# Proposed Development of Khanyazwe FlexPower (Pty) Ltd (KFP) and Associated infrastructures in Malelane, Nkomazi Local Municipality, Ehlanzeni District Municipality, Mpumalanga

Avifauna Impact Assessment Report

MBONENI
ECOLOGICAL SERVICES

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# July 2024

# Executive Summary

## Introduction and Background

Nsovo Environmental Consulting (hereafter referred to as Nsovo) has been appointed by Khanyazwe Flexpower (Pty) Ltd (KFP) to undertake Environmental Impact Assessment (EIA) process for the proposed Flexpower power Plant and associated infrastructures. The proposed project will be located inside an urban area, on Portions 1, 4, and 116 of Farm Malelane 389 FP, in Malelane, within the Nkomazi Local Municipality, Mpumalanga Province.

The project involves developing, constructing, and operating a (maximum) 1000MW natural gas-fired power plant using either Gas Engines (or Internal Combustion Engines (ICE)) or Combined Cycle Gas Turbines (CCGT). After careful engineering consideration and research during the public consultation period, the applicant reviewed the capacity of the proposed power plant. Base on the outcomes of further research and engineering, it was confirmed that this plant has capabilities to generated up to a maximum of 1000MW. KFP will source gas from the Republic of Mozambique Pipeline Investments Company (ROMPCO), which has an existing gas pipeline that connects Mozambique's Pande Temane gas fields to Sasol's operations in South Africa, as well as several industrial and retail customers. Alternative gas sources if gas from the existing Pande Temane fields is insufficient may include imported LNG projects being developed in Matola, which will provide additional gas into the ROMPCO pipeline. KFP is also proposing the development of approximately two 500m 275 and/or 132 kV overhead powerlines from the proposed power plant to the existing Eskom Khanyazwe substation. The power plant will provide a mid-merit power profile to the national grid.

The proposed development will include the construction and assembly of the following associated infrastructures:

- Gas or gas turbines for the generation of electricity through the use of natural gas
- Heat Recovery Steam Generators (HRSG) to capture heat from high-temperature exhaust gases to produce high-temperature and high-pressure dry steam to be utilised in the steam turbines
- Steam turbines for the generation of additional electricity through the use of dry steam generated by the HRSG
- Bypass stacks associated with each gas turbine
- Dirty water retention dams and clean water dams
- Firewater tanks
- Storm water channels
- Waste storage facilities (general and hazardous)

- Exhaust stacks for the discharge of combustion gases into the atmosphere
- A water treatment plant for the treatment of raw water into potable water and the production of demineralised water (for steam generation)
- Water pipelines from the power block to the station's boundary fence and water tanks to transport and store water of both industrial quality and potable quality
- Dry-cooled system consisting of air-cooled condenser fans situated in fan banks.
- LV and MV switch gear rooms.
- Control room
- Closed fin-fan coolers to cool lubrication oil for the gas and steam turbines
- A gas pipeline from the power block to the station's boundary fence and a gas pipeline supply conditioning process facility for the conditioning and measuring of natural gas before being supplied to the gas engines.
- Ancillary infrastructure, including access roads, warehousing, buildings, access control facilities and workshop area, storage facilities, emergency backup generators, firefighting systems, laydown areas, and 275/132kV switchyard.
- A power line to connect the project to the national grid to evacuate the generated electricity.

Mboneni Ecological Services (Pty) Ltd was appointed by Nsovo Environmental Consulting to undertake an Avifauna Impact Assessment as part of the Environmental Impact Assessment (EIA) process in order to assess the impacts that the proposed development will have on the receiving environment. The objective of this study was to identify sensitive and priority Avifauna species and their habitats on the study area.

**Study Area**

The proposed project will be located within an urban area, on Portions 1, 4, and 116 of Farm Malelane 389 FP, in Malelane within the Nkomazi Local Municipality, Mpumalanga Province.

**Regional Vegetation**

The entire project site falls within the Savanna biome and this Biome is the largest Biome in South Africa and occupies over one third of the country. It is characterized by a grassy ground layer and distinct upper layer of woody plants. This biome is defined by a herbaceous layer dominated by grass species and a discontinuous to sometimes very open tree layer. The project site is classified as falling within the Granite Lowveld, and no remnants of this vegetation type exist on site.

**Methodology**

Survey methodology included a comprehensive desktop review, utilising available provincial and national ecological data, relevant literature, GIS databases, topographical maps and aerial photography. This was then supplemented through a ground-truthing phase, where

pertinent areas associated with the project area were visited during field survey undertaken on the 13th of June 2024. The survey focused on avifauna species. Several Red Listed Data avifaunal species pertaining to the project area were identified during the desktop review and their habitat suitability was assessed through the ground-truthing phase of the survey.

**Results and Discussion**

Birds are considered good ecological indicators, since their presence or absence are symptomatic of whether the ecosystem is functioning properly or not. Bird communities and ecological conditions are linked to land cover; as the land cover changes, the types of bird species in the area also change. With the Kruger National Park located not far from the focus area (4Km North), the likelihood of avifaunal SCC migrating between the KNP and surrounding areas, including the focus area, or utilising the surrounding areas for foraging is medium. The proposed development site is not considered an important area for avifauna, particularly in terms of supporting breeding populations, and the actual diversity is expected to be made up of moderate numbers of more common and widespread species. On occasion, some of the more sensitive species may be encountered foraging onsite, however, the actual dependence on the site is probably very low.

Within the vegetation type found in the study area and immediate surrounding areas, three major bird micro-habitat systems were identified, namely agricultural fields, bushveld/savanna and watercourses.

**Agricultural land (Sugarcane)** is found within the project development site and is a common micro-habitat. Agriculture is a major environmental problem for threatened bird species, especially for species that depend on savanna for survival. The tilling of soil for cultivated fields is one of the most drastic and irrevocable alternations formed on natural systems, destroying the structure and species composition of the natural vegetation. This disturbance is mainly permanent and thereby has a massive impact on the taxa that are dependent on that vegetation. Bird species that are able to exploit monoculture and cultivated crops or by-products of cultivation such as bare ground may benefit temporarily. Avian species that will be attracted to these areas include Cranes, Harrier species and various Heron species. Arable or cultivated land represents a significant feeding area for many bird species in any landscape for the following reasons:

- Through exposing the soil surface, land preparation makes many insects, seeds, bulbs and other food sources readily accessible to birds;
- Seed-eating bird species (granivorous species), such as quelea, doves and bishops, largely benefit from agricultural lands as their seeds supply food in large quantities;
- The agricultural lands attract insects, which are in turn eaten by birds; and
- During the dry season, the arable lands often represent the only green or attractive food sources in an otherwise dry landscape.

The **Savanna biome** is particularly rich in large raptors, and forms the stronghold of Red Data species such as White-backed Vulture, Cape Vulture, Martial Eagle and Tawny Eagle. These

large raptors may occasionally utilise the study area for foraging arrays. The savanna biome contains a large variety of species (it is the most species-rich community in southern Africa) but is generally less important from a Red Data bird perspective, as very few bird species are restricted to this biome. Apart from Red Data species, the region provides habitat for several non-Red Data raptor species, such as the Brown Snake Eagle, Black-breasted Snake Eagle, Long-crested Eagle and a multitude of medium-sized raptors such as the migratory Steppe Buzzard, African Harrier Hawk (Gymnogene), Wahlberg's Eagle and African Hawk Eagle.

**Watercourses**: The study area contains pans/dams, mostly associated with the non-perennial river. No palustrine wetland habitats were observed on the site and adjacent areas. Several artificially created farm dams were observed and these dams are important refuges for a variety of waterbirds, including species such as African Fish Eagle as well Black Stork. The dams and larger rivers may be utilised on a temporary basis for foraging by Yellow-billed Stork and Marabou Storks. Common species that could use pans and dams include Red-knobbed Coot, Black-headed Heron, African Darter, Blacksmith Lapwing, and Egyptian Goose. The non-perennial river on site is considered important attractants to various bird species. Bird species such as herons, bishops, weavers, cisticolas and warblers will breed in the reeds growing on the banks of the rivers and will also feed on insects that live within the reeds. Many of these bird species make use of the thorny nature of these trees to build their nests. Water bodies represent sensitive areas because they provide habitat for a wide variety of terrestrial and aquatic species, particularly avifauna. Several more common water dependent species e.g., Red-knobbed Coot, Black-headed Heron, African Darter, White-faced Duck, Yellow-billed Duck, Blacksmith Lapwing, African Sacred Ibis and Egyptian Goose are known to utilise these habitat units. The larger rivers near the project site are particularly important for stork species such as Black Stork and Yellow-billed Stork and a variety of other waterbirds. The riparian habitat along the Malelane River (East of the project site) could provide refuge for shy and skulking species such as White-backed Night Heron.

Thirty-Seven (37) bird species were recorded during the field survey. Species recorded were common and widespread and typical of savanna biome. No Red Data bird species associated with the study site were recorded.

The impacts that could be associated with a project of this nature are: collision of birds on certain sections of the line, particularly within watercourses; electrocution of large birds perched on the poles; destruction of habitat, and disturbance of birds. The mitigation measures are shown in **Table 9** in this report.

***Mortality due to collisions of birds with the overhead powerlines***

Although all birds have the potential to be affected by collisions, species groups most at risk of collision impacts are those with heavier bodies and relatively small wingspan, making them less movable and therefore more prone to collisions. Species groups include bustards, storks, cranes, eagles, vultures, ibises, etc. Further groups at risk are fast-flying waterfowl, especially ducks and geese and these bird species are mostly heavy-bodied species, with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid

colliding with power lines. Collisions are probably the biggest single threat posed by transmission lines to birds in southern Africa. Several factors are thought to influence birds' collisions, including the manoeuvrability of the bird, topography, weather conditions and power line configuration

The proposed powerline could pose a limited collision threat to Red Data species. The biggest threat and also a possibility of collisions at pans, dams and wetlands which could potentially affect Ducks and a variety of non-threatened waterbirds (Hadeda Ibis, Black-shouldered Kite, Egyptian Goose, etc).
In order to mitigate these impacts, areas where bird collisions are likely to be high could be ameliorated by marking the lines with bird devices such as "bird diverters" and "flappers" to increase the visibility of the lines.

***Mortality of birds due to electrocution on the powerlines***

Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components. Electrocution of birds on overhead lines is an important cause of unnatural mortality of raptors and storks.

The risk of electrocution is strongly influenced by the power line voltage and the pole structure design, which mainly affects larger, perching species such as vultures, eagles and storks, easily capable of spanning the spaces between energized components. Due to the large size of the clearances on most overhead lines of above 275/132kV, electrocutions are generally ruled out as even the largest birds cannot physically bridge the gap between dangerous components. Other types of electrocutions happen by means of so-called "bird streamers". This happens when a bird, especially when taking off, excretes and thereby causing a short-circuit through the fluidity excreta. This method of electrocution is however a rare phenomenon. Most of these species (vultures, eagles, storks) are uncommon to rare in the study area and the impact is more likely to occur to other species that are prone towards roosting on the pylons such as the Black-headed Heron and Egyptian Goose. "Bird streamers" should be eliminated by fitting the poles with bird guards/spikes above the conductors.

Electrocution is possible on 275/132kV power lines such as those proposed, but is largely dependent on the exact pole structure used. It should be possible to ensure that zero electrocutions take place on the overhead power line. For the purpose of this study, it is assumed that a "bird friendly" structure will be used and the design of the pylon is an important consideration in preventing bird electrocutions. The height of the towers should allow for unrestricted movement of terrestrial birds between successive pylons. Electrocution of large birds perched on the poles could be a risk and should be mitigated by using the Eskom Bird Perch on all pole tops on the lines. This will provide safe perching area well above the dangerous hardware. The impact of electrocution is seen as being of low significance should the bird friendly structure be used. The steel monopole is generally a safe design for 132kV for birds and the fitment of the standard bird perch further increases this safety.

It is therefore recommended from an avifaunal perspective that for 275kV, a "bird friendly" pylon design be used which poses little electrocution risk.

***Habitat destruction and disturbances due to powerlines***

The minimal habitat destruction and alteration will take place during the construction phase of the power line, and this happens with the clearing of the site itself and any associated infrastructures. The existing vegetation between the old Substation and proposed substation has to be maintained in order to minimize the risk of fire.

The construction and operational activities can impact on birds through disturbance, mainly during bird breeding activities and the activities of concern include heavy earth moving general vehicular movement and any other activities which result in noise or increased human activity in an area. The disturbance of non-breeding birds may simply require them to move further away or adjust their activities during the disturbance. This may be either temporary or permanent. Disturbance of breeding birds may result in lower breeding productivity, failed breeding in the relevant season, and temporary or permanent abandonment of a breeding site. All of these reduce the recruitment of young birds to the population and can have significant implications for Red Listed species in particular, many of which are slow to reach breeding age and breed in small numbers.

The construction of a power line can be highly disturbing to birds breeding in the vicinity of the construction activities. Many birds are highly susceptible to disturbance, and should this disturbance take place during a critical time in the breeding cycle, for example when the eggs have not hatched or just prior to the chick fledging, it could lead to temporary or permanent abandonment of the nest or premature fledging. In both instances, the consequences are almost invariably fatal for the eggs or the fledgling. Such a sequence of events can have far reaching implications for certain large, rare species that only breed once a year or once every two years.

**Terrestrial Sensitivity**

The protocols set requirements for the assessment and reporting of environmental impacts of activities requiring Environmental Authorisation (EA). The higher the sensitivity rating of the features on the proposed site as identified by the screening tool report, the more rigorous the assessment and reporting requirements. bird species sensitive to solar energy developments.

Based on the Department of Forestry, Fisheries and the Environment (DFFE) environmental screening tool report generated for the report, the Animal Combined Sensitivity Theme is indicated as a combination of Medium and High sensitivity in areas that are said to contain the following Sensitivity Feature(s).

- *High -Aves-Bucorvus leadbeateri* (Southern ground Hornbill)
- *High -Aves-Gorsachius leuconotus* (White-backed night Heron)

The site verification was conducted concurrently with the Avifauna impact assessment and during the survey, it was concluded that the proposed development site is considered to be Low in terms of ecological and avifauna sensitivity.

