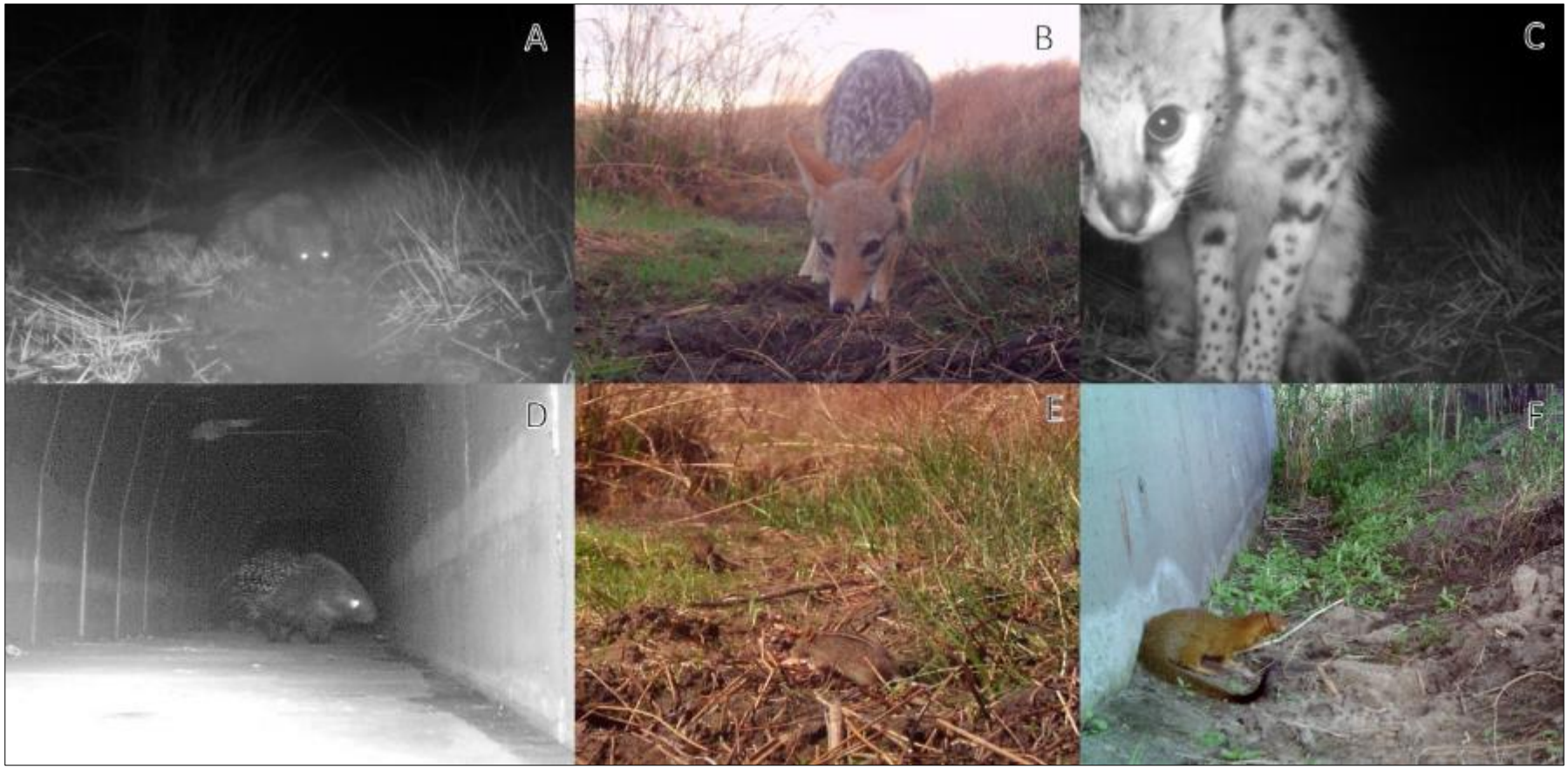

Figure 22: A) Water Mongoose (Atilax paludinosus), B) Black-backed Jackal (Canis mesomelas), C) Serval (Leptailurus serval), D) Cape Porcupine (Hystrix africaeaustralis), E) Xeric Four-striped Mouse (Rhabdomys pumilio) and F) Slender Mongoose (Herpestes sanguineus).

Figure 23: A) Scrub Hare (Lepus saxatilis), B) Serval (Leptailurus serval), C) Cape Clawless Otter (Aonyx capensis), D & F) Black-backed Jackal (Canis mesomelas) and E) Slender Mongoose (Herpestes sanguineus).

10.4.3 Herpetofauna (Reptiles & Amphibians)

Six (6) reptile species were recorded in the project area during the October 2018 surveys (Table 11). One near-endemic and one endemic snake species were recorded in the project area (Figure 24).

Reptile diversity was considered moderate to high in the project area considering the extent of existing agricultural activities which has already transformed some of the natural ecosystems (Figure 24).

Four (4) amphibian species were recorded in the project area during the October 2018 surveys based on visual observations as well as from calls made by various frog species (Figure 24). Due to the surveys being conducted towards the end of the dry season when herpetofaunal activity is low, it is expected that more species should occur in this area, especially considering the extent of the rivers and wet areas.

Table 11: A list of herpetofauna recorded in the Kalabasfontein project area

Species	Common Name	South African Endemic	Conservation Status	
			Regional (Eskom, 2016	Global (IUCN, 2017)
Reptiles				
Hemachatus haemachatus	Rinkhals	**Near-endemic**	LC	**LC**
Homoroselaps lacteus	Spotted Harlequin Snake	**Endemic**	**LC**	**LC**
Leptotyphlops scutifrons conjunctus	Eastern Thread Snake	No	LC	LC
Psammophylax rhombeatus	Spotted Grass Snake	No	LC	LC
Trachylepis punctatissima	Speckled Rock Skink	No	LC	Unlisted
Trachylepis varia	Variable Skink	No	LC	Unlisted
Amphibians				
Ametia quecketti	Common River Frog	No	LC	Unlisted
Sclerophrys gutturalis	Guttural Toad	No	LC	LC
Cacosternum boettgeri	Boettger's Caco	No	LC	LC
Sclerophrys rangeri	Raucous Toad	No	LC	Unlisted

Figure 24: Some of the herpetofauna recorded during the survey: Spotted Grass Snake with eggs (Psammophylax rhombeatus rhombeatus), B) Eastern Thread Snake (Leptotyphlops scutifrons conjunctus), C) Rinkhals (Hemachatus haemachatus) skin, D) Spotted Harlequin Snake (Homoroselaps lacteus) and E) Common Caco (Cacosternum boettgeri)

10.5 **Area Sensitivity**

As per the terms of reference for the project a GIS sensitivity map is required in order to identify sensitive features in terms of the relevant specialist discipline/s within the project area. Site sensitivities shall be classified and mapped in terms of the EIMS sensitivity mapping methodology as provided by EIMS. The sensitivity maps can be seen in Figure 25 and Figure 26.

- No Go Zones = 4
- Highly Sensitive = 3
- Medium Sensitive = 2
- Low Sensitive = 1
- Least Concern = 0

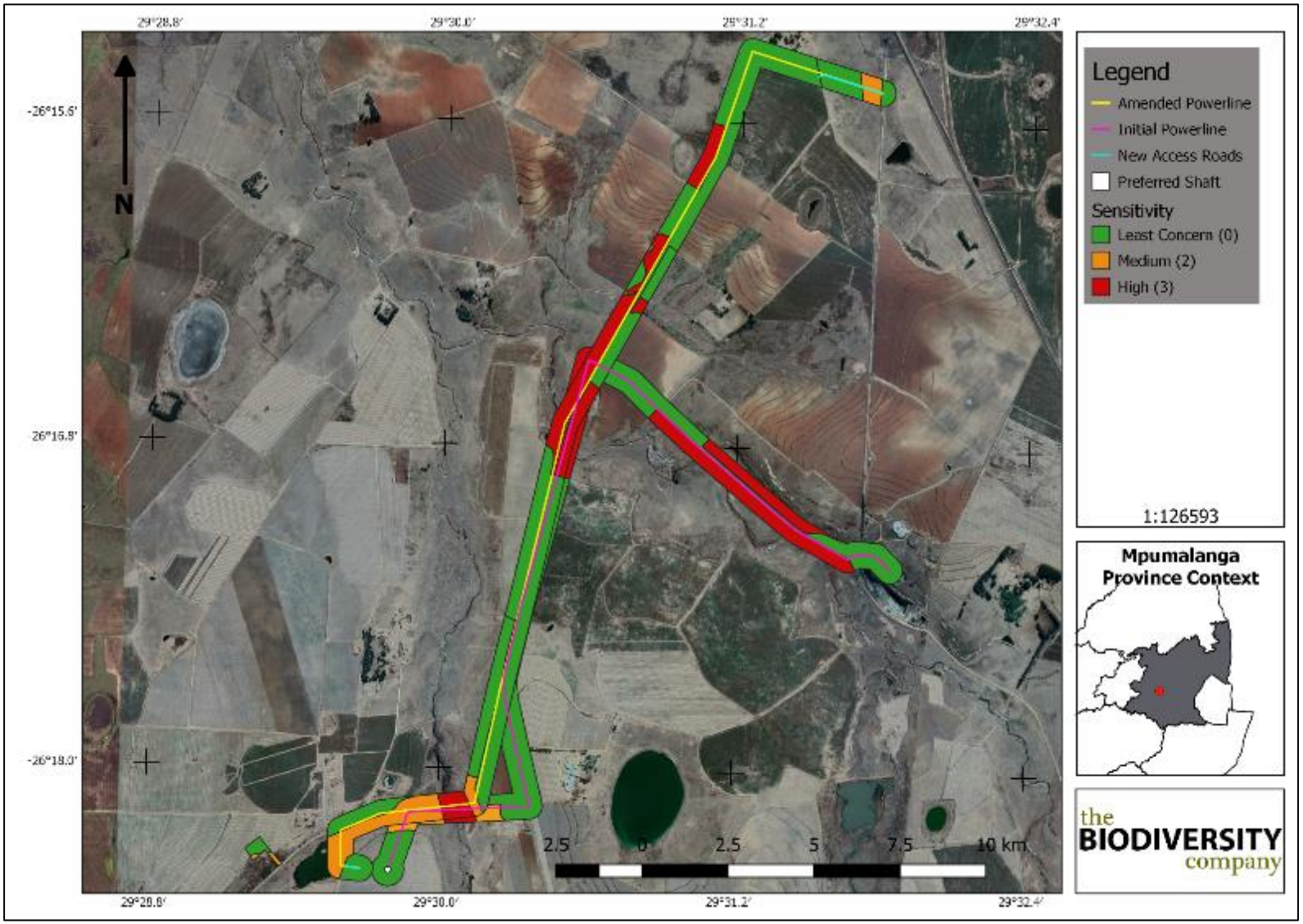

Figure 25: Habitat sensitivity map of the project area, shaft and powerlines specifically.

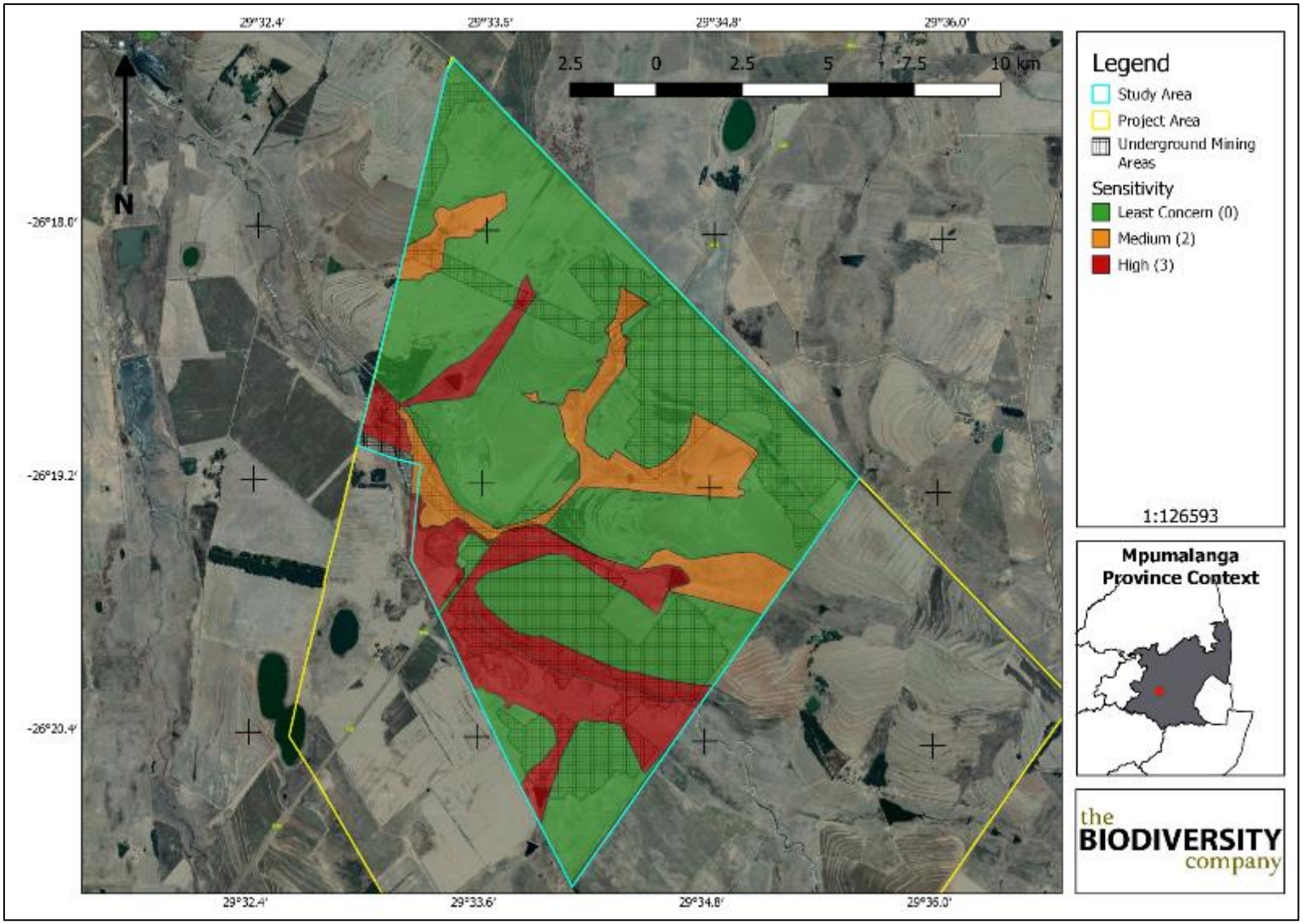

Figure 26: Habitat sensitivity map of the project area

11 Impact Assessment

The biodiversity impact assessment includes the following:

- Assess impacts of ongoing and proposed activities on biodiversity within the project area;
- Assess whether proposed activities are likely to have significant impacts on biodiversity and specifically species of conservation concern (SCC);
- Identify practically implementable mitigation measures to reduce the significance of proposed activities on biodiversity; and
- Assess residual and cumulative impacts after implementation of mitigation measures.