**Conclusion and Recommendations**

In order to minimize the impacts of collisions of avifauna, it is therefore recommended from an avifaunal perspective that a "bird friendly" pylon design be used which poses little electrocution risk. With regards to habitat destruction, the recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint and rehabilitation of disturbed areas is concerned.

Given the relative homogeneity of the habitat within the study area as well as existing levels of disturbance (existing power line and substation infrastructure, roads, agricultural lands etc), the proposed project is unlikely to have a significant, long-term impact on the local avifauna. Should any nests or breeding sites be found during the construction process, suitable recommendations should be provided and the EMPr must be amended. Mitigation measures to reduce any potential direct and acute impact on avifaunal species, must be enforced and implemented. Certain areas will require marking with anti-collision marking devices and this is due to the historical presence of some collision of sensitive species in the area. Moreover, a “bird friendly structure” must be used to mitigate against electrocutions. Standard EMP principles must be followed to mitigate for the impact of habitat destruction and disturbance on avifauna and should this be done; the project may proceed with mitigatable impacts on avifauna. The impacts associated with the proposed project, such as collisions, electrocution, habitat destruction and disturbances, can be mitigated to a satisfactory level.

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| | |
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| ADU | Animal Demography Unit |
| CCGT | Combined Cycle Gas Turbine |
| EA | Environmental Authorisation |
| EIA | Environmental Impact Assessment |
| EMPr | Environmental Management Programme |
| GPS | Global Positioning System |
| GIS | Geographic information system |
| QDS | Quarter degree Squares |
| HRSG | Heat Recovery Steam Generators |
| IBA | Important Bird and Biodiversity Area |
| ICE | Internal Combustion Engines |
| IUCN | International Union for Conservation of Nature |
| KFP | Khanyazwe Flexpower (Pty) Ltd |
| NBA | National Biodiversity Assessment |
| NEMA | National Environmental Management Act |
| PAOI | Project Area of Influence |
| ROMPCO | Republic of Mozambique Pipeline Investments Company |
| SAAB | South African Association of Botanists |
| SAIEES | South African Institute of Ecologists and Environmental Scientists |
| SABAP | South African Bird Atlas Project |
| SACNASP | South African Council for Natural Scientific Professions |
| SANBI | South African National Biodiversity Institute |
| SCC | Species of Conservation Concern |
| TOPS | Threatened or Protected Species |

## Declaration of Independence

I, Avhafarei Phamphe, declare that I –

- act as the independent specialist;
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations 2014;
- 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;
- there are no circumstances that may compromise my objectivity in performing such work;
- have expertise in conducting the specialist report relevant to this application, including knowledge of the National Environmental Management Act, 1998 (Act No. 107 of 1998), regulations and any guidelines that have relevance to the proposed activity;
- will comply with the Act, regulations and all other applicable legislation;
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- undertake that the report adheres to Appendix 6 of GN No. R 982 of 4 December 2014 (as amended), and
- will provide the Competent Authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not.

Avhafarei Phamphe:

- Holds a M. Sc in Botany from the University of the Pretoria;
- Is registered with South African Council for Natural Scientific Professions (SACNASP) as a Professional Natural Scientist (Pr.Sci.Nat) Ecological Science, (Registration No.: 400349/12), with expertise in floral and faunal ecology;
- Has been actively involved in the environmental consultancy field for over 18 years;
- Is a Professional Member of South African Institute of Ecologists and Environmental Scientists (SAIEES) and
- Is a member of the South African Association of Botanists (SAAB).

Avhafarei Phamphe

Name of Specialist

Mboneni Ecological Services (Pty) Ltd

Name of Company

08 July 2024

Date

Signature

# 1 INTRODUCTION AND BACKGROUND

Nsovo Environmental Consulting (hereafter referred to as Nsovo) has been appointed by Khanyazwe Flexpower (Pty) Ltd (KFP) to undertake Environmental Impact Assessment (EIA) process for the proposed Flexpower power Plant and associated infrastructures. The proposed project will be located inside an urban area, on Portions 1, 4, and 116 of Farm Malelane 389 FP, in Malelane, within the Nkomazi Local Municipality, Mpumalanga Province.

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# 2 STUDY AREA

The proposed project will be located within an urban area, on Portions 1, 4, and 116 of Farm Malelane 389 FP, in Malelane within the Nkomazi Local Municipality, Mpumalanga Province (**Figures 1** and **2**). A collage of photographs taken within the project site is indicated in **Figure 3** below.

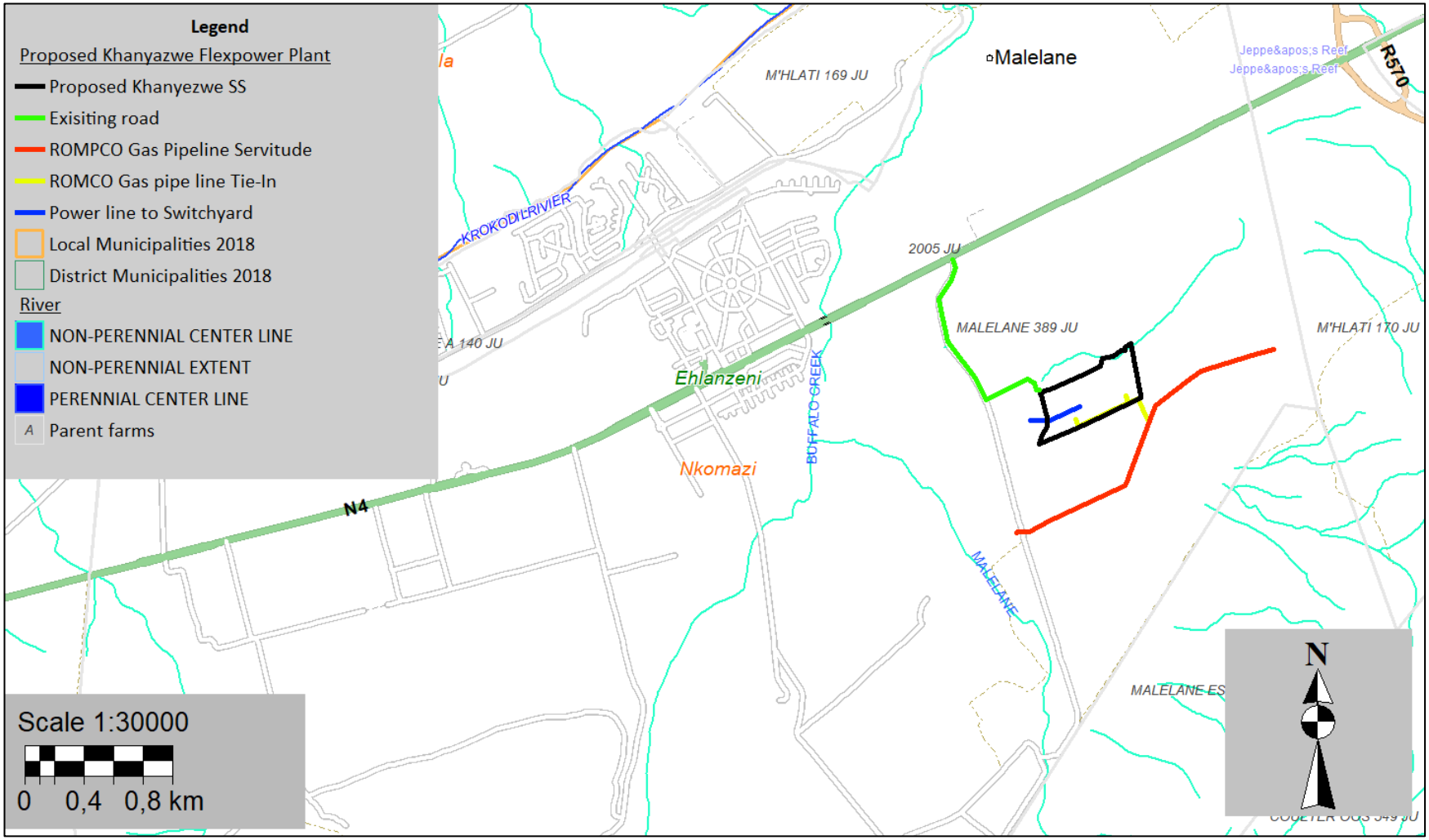


**Figure 1. Locality Map**

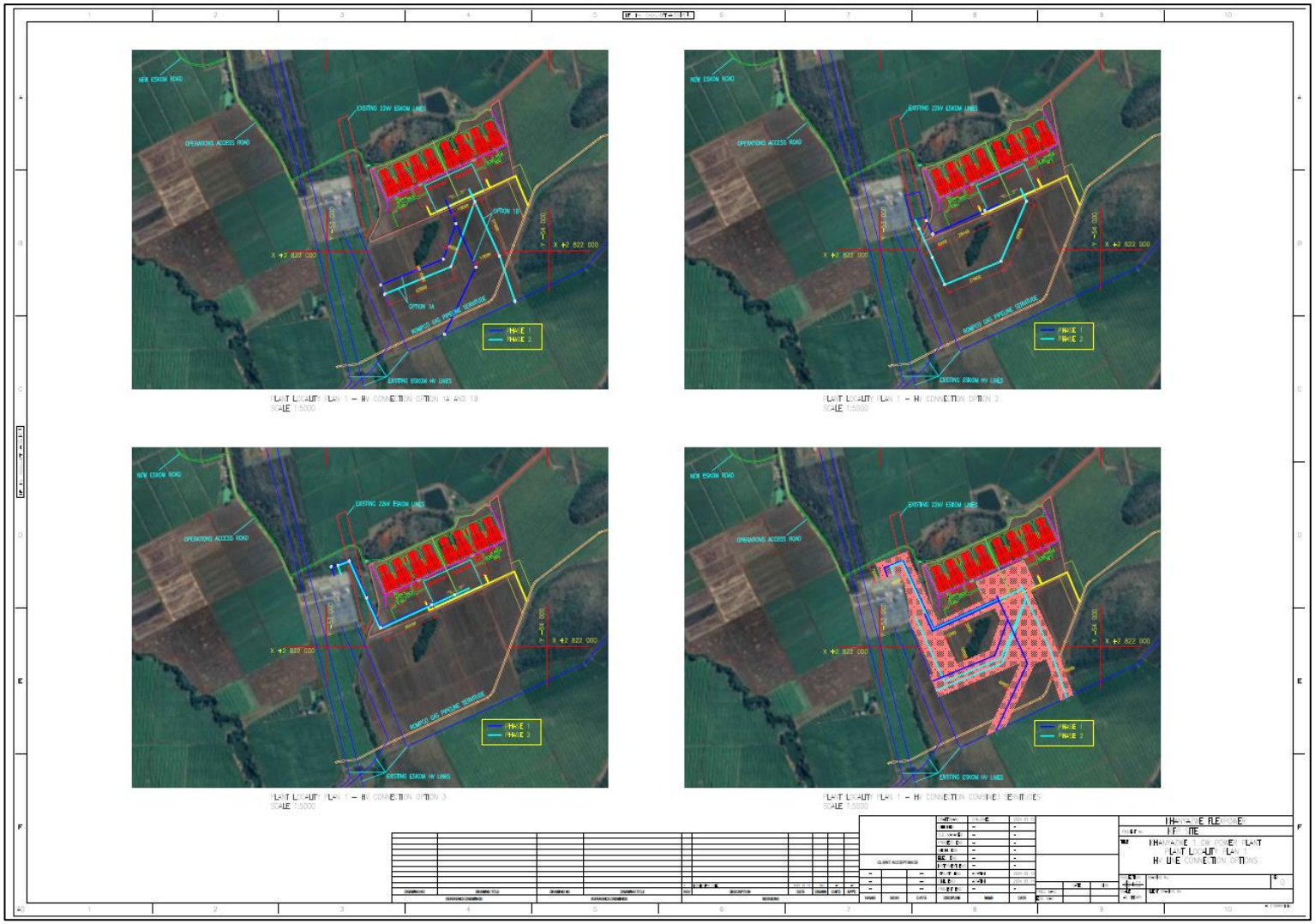


**Figure 2. Site Plan Map of the project site**

**Figure 3. A collage of photographs taken within the proposed project site**

# 3 RELEVANT LEGISLATION AND GUIDELINES

The following legislations are relevant to this project:

- The Constitution, 1996 (Act No. 108 of 1996) – Section 24;
- The white paper on the Conservation and Sustainable Use of South Africa's Biological Diversity (1997);
- Mpumalanga Nature Conservation Act, Act 10 of 1998;
- National Environmental Management Act, 1998 (Act No. 107 of 1998);
- National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004);
- National Environmental Management: Protected Areas Act (Act No. 57 of 2003);
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) Threatened or Protected Species regulations;
- Mpumalanga Tourism and Parks Agency Act, Act5 of 2005;
- African-Eurasian Migratory Waterbird Agreement (AEWA);
- Guidelines for assessing and monitoring the impact of solar power generating facilities on birds in southern Africa (2017);
- National Biodiversity Assessment (2018);
- National Protected Areas Expansion Strategy (NPAES);
- Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 320 of Government Gazette 43310 (March 2020) and
- Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 1150 of Government Gazette 43855 (October 2020).

# 4 LIMITATIONS, GAPS AND ASSUMPTIONS

The following constraints/limitations were applicable to this assessment:

- The site visit was conducted on the 13th of June 2024, and is considered sufficient from a seasonal perspective and no additional season assessment is deemed required. A site visit which was conducted therefore appear to be sufficient to address the objectives of this study.

- Animal species, especially birds, are mostly highly mobile and often migrate seasonally. Any field assessment of relatively short duration is therefore unlikely to record anything more than the most common species that happen to be on site at the time of the survey. Such field surveys are generally a poor reflection of the overall diversity of species that could potentially occur on site.
- Weather condition during the survey was favourable for recording avifaunal species.
- The information presented in this document only has reference to the investigated study area and cannot be applied to any other area without prior investigation.
- The focus of the study was primarily on the potential impacts of powerline on priority species. Priority species are defined as species which could potentially be impacted by powerline collisions or electrocutions, based on specific morphological and/or behavioural characteristics.
- The assessment of impacts is based on the baseline environment as it currently exists in the study area.
- The focus of the survey remains a habitat survey that concentrates on the possibility that species of particular conservation priority occur on the site or not.
- The potential of future similar developments in the same geographical area, which could lead to cumulative impacts cannot be meaningfully anticipated.
- The SABAP2 data is not regarded as a satisfactory indicator of the avifauna which could occur at the proposed development site, and it was therefore further augmented by data collected during the on-site surveys to date.
- In order to obtain a comprehensive understanding of the dynamics of the bird and fauna communities on the study area, as well as the status of endemic, rare or threatened species, assessments should always consider investigations at different time scales (across seasons/years) and through replication. However, due to time constraints such long-term studies are not feasible and were based on instantaneous sampling bouts.
- Though every effort was made to cover as much of the project site as possible, it is therefore possible that some bird species that are present within the project site were not recorded during the field survey due to their secretive behaviour.
- The conclusions drawn in this survey are based on experience and knowledge of the specialist on the species found on the proposed development site and similar species in different parts of South Africa. However, bird behaviour can never be entirely reduced to formulas that will be valid under all circumstances.
- The impact descriptions and assessment are based on the author’s understanding of the proposed development based on the site visit and information provided.

- Since ecological and avifaunal impact studies deal with dynamic natural systems additional information may come to light at a later stage and this Specialist can thus not accept responsibility for conclusions and mitigation measures made in good faith-based information gathered or databases consulted at the time of the investigation.

# 5 APPROACH AND METHODOLOGY

## 5.1 Avifauna

The assessment consisted of two complementary approaches:

- A desktop analysis, which included literature review, previous biodiversity reports, local knowledge, topographical maps, and Google Earth imagery; and
- Site visit was conducted on the 13th of June 2024.

The online databases of the Southern African Bird Atlas Project (SABAP 2), DFFE Screening report, and previous biodiversity reports were consulted as a means to determine which Red Listed bird species were previously recorded from the project area. The conservation status of all bird species occurring within the quarter degree squares (2531BC and 2531DA) was determined with the use of The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor *et al*. 2015).

The transects are probably the most widely used method of estimating the number of bird species in terrestrial habitats. Traditionally, observers will move along a fixed route undertaking surveys and recording the birds they see on either side of the route. For small birds, which are usually relatively numerous, a transect width of 10m on either side of the route (or 20-30m in open habitats) was found to be suitable for this study. Transects were placed in such a way that all dominant soil and associated habitat types were adequately covered. Birds outside the transect band or those flying over were noted. Surveys always commenced at first light when avian activity was at its peak. Bird calls are equally important in bird surveys and especially important during point counts in rugged terrain and dense bush where visual observations are limited. Point surveys can also be used within wide open areas where birds can be spotted from a distance, for example pans and grassland flats.

The following information sources were consulted to conduct this study:

- Bird distribution data of the SABAP 2 was obtained from the University of Cape Town, to ascertain which species occur within the broader area *i.e.,* within a block consisting of 2 pentads (grid cells) (2525_3130 and 2530_3130) within which the proposed project site is situated. A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8 × 7.6 km (**Figure 4**).

- The national threatened status of all priority species was determined with the use of the most recent edition of the Red Data Book of Birds of South Africa (Taylor *et al*. 2015), and the latest authoritative summary of southern African bird biology (Hockey *et al.* 2005).
- Coordinated Avifaunal Road counts (CAR) – The Coordinated Avifaunal Road counts (CAR) were pioneered in July 1993 in a joint Cape Bird Club/ADU project to monitor the populations of two threatened species: *Anthropoides paradiseus* (Blue Crane) and *Neotis denhamii* (Denham's Bustard). Presently it monitors 36 species of large terrestrial birds along 350 fixed routes covering over 19 000 km using a standardised method.
- Coordinated Water Bird Counts (CWAC) – The Animal Demography Unit (ADU) launched the Coordinated Waterbird Counts (CWAC) project in 1992 as part of South Africa's commitment to international waterbird conservation. The primary aim of CWAC is to act as an effective long-term waterbird monitoring tool. This is done through a programme of regular mid-summer and mid-winter censuses at several wetlands.
- The global threatened status of all priority species was determined by consulting the (2021.3) International Union for Conservation of Nature (IUCN) Red List of Threatened Species (http://www.iucnredlist.org/).
- A classification of the habitat in the Project Site was obtained from the Atlas of Southern African Birds 1 (SABAP 1) (Harrison et al. 1997) and the National Vegetation Map (2018) from the South African National Biodiversity Institute (SANBI) website (Mucina & Rutherford 2006 & http://bgisviewer.sanbi.org). The Project Site is the area covered by the land parcels where Project will be located.
- The Important Bird Areas of Southern Africa (Marnewick *et al*. 2015) was consulted for information on potentially relevant Important Bird Areas (IBAs).
- Satellite imagery (Google Earth ©2024) was used to view the Project Site on a landscape level and to help identify sensitive bird habitat.
- Priority species were defined as follows:
    - ✓ South African Red Data species: High conservation significance
    - ✓ South African endemics and near-endemics: High conservation significance Raptors: High conservation significance.
    - ✓ Raptors are at the top of the food chain and play a key role in their ecosystems. When populations of birds of prey go down, then the numbers of their prey species go up, creating an imbalance in the ecosystem.
- The SANBI BGIS map viewer was used to determine the locality of the proposed site relative to National Protected Areas and National Protected Areas Expansion Strategy (NPAES) focus areas.
- The Department of Forestry, Fisheries and the Environment (DFFE) National Screening Tool was used to determine the assigned avian sensitivity of the Project Site.
- The following source was used to determine the investigation protocol that is required for the site:

- ✓ Procedures for the Assessment and Minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of NEMA when applying for Environmental Authorisation (Gazetted October 2020); o Guidelines for the Implementation of the Terrestrial Flora & Terrestrial Fauna Species Protocols for EIAs in South Africa produced by the SANBI on behalf of the Department of Environment, Forestry and Fisheries (2020).

During the site visit, these lists were audited based on confirmed sightings of Red Listed bird species and the evaluation of suitable habitat for Red Listed bird species potentially present.

The study site, including the adjoining properties within 50 m, were surveyed on foot during random transect walks and all sightings were documented.

Birds were identified through visual identification by using a 10 x 50 Voyager binocular, by call, and from feathers. Where necessary, identifications were verified using field guides such as Sasol birds of Southern Africa (Sinclair *et al.* 2002) and the Chamberlain Guide to Birding Gauteng (Marais & Peacock, 2008).

Walked Transects, Driven Transect and Incidental Observations of Priority Species methodologies were utilised during the field survey.

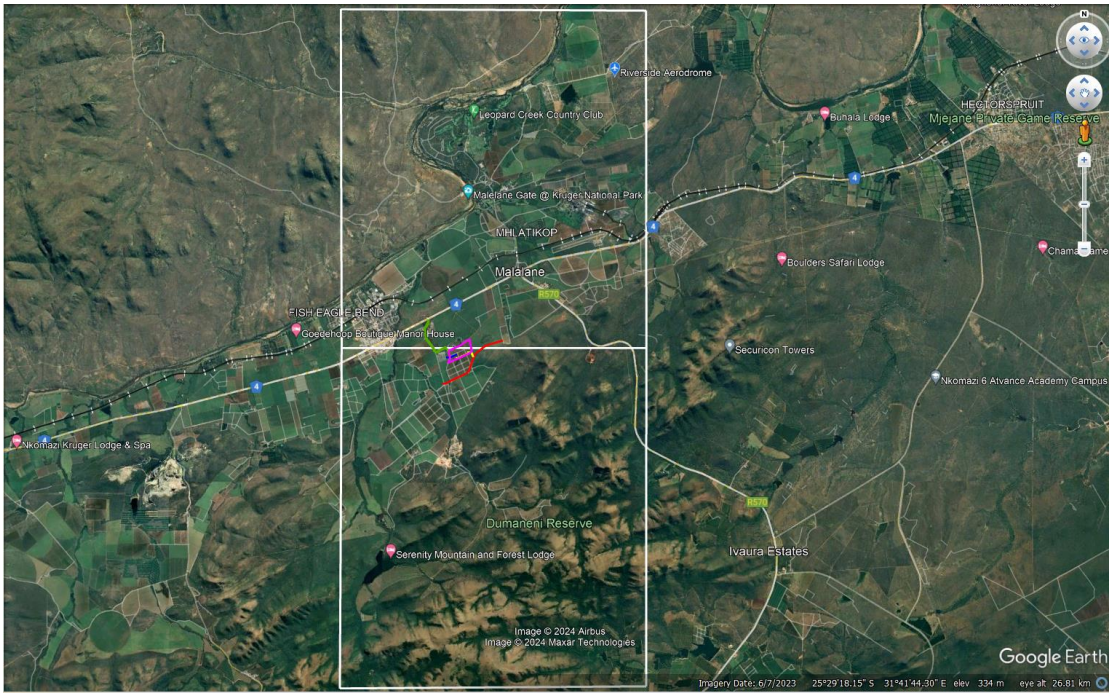


**Figure 4. Area covered by the 2 SABAP2 pentads outlined in white (*i.e.*, the broader area).**

# 6 REGIONAL VEGETATION

The entire project site falls within the Savanna biome and this Biome is the largest Biome in South Africa and occupies over one third of the country. It is characterized by a grassy ground layer and distinct upper layer of woody plants. This biome is defined by a herbaceous layer dominated by grass species and a discontinuous to sometimes very open tree layer (Low and Rebelo, 1996). Mucina and Rutherford (2018) classified the project site as falling within the Granite Lowveld, as indicated in **Figure 5**. No remnants of this vegetation type exist on site.

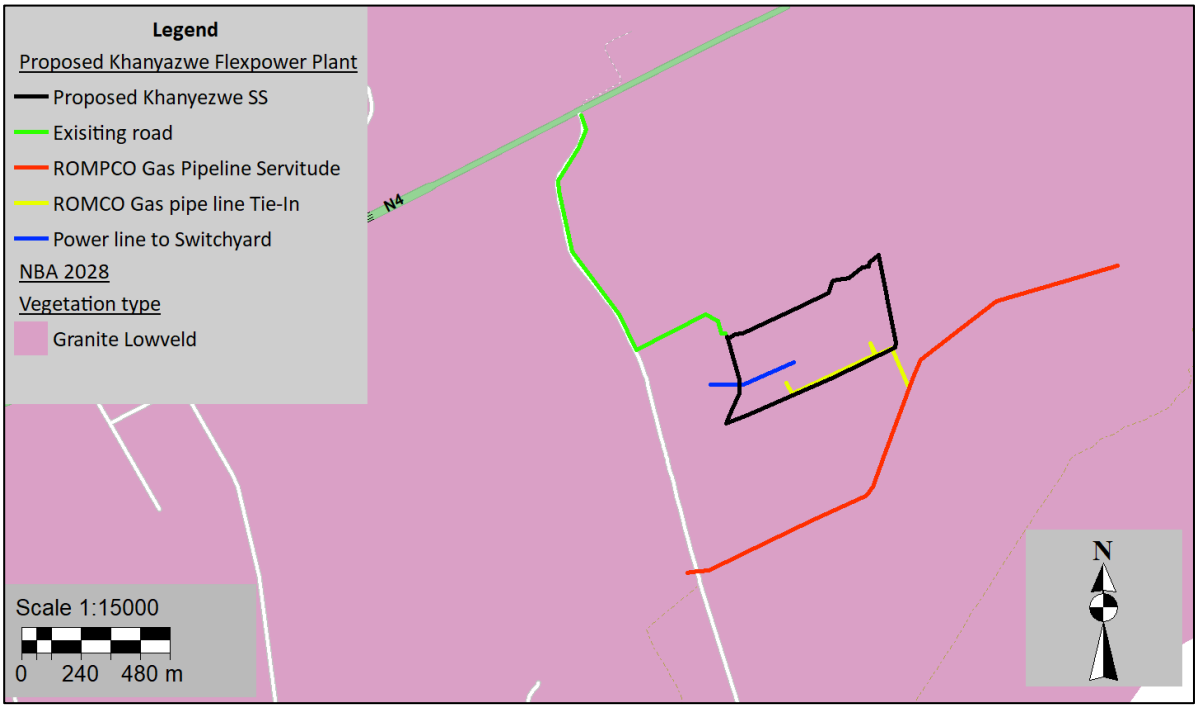


**Figure 5. Vegetation type within the project site**

The description of the vegetation types follows below:

## 6.1 Granite Lowveld

Granite Lowveld vegetation type is found in Limpopo and Mpumalanga Provinces, Swaziland and marginally also KwaZulu-Natal: A north-south belt on the plains east of the escarpment from Thohoyandou in the north, interrupted in the Bolobedu area, continued in the Bitavi area, with an eastward extension on the plains around the Murchison Range and southwards to Abel Erasmus Pass, Mica and Hoedspruit areas to the area east of Bushbuckridge. Substantial parts are found in the Kruger National Park spanning areas east of Orpen Camp southwards

through Skukuza and Mkuhlu, including undulating terrain west of Skukuza to the basin of the Mbyamiti River. It continues further southward to the Hectorspruit area with a narrow westward extension up the Crocodile River Valley past Malelane, Kaapmuiden and the Kaap River Valley, entering Swaziland between Jeppe's Reef in the west and the Komati River in the east, through to the area between Manzini and Siphofaneni, including the Grand Valley, narrowing irregularly and marginally entering KwaZulu-Natal near Pongola (Mucina and Rutherford, 2006).

The conservation status of this vegetation type is classified as **Vulnerable**, with a national conservation target of 19%. Some 17% is statutorily conserved in the Kruger National Park. About the same amount conserved in private reserves mainly the Selati, Klaserie, Timbavati, Mala, Sabi Sand and Manyeleti Reserves. More than 20% already transformed, mainly by cultivation and by settlement development (Mucina and Rutherford, 2006).

# 7 PROTECTED AND CONSERVATION AREAS

The aim of the National Environmental Management: Protected Areas Act (Act No. 57 of 2003) is to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and natural seascapes. The purpose of a Protected Environment is amongst others to protect a specific ecosystem outside a special nature reserve world heritage site or nature reserve and also to ensure the use of the natural resources in the area is sustainable.

The proposed development site does not fall within any of the formally Protected areas, with Kruger National Park (SAPAD, 2023) (**Figure 6**), situated 4km North of the project site.