11.1 Methodology

The methodology used in determining the significance of potential environmental impacts relating to the Kalabasfontein Project was supplied by EIMS. The details of this methodology can be found in Appendix F.

11.2 Existing Impacts

The existing impacts observed during surveys are listed below. Photographic evidence of a selection of these impacts is shown in Figure 27.

- Commercial crop production and plantations;
- Fences;
- Overgrazing and trampling of natural vegetation and wetlands by livestock;
- Farm roads and highways (and associated traffic and wildlife road mortalities);
- Artificial impoundments;
- Artificial drainage in agricultural fields;
- Farmsteads and houses;
- Exotic game;
- Erosion;
- Feral animals such as dogs and cats;
- Alien and/or Invasive Plants (AIP);
- Snaring of wildlife and poaching;
- Servitudes and infrastructure (powerlines)
- Water contamination; and
- Vegetation removal

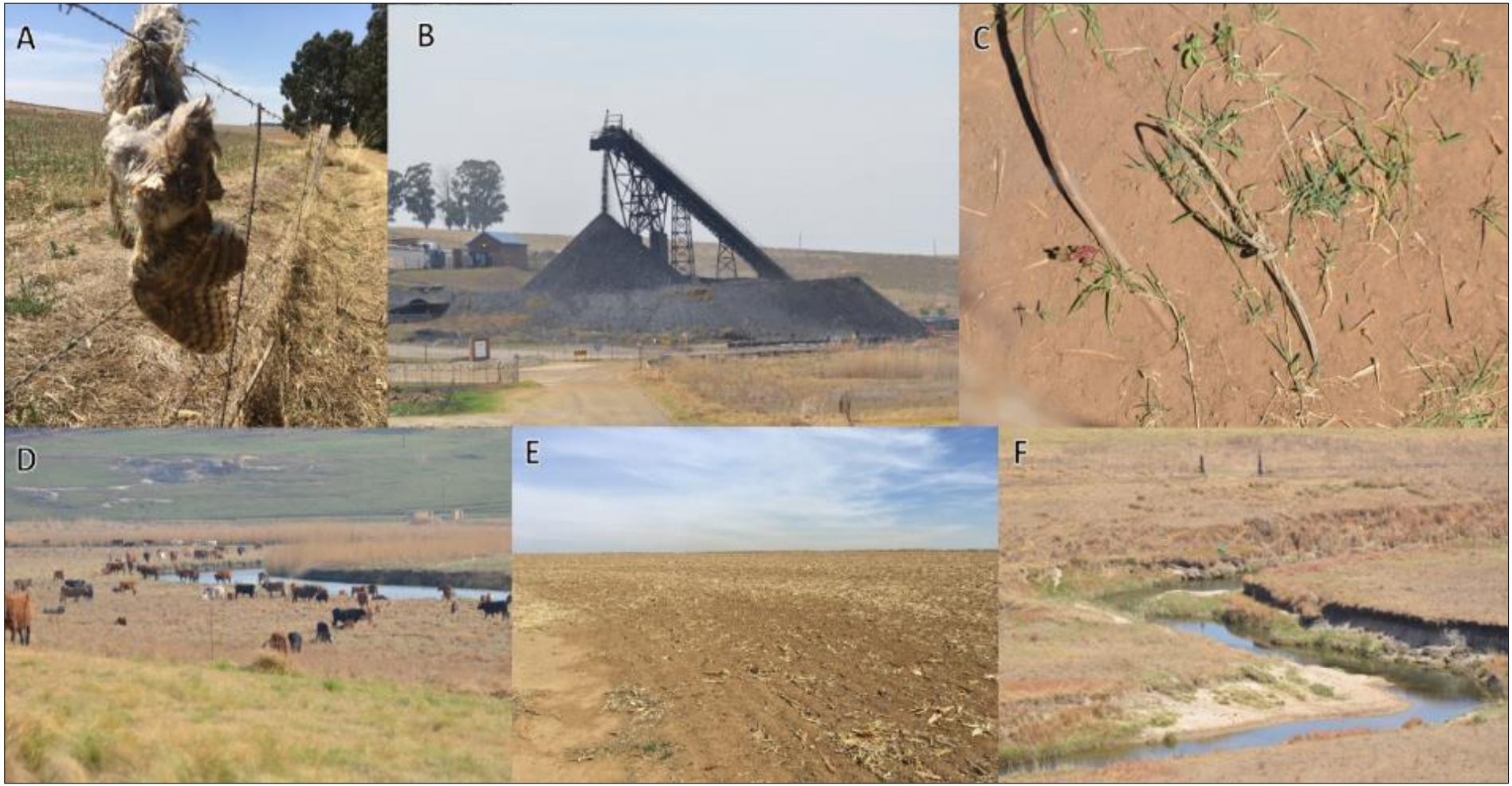

Figure 27: Some of the identified impacts within the project area: A) Fences, B) Coal mining, C) Wire Snares, D) Livestock, E) Extensive agricultural fields, and F) Erosion

11.3 Anticipated Impact Framework

An anticipated impact framework was considered for the impact assessment. The following list provides a framework for the anticipated major impacts associated with the project.

1. Loss / degradation of ecosystems
    a. Project activities that can cause loss of habitat (especially in regard to the two proposed infrastructure areas, i.e. powerline and ventilation shaft):
        i. Physical removal of vegetation
        ii. Access roads and servitudes
        iii. Construction camps & laydown areas
        iv. Infrastructure development (vent shafts)
        v. Soil dust precipitation
        vi. Coal dust precipitation
        vii. Stochastic events such as fire (cooking fires or cigarettes from staff)
    b. Secondary impacts anticipated
        i. Displacement/loss of flora & fauna (including SCC)
        ii. Increased potential for soil erosion (in conjunction with alterations in hydrological regimes)
        iii. Habitat fragmentation & loss of habitat corridors
        iv. Increased potential for establishment of alien & invasive vegetation
        v. Loss of stored carbon & carbon sequestration potential
        vi. Loss of ecosystem services
2. Spread and/or establishment of alien and/or invasive species
    a. Project activities that can cause the spread and/or establishment of alien and/or invasive species
        i. Vegetation removal
        ii. Soil excavations and soil transportation
        iii. Transportation vehicles potentially spreading seed while moving on, to and from mining areas
        iv. Unsanitary conditions surrounding infrastructure promoting the establishment of alien and/or invasive rodents
        v. Creation of infrastructure suitable for breeding activities of alien and/or invasive birds
    b. Secondary impacts anticipated
        i. Habitat loss for native flora & fauna (including SCC)
        ii. Reduced forage quality of grazing habitat
        iii. Spreading of potentially dangerous diseases
        iv. Alteration of fauna assemblages due to habitat modification
3. Direct mortality of fauna
    a. Project activities that can cause direct mortality of fauna
        i. Clearing of vegetation
        ii. Roadkill due to vehicle collision
        iii. Earth moving (removal and storage of topsoil and overburden)
        iv. Pollution of water resources due to dust effects, chemical spills, acid mine drainage etc.
        v. Intentional killing of fauna for food (hunting) or otherwise (killing of snakes)
        vi. Bird collisions with electrical lines and infrastructure guide wires
    b. Secondary impacts anticipated
        i. Loss of ecosystem services
        ii. Explosion of rodent populations and associated disease risk
4. Reduced dispersal/migration of fauna
    a. Project activities that can cause reduced dispersal/migration of fauna
        i. Removal of vegetation

    b. Secondary impacts associated with reduced dispersal/migration of fauna
        i. Loss of ecosystem services
        ii. Reduced plant seed dispersal
5. Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to noise
    a. Project activities that can cause disruption/alteration of ecological life cycles due to noise
        i. Operation of machinery (generators, crushers, vehicles)
    b. Secondary impacts associated with disruption/alteration of ecological life cycles due to noise
        i. Loss of ecosystem services
6. Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to dust
    a. Project activities that can cause disruption/alteration of ecological life cycles due to dust
        i. Operation of vehicles (generators, crushers, vehicles)
        ii. Vehicles operating at night
7. Staff interacting directly with potentially dangerous fauna
    a. Project activities that can cause staff to interact directly with potentially dangerous fauna
        i. All activities outdoors

12 Impact Assessment Results

The comprehensive qualitative impact assessment results with mitigation measures is available in Appendix G and Appendix H.

Due to the nature of the proposed mining development (being exclusively underground), the focus of the impact assessment was on the infrastructure areas (ventilation shafts and powerline areas) and associated access routes as provided by the client. These are deemed to have the most significant impact on biodiversity and SCC. It is assumed that the powerlines will be constructed in close proximity to the existing roads in order to avoid the high sensitivity areas, especially the section to the west of the initial powerline Figure 25

From the summary it is clear that the overall impact significance is moderate without mitigation for the construction phases of the project, and this changes to a significance of low to moderate for most of the listed activities following the implementation of mitigation measures and recommendations.

During the operational phase of the project, all listed activities are considered to pose a moderate to low level of risk without mitigation. Similarly, as for the operational phase, selected impacts anticipated for the decommissioning and closure phase could be mitigated and the significance decreases to a moderate or low level.

Underground mining can have significant impacts on sub-surface water and water flow, and therefore still poses possible threats to wetlands and river systems above ground, as well as to floral species. This can in turn have significant impacts on biodiversity. Therefore, it is vital that this report is read in conjunction with the wetland, hydropedology and aquatic reports as provided by those specialists.

12.1 Planning Phase

The planning phase activities are considered a low risk as they typically involve desktop assessments and initial site inspections. This would include compiling of mine and waste

management plans, obtaining of necessary permits, environmental and social impact assessments, characterisation of baseline site conditions, design of mine layouts and facilities and consultation with various contractors involved with a diversity of proposed project related activities going forward. Only one minor impact was assessed regarding the planning phase:

- Temporary disturbance of wildlife due to increased human presence and possible use of machinery and/or vehicles.

12.2 Construction Phase

The following potential impacts were considered on biodiversity (including flora and fauna) based on the proposed site clearance for infrastructure and associated access roads as well as disturbances such as noise and dust:

- Loss and fragmentation of the vegetation community, as well the alteration of a portion of an Endangered vegetation type (NBA, 2012);
- Loss of important Irreplaceable Critical Biodiversity Areas, Ecological Support Areas and Other Natural Areas (MTPA, 2014); and
- Displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust, vibrations, poaching and noise).

12.3 Operational Phase

The following potential impacts were considered on biodiversity (including flora and fauna) during the operational phase:

- Spread and/or establishment of alien and/or invasive species;
- Sudden sinking or gradual downward settling of the ground's surface over the areas where the underground mining is to take place;
- Displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust, vibrations and noise); and
- Infringement by humans into the few remaining natural grassland and wetlands areas, with associated impacts such as poaching, litter and introduction of diseases and feral species such as cats.

12.4 Decommissioning & Closure Phase

The following potential impacts were considered on biodiversity (including flora and fauna):

- Further impacts due to the spread and/or establishment of alien and/or invasive species; and
- Displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust, vibrations, poaching and noise).

12.5 Rehabilitation Phase

For the rehabilitation phase impacts relating to the ventilation shafts and the powerline construction, the anticipated impacts are expected to be low and may indeed have a positive impact should the correct mitigation measures be applied. The spread of alien and invasive plant species is considered a high risk during this phase as these plant species can take a hold once the soil layer is disturbed after the closure phase.

In line with the precautionary principle, it is possible that the undermining of wetlands and river systems within the study area may result in the subsidence of the surface. The resultant potential impacts include serious changes to surface hydrology resulting in the significant alteration of catchment areas and subsequent habitat levels impacts, which can in turn have negative impacts on habitat availability and resources for terrestrial fauna and flora.

Therefore, the following potential impacts were considered on biodiversity (including flora and fauna):

- Spread and/or establishment of alien invasive plant species;
- Soil erosion;
- Possible re-establishment of indigenous vegetation; and
- Subsidence and alteration of surface geology, hydrology and habitats.

12.6 Assessment of Significance

The summary tables below show the significance of the various impacts, which range from moderate to low before mitigation for the construction phase of the underground mining portion of the project. The significance of the impact's changes to a significance of moderate or low for all listed activities following the implementation of mitigation measures and recommendations.

Overall, the impacts of the underground mining have much lower significance and impact than those for opencast mining operations as this type of mining has less of an influence on biodiversity in the area. Nonetheless, underground mining also requires some surface infrastructure (and ventilation shafts in the case of this project), and the significance of these impacts cannot be overlooked or underestimated. However, for this particular project existing infrastructure will be used and as such there is a lower impact rating overall.

12.6.1 Planning Phase

The table below (

Table 12) presents the significance of potential planning phase impacts on the terrestrial ecosystems and terrestrial biodiversity before and after implementation of mitigation measures. All project aspects scored the same low level of risk as the planning phase is considered largely desktop with minimal impacts to the existing ecosystems. The activities for the planning phase for the construction of the ventilation shaft, the powerline and underground mining are considered to be the same and the impacts for the planning phase are therefore presented jointly in

Table 12.

Table 12: Impact significance during the planning phase pre- and post-mitigation

Impact Name	Temporary disturbance of wildlife due to increased human presence and possible use of machinery and/or vehicles.				
Alternative	**0**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	3	2
Extent	3	3	Reversibility	3	3
Duration	4	3	Probability	3	2
Environmental Risk (Pre-mitigation)					-9,75
Mitigation Measures					
See section 13					
Environmental Risk (Post-mitigation)					-5,50
Degree of confidence in impact prediction:					Medium

12.6.2 Construction Phase

The tables below (Table 13 to Table 16) show the significance of potential construction phase impacts on floral and faunal communities before and after implementation of mitigation measures. No construction phase was considered for the underground mining, it will be continuation of mining operation once approval is received.

Due to the known occurrence of some species of conservation importance in the secondary grassland and wetland areas, the existence of a CBA, an IBA and the location of the development within an Endangered vegetation type the significance was generally rated as moderate to high prior to mitigation.