According to National Protected Areas Expansion Strategy (NPAES) (DEA, 2016), its goal is to achieve cost-effective protected area expansion for ecological sustainability and increased resilience to climate change. It sets targets for protected area expansion, provides maps of the most important areas for protected area expansion, and makes recommendations on mechanisms for protected area expansion. The proposed development site does not fall within any of the NPAES Priority focus areas (**Figure 7**).

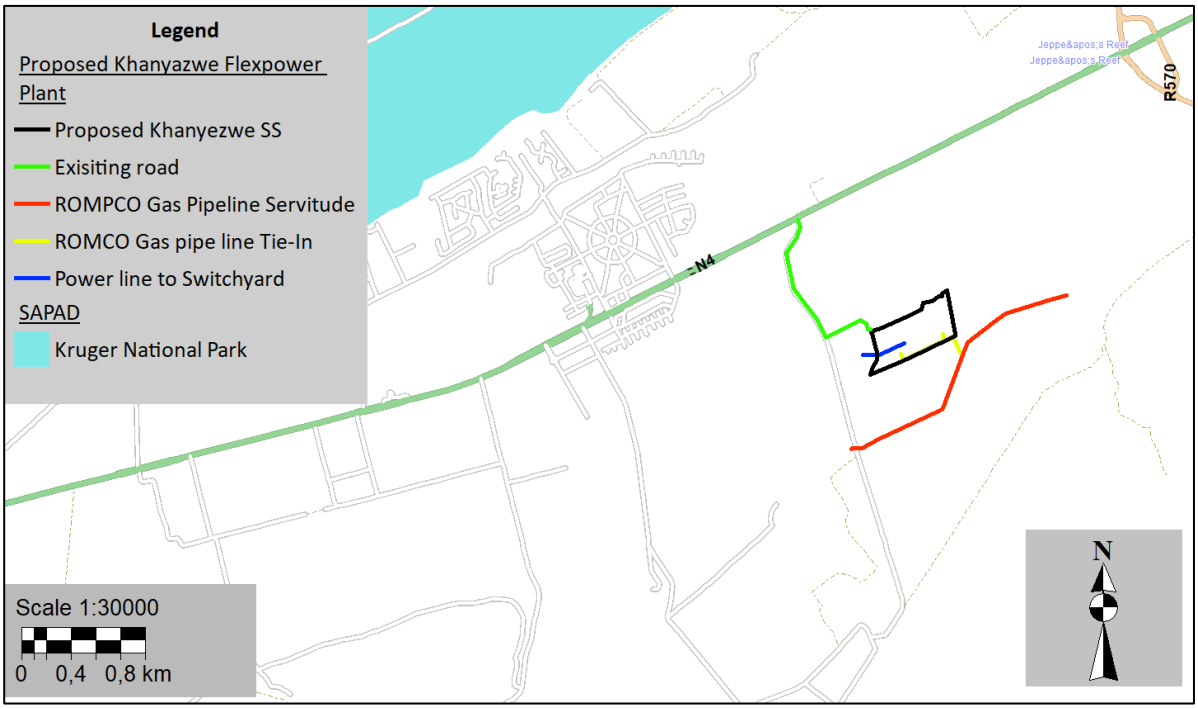


**Figure 6. Protected Area in relation to the project site**

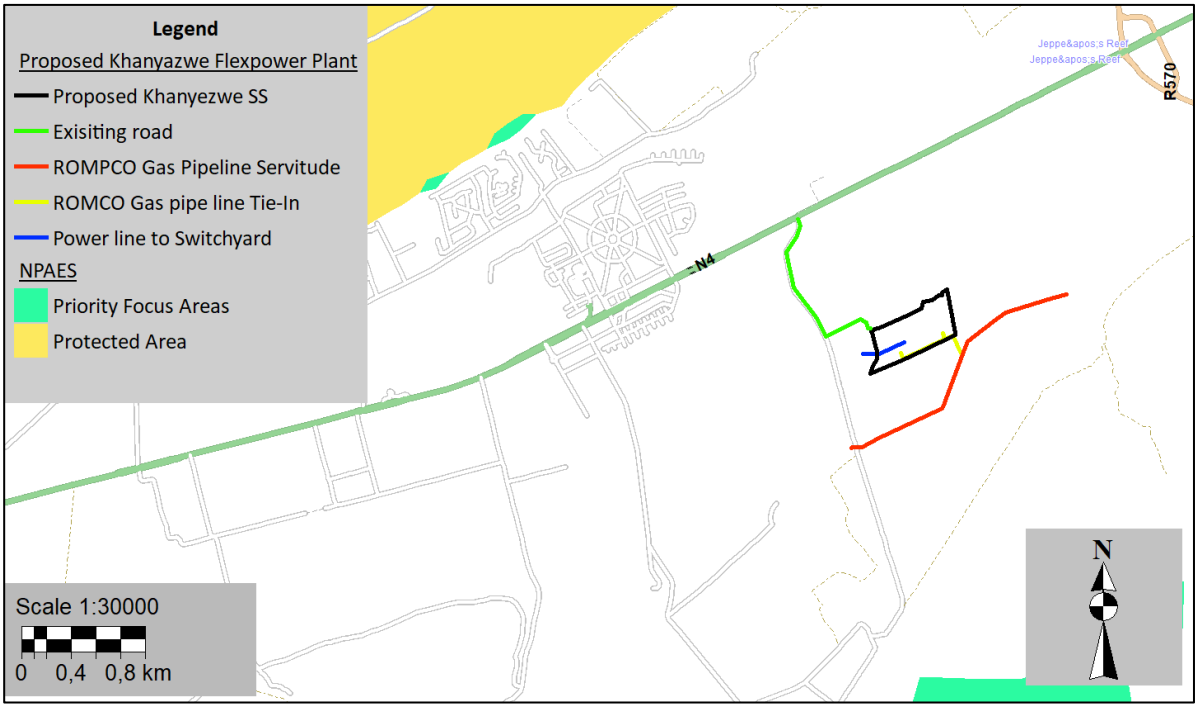


**Figure 7. NPAES Priority Focus area in relation to the project site**

# 8 NATIONAL FRESHWATER ECOSYSTEM PRIORITY AREAS

The National Freshwater Ecosystem Priority Areas (NFEPA) project aims to:

1. Identify Freshwater Ecosystem Priority Areas (FEPAs) to meet national biodiversity goals for freshwater ecosystems; and
2. Develop a basis for enabling effective implementation of measures to protect FEPAs, including free-flowing rivers (Nel *et al*. 2011).

In order to conserve aquatic ecosystems, South Africa has categorised its river systems according to set ecological criteria (*i.e*., ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs) (Driver *et al*. 2011). The FEPAs are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act (NEM:BA) biodiversity goals. River FEPAs are sub-quaternary catchments with good condition rivers (A or B Ecological Category) that achieve biodiversity targets for ecosystems and threatened or near-threatened fish species. These rivers should remain in good condition to contribute to the biodiversity targets for the country (Nel *et al*. 2011). All streams, rivers, wetlands are deemed legally sensitive environments in terms of National Water Act (NWA) and National Environmental Management Act (NEMA) and are automatically regarded as highly sensitive areas where they provide ecological connectivity and have at least remnant natural vegetation.

The project development site does not traverse any NFEPA wetlands and rivers, but a non-perennial river is found north of the proposed substation site (**Figure 8**).

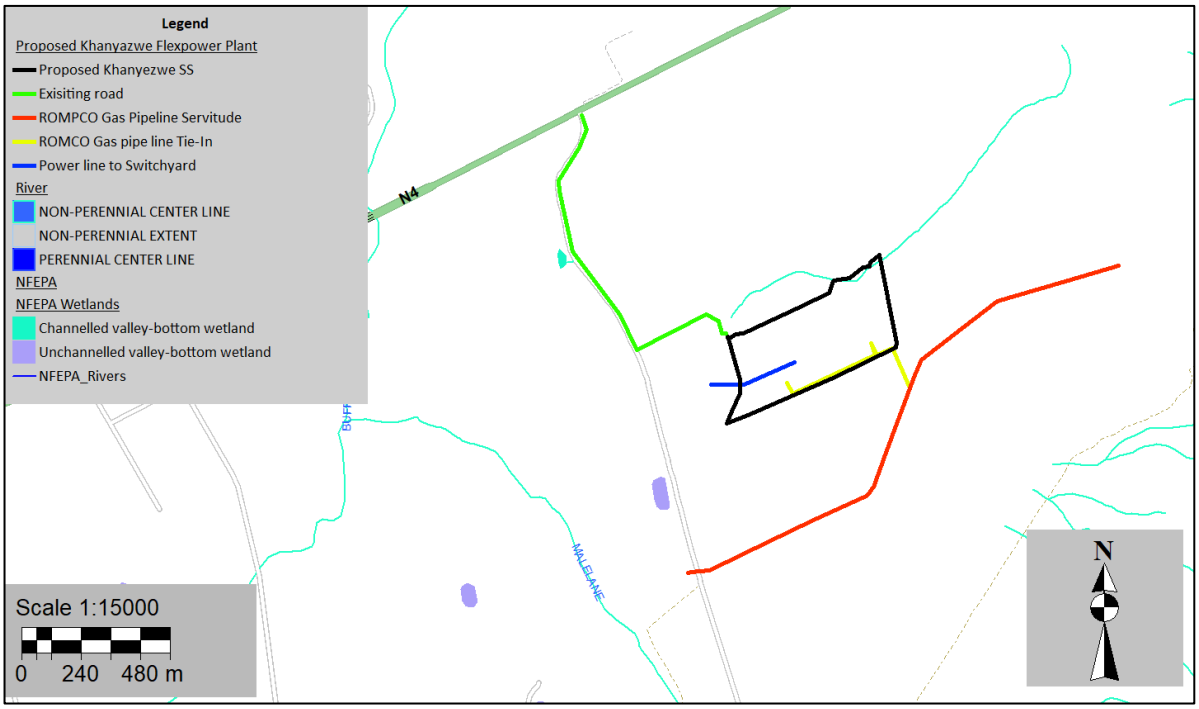


**Figure 8. NFEPA wetlands and NFEPA rivers in relation to the project site**

# 9 RESULTS AND DISCUSSION

## 9.1 Avifauna

### 9.1.1 Desktop survey results

The Important Bird and Biodiversity Areas (IBA) Programme identifies and works to conserve a network of sites critical for the long-term survival of bird species that are globally threatened, have a restricted range and are restricted to specific biomes/vegetation types (Barnes, 2000). As shown in **Figure 9** below, the project area does not fall within any of the IBAs and the nearest IBA is Kruger National Park and adjacent areas IBA, situated North of the project area.

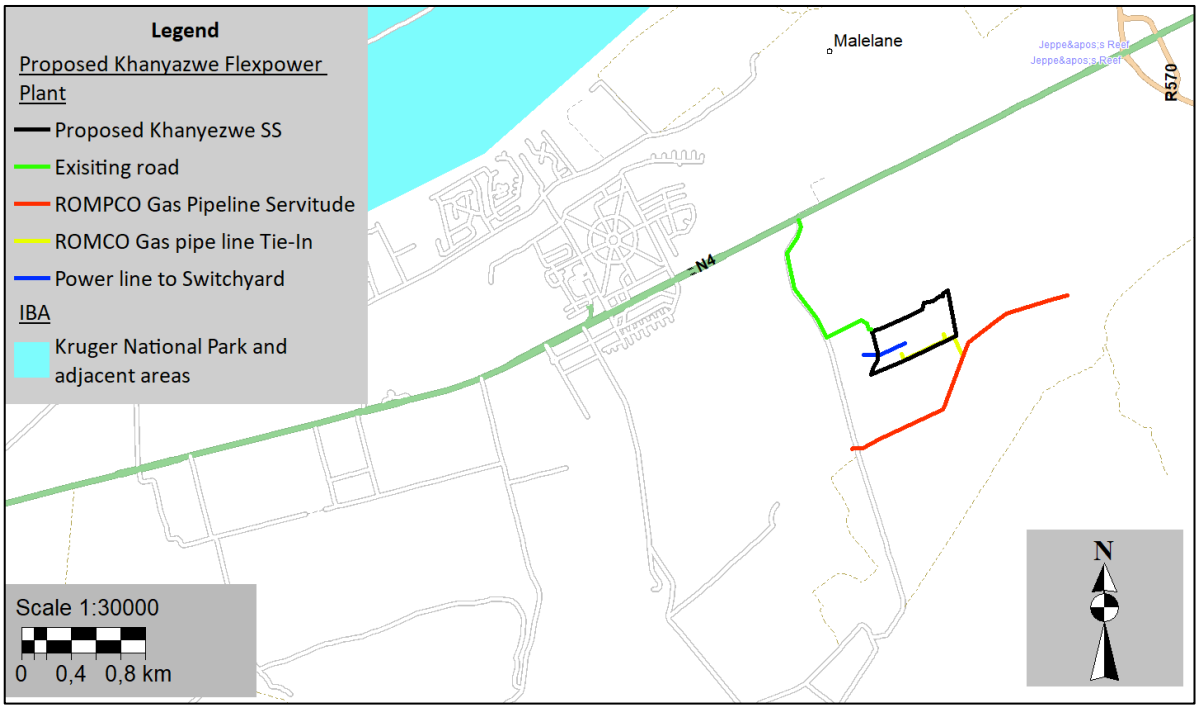


**Figure 9. *Kruger National Park and adjacent areas* IBA in relation to the project site**

The online database of the Mpumalanga Tourism & Parks Agency (MTPA) (**Table 1**), Southern African Bird Atlas Project (SABAP) (**Table 2**), DFFE Screening report and SANBI were queried for a list of Red data bird species confirmed to occur in the relevant pentads (mapping units) that the project area is located in, namely 2531BC and 2531DA (2525_3130 and 2530_3130). Taylor *et al*. (2015) was consulted for the most current conservation status of each species of conservation concern on the list