In regard to the shafts, the shaft on Portion 7 is expected to have a higher impact whereas with the powerlines the first alternative is expected to have the highest impact between the powerline alternatives.

Table 13: Impact significance during the **construction** phase pre- and post-mitigation for the first proposed ventilation shaft location (Portion 7 of the farm Uitgedacht 229 IS)

Impact Name	Loss and fragmentation of the vegetation community as well the destruction of a portion of an Endangered vegetation type (NBA, 2012). Loss of important Irreplaceable Critical Biodiversity Areas, Ecological Support Areas and Other Natural Areas (MTPA, 2014). Displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust and noise).				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	4	2
Extent	3	2	Reversibility	4	3
Duration	5	3	Probability	3	4
Environmental Risk (Pre-mitigation)					-12,00
Mitigation Measures					
See section 13					
Environmental Risk (Post-mitigation)					-10,00
Degree of confidence in impact prediction:					Medium

Table 14: Impact significance during the **construction** phase pre- and post-mitigation for the second proposed ventilation shaft location (Portion 22 of the farm Uitgedacht 229 IS)

Impact Name	**Loss and fragmentation of the vegetation community as well the destruction of a portion of an Endangered vegetation type (NBA, 2012). Loss of important Irreplaceable Critical Biodiversity Areas, Ecological Support Areas and Other Natural Areas (MTPA, 2014). Displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust and noise).**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	4	2
Extent	2	2	Reversibility	2	2
Duration	5	3	Probability	3	4
Environmental Risk (Pre-mitigation)					-9,75
Mitigation Measures					
See section 13					
Environmental Risk (Post-mitigation)					-9,00
Degree of confidence in impact prediction:					Medium

Table 15: Impact significance during the **construction** phase pre- and post-mitigation for the first alternative powerline route.

Impact Name	**Loss and fragmentation of the vegetation community as well the destruction of a portion of an Endangered vegetation type (NBA, 2012). Loss of important Irreplaceable Critical Biodiversity Areas, Ecological Support Areas and Other Natural Areas (MTPA, 2014). Displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust and noise).**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	4	2
Extent	3	2	Reversibility	3	3
Duration	5	3	Probability	3	4
Environmental Risk (Pre-mitigation)					-11.25
Mitigation Measures					
See section 13					
Environmental Risk (Post-mitigation)					-10.00

Table 16: Impact significance during the **construction** phase pre- and post-mitigation for the second alternative powerline route.

Impact Name	**Loss and fragmentation of the vegetation community as well the destruction of a portion of an Endangered vegetation type (NBA, 2012). Loss of important Irreplaceable Critical Biodiversity Areas, Ecological Support Areas and Other Natural Areas (MTPA, 2014). Displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust and noise).**				
Alternative	**Alternative 2**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	3	2
Extent	2	1	Reversibility	2	2
Duration	5	2	Probability	3	4
Environmental Risk (Pre-mitigation)					-9.00
Mitigation Measures					
See section 13					

Environmental Risk (Post-mitigation)	-7.00

12.6.3 Operational Phase

The tables below (Table 17 to Table 21) shows the significance of potential operational phase impacts on floral and faunal communities before and after implementation of mitigation measures. Due to the known occurrence of some species of conservation importance in the secondary grassland and wetland areas, the existence of a CBA: Optimal and the presence of the development within a VU vegetation type the significance was generally rated as moderate prior to mitigation. The spread of alien or invasive plant species was rated as the most significant impact for the operational phase.

Both of the proposed ventilation shaft locations are predicted to have the same impact during the operational phase and pose relatively low levels of disturbance.

The two alternative powerlines are anticipated to have the same impact however a higher impact during operation as during this time the powerline will pose a significant threat to avifauna, especially sensitive species which do occur in the area. If mitigation measures are followed this impact can be reduced as shown.

Table 17: Impact significance during the **operational phase** pre- and post-mitigation for the first proposed ventilation shaft location (Portion 7 of the farm Uitgedacht 229 IS)

Impact Name	**Further loss and fragmentation of the vegetation community and spread and/or establishment of alien and/or invasive species. Displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust and noise). Infringement by humans into the few remaining natural grassland and wetlands areas, with associated impacts such as poaching, litter and introduction of diseases.**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	4	2
Extent	2	2	Reversibility	2	2
Duration	5	3	Probability	3	4
Environmental Risk (Pre-mitigation)					-9,75
Mitigation Measures					
See section 13					
Environmental Risk (Post-mitigation)					-9,00
Degree of confidence in impact prediction:					Medium

Table 18: Impact significance during the **operational phase** pre- and post-mitigation for the second proposed ventilation shaft location (Portion 22 of the farm Uitgedacht 229 IS)

Impact Name	**Further loss and fragmentation of the vegetation community and spread and/or establishment of alien and/or invasive species. Displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust and noise). Infringement by humans into the few remaining natural grassland and wetlands areas, with associated impacts such as poaching, litter and introduction of diseases.**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	4	2
Extent	2	2	Reversibility	2	2
Duration	5	3	Probability	3	4
Environmental Risk (Pre-mitigation)					-9,75

Mitigation Measures	
See section 13	
Environmental Risk (Post-mitigation)	-9,00
Degree of confidence in impact prediction:	Medium

Table 19: Impact significance during the **operational phase** pre- and post-mitigation for the first alternative powerline route.

Impact Name	**Displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances. Spread and/or establishment of alien and/or invasive species.**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	4	2
Extent	3	2	Reversibility	4	2
Duration	5	2	Probability	4	4
Environmental Risk (Pre-mitigation)					-16.00
Mitigation Measures					
See section 13					
Environmental Risk (Post-mitigation)					-8.00
Degree of confidence in impact prediction:					Medium

Table 20: Impact significance during the **operational phase** phase pre- and post-mitigation for the second alternative powerline route.

Impact Name	**Displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances. Spread and/or establishment of alien and/or invasive species.**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	4	2
Extent	3	2	Reversibility	4	2
Duration	5	2	Probability	4	4
Environmental Risk (Pre-mitigation)					-16.00
Mitigation Measures					
See section 13					
Environmental Risk (Post-mitigation)					-8.00
Degree of confidence in impact prediction:					Medium

Table 21: Impact significance during the **operational phase** pre- and post-mitigation for underground mining activities

Impact Name	**Further loss and fragmentation of the vegetation community and spread and/or establishment of alien and/or invasive species. Sudden sinking or gradual downward settling of the ground's surface over the areas where the underground mining is to take place. Displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust and noise). Infringement by humans into the few remaining natural grassland and wetlands areas, with associated impacts such as poaching, litter and introduction of diseases.**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	3	2
Extent	4	3	Reversibility	4	4
Duration	5	3	Probability	4	3
Environmental Risk (Pre-mitigation)					-16,00
Mitigation Measures					

See section 13	
Environmental Risk (Post-mitigation)	-9,00
Degree of confidence in impact prediction:	Medium

12.6.4 Closure & Decommissioning Phase

The tables below (Table 22 to Table 26) show the significance of potential closure and decommissioning phase impacts on floral and faunal communities before and after implementation of mitigation measures.

Due to the fact that the closure phase will entail a significant decrease in the number of people present on site and eventually the removal of people altogether, this was removed as a potential impact during this phase. However, clearing of infrastructure such as the ventilation shafts and powerlines will increase certain impacts such as dust and noise for a period of time.

Table 22: Impact significance during the **closure and decommissioning** phase pre- and post-mitigation for the first proposed ventilation shaft location (Portion 7 of the farm Uitgedacht 229 IS)

Impact Name	**Further impacts due to the spread and/or establishment of alien and/or invasive species. Continued displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust and noise).**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	4	2
Extent	2	2	Reversibility	2	2
Duration	5	3	Probability	3	4
Environmental Risk (Pre-mitigation)					-9,75
Mitigation Measures					
See section 13					
Environmental Risk (Post-mitigation)					-9,00
Degree of confidence in impact prediction:					Medium

Table 23: Impact significance during the **closure and decommissioning** phase pre- and post-mitigation for the second proposed ventilation shaft location (Portion 22 of the farm Uitgedacht 229 IS)

Impact Name	**Further impacts due to the spread and/or establishment of alien and/or invasive species. Continued displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust and noise).**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	4	2
Extent	2	2	Reversibility	2	2
Duration	5	3	Probability	3	4
Environmental Risk (Pre-mitigation)					-9,75
Mitigation Measures					
See section 13					
Environmental Risk (Post-mitigation)					-9,00
Degree of confidence in impact prediction:					Medium

Table 24: Impact significance during the **closure and decommissioning** phase pre- and post- for the first alternative powerline route.

Impact Name	**Further impacts due to the spread and/or establishment of alien and/or invasive species. Continued displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust and noise).**				
Alternative	**Alternative 3**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	3	2
Extent	3	2	Reversibility	3	2
Duration	4	3	Probability	4	2
Environmental Risk (Pre-mitigation)					-13.00
Mitigation Measures					
See section 13					
Environmental Risk (Post-mitigation)					-4.50
Degree of confidence in impact prediction:					High

Table 25: Impact significance during the **closure and decommissioning** phase pre- and post- for the second alternative powerline route.

Impact Name	**Further impacts due to the spread and/or establishment of alien and/or invasive species. Continued displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust and noise).**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	3	2
Extent	3	2	Reversibility	3	2
Duration	4	2	Probability	3	2
Environmental Risk (Pre-mitigation)					-9.75
Mitigation Measures					
See section 13					
Environmental Risk (Post-mitigation)					-4.00
Degree of confidence in impact prediction:					High

Table 26: Impact significance during the **closure and decommissioning** phase pre- and post-mitigation for underground mining activities

Impact Name	**Further impacts due to the spread and/or establishment of alien and/or invasive species. Continued displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust and noise).**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	3	3
Extent	4	3	Reversibility	4	4
Duration	4	4	Probability	4	3
Environmental Risk (Pre-mitigation)					-15,00
Mitigation Measures					
See section 13					
Environmental Risk (Post-mitigation)					-10,50
Degree of confidence in impact prediction:					Medium

12.6.5 Rehabilitation Phase

The tables below (Table 27 to Table 31) show the significance of potential rehabilitation phase impacts on floral and faunal communities before and after implementation of mitigation measures.

Due to the fact that the rehabilitation phase will entail a significant decrease in the certain disturbances to the area, such as presence of people, vehicles and the possible re-establishment of natural vegetation, many of the associated impacts are significantly low or even positive. However, the possible risk and impact of subsidence (which is also difficult to mitigate) remains at a moderate level.

Table 27: Impact significance during the **rehabilitation** phase pre- and post-mitigation for the first proposed ventilation shaft location (Portion 7 of the farm Uitgedacht 229 IS)

Impact Name	**Spread and/or establishment of alien invasive plant species. Soil erosion. Possible re-establishment of indigenous vegetation.**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	4	2
Extent	2	2	Reversibility	2	2
Duration	5	3	Probability	3	4
Environmental Risk (Pre-mitigation)					-9,75
Mitigation Measures					
See section 13					
Environmental Risk (Post-mitigation)					-9,00
Degree of confidence in impact prediction:					High

Table 28: Impact significance during the **rehabilitation** phase pre- and post-mitigation for the second proposed ventilation shaft location (Portion 22 of the farm Uitgedacht 229 IS)

Impact Name	**Spread and/or establishment of alien invasive plant species. Soil erosion. Possible re-establishment of indigenous vegetation.**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	4	2
Extent	2	2	Reversibility	2	2
Duration	5	3	Probability	3	4
Environmental Risk (Pre-mitigation)					-9,75
Mitigation Measures					
See section 13					
Environmental Risk (Post-mitigation)					-9,00
Degree of confidence in impact prediction:					High

Table 29: Impact significance during the **rehabilitation** phase pre- and post- for the first alternative powerline route.

Impact Name	**Spread and/or establishment of alien invasive plant species, Soil erosion, Possible re-establishment of indigenous vegetation.**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	1	Magnitude	4	2
Extent	2	2	Reversibility	2	2

Duration	5	3	Probability	3	3
Environmental Risk (Pre-mitigation)					-9.75
Mitigation Measures					
See section 13					
Environmental Risk (Post-mitigation)					6.75
Degree of confidence in impact prediction:					High

Table 30: Impact significance during the **rehabilitation** phase pre- and post- for the first alternative powerline route.

Impact Name	**Spread and/or establishment of alien invasive plant species, Soil erosion, Possible re-establishment of indigenous vegetation.**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	1	Magnitude	4	2
Extent	2	2	Reversibility	2	2
Duration	5	3	Probability	3	3
Environmental Risk (Pre-mitigation)					-9.75
Mitigation Measures					
See section 13					
Environmental Risk (Post-mitigation)					6.75
Degree of confidence in impact prediction:					High

Table 31: Impact significance during the **rehabilitation** phase pre- and post-mitigation for underground mining activities

Impact Name	**Spread and/or establishment of alien invasive plant species. Soil erosion. Possible re-establishment of indigenous vegetation.**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	3	2
Extent	4	3	Reversibility	4	4
Duration	5	3	Probability	4	3
Environmental Risk (Pre-mitigation)					-16,00
Mitigation Measures					
See section 13					
Environmental Risk (Post-mitigation)					-9,00
Degree of confidence in impact prediction:					Medium

13 Mitigation Measures

The mitigation actions provided below are important to consider in conjunction with other specialist assessments which include but are not limited to the following specialist studies: Groundwater, Surface Water and Wetlands. These mitigation measures should be implemented in the Environmental Management Plan (EMP) should the project go-ahead. The mitigation hierarchy proposed by Macfarlane *et al*., (2016) was considered for this study (Figure 28).

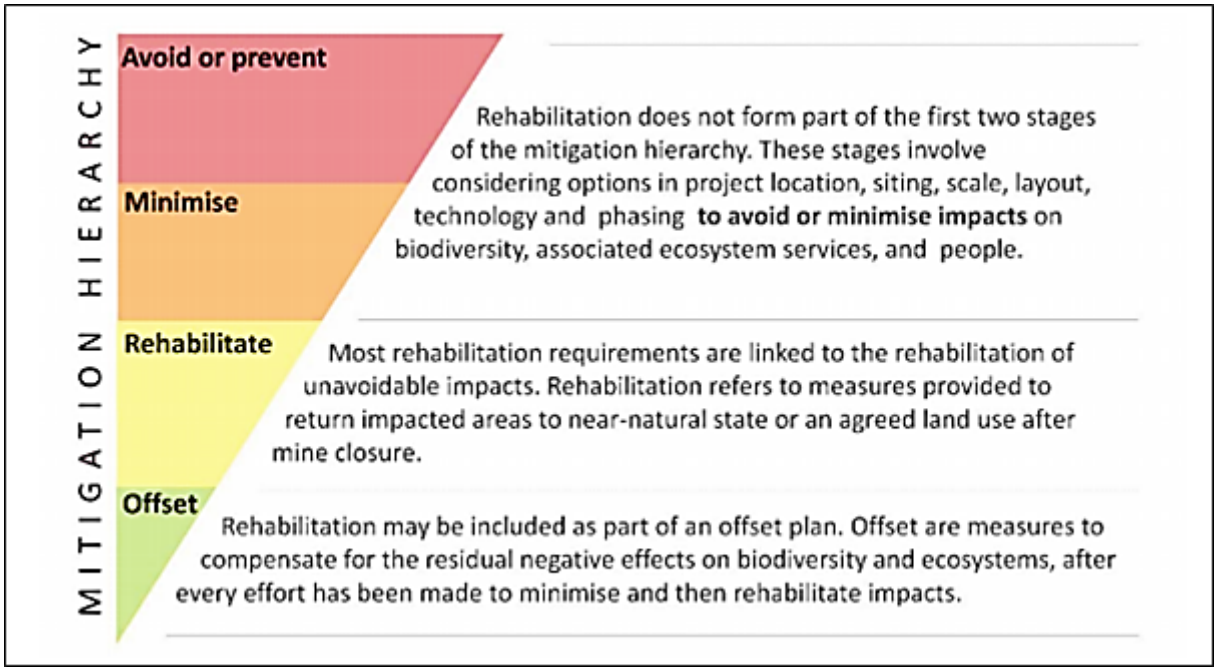

Figure 28: The Mitigation Hierarchy (Macfarlane et al., 2016)

As observed above, avoiding and preventing loss of sensitive landscapes are the first stage of the mitigation hierarchy. Considering this, the layout of the proposed infrastructure within the Kalabasfontein project area should, wherever possible, remain away from areas that are defined as sensitive as outlined in this report.

13.1 Mitigation Measures Objectives

A number of general mitigation measures are recommended for the project as a whole, while more specific measures are detailed in the following sections which relate to impacts to fauna and flora specifically. The mitigation measures supplied below must be read with, and implemented, in conjunction with those mitigation measures recommended in the specialist wetland and aquatics reports.

The general focus of mitigation measures must be to reduce the significance of potential impacts (as defined above) associated with the development and thereby to:

- Prevent the further loss and fragmentation of the vegetation community (listed as Vulnerable) and the CBAs and ONAs in the vicinity of the project area;
- Prevent the loss of the faunal community associated with this vegetation community and with sensitive wetland and ridge environments;
- Prevent the loss of species of conservation concern which are known to occur within the project area; and
- Limiting the construction area to the defined project areas and only impacting those areas where it is unavoidable to do so otherwise.

13.1.1 Mitigation Measures for Impacts on Vegetation Communities

Recommended mitigation and rehabilitation measures include the following:

- As far as possible, the proposed developments should be placed in areas that have already been disturbed (low sensitivity areas as defined in this report), and no further loss of secondary grassland or wetlands should be permitted;
- The proposed ventilation shaft areas and associated powerlines should be positioned (as far as feasible) in areas that are already disturbed (such as along existing road verges) or in areas that are regarded as least sensitive based on this report;
- Wherever possible, the new powerline development should avoid crossing sensitive CBAs or wetland areas;
- It is recommended that areas to be developed be specifically demarcated so that during the construction phase and operational phase, only the demarcated areas be impacted upon. All work areas, and access roads must be clearly demarcated from surrounding natural areas and no persons should be allowed to enter these areas under any circumstances;
- Areas of indigenous vegetation, even secondary communities should under no circumstances be fragmented or disturbed further or used as an area for dumping of waste;
- Areas rated as highly sensitive in this report, should be declared as 'no-go' areas during the construction phase and operational phase and all efforts must be made to prevent access to this area from construction workers and machinery;
- It should be made an offence for any staff to bring any plant species into any portion of the project site, including offices. No plant species whether indigenous or exotic should be brought into the project area, to prevent the spread of exotic or invasive species;
- An experienced, qualified environmental control office must be on site when construction begins to identify species that will be directly disturbed and to relocate fauna/flora that are found during construction (this includes all species of flora and fauna including reptiles and amphibians);
- Dust-reducing mitigation measures must be put in place and must be strictly adhered to. This includes wetting of exposed soft soil surfaces and not conducting activities on windy days which will increase the likelihood of dust being generated. No dust is allowed, whether intentionally or otherwise, to be blown across the wetland areas as they are demarcated in this report;
- Areas of indigenous vegetation should be delineated, and rehabilitation measures implemented in areas where the indigenous community is still present but degraded;
- 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;
- Any topsoil that is removed during construction must be appropriately removed and stored according to the national and provincial guidelines. This includes on-going maintenance of such topsoil piles so that they can be utilised during decommissioning phases and re-vegetation;

- All dumping of waste material, especially bricks and contaminated materials or soils, must be prevented; and
- Implementation of an alien vegetation management plan for the entire site, including the surrounding project area and especially the wetland areas.

13.1.2 Mitigation Measures for Impacts on Faunal Communities

Recommended mitigation and rehabilitation measures for faunal community's hinge largely on protecting their habitats and ensuring it remains intact, as well as limited other disturbance factors such as noise and dust. In additional to this the following measures are recommended:

- The primary mitigation measure recommended for the project area is for there to be no development in the high-sensitivity wet areas, rocky ridges and grasslands portions of the project area where species of conservation concern occur;
- The proposed ventilation shaft areas and associated powerlines should be positioned (as far as feasible) in areas that are already disturbed (such as along existing road verges) or in areas that are regarded as least sensitive based on this report;
- Where the proposed powerline crosses wetland areas (if it is unavoidable to do so otherwise), appropriate bird mitigation measures should be put in place to avoid bird collisions and direct impacts to the infrastructure. This includes the use of 'bird-flappers' and bird-friendly powerline structures;
- If any faunal species are recorded during construction, activities should temporarily cease, and an appropriate specialist should be consulted to identify the correct course of action. This is applicable to all species, even smaller species such as rodents, reptiles and amphibians;
- 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. The intentional killing of any animals including snakes, lizards, birds or other animals should be strictly prohibited;
- The areas rated as highly sensitive in the project area as defined in this report, should be declared a 'no-go' area during the construction phase and operational phase and all efforts must be made to prevent access to this area from construction workers and machinery; and
- No domestic animals are to be allowed into the project area under any circumstances, especially any dogs and cats. Any and all feral cats which may enter the project area must be removed immediately by an appropriate specialist.

13.2 Recommendations

These recommendations may supplement the prescribed mitigation measures, but these recommendations must be investigated prior to the issuing of environmental authorisation. These recommendations must be investigated for the feasibility to realistically achieve what is intended for this project. The following recommendations are applicable for this project:

1. It is recommended that a rehabilitation plan must be compiled and implemented, this should include the implementation of the alien vegetation control plan.

14 Conclusion

The completion of a comprehensive desktop study, in conjunction with the detailed results from the surveys mean that there is a high confidence in the information provided. The survey which were completed, and the corresponding studies resulted in good site coverage, assessing the major habitats and ecosystems, obtaining a general species (fauna and flora) overview and observing the major current impacts.

It is clear from the regional ecological overview, as well as the baseline data collected to date that the project area has been somewhat altered (historically and currently) predominantly by agricultural land use and nearby mining activities. It is further evident that the remaining natural habitats have been impacted on as a result of poor grazing practices and agricultural land use.

However, despite these impacts the remaining natural habitats (including grassland and wetland habitats) exhibited a healthy balance between various common grassland species and associated herbaceous plants.

The ecological integrity, importance and functioning of the natural grassland and wetland systems within the larger project area is furthermore reflected in the diverse community structures. This diversity is indicative of the importance of these systems to collectively provide refugia, food and corridors for dispersal in and through the project area. The preservation of these systems, albeit the majority are modified to some extent, is the most important aspect to consider for the consideration of the proposed mining project.

According to the Mining and Biodiversity Guidelines (2013), the proposed project area Kalabasfontein falls within an area which is considered ‘high risk for mining’ and of ‘high biodiversity importance’.

Consideration must be afforded each of the recommendations provided in this report. In the event that environmental authorisation is issued for this project, proven ecological (or environmental) controls and mitigation measures must be entrenched in the management framework.

The following further conclusions were reached based on the results of this assessment:

- Much of the project area is identified as either HMAs or ONAs, while a smaller percentage are classified as ESAs and as CBAs. Both proposed ventilation shaft areas intersect predominantly with HMAs and ONAs. A large CBA bisects the southern portion of the main project area.;
    - According to the MPAES (2013) this CBA area is also a provincially protected area and part of the ‘provincial protected area expansion strategy’;
- The Kalabasfontein project area does overlap with any areas that represent a biodiversity risk to mining according to the Mining and Biodiversity Guidelines (2013);
- The project area was superimposed on the terrestrial ecosystem threat status. According to this, the overall project area, overlaps entirely with ecosystems that are listed as Vulnerable (VU);
- The Kalabasfontein project area was superimposed on the ecosystem protection level map to assess the protection status of terrestrial ecosystems associated with the

development. Based on this the majority of the terrestrial ecosystems associated with the development are rated as *not protected* and small pockets in both the portions of the project area are rated as *poorly protected*;

- Based on the SANBI (2010) Protected Areas Map and the National Protected Areas Development Strategy (NPAES) the project area does not overlap with, nor will the proposed development impact upon, any formally or informally protected area;
- The project area does overlap with certain wetland areas and two significant perennial rivers. One of these rivers, occurs along the southern boundary of the main project area and is classified as an NFEPA river. This river is classed as 'D', which means it is considered to be heavily modified;
- The proposed powerlines cross one NFEPA wetland and one Non-FEPA wetland;
- The Kalabasfontein project area in relation to the MBSP Freshwater Assessment overlaps with the following areas: Ecological Support Areas (ESAs), Heavily Modified Areas (HMAs) and Other Natural Areas (ONAs);
- The project area is situated entirely within one vegetation type; namely the Eastern Highveld Grassland (GM12). This vegetation type is listed as Endangered according to Mucina & Rutherford (2006);
- Based on the Plants of Southern Africa (BODATSA-POSA, 2016) database, 445 plant species are expected to occur in the area. Of these, four (4) species are listed as being SCC;
- A total of 52 plant species were recorded during fieldwork. Two (2) plant species which are protected in terms of the Mpumalanga Nature Conservation Act, 1998 (No. 10 of 1998) were recorded;
    - Nine (9) alien and/or invasive plants were recorded during the field survey within the project area.
- Based on the South African Bird Atlas Project, Version 2 (SABAP2) database and records from the Animal Demography Unit (2018), 239 bird species are expected to occur in the vicinity of the project area;
    - Of the expected bird species, twenty-three (23) species (9.1%) are listed as SCC either on a regional (21) or global scale (13).
- The IUCN Red List Spatial Data (IUCN, 2017) lists 84 mammal species that could be expected to occur within the project area. Of these, fourteen (14) (15.8%) are listed as being of conservation concern on a regional or global basis;
- One bird SCC was recorded during the survey, namely Secretary bird (*Sagittarius serpentarius*) during the October 2018 survey;
- Overall, mammal diversity in the project area was moderate to high, with fifteen (15) mammal species being recorded during the October 2018 survey. Three (3) mammal species of conservation concern were recorded; and

- Six (6) reptile species were recorded in the project area during the October 2018 surveys. One near-endemic and one endemic snake species were recorded in the project area.
- With regards to the shafts, the shaft on Portion 7 is expected to have a higher impact whereas with the powerlines the first alternative is expected to have the highest impact between the powerline alternatives.

14.1 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 specialist that the Kalabasfontein project area, with the current proposed infrastructures layout areas (ventilation shafts and powerlines), may be favourably considered. The Kalabasfontein project area, although predominantly classed as an HMA, also intersects with a large CBA and this area has proven to be a sensitive ecological area. Also, according to the Mining and Biodiversity Guidelines (2013) Kalabasfontein is classed as an area which is considered ‘high risk for mining’ and of ‘high biodiversity importance’.

The main Kalabasfontein project areas are situated close to sensitive critical biodiversity areas as well as close to wetland areas and ridges where species of conservation of concern occur. The presence of some of these species was confirmed during field surveys. Due to the sensitivities of the project environment, and should authorisation be approved for this project, all mitigation measures and recommendations must be strictly adhered to.

15 References

Animal Demography Unit (2018). Virtual Museum. Accessed on the following date: 2018-10-09.

Bates, M.F., Branch, W.R., Bauer, A.M., Burger, M., Marais, J., Alexander, G.J. & De Villiers, M.S. (EDS). 2014. Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland. Suricata 1. South African National Biodiversity Institute, Pretoria, South Africa.

Bird Atlas Project (SABAP2). 2018. http://vmus.adu.org.za/.

BirdLife International (2018) Important Bird Areas factsheet: Steenkampsberg. Downloaded from http://www.birdlife.org on 11/10/2018.

Botanical Society of South Africa. 2012 Vegetation Map App [Vector] 2012. Available from the Biodiversity GIS website, downloaded on 29 September 2018.

Burrows, J.E., Lötter, M. & von Staden, L. 2006. Indigofera hybrida N.E.Br. National Assessment: Red List of South African Plants version 2017.1. Accessed on 2018/10/15.

Critical Biodiversity Areas for Limpopo (LCPv2_CBA_Layer.shp) - SANBI. Web. Accessed on 2018/10/01.

Cyrus, D. P., Wepener, V., Mackay, C. F., Cilliers, P. M., Weerts, S. P., & Viljoen, A. 2000. The effects of Intrabasin Transfer on the Hydrochemistry, Benthic Invertebrates and Ichthyofauna on the Mhlathuze Estuary and Lake Nsezi. Water Research Commision.

Dallas, H.F., & Day, J.A., 1993. The Effect of Water Quality Variables on Riverine Ecosystems: A Review. Water Research Commission TT 61/93.

Department of Water Affairs and Forestry (DWAF) 2005. Final draft: A practical field procedure for identification and delineation of wetlands and Riparian areas.

Driver A., Sink, K.J., Nel, J.N., Holness, S., Van Niekerk, L., Daniels, F., Jonas, Z., Majiedt, P.A., Harris, L. & Maze, K. 2012. National Ecological Assessment 2011: An assessment of South Africa's biodiversity and ecosystems. Synthesis Report. South African National Biodiversity Institute and Department of Environmental Affairs, Pretoria.