**Table 1. Red listed bird species which could potentially occur on the project area (MTPA)**

| Farm Name/Area | Common Name | Scientific name | Conservation status | |
|---|---|---|---|---|
| | | | RSA | MTPA |
| Malelane | Cape Parrot | *Poicephalus robustus* | EN | EN |
| SABBL01070434; Seen on foot on patrol in Malelane | Bateleur | *Terathopius ecaudatus* | EN | EN |
| SABBL01070443; Seen from vehicle in Malelane region | Bateleur | *Terathopius ecaudatus* | EN | EN |
| SABBL01070458; Seen from vehicle in Malelane region | Bateleur | *Terathopius ecaudatus* | EN | EN |
| SABBL01070483; Seen on foot on patrol in Malelane | Bateleur | *Terathopius ecaudatus* | EN | EN |
| SABBL01070523; Seen on foot on patrol in Malelane | Bateleur | *Terathopius ecaudatus* | EN | EN |
| SABBL01080652; Malelane | Bateleur | *Terathopius ecaudatus* | EN | EN |
| SABBL01081739; Malelane | Bateleur | *Terathopius ecaudatus* | EN | EN |
| SABBL01090217; | Bateleur | *Terathopius ecaudatus* | EN | EN |
| SABEA02070223; Malelane | Martial Eagle | *Polemaetus bellicosus* | EN | EN |
| SABEA02070417; Malelane | Martial Eagle | *Polemaetus bellicosus* | EN | EN |
| SABVU02070383; Seen on foot on patrol in Malelane region | White-backed Vulture | *Gyps africanus* | CR | CR |
| SABVU02070391; Seen from vehicle in Malelane region | White-backed Vulture | *Gyps africanus* | CR | CR |
| SABVU02070403; Seen from vehicle in Malelane region | White-backed Vulture | *Gyps africanus* | CR | CR |
| SABVU02080226; Malelane | White-backed Vulture | *Gyps africanus* | CR | CR |
| SABVU02080369; Malelane | White-backed Vulture | *Gyps africanus* | CR | CR |
| SABVU04070097; Seen from vehicle in Malelane region | White-headed Vulture | *Aegypius occipitalis* | EN | EN |
| Barberton; Coulter 391 Farm,13K S Malelane | Orange Ground-Thrush | *Zoothera gurneyi* | NT | NT |

**Table 2. Red listed bird species which could potentially occur on the project area (SABAP 2)**

| Common Name | Species | Red List Category |
|---|---|---|
| Hooded Vulture | *Necrosyrtes monachus* | Critically Endangered |
| Lappet-faced Vulture | *Torgos tracheliotos* | Endangered |
| Cape Vulture | *Gyps coprotheres* | Endangered |
| White-headed Vulture | *Aegypius occipitalis* | Critically Endangered |
| White-backed Vulture | *Gyps africanus* | Critically Endangered |
| Half-collared Kingfisher | *Alcedo semitorquata* | Near Threatened |
| Tawny Eagle | *Aquila rapax* | Endangered |
| Southern Ground-Hornbill | *Bucorvus leadbeateri* | Endangered |
| Martial Eagle | *Polemaetus bellicosus* | Endangered |
| Secretarybird | *Sagittarius serpentarius* | Vulnerable |
| Lanner Falcon | *Falco biarmicus* | Vulnerable |
| Black Stork | *Ciconia nigra* | Vulnerable |
| Yellow-billed Stork | *Mycteria ibis* | Endangered |
| Saddle-billed Stork | *Ephippiorhynchus senegalensis* | Endangered |
| Greater Painted-snipe | *Rostratula benghalensis* | Near Threatened |
| European Roller | *Coracias garrulus* | Near Threatened |
| Pel's Fishing Owl | *Scotopelia peli* | Endangered |
| Bateleur | *Terathopius ecaudatus* | Endangered |
| White-backed night Heron | *Gorsachius leuconotus* | Vulnerable |
| Crowned Eagle | *Stephanoaetus coronatus* | Vulnerable |
| African Finfoot | *Podica senegalensis* | Vulnerable |

### 9.1.2 Field work results and discussion

Birds are considered good ecological indicators, since their presence or absence are symptomatic of whether the ecosystem is functioning properly or not. Bird communities and ecological conditions are linked to land cover; and as the land cover changes, the types of bird species in the area also change. With the Kruger National Park located not far from the focus area (4km North), the likelihood of avifaunal SCC migrating between the KNP and surrounding areas, including the focus area, or utilising the surrounding areas for foraging, is medium. The proposed development site is not considered an important area for avifauna, particularly in terms of supporting breeding populations, and the actual diversity is expected to be made up of moderate numbers of more common and widespread species. On occasion, some of the more sensitive species may be encountered foraging onsite, however, the actual dependence on the site is probably very low.

Within the vegetation type found in the study area and immediate surrounding areas, three major bird micro-habitat systems were identified, namely agricultural fields, bushveld/savanna and watercourses (**Figure 10**).

**Figure 10. Micro-habitats on and around the project development site**

**Agricultural land (Sugarcane)** is found within the project development site and is a common micro-habitat. Agriculture is a major environmental problem for threatened bird species, especially for species that depend on savanna for survival. The tilling of soil for cultivated fields is one of the most drastic and unchangeable alternations formed on natural systems, destroying the structure and species composition of the natural vegetation (Barnes, 1998). This disturbance is mainly permanent and thereby has a massive impact on the taxa that are dependent on that vegetation. Bird species that are able to exploit monoculture and cultivated crops or by-products of cultivation, such as bare ground, may benefit temporarily. Avian species that will be attracted to these areas include Cranes, Harrier species and various Heron species. Arable or cultivated land represents a significant feeding area for many bird species in any landscape for the following reasons:

- Through exposing the soil surface, land preparation makes many insects, seeds, bulbs and other food sources readily accessible to birds;

- Seed-eating bird species (granivorous species), such as quelea, doves and bishops, largely benefit from agricultural lands as their seeds supply food in large quantities;
- The agricultural lands attract insects, which are in turn eaten by birds; and
- During the dry season, the arable lands often represent the only green or attractive food sources in an otherwise dry landscape.

The **Savanna biome** is particularly rich in large raptors, and forms the stronghold of Red Data species such as White backed Vulture, Cape Vulture, Martial Eagle and Tawny Eagle. These large raptors may occasionally utilise the study area for foraging arrays. The savanna biome contains a large variety of species (it is the most species-rich community in southern Africa) but is generally less important from a Red Data bird perspective, as very few bird species are restricted to this biome. Apart from Red Data species, the region provides habitat for several non-Red Data raptor species, such as the Brown Snake Eagle, Black-breasted Snake Eagle, Long-crested Eagle and a multitude of medium-sized raptors such as the migratory Steppe Buzzard, African Harrier Hawk (Gymnogene), Wahlberg's Eagle and African Hawk Eagle.

**Watercourses**: The study area contains pans/dams, mostly associated with the non-perennial river. No palustrine wetland habitats were observed on the project site and adjacent areas. Several artificially created farm dams were observed and these dams are important refuges for a variety of waterbirds, including species such as African Fish Eagle as well Black Stork. The dams and larger rivers may be utilised on a temporary basis for foraging by Yellow billed Stork and Marabou Storks. Common species that could use pans and dams include Red-knobbed Coot, Black-headed Heron, African Darter, Blacksmith Lapwing, and Egyptian Goose. The non-perennial river on site is considered important attractants to various bird species. Bird species such as herons, bishops, weavers, cisticolas and warblers will breed in the reeds growing on the banks of the rivers and will also feed on insects that live within the reeds. Many of these bird species make use of the thorny nature of these trees to build their nests. Water bodies represent sensitive areas because they provide habitat for a wide variety of terrestrial and aquatic species, particularly avifauna. Several more common water dependent species e.g., Red-knobbed Coot, Black-headed Heron, African Darter, White-faced Duck, Yellow-billed Duck, Blacksmith Lapwing, African Sacred Ibis and Egyptian Goose are known to utilise these habitat units. The larger rivers near the project site are particularly important for stork species such as Black Stork and Yellow billed Stork and a variety of other waterbirds. The riparian habitat along the Malelane River (East of the project site) could provide refuge for shy and skulking species such as White backed Night Heron.

Thirty-Seven (37) bird species (**Table 3**) were recorded during the field survey. Species recorded were common and widespread and typical of savanna biome. No Red Data bird species associated with the study site were recorded. Some of the bird species recorded within the project site are shown in **Figures 11-18.**

**Table 3. Bird species recorded within the project site**

| Common name | Scientific name | Conservation status |
|---|---|---|
| Cattle Egret | *Bubulcus ibis* | Least concern |
| Hadeda Ibis | *Bostrychia hagedash* | Least concern |
| African Darter | *Anhinga rufa* | Least concern |
| Reed Cormorant | *Microcarbo africanus* | Least concern |
| African Sacred Ibis | *Threskiornis aethiopicus* | Least concern |
| Black-winged Kite | *Elanus caerulus* | Least concern |
| Swainson's Spurfowl | *Pternistis swainsonii* | Least concern |
| Helmeted Guineafowl | *Numida meleagris* | Least concern |
| Cape Turtle Dove | *Streptopelia capicola* | Least concern |
| Laughing Dove | *Streptopelia senegalensis* | Least concern |
| Common (Indian) Myna | *Acridotheres zeylonus* | Introduced species |
| Pin-tailed Whydah | *Vidua macroura* | Least concern |
| House Sparrow | *Passer domesticus* | Least concern |
| Southern Grey-headed Sparrow | *Passer diffusus* | Least concern |
| Blacksmith Lapwing (Plover) | *Vanellus armatus* | Least concern |
| Crowned Lapwing | *Vanellus coronatus* | Least concern |
| Southern-masked Weaver | *Ploceus velannus* | Least concern |
| Thick-billed Weaver | *Amblyospiza albifrons* | Least concern |
| Pied Crow | *Corvus albus* | Least concern |
| Zitting Cisticola | *Cisticola juncidis* | Least concern |
| Southern Fiscal | *Lanius collaris* | Least concern |
| Southern Red Bishop | *Euplectes orix* | Least concern |
| Speckled Mousebird | *Colius striatus* | Least concern |
| Little Swift | *Apus affinis* | Least concern |
| Long-crested Eagle | *Lophaetus occipitalis* | Least concern |
| Egyptian Goose | *Alopochen aegyptiacus* | Least concern |
| Dark-capped Bulbul | *Pycnonotus tricolor* | Least concern |
| Glossy starling | *Lamprotornis nitens* | Least concern |
| Speckled Mousebird | *Colius striatus* | Least concern |
| Cape Robin-Chat | *Cossypha caffra* | Least concern |
| Cape Glossy-Starling | *Lamprotornis nitens* | Least concern |
| Village Weaver | *Ploceus cucullatus* | Least concern |
| Little Swift | *Apus affinis* | Least concern |
| Rattling Cisticola | *Cisticola chiniana* | Least concern |
| Tawny-flanked Prinia | *Prinia subflava* | Least concern |
| African pied Wagtail | *Motacilla aguimp* | Least concern |
| African Pipit | *Anthus cinnamomeus* | Least concern |

**Figure 11. Long crested Eagle on site**

**Figure 12. Glossy Starling on site**

**Figure 13. Speckled Mousebird on site**

**Figure 14. Pied Crow on site**

**Figure 15. African Pied Wagtail on site**

**Figure 16. Common Myna on site**

**Figure 17. Common Fiscal on site**

**Figure 18. Black-shouldered Kite on site**

### 9.1.3 Mortality due to collisions of birds with the overhead powerline

Although all birds have the potential to be affected by collisions, species groups most at risk of collision impacts are those with heavier bodies and relatively small wingspan, making them less movable and therefore more prone to collisions. Species groups include bustards, storks, cranes, eagles, vultures, ibises, etc. Further groups at risk are fast-flying waterfowl, especially ducks and geese and these bird species are mostly heavy-bodied species, with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines. Collisions are probably the biggest single threat posed by transmission lines to birds in southern Africa. Several factors are thought to influence birds' collisions, including the manoeuvrability of the bird, topography, weather conditions and power line configuration (Van Rooyen, 2004).

The proposed powerline could pose a limited collision threat to Red Data bird species. The biggest threat and also a possibility of collisions at pans, dams and wetlands which could potentially affect Ducks and a variety of non-threatened waterbirds (Hadeda Ibis, Black-shouldered Kite, Egyptian Goose, etc).
In order to mitigate these impacts, areas where bird collisions are likely to be high could be ameliorated by marking the lines with bird devices such as "bird diverters" and "flappers" to increase the visibility of the lines.

### 9.1.4 Mortality of birds due to electrocution on the powerline

According to van Rooyen (2004), electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components. Electrocution of birds on overhead lines is an important cause of unnatural mortality of raptors and storks.

The risk of electrocution is strongly influenced by the power line voltage and the pole structure design, which mainly affects larger, perching species such as vultures, eagles and storks, easily capable of spanning the spaces between energized components. Due to the large size of the clearances on most overhead lines of above 275/132kV, electrocutions are generally ruled out as even the largest birds cannot physically bridge the gap between dangerous components. Other types of electrocutions happen by means of so-called "bird streamers". This happens when a bird, especially when taking off, excretes and thereby causing a short-circuit through the fluidity excreta (Van Rooyen & Taylor, 1999). This method of electrocution is however a rare phenomenon. Most of these species (vultures, eagles, storks) are uncommon to rare in the study area and the impact is more likely to occur to other species that are prone towards roosting on the pylons such as the Black-headed Heron and Egyptian Goose. "Bird streamers" should be eliminated by fitting the poles with bird guards/spikes above the conductors.

Electrocution is possible on 275/132kV power lines such as those proposed, but is largely dependent on the exact pole structure used. It should be possible to ensure that zero electrocutions take place on the overhead power line. For the purpose of this study, it is assumed that a “bird friendly structure” will be used and the design of the pylon is an important consideration in preventing bird electrocutions. The height of the towers should allow for unrestricted movement of terrestrial birds between successive pylons. Electrocution of large birds perched on the poles could be a risk and should be mitigated by using the Eskom Bird Perch on all pole tops on the lines. This will provide safe perching area well above the dangerous hardware. The impact of electrocution is seen as being of low significance should the bird friendly structure be used. The steel monopole is generally a safe design for 132kV for birds and the fitment of the standard bird perch further increases this safety.

It is therefore recommended from an avifaunal perspective that for 275kV, a "bird friendly" pylon design be used which poses little electrocution risk.

### 9.1.5 Habitat destruction and disturbances due to powerlines

The minimal habitat destruction and alteration will take place during the construction phase of the power line, and this happens with the clearing of the site itself and any associated infrastructures. The existing vegetation between the old Substation and proposed substation has to be maintained in order to minimize the risk of fire.

The construction and operational activities can impact on birds through disturbance, mainly during bird breeding activities and the activities of concern include heavy earth moving general vehicular movement and any other activities which result in noise or increased human activity in an area. The disturbance of non-breeding birds may simply require them to move further away or adjust their activities during the disturbance. This may be either temporary or permanent. Disturbance of breeding birds may result in lower breeding productivity, failed breeding in the relevant season, and temporary or permanent abandonment of a breeding site. All of these reduce the recruitment of young birds to the population and can have significant implications for Red Listed species in particular, many of which are slow to reach breeding age and breed in small numbers.

The construction of a power line can be highly disturbing to birds breeding in the vicinity of the construction activities. Many birds are highly susceptible to disturbance, and should this disturbance take place during a critical time in the breeding cycle, for example when the eggs have not hatched or just prior to the chick fledging, it could lead to temporary or permanent abandonment of the nest or premature fledging. In both instances, the consequences are almost invariably fatal for the eggs or the fledgling. Such a sequence of events can have far reaching implications for certain large, rare species that only breed once a year or once every two years.

There are positive interactions between overhead powerlines and avifauna as well (van Rooyen, 2004):

- Power lines have proven to be partially beneficial to many birds, including species such as Martial Eagles, Tawny Eagles, African White-backed Vultures, and even occasionally Verreaux's Eagles by providing safe nesting and roosting sites in areas where suitable natural alternatives are scarce.
- Pylons can provide a safe nesting and perching sites away from predators. Some Lesser kestrel colonies have been shown to use overhead lines almost exclusively as perching sites. This species has been recorded from the region and has been considered during the survey. Large colonies are not thought to occur within the area, however. Existing overhead wires and towers were noted to be utilised by a small raptor such as Black-winged Kite;
- Pylons can also provide nesting sites within areas devoid of tall trees. This has enabled certain species to expand their range. Large trees were absent throughout the survey area and therefore this is of relevance.

### 9.1.6 Potential occurrence of Red Data bird species

**Table 4** indicates the preferred habitat, together with the probability of occurrence. The probability of occurrence is based on the availability of suitable habitat, known distribution, overall abundance, food availability, disturbance factors, anthropogenic change and the preferred habitats of the species. Only bird species which have higher probability of occurrence on the study area are discussed in the **Table 4**.

**Table 4. Probability of Occurrence of Red listed bird species which could potentially occur within the project site**

| Common Name | Species | Red List Category | Suitable Habitat | Probability of occurrence |
|---|---|---|---|---|
| Hooded Vulture | *Necrosyrtes monachus* | Critically Endangered | It generally prefers moist savanna, especially well-developed Mopane (*Colosphermum mopane*) woodland with scattered trees, such as Jackal-berry (*Diosypros mespiliformis*) and Nyala-tree (*Xanthocercis zambesiaca*). | Low |
| Lappet-faced Vulture | *Torgos tracheliotos* | Endangered | It generally prefers arid and semi-arid open woodland, especially with *Acacia*, Shepherds-tree (*Boscia albitrunca*), Purple-pod cluster-leaf (*Terminalia prunioides*) and Mopane (*Colosphermum mopane*). | Low |
| Cape Vulture | *Gyps coprotheres* | Endangered | It can occupy a variety of habitat types, although it especially favours subsistence farming communal grazing areas, where there is plenty of livestock to feed on. | Medium |
| White-headed Vulture | *Aegypius occipitalis* | Critically Endangered | In southern Africa it is uncommon in north-west-Zimbabwe, Botswana, northern Namibia, Mozambique and eastern South Africa, generally preferring semi-arid woodland, such as Mopane (*Colosphermum mopane*), miombo (*Brachystegia*) and mixed woodland. | Low |
| White-backed Vulture | *Gyps africanus* | Critically Endangered | It generally prefers arid savanna with scattered trees, such as Mopane (*Colosphermum mopane*), largely avoiding forests, deserts, treeless grassland and shrubland. | Low |
| Half-collared Kingfisher | *Alcedo semitorquata* | Near Threatened | It generally prefers narrow rivers, streams and estuaries with dense vegetation onshore, but it may also move into coastal lagoons and lakes | Low |
| Tawny Eagle | *Aquila rapax* | Endangered | It generally prefers lightly-wooded savanna, but it also occurs Nama Karoo and treeless grasslands, provided that there are pylons and alien trees to nest in. | Low |
| Southern Ground-Hornbill | *Bucorvus leadbeateri* | Endangered | It generally prefers grassland and savanna woodland habitats, ranging from montane grassland to extensive, tall stands of Zambezi teak (*Baikiaea plurijaga*), Mopane (*Colospermum mopane*) and Musasa (*Brachystegia spiciformis*) woodlands with sparse understorey. | Low |
| Martial Eagle | *Polemaetus bellicosus* | Endangered | Occurs in a variety of habitats but seem to prefer arid and mesic savannah but is also commonly found at forest edges and in open shrubland | Low |

| Common Name | Species | Red List Category | Suitable Habitat | Probability of occurrence |
|---|---|---|---|---|
| Secretarybird | *Sagittarius serpentarius* | Vulnerable | Prefers open grassland with scattered trees, shrubland, open *Acacia* and *Combretum* savannah. Restricted to large conservation areas in the region. Avoids densely wooded areas, rocky hills and mountainous areas | Low |
| Lanner Falcon | *Falco biarmicus* | Vulnerable | Inhabits a wide variety of habitats, from lowland deserts to forested mountains. | Low |
| Black Stork | *Ciconia nigra* | Vulnerable | It can occupy almost any type of wetland, such as pans, rivers, flood plains, ponds, lagoons, dams, swamp forests, mangrove swamps, estuaries, tidal mudflats and patches of short grass close to water. | Low |
| Yellow-billed Stork | *Mycteria ibis* | Endangered | It generally prefers wetlands, such as pans, flood plains, marshes, streams, flooded grassland and small pools, occasionally moving into mudflats and estuaries. | Low |
| Saddle-billed Stork | *Ephippiorhynchus senegalensis* | Endangered | It generally prefers freshwater marshes, rivers through open savanna, lake shores, pans and flood plains. | Low |
| Greater Painted-snipe | *Rostratula benghalensis* | Near Threatened | It generally prefers dams, pans and marshy river flood plains, or any waterside habitat with mud and vegetation. | Low |
| European Roller | *Coracias garrulus* | Near Threatened | It is locally common in northern and central Namibia, Botswana, Zimbabwe, Mozambique and north-eastern and central South Africa. It generally prefers savanna, such as broad-leaved and *Acacia* woodland. | Low |
| White-backed night Heron | *Calherodius leuconotus* | Vulnerable | It generally prefers clear and slow-moving watercourses with overhanging vegetation, especially in woodland and forest but also in more open country. It occasionally moves to lakes, dams, marshes, mangrove swamps and occasionally reedbeds. | Low |
| Pel's Fishing Owl | *Scotopelia peli* | Endangered | It generally prefers swamps or large tropical rivers adjacent to riverine forest, but it may rarely move into small pans, waterholes or narrow streams. It is generally localized and uncommon, with an estimated 100 breeding pairs in the Okavango Delta. | Low |
| Bateleur | *Terathopius ecaudatus* | Endangered | It generally prefers savanna and woodland habitats, such as arid *Acacia* savanna and miombo (*Brachystegia*) woodland and Mopane (*Colosphermum mopane*) woodland, especially with long grass. It may also move into drainage-line woodland in semi-desert shrubland. | Low to Medium |

| Common Name | Species | Red List Category | Suitable Habitat | Probability of occurrence |
|---|---|---|---|---|
| Crowned Eagle | *Stephanoaetus coronatus* | Vulnerable | It generally prefers forest habitats, such as gallery forest, dense woodland, forest gorges in savanna or grassland and alien tree plantations (such as *Eucalyptus* and pine). | Low |
| African Finfoot | *Podica senegalensis* | Vulnerable | Generally preferring quiet wooded watercourses bordered by dense riparian vegetation, largely avoiding fast-flowing and stagnant rivers. It is a rarely seen bird because of its habits and habitat. | Low |
| Orange Ground-Thrush | *Zoothera gurneyi* | Near Threatened | It is generally uncommon in moist Afromontane evergreen forest along the escarpment of eastern and southern South Africa (also in Zimbabwe's eastern highlands), especially along perennial streams in deeply incised drainage lines. | Low |

# 10 TERRESTRIAL ECOLOGICAL SENSITIVITY ANALYSIS OF THE STUDY AREA

The Screening Tool was accessed to obtain a list of potentially occurring species of conservation concern for the study area. Each of the themes in the Screening Tool consists of theme-specific spatial datasets which have been assigned a sensitivity level namely, “low”, “medium”, “high” and “very high” sensitivity. The four levels of sensitivity are derived and identified in different ways, e.g., for confirmed areas of occupied habitat for SCC a Very High and High Sensitivity is assigned and for areas of suitable habitat where SCC may occur based on spatial models only, a Medium Sensitivity is assigned. The different sensitivity ratings pertaining to the Plant [and Animal] Protocols are described below (**Table 5**).

**Table 5. A description of the different screening tool sensitivity ratings**

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

## 10.1 Sensitivity Assessment

The evaluation of the terrestrial biodiversity, fauna, flora and vegetation importance of the project site was evaluated according to the procedures for the assessment and reporting of impacts on terrestrial biodiversity, terrestrial fauna and species and flora, for activities requiring environmental authorisation as published under the national Environmental Management Act, 1998 (Act No. 107 of 1998): *Procedures to be followed for the assessment and minimum criteria for reporting of identified environmental themes in terms of section 24 (5)a and (h) of the National Environmental Management Act, 1998, when applying for environmental authorisation (G 42946 – GN 9) and SANBI's Species Protocols for Environmental Impact Assessment in South Africa.*

The protocols set requirements for the assessment and reporting of environmental impacts of activities requiring Environmental Authorisation (EA). The higher the sensitivity rating of the features on the proposed site as identified by the screening tool report, the more rigorous the assessment and reporting requirements.

Based on the DFFE environmental screening tool report generated for this study, the Animal Combined Sensitivity Theme, is indicated as a combination of Medium and High sensitivity (**Figure 19**), in areas that are said to contain the following Sensitivity Feature(s).

- *High -Aves-Bucorvus leadbeateri* (Southern ground Hornbill)
- *High -Aves-Gorsachius leuconotus* (White-backed night Heron)

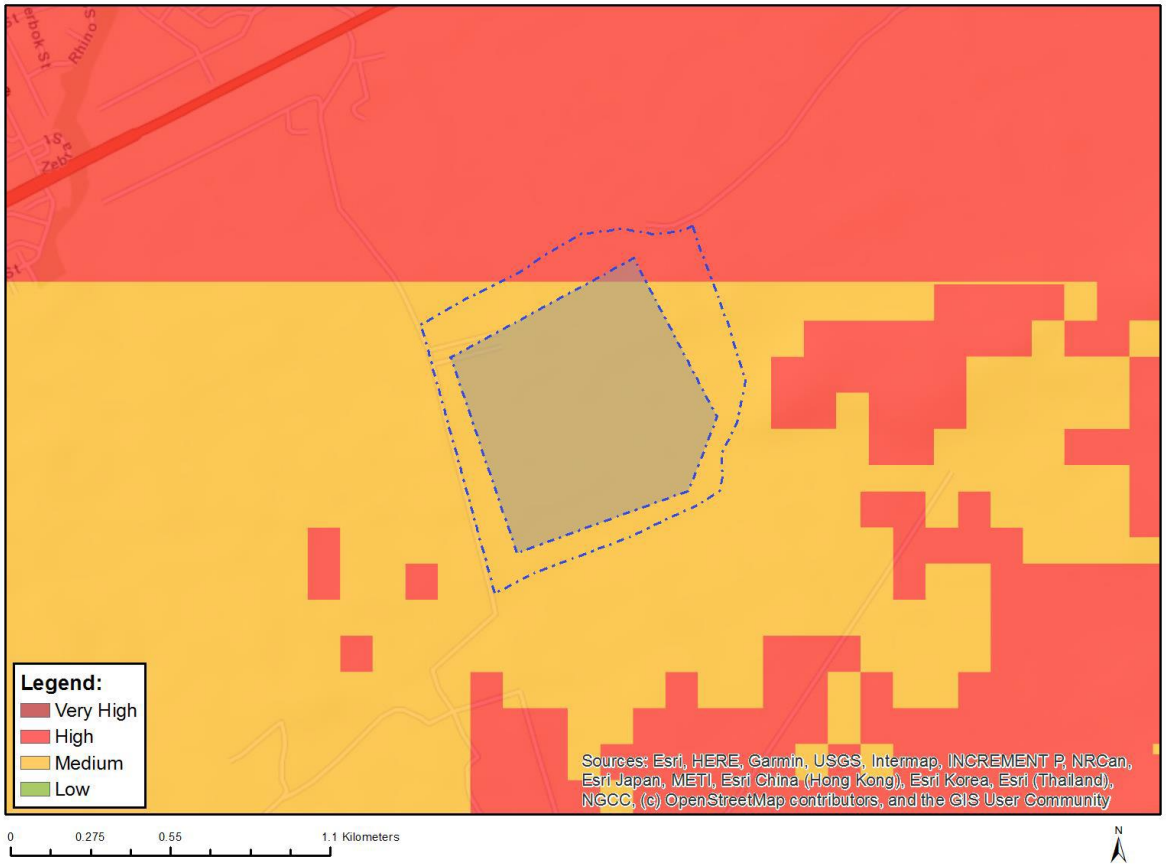


**Figure 19. Map of relative Animal species Theme Sensitivity**

The Species Environmental Assessment guideline (SANBI, 2020) was applied to assess the Site Ecological Importance (SEI) of the project area. The habitats and the species of conservation concern in the project area were assessed based on their conservation importance, functional integrity and receptor resilience (**Table 6**). The combination of these resulted in a rating of SEI and interpretation of mitigation requirements based on the ratings. The sensitivity map was developed using available spatial planning tools as well as by applying the SEI sensitivity based on the field survey.