Du Preez, L.H. & Carruthers, V. 2009. A complete guide to the frogs of southern Africa. Random House Struik, Cape Town.

DWAF: The Regulations on the National Forests Act of 1998 (Act No. 84 of 1998) – published 29 May 2009 in the Government Gazette under the auspices of the Department of Water Affairs and Forestry (DWAF).

EWT (Endangered Wildlife Trust). 2017. Threatened Amphibian Programme. Available at FrogMap 2015. The Southern African Frog Atlas Project https://www.ewt.org.za/TAP/refrence.html (SAFAP, now FrogMAP). http://vmus.adu.org.za (Visited on the 3rd September 2018)

Hockey, P.A.R., Dean, W.R.J. & Ryna, P.G. (eds.) 2005. Roberts – Birds of Southern Africa, VIIth ed. The Trustees of the John Voelker Bird Book Fund, Cape Town.

IUCN, 2017. The IUCN Red List of Threatened Species. Available at www.iucnredlist.org (Accessed in September 2018).

Kotze DC, Marneweck GC, Batchelor AL, Lindley DC, Collins NB. 2009. A Technique for rapidly assessing ecosystem services supplied by wetlands. Mondi Wetland Project.

Land Type Survey Staff. (1972 - 2006). Land Types of South Africa: Digital Map (1:250 000 Scale) and Soil Inventory Databases. Pretoria: ARC-Institute for Soil, Climate, and Water.

Lötter, M., Nicholas, A. & von Staden, L. 2007. Pachycarpus suaveolens (Schltr.) Nicholas & Goyder. National Assessment: Red List of South African Plants version 2017.1. Accessed on 2018/04/15.

Macfarlane DM, Dickens J, Von Hase F. 2009. Development of a methodology to determine the appropriate buffer zone width and type for developments associated with wetlands, watercourses and estuaries Deliverable 1: Literature Review. INR Report No: 400/09.

Macfarlane DM, Bredin IP, Adams JB, Zungu MM, Bate GC, Dickens CWS. 2014. Preliminary guideline for the determination of buffer zones for rivers, wetlands and estuaries. Final Consolidated Report. WRC Report No TT 610/14, Water Research Commission, Pretoria.

Mucina, L. and Rutherford, M.C. (Eds.) 2006. The vegetation of South Africa, Lesotho and Swaziland. Strelizia 19. South African National Biodiversity Institute, Pretoria South Africa.

National Water Act (NWA). 2016. Act 36 of 1998. New Nine (9) Water Management Areas of South Africa. National Gazettes, No. 40279 of 16 May 2016.

Nel JL, Murray KM, Maherry AM, Petersen CP, Roux DJ, Driver A, Hill L, Van Deventer H, Funke N, Swartz ER, Smith-Adao LB, Mbona N, Downsborough L and Nienaber S. 2011. Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.

Ollis DJ, Snaddon CD, Job NM, and Mbona N. 2013. Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems. SANBI Biodiversity Series 22. South African Biodiversity Institute, Pretoria.

POSA, 2017. Plants of South Africa - an online checklist. POSA ver. 3.0. Available at: http://posa.sanbi.org.

South African Bird Atlas Project (SABAP2). 2018. Available at http://vmus.adu.org.za/. Accessed on 30/04/2018.

SANBI. 2017. Red List of South African Plants version 2018.1. Downloaded from Redlist.sanbi.org on 2018/04/24.

SANBI. 2017. Technical guidelines for CBA Maps: Guidelines for developing a map of Critical Biodiversity Areas & Ecological Support Areas using systematic biodiversity planning. First Edition (Beta Version), June 2017. Compiled by Driver, A., Holness, S. & Daniels, F. South African National Biodiversity Institute, Pretoria.

SANBI. 2017. NBA 2011 Terrestrial Formal Protected Areas 2012. Downloaded on 03 September 2018.

Skinner J.D. & Chimimba, C.T. 2005. The Mammals of the Southern African Subregion (New Edition). Cambridge University Press. South Africa.

Stuart, C & T. (1994) A field guide to the tracks and signs of Southern, Central East African Wildlife. Struik Nature, Cape Town.

Taylor MR, Peacock F, Wanless RM (eds) 2015. The 2015 Eskom Red Data Book of birds of South Africa, Lesotho and Swaziland. BirdLife South Africa, Johannesburg.

Taylor P, Baxter R, Child MF. 2016. A conservation assessment of Otomys auratus. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa

Van Oudtshoorn F. 2004. Gids tot die grasse van Suider-Afrika. Second Edition. Pretoria. Briza Publikasies.

Van Wyk, B and Van Wyk, P. 1997. Field guide to trees of Southern Africa. Cape Town. Struik Publishers.

APPENDIX A: *Flora species expected to occur in the project area*

Family	Taxon	IUCN	Ecology
Fabaceae	*Acacia karroo Hayne*		Indigenous
Euphorbiaceae	*Acalypha angustata Sond.*	LC	Indigenous
Rosaceae	*Agrimonia procera Wallr.*	LC	Not indigenous; Naturalised; Invasive
Hyacinthaceae	*Albuca setosa Jacq.*		Indigenous
Asphodelaceae	*Aloe boylei Baker*		Indigenous
Asphodelaceae	*Aloe craibii Gideon F.Sm.*	CR	Indigenous; Endemic
Amaranthaceae	*Amaranthus hybridus L. subsp. hybridus var. hybridus*		Not indigenous; Naturalised
Poaceae	*Andropogon eucomus Nees*	LC	Indigenous
Agavaceae	*Anthericum cooperi Baker*		Indigenous
Agavaceae	*Anthericum fasciculatum Baker*		Indigenous
Poaceae	*Aristida congesta Roem. & Schult. subsp. congesta*	LC	Indigenous
Poaceae	*Aristida diffusa Trin. subsp. burkei (Stapf) Melderis*	LC	Indigenous
Poaceae	*Aristida junciformis Trin. & Rupr. subsp. junciformis*	LC	Indigenous
Poaceae	*Aristida meridionalis Henrard*	LC	Indigenous
Asparagaceae	*Asparagus laricinus Burch.*	LC	Indigenous
Asparagaceae	*Asparagus sp.*		
Asteraceae	*Berkheya echinacea (Harv.) O.Hoffm. ex Burtt Davy subsp. echinacea*	LC	Indigenous
Asteraceae	*Berkheya pinnatifida (Thunb.) Thell. subsp. pinnatifida*	LC	Indigenous; Endemic
Asteraceae	*Berkheya radula (Harv.) De Wild.*	LC	Indigenous
Asteraceae	*Berkheya setifera DC.*	LC	Indigenous
Poaceae	*Bewsia biflora (Hack.) Gooss.*	LC	Indigenous
Asteraceae	*Bidens bipinnata L.*		Not indigenous; Naturalised
Asteraceae	*Bidens pilosa L.*		Not indigenous; Naturalised
Acanthaceae	*Blepharis subvolubilis C.B.Clarke*		Indigenous
Amaryllidaceae	*Boophone disticha (L.f.) Herb.*	LC	Indigenous
Poaceae	*Brachiaria serrata (Thunb.) Stapf*	LC	Indigenous
Poaceae	*Bromus catharticus Vahl*	NE	Not indigenous; Naturalised
Cyperaceae	*Bulbostylis burchellii (Ficalho & Hiern) C.B.Clarke*	LC	Indigenous
Asteraceae	*Campuloclinium macrocephalum (Less.) DC.*		Not indigenous; Naturalised; Invasive
Pteridaceae	*Cheilanthes sp.*		
Asteraceae	*Cirsium vulgare (Savi) Ten.*		Not indigenous; Naturalised; Invasive
Commelinaceae	*Commelina africana L. var. krebsiana (Kunth) C.B.Clarke*	LC	Indigenous
Asteraceae	*Conyza bonariensis (L.) Cronquist*		Not indigenous; Naturalised
Asteraceae	*Cosmos bipinnatus Cav.*		Not indigenous; Naturalised
Asteraceae	*Cotula anthemoides L.*	LC	Indigenous

Acanthaceae	*Crabbea hirsuta Harv.*		Indigenous
Crassulaceae	*Crassula alba Forssk. var. alba*		Indigenous
Poaceae	*Cymbopogon caesius (Hook. & Arn.) Stapf*	LC	Indigenous
Poaceae	*Cynodon dactylon (L.) Pers.*	LC	Indigenous
Cyperaceae	*Cyperus congestus Vahl*	LC	Indigenous
Solanaceae	*Datura stramonium L.*		Not indigenous; Naturalised; Invasive
Caryophyllaceae	*Dianthus mooiensis F.N.Williams subsp. mooiensis var. mooiensis*		Indigenous; Endemic
Asteraceae	*Dicoma anomala Sond. subsp. anomala*	LC	Indigenous
Poaceae	*Digitaria eriantha Steud.*	LC	Indigenous
Poaceae	*Diheteropogon amplectens (Nees) Clayton var. amplectens*	LC	Indigenous
Ebenaceae	*Diospyros austro-africana De Winter var. austro-africana*		Indigenous; Endemic
Ebenaceae	*Diospyros lycioides Desf. subsp. guerkei (Kuntze) De Winter*		Indigenous
Poaceae	*Elionurus muticus (Spreng.) Kunth*	LC	Indigenous
Poaceae	*Enneapogon scoparius Stapf*	LC	Indigenous
Poaceae	*Eragrostis biflora Hack. ex Schinz*	LC	Indigenous
Poaceae	*Eragrostis capensis (Thunb.) Trin.*	LC	Indigenous
Poaceae	*Eragrostis chloromelas Steud.*	LC	Indigenous
Poaceae	*Eragrostis curvula (Schrad.) Nees*	LC	Indigenous
Poaceae	*Eragrostis gummiflua Nees*	LC	Indigenous
Poaceae	*Eragrostis lehmanniana Nees*		Indigenous
Poaceae	*Eragrostis racemosa (Thunb.) Steud.*	LC	Indigenous
Poaceae	*Eragrostis superba Peyr.*	LC	Indigenous
Fabaceae	*Erythrina zeyheri Harv.*	LC	Indigenous
Myrtaceae	*Eucalyptus sp.*		Not indigenous; Cultivated; Naturalised; Invasive
Euphorbiaceae	*Euphorbia striata Thunb.*	LC	Indigenous; Endemic
Asteraceae	*Felicia filifolia (Vent.) Burtt Davy subsp. filifolia*	LC	Indigenous
Asteraceae	*Felicia muricata (Thunb.) Nees subsp. muricata*	LC	Indigenous
Asteraceae	*Gazania krebsiana Less. subsp. krebsiana*	LC	Indigenous
Asteraceae	*Gazania krebsiana Less. subsp. serrulata (DC.) Roessler*	LC	Indigenous
Asteraceae	*Gerbera ambigua (Cass.) Sch.Bip.*	LC	Indigenous
Iridaceae	*Gladiolus elliotii Baker*	LC	Indigenous
Iridaceae	*Gladiolus sericeovillosus Hook.f. subsp. sericeovillosus*	LC	Indigenous; Endemic
Thymelaeaceae	*Gnidia capitata L.f.*		Indigenous
Thymelaeaceae	*Gnidia triplinervis Meisn.*		Indigenous; Endemic
Apocynaceae	*Gomphocarpus fruticosus (L.) Aiton f. subsp. fruticosus*	LC	Indigenous
Amaranthaceae	*Gomphrena celosioides Mart.*		Not indigenous; Naturalised
Celastraceae	*Gymnosporia buxifolia (L.) Szyszyl.*	LC	Indigenous
Amaryllidaceae	*Haemanthus humilis Jacq. subsp. humilis*	LC	Indigenous

Asteraceae	*Haplocarpha scaposa Harv.*	LC	Indigenous
Poaceae	*Harpochloa falx (L.f.) Kuntze*	LC	Indigenous
Asteraceae	*Helichrysum cephaloideum DC.*	LC	Indigenous
Asteraceae	*Helichrysum nudifolium (L.) Less. var. nudifolium*	LC	Indigenous
Asteraceae	*Helichrysum rugulosum Less.*	LC	Indigenous
Malvaceae	*Hermannia depressa N.E.Br.*	LC	Indigenous
Apiaceae	*Heteromorpha arborescens (Spreng.) Cham. & Schltdl. var. abyssinica (Hochst. ex A.Rich.) H.Wolff*	LC	Indigenous
Malvaceae	*Hibiscus microcarpus Garcke*	LC	Indigenous
Malvaceae	*Hibiscus trionum L.*		Not indigenous; Naturalised
Poaceae	*Hyparrhenia hirta (L.) Stapf*	LC	Indigenous
Poaceae	*Hyperthelia dissoluta (Nees ex Steud.) Clayton*	LC	Indigenous
Hypoxidaceae	*Hypoxis hemerocallidea Fisch., C.A.Mey. & Avé-Lall.*	LC	Indigenous
Hypoxidaceae	*Hypoxis iridifolia Baker*	LC	Indigenous
Hypoxidaceae	*Hypoxis multiceps Buchinger ex Baker*	LC	Indigenous
Hypoxidaceae	*Hypoxis rigidula Baker var. rigidula*	LC	Indigenous
Poaceae	*Imperata cylindrica (L.) Raeusch.*	LC	Indigenous
Convolvulaceae	*Ipomoea crassipes Hook. var. crassipes*	LC	Indigenous
Scrophulariaceae	*Jamesbrittenia aurantiaca (Burch.) Hilliard*	LC	Indigenous
Hyacinthaceae	*Ledebouria ovatifolia (Baker) Jessop subsp. ovatifolia*		Indigenous; Endemic
Lamiaceae	*Leonotis leonurus (L.) R.Br.*	LC	Indigenous
Lamiaceae	*Leucas martinicensis (Jacq.) R.Br.*		Indigenous
Poaceae	*Loudetia flavida (Stapf) C.E.Hubb.*	LC	Indigenous
Asteraceae	*Macledium zeyheri (Sond.) S.Ortiz subsp. zeyheri*		Indigenous
Orchidaceae	*Habenaria falcicornis (Burch. ex Lindl.) Bolus subsp. falcicornis*	LC	Indigenous
Meliaceae	*Melia azedarach L.*	NE	Not indigenous; Naturalised; Invasive
Poaceae	*Melinis repens (Willd.) Zizka subsp. repens*	LC	Indigenous
Poaceae	*Microchloa caffra Nees*	LC	Indigenous
Lobeliaceae	*Monopsis decipiens (Sond.) Thulin*	LC	Indigenous
Geraniaceae	*Monsonia burkeana Planch. ex Harv.*	LC	Indigenous
Scrophulariaceae	*Nemesia fruticans (Thunb.) Benth.*	LC	Indigenous
Asteraceae	*Nidorella podocephala (DC.) J.C.Manning & Goldblatt*	LC	Indigenous
Lamiaceae	*Ocimum obovatum E.Mey. ex Benth.*		Indigenous
Onagraceae	*Oenothera rosea L'Hér. ex Aiton*		Not indigenous; Naturalised
Onagraceae	*Oenothera stricta Ledeb. ex Link subsp. stricta*		Not indigenous; Naturalised
Rubiaceae	*Oldenlandia herbacea (L.) Roxb. var. herbacea*	LC	Indigenous
Cactaceae	*Opuntia imbricata (Haw.) DC.*		Not indigenous; Naturalised
Oxalidaceae	*Oxalis sp.*		
Poaceae	*Paspalum dilatatum Poir.*	NE	Not indigenous; Naturalised
Pteridaceae	*Pellaea calomelanos (Sw.) Link var. calomelanos*	LC	Indigenous