**Table 6. Criteria for establishing Site Ecological importance and description of criteria**

| Criteria | Description |
|---|---|
| Conservation Importance (CI) | The importance of a site for supporting biodiversity features of conservation concern present e.g., populations of IUCN Threatened and Near-Threatened species (CR, EN, VU & NT), Rare, range-restricted species, globally significant populations of congregatory species, and areas of threatened ecosystem types, through predominantly natural processes |

| Criteria | Description |
|---|---|
| Functional Integrity (FI) | A measure of the ecological condition of the impact receptor as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts |
| Biodiversity Importance (BI) is a function of Conservation Importance (CI) and the Functional Integrity (FI) of a receptor. | |
| Receptor Resilience (RR) | The intrinsic capacity of the receptor to resist major damage from disturbance and/or to recover to its original state with limited or no human intervention |
| Site Ecological Importance (SEI) is a function of Biodiversity Importance (BI) and Receptor Resilience (RR) (SEI = BI + RR) | |

The method used to assess site sensitivity has been described in **Table 6** above. **Tables 7** and **8** below provides a summary of how each site was assessed.

**Table 7. Evaluation of Site Ecological Importance (SEI) of habitat, SCC and Project Area of Influence (PAOI)**

| Habitat | Conservation Importance (CI) | Functional Integrity (FI) | Receptor Resilience (RR) | SEI |
|---|---|---|---|---|
| Agricultural fields | Low | Low | Medium | BI = Low<br>RR =Medium<br><br>(=Low) |
| | No confirmed or highly likely populations of SCC. | Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. | Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) returning to a site once the disturbance or impact has been removed. | |

**Table 8. Guidance for interpreting Site Ecological Importance (SEI) in the context of the proposed development activities**

| Site Ecological Importance | Interpreting in relation to the proposed development activities |
|---|---|
| Low | Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities. |

The site verification was conducted concurrently with the Avifauna impact assessment and during the survey, it was concluded that the proposed development site is considered to be Low in terms of ecological and avifauna sensitivity.

# 11 ENVIRONMENTAL IMPACT ASSESSMENT

## 11.1 Methodology

The impacts and the proposed management thereof are first discussed on a qualitative level and thereafter quantitatively assessed by evaluating the duration, extent, magnitude, probability and ultimately the significance of the impacts (refer to methodology provided below). The assessment considers impacts before and after mitigation measures.

The duration of the impact

| Score | Duration | Description |
|---|---|---|
| 1 | Short term | 0 – 1 years |
| 2 | Short to medium term | 2 – 5 years |
| 3 | Medium term | 5 – 15 years |
| 4 | Medium to long term | 15+ years |
| 5 | Permanent | Permanent |

The extent (spatial scale) of the impact

| Score | Extent | Description |
|---|---|---|
| 1 | Site specific | Within the site boundary |
| 2 | Local | Affects immediate surrounding areas |
| 3 | Regional | Extends substantially beyond the site boundary |
| 4 | Provincial | Extends to almost entire province or larger region |
| 5 | National | Affects country or possibly world |

The magnitude (severe or beneficial) of the impact

| Score | Severe/beneficial effect | Description |
|---|---|---|
| 0 | None | No effect – No disturbance/benefit |
| 2 | Slight | 2 Little effect – negligible disturbance/benefit |
| 4 | Slight to moderate | Effects observable – environmental impacts reversible with time |
| 6 | Moderate | Effects observable – impacts reversible with rehabilitation |
| 8 | Moderate to high | Extensive effects – irreversible alteration to the environment |
| 10 | High | Extensive permanent effects with irreversible alteration |

The probability of the impact

| Score | Rating | Description |
|---|---|---|
| 1 | Very Improbable | Probably won't occur |
| 2 | Improbable | Low likelihood of occurring |
| 3 | Probable | Distinct possibility of occurring |
| 4 | Highly Probable | Very likely to occur |
| 5 | Definite | Will occur, regardless of any intervention |

Significance of the impact, Degree of Irreversibility, Degree of loss of Resource are rated as follows:

| Significance Rating | Description |
|---|---|
| Low (score of 1-29) | Impact will not significantly change fauna biodiversity and requires no significant mitigation measures. |
| Moderate (score of 30-60) | Impact will change fauna biodiversity and requires some mitigation measures. |
| High (Score of 61-100) | Impact will significantly change fauna biodiversity and significant mitigation measures and management is required. Potential fatal flaw. |

The Significance = (Magnitude + Spatial Scale + Duration) x Probability

## 11.2 Assessment of Environmental Impacts and Suggested Mitigation Measures

Only the ecological issues identified during the appraisal of the receiving environment and potential impacts are assessed in **Table 9**. Mitigation measures are provided to prevent (first priority), reduce or remediate adverse environmental impacts.

The pre/construction phases of the proposed development are anticipated to have direct impacts on floral habitat, especially within the areas with watercourses. Site clearing along the watercourses will potentially result in permanent removal of floral habitat and therefore the disturbance and clearing of vegetation must be limited to the construction footprint only.

Based on the results of the field survey, it is evident that the project site provides limited suitable habitat to a number of avifauna species, however, the canal and dams provide habitats for water-dependant birds. Although it is assumed that the majority of avifauna species will move to nearby areas as a result of disturbance, many SCC avifauna species have a specific habitat requirement and the destruction of their habitats will result in displacement to less optimal habitats, or ultimately may result in their demise. However, this impact can be mitigated as the site is used for agriculture.

Increased levels of noise, disturbance and human activity during construction may be detrimental to avifauna. The risk of illegal hunting/poaching/trapping of avifauna for various uses is likely. Many species would however become habituated to the existing activities and would return to normal activity after some time. The operational phase of the development will be permanent. Potential impacts on local avifaunal species as a result of disturbance/displacement has been assessed as not significant at a local scale.

The impact of fatalities from collision with the powerline by avifaunal species is regarded as the most significant medium to long-term impact. The development of the powerline will require the clearing of a servitude as a safety factor, which will include removal of trees and shrubs that occur beneath or close to the overhead line. This will result in displacement of species. Each tower footprint will also be impacted through habitat destruction, but this is thought to be of lesser significance and of a short term. The actual overhead powerline and associated towers are thought to not have a significant long-term impact as most of the habitat impacted during the construction phase will be either reinstated as part of a rehabilitation plan, or the vegetation will naturally reinstate. This means that avifauna will be temporarily displaced, but will return back into the area once disturbance impacts (mainly limited to the construction phase) are completed. In order to rate the impact of electrocutions, an assumption was made with regard to structural design of the power line poles. It is assumed that a bird friendly structure is generally a safe design for birds and the fitment of the standard bird perch further increases this safety and this the impact of electrocution is seen as low.

The potential impacts associated with the pre-construction, construction and operational activities are discussed in **Table 9**.

#### 11.2.1.1 Pre-construction / Construction Phases

Activities associated with the pre-construction and construction phases, include the following:

- Vegetation clearance of the site.

Potential impacts to avifauna during the pre-/and construction phases, include the following:

- Destruction of indigenous flora and habitats (watercourses) during site establishment;
- Potential loss of a riparian vegetation/watercourses;
- Loss/displacement of avifauna species potentially present on site;
- Disturbance of local avifauna populations due to construction activities; and
- Loss of avifauna habitat due to vegetation clearance.

#### 11.2.1.2 Operational Phase

Activities associated with the operational phase, include the following:

- Vegetation management activities; and
- Avifauna management activities.

Potential impacts associated with the operational phase, include the following:

- Collision of birds with overhead cables;
- Electrocution of birds; and
- Disturbance of local faunal communities

**Table 9: Potential impacts and recommended mitigation measures with significance rating before and after mitigation**

| Potential impact BEFORE mitigation | | | | | | Mitigation Measures | Potential impact AFTER mitigation | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nature of the impact** | **Duration** | **Extent** | **Probability** | **Magnitude** | **Significance** | | **Duration** | **Extent** | **Probability** | **Magnitude** | **Significance** |
| **Pre-Construction Phases** | | | | | | | | | | | |
| Loss of avifaunal habitat, species and avifaunal SCC | Medium to long term (4) | Site specific (1) | Probable (3) | Slight to moderate (4) | 27 (Low) Status (-ve) | • Pre-construction environmental induction must be conducted to all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness as to conservation and importance of SCC which have High probability of occurring on site.<br>• Prior to the commencement of any excavations, the required disturbance footprint will | Short to medium term (2) | Site specific (1) | Improbable (2) | Slight (2) | 10 (low) Status (-ve) |

| Potential impact BEFORE mitigation | | | | | | Mitigation Measures | Potential impact AFTER mitigation | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nature of the impact** | **Duration** | **Extent** | **Probability** | **Magnitude** | **Significance** | | **Duration** | **Extent** | **Probability** | **Magnitude** | **Significance** |
| | | | | | | be demarcated and all activities will be located within the demarcated area. No vegetation disturbance to take place outside the demarcated area.<br>• The mitigation measures proposed by the vegetation specialist must be strictly enforced.<br>• If avian SCC nests are located, a qualified avifaunal specialist should be consulted to determine the best management options. If nests are | | | | | |

| Potential impact BEFORE mitigation | | | | | | Mitigation Measures | Potential impact AFTER mitigation | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nature of the impact** | **Duration** | **Extent** | **Probability** | **Magnitude** | **Significance** | | **Duration** | **Extent** | **Probability** | **Magnitude** | **Significance** |
| | | | | | | known to have nestlings or eggs within, these should be allowed to fledge prior to the nest removal.<br>• Design of infrastructure should be environmentally sound and all construction equipment to be utilised must be a good working condition, and all possible precautions taken to prevent potential avifaunal collisions or electrocutions, and mechanical spills and/or leaks.<br>• No hunting/trapping or | | | | | |

| Potential impact BEFORE mitigation | | | | | | Mitigation Measures | Potential impact AFTER mitigation | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nature of the impact** | **Duration** | **Extent** | **Probability** | **Magnitude** | **Significance** | | **Duration** | **Extent** | **Probability** | **Magnitude** | **Significance** |
| | | | | | | collecting of avifaunal species is allowed. | | | | | |
| Disturbance of bird roosts and breeding sites | Medium to long term (4) | Site specific (1) | Probable (3) | Slight to moderate (4) | 27 (Low) Status (-ve) | • In terms of Tower infrastructure, commencement of construction should be, if possible, limited to the months of December, January, February, March, April, May, September, October, November (latest) to minimise dust effects and subsequent destruction of the avifaunal habitats, especially during foraging and breeding season.<br>• Mitigation for disturbance includes the | Short to medium term (2) | Site specific (1) | Improbable (2) | Slight (2) | 10 (low) Status (-ve) |

| Potential impact BEFORE mitigation | | | | | | Mitigation Measures | Potential impact AFTER mitigation | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nature of the impact** | **Duration** | **Extent** | **Probability** | **Magnitude** | **Significance** | | **Duration** | **Extent** | **Probability** | **Magnitude** | **Significance** |
| | | | | | | establishment and monitoring of an EMP by an onsite ECO during construction. | | | | | |
| Displacement of priority species due to disturbance associated with construction activities | Medium to long term (4) | Local (2) | Probable (3) | Moderate to slight (4) | 30 (Medium) Status (-ve) | • Construction activity should be restricted to the immediate footprint of the infrastructure.<br>• Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species.<br>• Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum. | Short to medium term (2) | Site specific (1) | Improbable (2) | Slight (2) | 10 (low) Status (-ve) |

| Potential impact BEFORE mitigation | | | | | | Mitigation Measures | Potential impact AFTER mitigation | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nature of the impact** | **Duration** | **Extent** | **Probability** | **Magnitude** | **Significance** | | **Duration** | **Extent** | **Probability** | **Magnitude** | **Significance** |
| **Operational phases** | | | | | | | | | | | |
| Collision of birds with infrastructures | Medium to long term (4) | Local (2) | Probable (3) | Moderate to slight (4) | 30 (Medium) Status (-ve) | • Mitigation for collisions involves routing the line correctly as well as installing anti-collision marking devices to the line where necessary.<br>• Only a bird friendly pylon structure is permissible for the construction of the new proposed power line. This will ensure that large birds can perch and roost safely on the hardware.<br>• Fitment of devices on the earth wires to make the lines more visible<br>• All construction and maintenance | Short to medium term (2) | Site specific (1) | Improbable (2) | Slight (2) | 10 (low) Status (-ve) |

| Potential impact BEFORE mitigation | | | | | | Mitigation Measures | Potential impact AFTER mitigation | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nature of the impact** | **Duration** | **Extent** | **Probability** | **Magnitude** | **Significance** | | **Duration** | **Extent** | **Probability** | **Magnitude** | **Significance** |
| | | | | | | activities should be carried out according to generally accepted environmental best practices.<br>• The bird flight diverters should be installed on the line, for the span length on the earth wire. Light and dark colour devices must be alternated to provide contrast against both dark and light backgrounds respectively. These devices must be installed as soon as the conductors are strung. | | | | | |
| Electrocution of birds | Medium to long term (4) | Local (2) | Probable (3) | Moderate to slight (4) | 30 (Medium) Status (-ve) | • During operational phase, any nest found on the lines | Short to medium term (2) | Site specific (1) | Improbable (2) | Slight (2) | 10 (low) Status (-ve) |

| Potential impact BEFORE mitigation | | | | | | Mitigation Measures | Potential impact AFTER mitigation | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nature of the impact** | **Duration** | **Extent** | **Probability** | **Magnitude** | **Significance** | | **Duration** | **Extent** | **Probability** | **Magnitude** | **Significance** |
| | | | | | | should be managed in accordance with Eskom Distribution Nest Management Guidelines and relevant provincial and national legislation.<br>• In order to prevent the electrocution of any birds, on the poles, all poles should be fitted with a standard type, Eskom approved "bird perch" at the top of the pole. This will provide ample safe perching space for any bird well clear of the dangerous hardware. | | | | | |
| Loss of avifaunal habitat, species and SCC | Permanent (5) | Local (2) | Highly Probable (4) | Moderate to high (8) | 60 (Medium) Status (-ve) | • All vehicles should be restricted to travelling only on | Medium to long term (4) | Local (2) | Probable (3) | Moderate to slight (4) | 30 (Medium) Status (-ve) |

| Potential impact BEFORE mitigation | | | | | | Mitigation Measures | Potential impact AFTER mitigation | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nature of the impact** | **Duration** | **Extent** | **Probability** | **Magnitude** | **Significance** | | **Duration** | **Extent** | **Probability** | **Magnitude** | **Significance** |
| | | | | | | designated roadways to limit the ecological footprint of the development activities.<br>• Continuous monitoring (monthly) should be undertaken, and a record of potential bird electrocutions or collisions should be kept and reported to the ECO. Mitigation measures should be updated annually depending on monitoring results | | | | | |
| Rehabilitation/landscaping of the site after construction activities | Medium to long term (4) | Site specific (1) | Probable (3) | Slight to moderate (4) | 27 (Low) Status (-ve) | • Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural | Permanent (5) | Regional (3) | Highly Probable (4) | High (10) | 72 (High) Status (+ve) |

| Potential impact BEFORE mitigation | | | | | | Mitigation Measures | Potential impact AFTER mitigation | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nature of the impact** | **Duration** | **Extent** | **Probability** | **Magnitude** | **Significance** | | **Duration** | **Extent** | **Probability** | **Magnitude** | **Significance** |
| | | | | | | vegetative conditions prevailing prior to construction<br>• The plant material to be used for rehabilitation should be similar to what is naturally found in the surrounding area.<br>• When rehabilitating the construction footprint site, it is imperative that as far as possible, the habitat that was present prior to disturbances is improved, so that avifaunal species that were displaced by vegetation clearing and | | | | | |

| Potential impact BEFORE mitigation | | | | | | Mitigation Measures | Potential impact AFTER mitigation | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nature of the impact** | **Duration** | **Extent** | **Probability** | **Magnitude** | **Significance** | | **Duration** | **Extent** | **Probability** | **Magnitude** | **Significance** |
| | | | | | | construction activities are able to recolonize the rehabilitated area.<br>• All disturbed areas can be re-vegetated with an indigenous grass mix to re-establish a protective grass strip within the power line servitude to minimize soil erosion and dust emission. | | | | | |

#### 11.2.1.3 Cumulative impacts

Cumulative impacts can be identified by combining the potential environmental implications of the proposed project with the impacts of projects and activities that have occurred in the past, are currently occurring, or are proposed in the future within the project area.