Poaceae	*Pennisetum clandestinum Hochst. ex Chiov.*	NE	Not indigenous; Naturalised; Invasive
Polygonaceae	*Persicaria lapathifolia (L.) Gray*		Not indigenous; Naturalised
Solanaceae	*Physalis viscosa L.*		Not indigenous; Naturalised; Invasive
Plantaginaceae	*Plantago longissima Decne.*	LC	Indigenous
Caryophyllaceae	*Pollichia campestris Aiton*		Indigenous
Polygalaceae	*Polygala hottentotta C.Presl*	LC	Indigenous
Salicaceae	*Populus alba L. var. alba*		Not indigenous; Naturalised
Rosaceae	*Prunus persica (L.) Batsch var. persica*		Not indigenous; Naturalised; Invasive
Molluginaceae	*Psammotropha myriantha Sond.*	LC	Indigenous
Rosaceae	*Pyracantha angustifolia (Franch.) C.K.Schneid.*		Not indigenous; Cultivated; Naturalised; Invasive
Anacardiaceae	*Rhus magalismontana Sond.*		Indigenous
Salicaceae	*Salix mucronata Thunb. subsp. mucronata*	LC	Indigenous
Dipsacaceae	*Scabiosa columbaria L.*	LC	Indigenous
Asteraceae	*Schkuhria pinnata (Lam.) Kuntze ex Thell.*		Not indigenous; Naturalised
Anacardiaceae	*Searsia rigida (Mill.) F.A.Barkley var. rigida*		Indigenous
Gentianaceae	*Sebaea grandis (E.Mey.) Steud.*		Indigenous
Asteraceae	*Senecio inornatus DC.*	LC	Indigenous
Poaceae	*Setaria pumila (Poir.) Roem. & Schult.*	LC	Indigenous
Poaceae	*Setaria sphacelata (Schumach.) Stapf & C.E.Hubb. ex M.B.Moss var. sericea (Stapf) Clayton*	LC	Indigenous
Solanaceae	*Solanum panduriforme Drège ex Dunal*		Indigenous
Solanaceae	*Solanum pseudocapsicum L.*		Not indigenous; Naturalised; Invasive
Poaceae	*Sporobolus africanus (Poir.) Robyns & Tournay*	LC	Indigenous
Asteraceae	*Stoebe plumosa (L.) Thunb.*	LC	Indigenous
Orobanchaceae	*Striga elegans Benth.*	LC	Indigenous
Asteraceae	*Tagetes minuta L.*		Not indigenous; Naturalised; Invasive
Fabaceae	*Tephrosia capensis (Jacq.) Pers. var. capensis*	LC	Indigenous
Fabaceae	*Tephrosia rhodesica Baker f. var. rhodesica*	LC	Indigenous
Poaceae	*Themeda triandra Forssk.*	LC	Indigenous
Poaceae	*Trachypogon spicatus (L.f.) Kuntze*	LC	Indigenous
Poaceae	*Trichoneura grandiglumis (Nees) Ekman*	LC	Indigenous
Poaceae	*Tristachya leucothrix Trin. ex Nees*	LC	Indigenous
Poaceae	*Urochloa panicoides P.Beauv.*	LC	Indigenous
Asteraceae	*Ursinia nana DC. subsp. nana*	LC	Indigenous
Verbenaceae	*Verbena bonariensis L.*		Not indigenous; Naturalised; Invasive
Campanulaceae	*Wahlenbergia grandiflora Brehmer*	LC	Indigenous
Scrophulariaceae	*Walafrida densiflora (Rolfe) Rolfe*		Indigenous
Apocynaceae	*Xysmalobium undulatum (L.) Aiton f. var. undulatum*	LC	Indigenous

Scrophulariaceae	*Zaluzianskya katharinae Hiern*	LC	Indigenous; Endemic

APPENDIX B*: Avifaunal species expected to occur in the project area*

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Accipiter melanoleucus	Sparrowhawk, Black	Unlisted	LC
Accipiter minullus	Sparrowhawk, Little	Unlisted	LC
Accipiter ovampensis	Sparrowhawk, Ovambo	Unlisted	LC
Acridotheres tristis	Myna, Common	Unlisted	LC
Acrocephalus arundinaceus	Reed-warbler, Great	Unlisted	LC
Acrocephalus baeticatus	Reed-warbler, African	Unlisted	Unlisted
Acrocephalus gracilirostris	Swamp-warbler, Lesser	Unlisted	LC
Acrocephalus palustris	Warbler, Marsh	Unlisted	LC
Acrocephalus schoenobaenus	Warbler, Sedge	Unlisted	LC
Actitis hypoleucos	Sandpiper, Common	Unlisted	LC
Actophilornis africanus	Jacana, African	Unlisted	LC
Afrotis afraoides	Korhaan, Northern Black	Unlisted	LC
Alcedo cristata	Kingfisher, Malachite	Unlisted	Unlisted
Alcedo semitorquata	Kingfisher, Half-collared	NT	LC
Alopochen aegyptiacus	Goose, Egyptian	Unlisted	LC
Amadina erythrocephala	Finch, Red-headed	Unlisted	LC
Amandava subflava	Waxbill, Orange-breasted	Unlisted	Unlisted
Amaurornis flavirostris	Crake, Black	Unlisted	LC
Amblyospiza albifrons	Weaver, Thick-billed	Unlisted	LC
Anas capensis	Teal, Cape	Unlisted	LC
Anas erythrorhyncha	Teal, Red-billed	Unlisted	LC
Anas hottentota	Teal, Hottentot	Unlisted	LC
Anas smithii	Shoveler, Cape	Unlisted	LC
Anas sparsa	Duck, African Black	Unlisted	LC
Anas undulata	Duck, Yellow-billed	Unlisted	LC
Andropadus importunus	Greenbul, Sombre	Unlisted	LC
Anhinga rufa	Darter, African	Unlisted	LC
Anomalospiza imberbis	Finch, Cuckoo	Unlisted	LC
Anthropoides paradiseus	Crane, Blue	NT	VU
Anthus cinnamomeus	Pipit, African	Unlisted	LC
Anthus leucophrys	Pipit, Plain-backed	Unlisted	LC
Anthus lineiventris	Pipit, Striped	Unlisted	LC
Anthus similis	Pipit, Long-billed	Unlisted	LC
Anthus vaalensis	Pipit, Buffy	Unlisted	LC
Apalis thoracica	Apalis, Bar-throated	Unlisted	LC
Apus affinis	Swift, Little	Unlisted	LC
Apus apus	Swift, Common	Unlisted	LC
Apus barbatus	Swift, African Black	Unlisted	LC
Apus caffer	Swift, White-rumped	Unlisted	LC
Apus horus	Swift, Horus	Unlisted	LC

Aquila pennatus	Eagle, Booted	Unlisted	LC
Ardea cinerea	Heron, Grey	Unlisted	LC
Ardea goliath	Heron, Goliath	Unlisted	LC
Ardea melanocephala	Heron, Black-headed	Unlisted	LC
Ardea purpurea	Heron, Purple	Unlisted	LC
Ardeola ralloides	Heron, Squacco	Unlisted	LC
Asio capensis	Owl, Marsh	Unlisted	LC
Bostrychia hagedash	Ibis, Hadeda	Unlisted	LC
Botaurus stellaris	Bittern, Eurasian	Unlisted	LC
Bradypterus baboecala	Rush-warbler, Little	Unlisted	LC
Bubo africanus	Eagle-owl, Spotted	Unlisted	LC
Bubulcus ibis	Egret, Cattle	Unlisted	LC
Bugeranus carunculatus	Crane, Wattled	CR	VU
Burhinus capensis	Thick-knee, Spotted	Unlisted	LC
Burhinus vermiculatus	Thick-knee, Water	Unlisted	LC
Buteo rufofuscus	Buzzard, Jackal	Unlisted	LC
Buteo vulpinus	Buzzard, Common	Unlisted	Unlisted
Butorides striata	Heron, Green-backed	Unlisted	LC
Calandrella cinerea	Lark, Red-capped	Unlisted	LC
Calendulauda sabota	Lark, Sabota	Unlisted	LC
Calidris ferruginea	Sandpiper, Curlew	LC	NT
Calidris minuta	Stint, Little	LC	LC
Centropus burchellii	Coucal, Burchell's	Unlisted	Unlisted
Centropus superciliosus	Coucal, White-browed	Unlisted	LC
Cercomela familiaris	Chat, Familiar	Unlisted	LC
Certhilauda benguelensis	Lark, Benguela Long-billed	Unlisted	Unlisted
Certhilauda curvirostris	Lark, Cape Long-billed	Unlisted	LC
Certhilauda semitorquata	Lark, Eastern Long-billed	Unlisted	LC
Certhilauda subcoronata	Lark, Karoo Long-billed	Unlisted	LC
Ceryle rudis	Kingfisher, Pied	Unlisted	LC
Chalcomitra amethystina	Sunbird, Amethyst	Unlisted	LC
Charadrius hiaticula	Plover, Common Ringed	Unlisted	LC
Charadrius pallidus	Plover, Chestnut-banded	NT	NT
Charadrius pecuarius	Plover, Kittlitz's	Unlisted	LC
Charadrius tricollaris	Plover, Three-banded	Unlisted	LC
Chersomanes albofasciata	Lark, Spike-heeled	Unlisted	LC
Chlidonias hybrida	Tern, Whiskered	Unlisted	LC
Chlidonias leucopterus	Tern, White-winged	Unlisted	LC
Chrysococcyx caprius	Cuckoo, Diderick	Unlisted	LC
Ciconia abdimii	Stork, Abdim's	NT	LC
Ciconia ciconia	Stork, White	Unlisted	LC
Cinnyricinclus leucogaster	Starling, Violet-backed	Unlisted	LC
Cinnyris talatala	Sunbird, White-bellied	Unlisted	LC
Circaetus pectoralis	Snake-eagle, Black-chested	Unlisted	LC
Circus aeruginosus	Marsh-harrier, Western	Unlisted	LC

Circus macrourus	Harrier, Pallid	NT	NT
Circus maurus	Harrier, Black	EN	VU
Circus pygargus	Harrier, Montagu's	Unlisted	LC
Circus ranivorus	Marsh-harrier, African	EN	LC
Cisticola aridulus	Cisticola, Desert	Unlisted	LC
Cisticola ayresii	Cisticola, Wing-snapping	Unlisted	LC
Cisticola cinnamomeus	Cisticola, Pale-crowned	Unlisted	LC
Cisticola fulvicapilla	Neddicky, Neddicky	Unlisted	LC
Cisticola juncidis	Cisticola, Zitting	Unlisted	LC
Cisticola lais	Cisticola, Wailing	Unlisted	LC
Cisticola textrix	Cisticola, Cloud	Unlisted	LC
Cisticola tinniens	Cisticola, Levaillant's	Unlisted	LC
Colius striatus	Mousebird, Speckled	Unlisted	LC
Columba arquatrix	Olive-pigeon, African	Unlisted	LC
Columba guinea	Pigeon, Speckled	Unlisted	LC
Columba livia	Dove, Rock	Unlisted	LC
Coracias caudatus	Roller, Lilac-breasted	Unlisted	LC
Coracias garrulus	Roller, European	NT	LC
Corvus albus	Crow, Pied	Unlisted	LC
Corvus capensis	Crow, Cape	Unlisted	LC
Corythaixoides concolor	Go-away-bird, Grey	Unlisted	LC
Cossypha caffra	Robin-chat, Cape	Unlisted	LC
Coturnix coturnix	Quail, Common	Unlisted	LC
Coturnix delegorguei	Quail, Harlequin	Unlisted	LC
Creatophora cinerea	Starling, Wattled	Unlisted	LC
Crecopsis egregia	Crake, African	Unlisted	LC
Crithagra atrogularis	Canary, Black-throated	Unlisted	LC
Crithagra flaviventris	Canary, Yellow	Unlisted	LC
Crithagra gularis	Seedeater, Streaky-headed	Unlisted	LC
Crithagra mozambicus	Canary, Yellow-fronted	Unlisted	LC
Cuculus solitarius	Cuckoo, Red-chested	Unlisted	LC
Cursorius temminckii	Courser, Temminck's	Unlisted	LC
Cypsiurus parvus	Palm-swift, African	Unlisted	LC
Delichon urbicum	House-martin, Common	Unlisted	LC
Dendrocygna bicolor	Duck, Fulvous	Unlisted	LC
Dendrocygna viduata	Duck, White-faced Whistling	Unlisted	LC
Dendropicos fuscescens	Woodpecker, Cardinal	Unlisted	LC
Dicrurus adsimilis	Drongo, Fork-tailed	Unlisted	LC
Egretta alba	Egret, Great	Unlisted	LC
Egretta ardesiaca	Heron, Black	Unlisted	LC
Egretta garzetta	Egret, Little	Unlisted	LC
Egretta intermedia	Egret, Yellow-billed	Unlisted	LC
Elanus caeruleus	Kite, Black-shouldered	Unlisted	LC
Emberiza capensis	Bunting, Cape	Unlisted	LC
Emberiza tahapisi	Bunting, Cinnamon-breasted	Unlisted	LC

Eremopterix leucotis	Sparrowlark, Chestnut-backed	Unlisted	LC
Estrilda astrild	Waxbill, Common	Unlisted	LC
Estrilda erythronotos	Waxbill, Black-faced	Unlisted	LC
Euplectes afer	Bishop, Yellow-crowned	Unlisted	LC
Euplectes albonotatus	Widowbird, White-winged	Unlisted	LC
Euplectes ardens	Widowbird, Red-collared	Unlisted	LC
Euplectes axillaris	Widowbird, Fan-tailed	Unlisted	LC
Euplectes capensis	Bishop, Yellow	Unlisted	LC
Euplectes orix	Bishop, Southern Red	Unlisted	LC
Euplectes progne	Widowbird, Long-tailed	Unlisted	LC
Eupodotis caerulescens	Korhaan, Blue	LC	NT
Eupodotis senegalensis	Korhaan, White-bellied	VU	LC
Falco amurensis	Falcon, Amur	Unlisted	LC
Falco biarmicus	Falcon, Lanner	VU	LC
Falco naumanni	Kestrel, Lesser	Unlisted	LC
Falco rupicoloides	Kestrel, Greater	Unlisted	LC
Falco rupicolus	Kestrel, Rock	Unlisted	LC
Falco vespertinus	Falcon, Red-footed	NT	NT
Fulica cristata	Coot, Red-knobbed	Unlisted	LC
Gallinago nigripennis	Snipe, African	Unlisted	LC
Gallinula chloropus	Moorhen, Common	Unlisted	LC
Geronticus calvus	Ibis, Southern Bald	VU	VU
Glareola nordmanni	Pratincole, Black-winged	NT	NT
Halcyon albiventris	Kingfisher, Brown-hooded	Unlisted	LC
Haliaeetus vocifer	Fish-eagle, African	Unlisted	LC
Himantopus himantopus	Stilt, Black-winged	Unlisted	LC
Hirundo abyssinica	Swallow, Lesser Striped	Unlisted	LC
Hirundo albigularis	Swallow, White-throated	Unlisted	LC
Hirundo cucullata	Swallow, Greater Striped	Unlisted	LC
Hirundo fuligula	Martin, Rock	Unlisted	Unlisted
Hirundo rustica	Swallow, Barn	Unlisted	LC
Hirundo semirufa	Swallow, Red-breasted	Unlisted	LC
Indicator indicator	Honeyguide, Greater	Unlisted	LC
Ixobrychus minutus	Bittern, Little	Unlisted	LC
Jynx ruficollis	Wryneck, Red-throated	Unlisted	LC
Lamprotornis nitens	Starling, Cape Glossy	Unlisted	LC
Laniarius atrococcineus	Shrike, Crimson-breasted	Unlisted	LC
Laniarius ferrugineus	Boubou, Southern	Unlisted	LC
Lanius collaris	Fiscal, Common (Southern)	Unlisted	LC
Lanius collurio	Shrike, Red-backed	Unlisted	LC
Lanius minor	Shrike, Lesser Grey	Unlisted	LC
Larus fuscus	Gull, Lesser Black-backed	Unlisted	LC
Lophaetus occipitalis	Eagle, Long-crested	Unlisted	LC
Lybius torquatus	Barbet, Black-collared	Unlisted	LC
Macronyx capensis	Longclaw, Cape	Unlisted	LC

Megaceryle maximus	Kingfisher, Giant	Unlisted	Unlisted
Merops apiaster	Bee-eater, European	Unlisted	LC
Merops bullockoides	Bee-eater, White-fronted	Unlisted	LC
Milvus aegyptius	Kite, Yellow-billed	Unlisted	Unlisted
Milvus migrans	Kite, Black	Unlisted	LC
Mirafra africana	Lark, Rufous-naped	Unlisted	LC
Mirafra apiata	Lark, Cape Clapper	Unlisted	LC
Mirafra cheniana	Lark, Melodious	LC	NT
Mirafra fasciolata	Lark, Eastern Clapper	Unlisted	LC
Mirafra marjoriae	Lark, Agulhas Clapper	Unlisted	Unlisted
Monticola explorator	Rock-thrush, Sentinel	Unlisted	LC
Monticola rupestris	Rock-thrush, Cape	Unlisted	LC
Motacilla aguimp	Wagtail, African Pied	Unlisted	LC
Motacilla capensis	Wagtail, Cape	Unlisted	LC
Muscicapa adusta	Flycatcher, African Dusky	Unlisted	LC
Muscicapa striata	Flycatcher, Spotted	Unlisted	LC
Mycteria ibis	Stork, Yellow-billed	EN	LC
Myrmecocichla formicivora	Chat, Anteating	Unlisted	LC
Neotis denhami	Bustard, Denham's	VU	NT
Netta erythrophthalma	Pochard, Southern	Unlisted	LC
Numida meleagris	Guineafowl, Helmeted	Unlisted	LC
Nycticorax nycticorax	Night-Heron, Black-crowned	Unlisted	LC
Oena capensis	Dove, Namaqua	Unlisted	LC
Oenanthe monticola	Wheatear, Mountain	Unlisted	LC
Oenanthe pileata	Wheatear, Capped	Unlisted	LC
Onychognathus morio	Starling, Red-winged	Unlisted	LC
Oriolus larvatus	Oriole, Black-headed	Unlisted	LC
Ortygospiza atricollis	Quailfinch, African	Unlisted	LC
Oxyura maccoa	Duck, Maccoa	NT	NT
Parisoma subcaeruleum	Tit-babbler, Chestnut-vented	Unlisted	Unlisted
Passer diffusus	Sparrow, Southern Grey-headed	Unlisted	LC
Passer domesticus	Sparrow, House	Unlisted	LC
Passer melanurus	Sparrow, Cape	Unlisted	LC
Pernis apivorus	Honey-buzzard, European	Unlisted	LC
Phalacrocorax africanus	Cormorant, Reed	Unlisted	Unlisted
Phalacrocorax lucidus	Cormorant, White-breasted	Unlisted	LC
Philomachus pugnax	Ruff, Ruff	Unlisted	LC
Phoeniconaias minor	Flamingo, Lesser	NT	NT
Phoenicopterus ruber	Flamingo, Greater	NT	LC
Phoeniculus purpureus	Wood-hoopoe, Green	Unlisted	LC
Phylloscopus trochilus	Warbler, Willow	Unlisted	LC
Platalea alba	Spoonbill, African	Unlisted	LC
Plectropterus gambensis	Goose, Spur-winged	Unlisted	LC
Plegadis falcinellus	Ibis, Glossy	Unlisted	LC
Plocepasser mahali	Sparrow-weaver, White-browed	Unlisted	LC

Ploceus capensis	Weaver, Cape	Unlisted	LC
Ploceus cucullatus	Weaver, Village	Unlisted	LC
Ploceus velatus	Southern Masked-weaver	Unlisted	LC
Podica senegalensis	Finfoot, African	VU	LC
Podiceps cristatus	Grebe, Great Crested	Unlisted	LC
Podiceps nigricollis	Grebe, Black-necked	Unlisted	LC
Polyboroides typus	Harrier-Hawk, African	Unlisted	LC
Porphyrio madagascariensis	Swamphen, African Purple	Unlisted	Unlisted
Porzana porzana	Crake, Spotted	Unlisted	LC
Porzana pusilla	Crake, Baillon's	Unlisted	LC
Prinia flavicans	Prinia, Black-chested	Unlisted	LC
Prinia subflava	Prinia, Tawny-flanked	Unlisted	LC
Pternistis swainsonii	Spurfowl, Swainson's	Unlisted	LC
Pycnonotus nigricans	Bulbul, African Red-eyed	Unlisted	LC
Pycnonotus tricolor	Bulbul, Dark-capped	Unlisted	Unlisted
Pytilia melba	Pytilia, Green-winged	Unlisted	LC
Quelea quelea	Quelea, Red-billed	Unlisted	LC
Rallus caerulescens	Rail, African	Unlisted	LC
Recurvirostra avosetta	Avocet, Pied	Unlisted	LC
Rhinopomastus cyanomelas	Scimitarbill, Common	Unlisted	LC
Riparia cincta	Martin, Banded	Unlisted	LC
Riparia paludicola	Martin, Brown-throated	Unlisted	LC
Riparia riparia	Martin, Sand	Unlisted	LC
Rostratula benghalensis	Painted-snipe, Greater	NT	LC
Sagittarius serpentarius	Secretarybird, Secretarybird	VU	VU
Sarkidiornis melanotos	Duck, Comb	Unlisted	LC
Sarothrura rufa	Flufftail, Red-chested	Unlisted	LC
Saxicola torquatus	Stonechat, African	Unlisted	LC
Scleroptila levaillantii	Francolin, Red-winged	Unlisted	LC
Scleroptila levaillantoides	Francolin, Orange River	Unlisted	Unlisted
Scopus umbretta	Hamerkop, Hamerkop	Unlisted	LC
Serinus canicollis	Canary, Cape	Unlisted	LC
Sigelus silens	Flycatcher, Fiscal	Unlisted	LC
Spermestes cucullatus	Mannikin, Bronze	Unlisted	Unlisted
Sphenoeacus afer	Grassbird, Cape	Unlisted	LC
Spizocorys conirostris	Lark, Pink-billed	Unlisted	LC
Spreo bicolor	Starling, Pied	Unlisted	Unlisted
Stenostira scita	Flycatcher, Fairy	Unlisted	LC
Streptopelia capicola	Turtle-dove, Cape	Unlisted	LC
Streptopelia semitorquata	Dove, Red-eyed	Unlisted	LC
Streptopelia senegalensis	Dove, Laughing	Unlisted	LC
Struthio camelus	Ostrich, Common	Unlisted	LC
Sylvia borin	Warbler, Garden	Unlisted	LC
Sylvietta rufescens	Crombec, Long-billed	Unlisted	LC
Tachybaptus ruficollis	Grebe, Little	Unlisted	LC

Tachymarptis melba	Swift, Alpine	Unlisted	LC
Tadorna cana	Shelduck, South African	Unlisted	LC
Telophorus zeylonus	Bokmakierie, Bokmakierie	Unlisted	LC
Terpsiphone viridis	Paradise-flycatcher, African	Unlisted	LC
Thalassornis leuconotus	Duck, White-backed	Unlisted	LC
Thamnolaea cinnamomeiventris	Cliff-chat, Mocking	Unlisted	LC
Threskiornis aethiopicus	Ibis, African Sacred	Unlisted	LC
Trachyphonus vaillantii	Barbet, Crested	Unlisted	LC
Tricholaema leucomelas	Barbet, Acacia Pied	Unlisted	LC
Tringa glareola	Sandpiper, Wood	Unlisted	LC
Tringa nebularia	Greenshank, Common	Unlisted	LC
Tringa stagnatilis	Sandpiper, Marsh	Unlisted	LC
Turdoides jardineii	Babbler, Arrow-marked	Unlisted	LC
Turdus libonyanus	Thrush, Kurrichane	Unlisted	Unlisted
Turdus olivaceus	Thrush, Olive	Unlisted	LC
Turdus smithi	Thrush, Karoo	Unlisted	LC
Turtur chalcospilos	Wood-dove, Emerald-spotted	Unlisted	LC
Tyto alba	Owl, Barn	Unlisted	LC
Tyto capensis	Grass-owl, African	VU	LC
Upupa africana	Hoopoe, African	Unlisted	LC
Urocolius indicus	Mousebird, Red-faced	Unlisted	LC
Vanellus armatus	Lapwing, Blacksmith	Unlisted	LC
Vanellus coronatus	Lapwing, Crowned	Unlisted	LC
Vanellus senegallus	Lapwing, African Wattled	Unlisted	LC
Vidua macroura	Whydah, Pin-tailed	Unlisted	LC
Zosterops pallidus	White-eye, Orange River	Unlisted	LC
Zosterops virens	White-eye, Cape	Unlisted	LC

APPENDIX C: *Mammals species expected to occur in the project area*

Species	Common name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Aethomys ineptus	Tete Veld Rat	LC	LC
Alcelaphus buselaphus	Red Hartebeest	LC	LC
Antidorcas marsupialis	Springbok	LC	LC
Aonyx capensis	Cape Clawless Otter	**NT**	**NT**
Atelerix frontalis	South Africa Hedgehog	**NT**	LC
Atilax paludinosus	Water Mongoose	LC	LC
Canis mesomelas	Black-backed Jackal	LC	LC
Caracal caracal	Caracal	LC	LC
Ceratotherium simum	White Rhinoceros	**NT**	**NT**
Connochaetes gnou	Black Wildebeest	LC	LC
Connochaetes taurinus	Blue Wildebeest	LC	LC
Crocidura cyanea	Reddish-grey Musk Shrew	LC	LC
Crocidura mariquensis	Swamp Musk Shrew	**NT**	LC
Crocidura silacea	Lesser Grey-brown Musk Shrew	LC	LC
Cryptomys hottentotus	Common Mole-rat	LC	LC
Cynictis penicillata	Yellow Mongoose	LC	LC
Damaliscus pygargus	Blesbok	LC	LC
Dasymys incomtus	African Marsh Rat	**NT**	LC
Desmodillus auricularis	Short-tailed Gerbil	LC	LC
Diceros bicornis	Black Rhinoceros	**EN**	**CR**
Eidolon helvum	African Straw-colored Fruit Bat	LC	NT
Elephantulus brachyrhynchus	Short-snouted Sengi	LC	LC
Elephantulus myurus	Eastern Rock Sengi	LC	LC
Eptesicus hottentotus	Long-tailed Serotine Bat	LC	LC
Equus quagga	Plains Zebra	LC	NT
Felis nigripes	Black-footed Cat	**VU**	**VU**
Felis silvestris	African Wildcat	LC	LC
Genetta genetta	Small-spotted Genet	LC	LC
Gerbilliscus brantsii	Highveld Gerbil	LC	LC
Gerbilliscus leucogaster	Bushveld Gerbil	LC	LC
Herpestes sanguineus	Slender Mongoose	LC	LC
Hydrictis maculicollis	Spotted-necked Otter	VU	NT
Hystrix africaeaustralis	Cape Porcupine	LC	LC
Ichneumia albicauda	White-tailed Mongoose	LC	LC
Ictonyx striatus	Striped Polecat	LC	LC
Kerivoula lanosa	Lesser Woolly Bat	LC	LC
Leptailurus serval	Serval	**NT**	LC
Lepus saxatilis	Scrub Hare	LC	LC
Lepus victoriae	African Savanna Hare	LC	LC
Mastomys coucha	Multimammate Mouse	LC	LC
Mastomys natalensis	Natal Multimammate Mouse	LC	LC