- The cumulative impacts of power lines on birds through electrocution and collisions are significant nationally. This particular area already has several existing distribution power lines. No effort should be spared to ensure that the new power line is built bird friendly and results in no additional impact on birds in the area.
- Habitat loss due to construction of the power line and power station would result in cumulative impacts on listed vegetation type and this would also increase habitat fragmentation and potentially result in a loss of broad-scale landscape connectivity.
- Destruction of nesting habitat displaces the affected species eventually leading to loss of those species.
- Powerlines represent the largest proportion of established aerial infrastructure throughout the country and collision impacts are of national concern. Fitment of devices on the earth wires to make the lines more visible is reducing this impact at the national level.

#### 11.2.1.4 Decommissioning

Post to the economic lifespan of the Khanyazwe FlexPower Power Plant project, decommissioning and rehabilitation will comply with the appropriate environmental legislation and best practices at that time.

# 12 CONCLUSION AND RECOMMENDATIONS

This avifaunal impact report has characterised the avifaunal assemblage of the study area by examining bird atlas data for the area, and through the site visit, in which birds were identified within the project site. Habitat type is a critical factor in determining the species assemblages of birds and priority bird species in a particular area, and a number of different habitat types have been identified on the site, a number of which are associated with particular assemblages of bird species. Watercourses have been identified as the most sensitive avifaunal habitats in the study area.

Anthropogenic impacts, mainly in the form of agriculture (sugar cane), have largely transformed the landscape resulting in a negative impact on avifaunal diversity and abundance. The construction of the proposed power station and power line will result in various impacts of low to medium significance to the birds occurring in the vicinity of the new infrastructure, which can be reduced through the application of mitigation measures. Given the presence of existing habitat degradation and disturbance, it is anticipated that the proposed development site can be constructed within the study area with acceptable levels of impact on the resident avifauna subject to the following recommendations:

- Power line marking will be required to mitigate for the collision impact, since the project site contains dams and waterbodies.
- Construction activity should be restricted to the immediate footprint of the infrastructure.
- Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of avifaunal species.
- Furthermore, the environmental good practices should be applied, such as ensuring strict control of staff, vehicles and machinery on site and limiting the creation of new roads as far as possible.

In order to minimize the impacts of collisions of avifauna, it is therefore recommended from an avifaunal perspective that a "bird friendly" pylon design be used which poses little electrocution risk. With regards to habitat destruction, the recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint and rehabilitation of disturbed areas is concerned.

Given the relative homogeneity of the habitat within the study area as well as existing levels of disturbance (existing power line and substation infrastructure, roads, agricultural lands etc), the proposed project is unlikely to have a significant, long-term impact on the local avifauna. Should any nests or breeding sites be found during the construction process, suitable recommendations should be provided and the EMPr must be amended. Mitigation measures to reduce any potential direct and acute impact on avifaunal species, must be enforced and implemented. Certain areas will require marking with anti-collision marking devices and this is due to the

historical presence of some collision of sensitive species in the area. Moreover, a “bird friendly structure” must be used to mitigate against electrocutions. Standard EMP principles must be followed to mitigate for the impact of habitat destruction and disturbance on avifauna and should this be done; the project may proceed with mitigatable impacts on avifauna. The impacts associated with the proposed project, such as collisions, electrocution, habitat destruction and disturbances, can be mitigated to a satisfactory level.

# 13 REFERENCES

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VAN ROOYEN, C.S. & TAYLOR, P.V. (1999). Bird streamers as probable cause of electrocutions in South Africa. EPRI Workshop on Avian Interactions with Utility Structures, Charleston, South Carolina.

### *Appendix A: Structure of the Report*

The Terrestrial Biodiversity Specialist Assessment was conducted in accordance with the Terrestrial Biodiversity Protocol (2020). This protocol provides the criteria for the specialist assessment and minimum report content requirements for impacts on Terrestrial biodiversity for activities requiring EA. This protocol replaces the requirements of Appendix 6 of the EIA Regulations 2014, GN R. 982 (as amended), published under NEMA.

The assessment and reporting requirements of this protocol are associated with a level of environmental sensitivity identified by DFFE's national web-based environmental screening tool screening tool. The screening tool identified the site footprint as falling within an area of "Low Sensitivity" for Terrestrial biodiversity theme. The screening tool identified the site footprint as falling within an area of "High" and "Medium" sensitivity for terrestrial animal and plant species diversity, respectively. Table indicates how the assessment complied with the requirements of the Terrestrial Biodiversity Protocol, with reference to specific sections in this report.

| **Requirement of GN 648 of 10 May 2019<br>VERY HIGH SENSITIVITY RATING – for Animal Features** | **Fulfilment** |
|---|---|
| The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information: | |
| Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae; | Page xiv and Appendix B |
| A signed statement of independence by the specialist; | Page xiv |
| A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment; | Chapter 4 |
| A description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant; | Chapter 5 |
| A description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations; | Chapter 4 |
| A location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant); | Not Applicable to this project |
| Additional environmental impacts expected from the proposed development; | Chapter 11 |
| Any direct, indirect and cumulative impacts of the proposed development; | Chapter 11 |
| The degree to which impacts and risks can be mitigated; | Chapter 11 |
| The degree to which the impacts and risks can be reversed; | Chapter 11 |
| The degree to which the impacts and risks can cause loss of irreplaceable resources | Chapter 11 |
| Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr); | Chapter 11 and Table 9 |
| A motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a "low" terrestrial biodiversity sensitivity and that were not considered appropriate; | Not Applicable to this report |
| A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not; and | Executive summary and Chapter 12 |
| Any conditions to which this statement is subjected | Chapters 9,10,11 and 12 |

*Appendix B: Biodiversity Specialist CV*

# AVHAFAREI PHAMPHE

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## Educational Qualification

University of Pretoria – MSc. Botany.
University of Venda – University Education Diploma (Biological Science))
University of Venda - Bachelor of Science Honours (Botany)
University of Venda – Bachelor of Science (Botany & Chemistry)

## Professional Registrations

- South African Council of Natural Scientific Professions (SACNASP) (Ecological Science- 400349/12)
- South African Institute of Ecologists and Environmental scientists (SAIEES)
- South African Green Industries Council (SAGIC AIS)
- South African Association of Botanists (SAAB)

## Project Experience (Selected Projects)

- Proposed upgrading of Olifantspoort and Ebenezer Water Supply Schemes, Phase 1, within the Jurisdiction of Capricorn and Mopani District Municipalities, Limpopo Province.
- Proposed Mokolo and Crocodile River (West) Water Augmentation Project (Phase 2A) (MCWAP-2A): Water Transfer Infrastructure
- Proposed Vaal Gamagara Regional Water Supply Phase 2: Upgrading of the existing Scheme
- Terrestrial ecological assessment report. Nketoana Regional Bulk Water Scheme Project Free State province.
- Terrestrial ecological assessment report. Proposed Surface Water Developments for Augmentation of the Western Cape Water Supply System
- Terrestrial ecological assessment report. Eskom Emkhiweni Substation and 400KV Line from Emkhiweni Substation to Silimela, Limpopo and Mpumalanga Provinces
- Botanical survey at Eskom Skaapvlei substation included in the West Coast Group of Battery Energy Storage System (BESS) project, Western Cape province
- Botanical Survey at Eskom Paleisheuwel Substation in the West Coast. Group of Battery Energy Storage System (BESS) Project in Western Cape
- Proposed Matjhabeng Solar PV with Battery Energy Storage Systems Project: Phase 1 and Phase 2 Sites
- Proposed Turffontein sewer upgrade
- Proposed Greater Orange Farm water upgrade
- Proposed sewer pipe replacement in Lorentzville, City of Johannesburg
- Proposed Lanseria outfall sewer
- Proposed desludging and lining of dam 02 within the Northern Wastewater Treatment Works, in Johannesburg, Gauteng province
- Proposed uMkhomazi water project phase 1 – Raw water component

- Proposed roads and stormwater infrastructure for Soshanguve Block L
- Proposed stormwater and sewer infrastructure for the uMhlanga Ridgeside development
- Proposed High altitude training Centre in Belfast
- Flora and fauna assessment, Proposed BG3 pipeline, Vaal River.
- Terrestrial ecological assessment report. New wastewater treatment works at Lanseria, City of Johannesburg.
- Terrestrial ecological assessment report. Proposed 100ml Bronberg reservoir and associated infrastructure
- Ecological Assessment; Proposed Ncwabeni Off-Channel Storage Dam
- Flora and Fauna assessment in Bankfontein farms, Breyten, Mpumalanga
- Flora and Fauna assessment in Vaalbank, Carolina, Mpumalanga.
- Flora and fauna assessment Proposed hydropower plant within Rand Water's hydraulic network at Zoekfontein site.
- Proposed upgrade of O6 pipeline
- Proposed construction of BG3 pipeline near Vaal River
- Proposed construction of S4 pipeline.
- Proposed construction of B16 pipeline.
- Terrestrial ecological assessment report. Proposed Foxwood Dam, Eastern Cape province
- Monitoring reporting for *Warburgia salutaris* in Ithala Game Reserve
- Status report for Black and White rhino in Ithala Game Reserve
- Recovery plan for *Protea comptonii* for Ithala Game Reserve
- Fire monitoring report for Ithala Game Reserve, Vryheid hill nature reserve and Pongola bush nature reserve
- Mechanical removal of *Dichrostachys cinerea* in Ithala game reserve

**Work Experience**

1. Independent Biodiversity Specialist

June 2020 to present

- Vegetation Surveys
- Fauna surveys
- Development of biodiversity sector plans
- Interpreting conservation plans to inform local and regional planning
- Alien Plant Management Plans
- Search, Rescue and Relocation Plans
- Walk-through surveys
- Development of management plans for important species and habitats
- Undertaking environmental audits

2. Nemai Consulting (Pty) Ltd- Senior Biodiversity Specialist

May 2010-May 2020

- Compile flora and fauna reports
- Compile rehabilitation plans.
- Compile Basic Assessments reports and Environmental Management Programmes.
- Scientific data collection.
- Compile scientific flora and flora reports
- Involved in Public Participation Process

- Project management
- Compile Biodiversity Sector Plans
- Acted as an Environmental Control Officers

3. Digby Wells and Associates- Flora and Fauna Specialist
January 2008-April 2010
- Compile flora and fauna reports
- Compile rehabilitation plans.

4. Ezemvelo KZN Wildlife- Ecologist
March 2004-December 2007
- fire management and reporting,
- GIS mapping,
- Monitoring of endangered species,
- Liaise with neighbouring communities and schools about environmental education,
- Handling budget for the research station,
- Annual game count census,
- Involved in integrated management plans,
- Elephant management plan.
- Compile rehabilitation plans.

5. South African National Biodiversity Institute- Agricultural Development Technician
January 2004-February 2004
- Herbarium database
- Herbarium specimens filling
- Data Quality Controller,

6. South African National Biodiversity Institute- Volunteer and Ad Hoc
January 2002-December 2003
- PRECIS database,
- Mounting of specimens,
- Filing,
- Data quality control

7. University of Pretoria-Zoology Department- African National Biodiversity Institute- Volunteer and Ad Hoc
July 2001-September 2001
- Filing,
- Data quality control

**Courses/workshops/conferences attended**

- Biodiversity Offset training October 2019, organized by SANBI and DEFF
- Alien invasive plants workshop, 2016
- South African Association of Botanists conference in Drakensville, hosted by the university of KwaZulu Natal, January 2013
- South African association of botanist's conference in Rhodes university (Grahamstown 2001)
- South African association of botanists' conference in Pretoria university (2002)
- Distance course (01-03 June 2004)
- Financial policies and procedures (08-10 June 2004)
- Population modeling course (01-04 November 2004)
- Vegetation monitoring (22-24 November 2004)

- Vulture monitoring workshop (19-21 January 2005)
- Grassland ecology course (08-10 March 2005)
- Introduction to geographic information systems (18-26 April 2005)
- Waste management course (13-15 March 2006)
- Elephants of the red volta: earth watch expedition in Ghana (1-18 July 2006)
- 21st international conference of society for conservation biology in nelson Mandela metropolitan university in port Elizabeth (1-5 July 2007)
- Wetlands workshop, organized by GDARD, 2010

**Scientific paper reviewed**

- J.P. VAN DER LINDEN, D.P. FERREIRA, S.J. SIEBERT, G.J. BREDENKAMP AND F. SIEBERT. 2007. Vegetation dynamics of the woody layer of Zululand coastal thornveld, KwaZulu-Natal.

**References**

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