Micaelamys namaquensis	Namaqua Rock Mouse	LC	LC
Mellivora capensis	Honey Badger	LC	LC
Mungos mungo	Banded Mongoose	LC	LC
Mus musculus	House Mouse	Unlisted	LC
Myotis welwitschii	Welwitsch's Hairy Bat	LC	LC
Mystromys albicaudatus	White-tailed Rat	**VU**	**EN**
Neoromicia capensis	Cape Serotine Bat	LC	LC
Neoromicia zuluensis	Aloe Bat	LC	LC
Nycteris thebaica	Egyptian Slit-faced Bat	LC	LC
Orycteropus afer	Aardvark	LC	LC
Otomys angoniensis	Angoni Vlei Rat	LC	LC
Otomys irroratus	Vlei Rat (Fynbos type)	LC	LC
Ourebia ourebi	Oribi	**EN**	LC
Panthera pardus	Leopard	**VU**	**VU**
Papio ursinus	Chacma Baboon	LC	LC
Parahyaena brunnea	Brown Hyaena	**NT**	**NT**
Pedetes capensis	Springhare	LC	LC
Pelea capreolus	Grey Rhebok	**NT**	LC
Poecilogale albinucha	African Striped Weasel	**NT**	LC
Procavia capensis	Rock Hyrax	LC	LC
Pronolagus randensis	Jameson's Red Rock Rabbit	LC	LC
Pronolagus saundersiae	Hewitt's Red Rock Rabbit	LC	LC
Proteles cristata	Aardwolf	LC	LC
Raphicerus campestris	Steenbok	LC	LC
Rattus rattus	House Rat	Exotic (Not listed)	LC
Redunca fulvorufula	Mountain Reedbuck	**EN**	LC
Rhabdomys pumilio	Xeric Four-striped Mouse	LC	LC
Rhinolophus blasii	Peak-saddle Horseshoe Bat	LC	LC
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	LC	LC
Rhinolophus darlingi	Darling's Horseshoe Bat	LC	LC
Saccostomus campestris	Pouched Mouse	LC	LC
Sauromys petrophilus	Flat-headed Free-tail Bat	LC	LC
Scotophilus dinganii	Yellow House Bat	LC	LC
Steatomys pratensis	Fat Mouse	LC	LC
Suncus varilla	Lesser Dwarf Shrew	LC	LC
Suricata suricatta	Suricate	LC	LC
Sylvicapra grimmia	Common Duiker	LC	LC
Syncerus caffer	African Buffalo	LC	LC
Tadarida aegyptiaca	Egyptian Free-tailed Bat	LC	LC
Taphozous mauritianus	Mauritian Tomb Bat	LC	LC
Thryonomys swinderianus	Greater Cane Rat	LC	LC
Tragelaphus oryx	Common Eland	LC	LC
Vulpes chama	Cape Fox	LC	LC

APPENDIX D: *Reptile species expected to occur within the project area*

Species	Common name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Acontias gracilicauda	Thin-tailed Legless Skink	LC	LC
Agama atra	Southern Rock Agama	LC	LC
Aparallactus capensis	Black-headed Centipede-eater	LC	LC
Boaedon capensis	Brown House Snake	LC	LC
Chamaeleo dilepis	Common Flap-neck Chameleon	LC	LC
Cordylus vittifer	Common Girdled Lizard	LC	LC
Crocodylus niloticus	Nile Crocodile	**VU**	LC
Dasypeltis scabra	Rhombic Egg-eater	LC	LC
Duberria lutrix	South African Slug-eater	LC	LC
Gerrhosaurus flavigularis	Yellow-throated Plated Lizard	LC	LC
Hemachatus haemachatus	Rinkhals	LC	LC
Lamprophis aurora	Aurora House Snake	LC	LC
Leptotyphlops scutifrons conjunctus	Eastern Thread Snake	Unlisted	LC
Lycodonomorphus inornatus	Olive House Snake	LC	Unlisted
Lycodonomorphus rufulus	Brown Water Snake	LC	Unlisted
Prosymna ambigua	East African Shovel-Snout	LC	Unlisted
Psammophis subtaeniatus	Stripe-bellied Sand Snake	LC	LC

APPENDIX E: *Amphibian species expected to occur within the project area*

Species	Common name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Amietia angolensis	Angola river frog	LC	LC
Breviceps adspersus	Bushveld Rain Frog	LC	LC
Cacosternum boettgeri	Common Caco	LC	LC
Kassina senegalensis	Bubbling Kassina	LC	LC
Phrynobatrachus natalensis	Snoring Puddle Frog	LC	LC
Pyxicephalus adspersus	Giant Bull Frog	LC	LC
Sclerophrys capensis	Raucous Toad	LC	LC
Sclerophrys garmani	Olive Toad	LC	LC
Sclerophrys gutturalis	Guttural Toad	LC	LC
Semnodactylus wealii	Rattling Frog	LC	LC
Strongylopus fasciatus	Striped Stream Frog	LC	LC
Tomopterna cryptotis	Tremelo Sand Frog	LC	LC
Tomopterna natalensis	Natal Sand Frog	LC	LC
Tomopterna tandyi	Tandy's Sand Frog	LC	LC
Xenopus laevis	Common Platanna	LC	LC
Amietia fuscigula	Cape River Frog	LC	LC
Schismaderma carens	Red Toad	LC	LC

APPENDIX F: *Method of Assessing Impacts*

The impact assessment methodology is guided by the requirements of the NEMA EIA Regulations (2010). The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/likelihood (P) of the impact occurring. This determines the environmental risk. In addition other factors, including cumulative impacts, public concern, and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S). Please note that the impact assessment must apply to the identified Sub Station alternatives as well as the identified Transmission line routes.

Determination of Environmental Risk:

The significance (S) of an impact is determined by applying a prioritisation factor (PF) to the environmental risk (ER).

The environmental risk is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and reversibility (R) applicable to the specific impact.

For the purpose of this methodology the consequence of the impact is represented by:

$$C = \frac{(E+D+M+R)}{4} \times N$$

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Table 32.

Table 32: Criteria for Determining Impact Consequence

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e. limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property boundary),
	3	Local (i.e. the area within 5 km of the site),
	4	Regional (i.e. extends between 5 and 50 km from the site
	5	Provincial / National (i.e. extends beyond 50 km from the site)
Duration	1	Immediate (<1 year)
	2	Short term (1-5 years),
	3	Medium term (6-15 years),
	4	Long term (the impact will cease after the operational life span of the project),
	5	Permanent (no mitigation measure of natural process will reduce the impact after construction).
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected),
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected),

Aspect	Score	Definition
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way),
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease), or
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease).
Reversibility	1	Impact is reversible without any time and cost.
	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible Impact

Once the C has been determined the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/scored as per Table 33.

Table 33: Probability Scoring

Probability	1	Improbable (the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <25%),
	2	Low probability (there is a possibility that the impact will occur; >25% and <50%),
	3	Medium probability (the impact may occur; >50% and <75%),
	4	High probability (it is most likely that the impact will occur- > 75% probability), or
	5	Definite (the impact will occur),

The result is a qualitative representation of relative ER associated with the impact. ER is therefore calculated as follows:

ER= C x P

Table 34: Determination of Environmental Risk

Consequence	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
	Probability					

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in Table 35.

Table 35: Significance Classes

Environmental Risk Score	
Value	**Description**
< 9	Low (i.e. where this impact is unlikely to be a significant environmental risk),
≥9; <17	Medium (i.e. where the impact could have a significant environmental risk),
≥ 17	High (i.e. where the impact will have a significant environmental risk).

The impact ER will be determined for each impact without relevant management and mitigation measures (pre-mitigation), as well as post implementation of relevant management and mitigation measures (post-mitigation). This allows for a prediction in the degree to which the impact can be managed/mitigated.

Impact Prioritisation:

In accordance with the requirements of Regulation 31 (2)(l) of the EIA Regulations (GNR 543), and further to the assessment criteria presented in the Section above it is necessary to assess each potentially significant impact in terms of:

- Cumulative impacts; and
- The degree to which the impact may cause irreplaceable loss of resources.

In addition it is important that the public opinion and sentiment regarding a prospective development and consequent potential impacts is considered in the decision making process.

In an effort to ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impact ER (post-mitigation). This prioritisation factor does not aim to detract from the risk ratings but rather to focus the attention of the decision-making authority on the higher priority/significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/mitigation impacts are implemented.

Table 36: Criteria for Determining Prioritisation

Public response (PR)	Low (1)	Issue not raised in public response.
	Medium (2)	Issue has received a meaningful and justifiable public response.
	High (3)	Issue has received an intense meaningful and justifiable public response.
Cumulative Impact (CI)	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.
	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.
Irreplaceable loss of resources (LR)	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in Table 11. The impact priority is therefore determined as follows:

Priority = PR + CI + LR

The result is a priority score which ranges from 3 to 9 and a consequent PF ranging from 1 to 2 (Refer to Table 37).

Table 37: Determination of Prioritisation Factor

Priority	Ranking	Prioritisation Factor
3	Low	1
4	Medium	1.17
5	Medium	1.33
6	Medium	1.5
7	Medium	1.67
8	Medium	1.83
9	High	2

In order to determine the final impact significance the PF is multiplied by the ER of the post mitigation scoring. The ultimate aim of the PF is to be able to increase the post mitigation environmental risk rating by a full ranking class, if all the priority attributes are high (i.e. if an impact comes out with a medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential, significant public response, and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a high significance).

Table 38: Final Environmental Significance Rating

Environmental Significance Rating	
Value	**Description**
< 10	Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
≥10 <20	Medium (i.e. where the impact could influence the decision to develop in the area),
≥ 20	High (i.e. where the impact must have an influence on the decision process to develop in the area).

APPENDIX G: Impact Assessment Results for underground mining

IMPACT DESCRIPTION			PRE - MITIGATION							POST - MITIGATION								IMPACT PRIORITISATION				
Impact	Alternative	Phase	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Pre-mitigation ER	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Post-mitigation ER	Confidence	Public response	Cumulative Impact	Irreplaceable loss	Priority Factor	Final score
Loss and fragmentation of the vegetation community, CBA, ESA and ONA as well as displacement of fauna.	0	Construction	-1	4	5	3	4	4	-16	-1	3	3	3	3	3	-9	Medium	2	2	2	1,50	-13,50
Further loss and fragmentation of the vegetation community and spread and/or establishment of alien and/or invasive species, displacement of fauna, human infringement.	0	Operation	-1	4	5	3	4	4	-16	-1	3	3	2	4	3	-9	Medium	2	2	2	1,50	-13,50
Spread and/or establishment of alien and/or invasive species, Continued displacement, direct mortalities and disturbance of faunal community.	0	Decommissioning	-1	4	4	3	4	4	-15	-1	3	4	3	4	3	-10,5	Medium	1	1	1	1,00	-10,50
Spread and/or establishment of alien invasive plant species, Soil erosion and possible re-establishment of indigenous vegetation.	0	Operation	-1	4	5	3	4	4	-16	-1	3	3	2	4	3	-9	Medium	1	1	1	1,00	-9,00

APPENDIX H: Impact Assessment Results for underground mining

IMPACT DESCRIPTION			PRE - MITIGATION						POST - MITIGATION								IMPACT PRIORITISATION				
Impact	Alternative	Phase	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Pre-mitigation ER	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Post-mitigation ER	Confidence	Public response	Cumulative Impact	Irreplaceable loss	Priority Factor	Final score
Temporary disturbance of wildlife due to increased human presence and possible use of machinery and/or vehicles.	0	Planning	-1	3	4	3	3	3	-9,75	-1	3	3	2	3	2	-5,5	Medium	2	2	3	1,67	-9,17
Loss and fragmentation of the vegetation community, CBA, ESA, ONA and fauna displacement	0	Construction	-1	4	5	4	4	3	-12,75	-1	2	3	2	3	4	-10	Medium	1	1	1	1,00	-10,00
Loss and fragmentation of the vegetation community, CBA, ESA, ONA and fauna displacement	0	Construction	-1	2	5	4	2	3	-9,75	-1	2	3	2	2	4	-9	Medium	1	1	1	1,00	-9,00
Loss and fragmentation of the vegetation community, CBA, ESA, ONA and fauna displacement	0	Construction	-1	4	5	3	4	4	-16	-1	3	3	2	2	3	-7,5	Medium	1	1	1	1,00	-7,50

Further loss and fragmentation of the vegetation community and spread and/or establishment of alien and/or invasive species, faunal mortalities and human infringement.	0	Operation	-1	2	5	4	2	3	-9,75	-1	2	3	2	2	4	-9	Medium	1	1	1	1,00	-9,00
Further loss and fragmentation of the vegetation community and spread and/or establishment of alien and/or invasive species, faunal mortalities and human infringement.	0	Operation	-1	2	5	4	2	3	-9,75	-1	2	3	2	2	4	-9	Medium	1	1	1	1,00	-9,00
Further loss and fragmentation of the vegetation community and spread and/or establishment of alien and/or invasive species, faunal mortalities and human infringement.	0	Operation	-1	4	5	3	4	4	-16	-1	3	3	2	2	3	-7,5	Medium	1	1	1	1,00	-7,50
Spread and/or establishment of alien and/or invasive species, continued displacement, direct mortalities and disturbance of faunal community due to habitat loss and disturbances	0	Decommissioning	-1	2	5	4	2	3	-9,75	-1	2	3	2	2	4	-9	Medium	1	1	1	1,00	-9,00

Spread and/or establishment of alien and/or invasive species, continued displacement, direct mortalities and disturbance of faunal community due to habitat loss and disturbances	0	Decommissioning	-1	2	5	4	2	3	-9,75	-1	2	3	2	2	4	-9	Medium	1	1	1	1,00	-9,00
Spread and/or establishment of alien and/or invasive species, continued displacement, direct mortalities and disturbance of faunal community due to habitat loss and disturbances	0	Decommissioning	-1	4	5	3	4	4	-16	-1	3	3	2	2	3	-7,5	High	1	1	1	1,00	-7,50
Spread and/or establishment of alien invasive plant species, Soil erosion, Possible re-establishment of indigenous vegetation.	0	Rehab and closure	-1	2	5	4	2	3	-9,75	-1	2	3	2	2	4	-9	High	1	1	1	1,00	-9,00
Spread and/or establishment of alien invasive plant species, Soil erosion, Possible re-establishment of indigenous vegetation.	0	Rehab and closure	-1	2	5	4	2	3	-9,75	-1	2	3	2	2	4	-9	High	1	1	1	1,00	-9,00

Spread and/or establishment of alien invasive plant species, Soil erosion, Possible re-establishment of indigenous vegetation.	0	Rehab and closure	-1	2	5	4	2	3	-9,75	-1	2	3	2	2	4	-9	High	1	1	1	1,00	-9,00