APPENDIX

F SPECIALIST STUDIES

APPENDIX

F-1 AVIFAUNA

AVIFAUNAL IMPACT ASSESSMENT

Mukondeleli Wind Energy Facility Grid Connection up to 132kV, Mpumalanga Province

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AFRIMAGE Photography (Pty) Ltd t/a:
Chris van Rooyen Consulting
VAT#: 4580238113
email: vanrooyen.chris@gmail.com
Tel: +27 (0)82 4549570 cell

EXECUTIVE SUMMARY

1 Background

Mukondeleli (RF) (Pty) Ltd is proposing to develop the 300 MW Mukondeleli Wind Energy Facility (WEF) with a maximum export capacity of up to 300 MW. Associated with this development is a grid connection of 132kV (hereafter referred to as the 'Mukondeleli Grid Connection'). Within this project area the extent of the buildable area is subject to a Basic Assessment process in terms of the 2014 NEMA EIA Regulations, as amended.
This report has been prepared in terms of the Environmental Impact Assessment (EIA) Regulations under the National Environmental Management Act (Act No. 107 of 1998) (NEMA 2014, 2017) and the gazetted 'Procedures for the assessment and minimum criteria for reporting on identified environmental themes (Government Gazette 43110, No. 320, 20 March 2020 and Government Gazette 43855, No. 1150, 30 October 2020) (NEMA 2020a, 2020b). Note that these protocols replace the requirements of Appendix 6 of the 2014 NEMA EIA Regulations. The approach, methodology and regulatory framework is explained in Chapters 2-5 of the report.

2 Avifauna

A total of 189 species could potentially occur within the broader area where the project site is located (see Appendix 1). Sixty-six (66) of these bird species are classified as powerline priority species, of which fifty-two (52) are considered to regularly occur in the development PAOI, with thirty-seven (37) such species having been recorded during the Site Sensitivity Verification field surveys.

3 Summary and conclusion

The proposed Mukondeleli Grid Connection could have several potential impacts on priority avifauna. These impacts are the following:

- Displacement of priority species due to disturbance linked to construction activities in the construction phase.
- Displacement due to habitat transformation in the construction phase.
- Collisions with the 132kV HV overhead lines in the operational phase.
- Displacement of priority species due to disturbance linked to dismantling activities in the decommissioning phase.

3.1 Displacement of priority species due to habitat transformation in the construction phase

Unfortunately, very little mitigation can be applied to reduce the significance of this impact as the total permanent transformation of the natural habitat within the construction footprint of the Mukondeleli Grid Connection is unavoidable. The loss of habitat for powerline sensitive species due to direct habitat transformation associated with the construction of the proposed Mukondeleli Grid Connection is likely to be moderate due to the small size of the footprint, but ideally high-quality grassland should be avoided if possible. In summary, the powerline priority bird species which may regularly occur at the development area could be impacted by habitat transformation associated with the development of the grid infrastructure: Black-headed Heron, Black-winged Kite, Blue Crane, Blue Korhaan, Common Buzzard, Greater Kestrel, Helmeted Guineafowl, Jackal Buzzard, Lanner Falcon, Long-crested Eagle, Marsh Owl, Northern Black Korhaan, Pallid Harrier, Rock Kestrel, Secretarybird, and Spotted Eagle-Owl.
The impact is rated as **moderate** pre-mitigation and **low** post-mitigation.

3.2 Displacement of priority species due to disturbance linked to the construction activities in the construction phase

It is inevitable that a measure of displacement will take place at the Mukondeleli Grid Connection development area for the priority species during the construction phase, due to the disturbance factor associated with the construction activities. This is likely to affect ground nesting species in the remaining high-quality grassland, wetlands and wetland fringes the most, as this could temporarily disrupt their reproductive cycle. In summary, the powerline priority bird species which may regularly occur at the development area could be impacted by disturbances during the construction phase: Black Sparrowhawk, Black-headed Heron, Black-winged Kite, Blue Crane, Blue Korhaan, Cape Crow, Egyptian Goose, Goliath Heron, Greater Kestrel, Grey Heron, Hadada Ibis, Hamerkop, Helmeted Guineafowl, Jackal Buzzard, Lanner Falcon, Long-crested Eagle, Marsh Owl, Northern Black Korhaan, Pied Crow ,Rock Kestrel, Secretarybird, and Spotted Eagle-Owl
The impact is rated as **moderate** pre-mitigation and **low** post-mitigation.

3.3 Electrocution of priority species in the onsite substation in the operational phase

Electrocutions within the proposed on-site substation yard are possible but should not affect the more sensitive Red List bird species, as these species are unlikely to use the infrastructure within the substation yard for perching or roosting. Species that are more vulnerable to this impact are corvids, owls, and certain species of waterbirds. In summary, the following powerline priority bird species which may regularly occur at the development area are vulnerable to electrocution in this manner: African Sacred Ibis, Amur Falcon, Black Sparrowhawk, Black-headed Heron, Black-winged Kite, Cape Crow, Common Buzzard, Egyptian Goose, Greater Kestrel, Hadada Ibis, Helmeted Guineafowl, Jackal Buzzard, Lanner Falcon, Long-crested Eagle, Marsh Owl, Pallid Harrier, Pied Crow, Rock Kestrel, Spotted Eagle-Owl, Spur-winged Goose, and Western Cattle Egret
The impact is rated as **low** pre-mitigation and **very low** post-mitigation.

3.4 Collisions of priority species with the overhead 132kV powerlines in the operational phase

Collisions are arguably the biggest threat posed by transmission lines to birds in southern Africa. Most heavily impacted upon are bustards, storks, cranes, and various species of waterbirds, and to a lesser extent, vultures. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with transmission lines. In summary, the following powerline priority bird species which may regularly occur at the development area are particularly vulnerable to risk of collisions with the overhead 132kV powerlines: African Sacred Ibis, African Spoonbill, Black-headed Heron, Blue Crane, Blue Korhaan, Cape Shoveler, Egyptian Goose, Glossy Ibis, Goliath Heron, Great Egret, Greater Flamingo, Grey Heron, Hadada Ibis, Hamerkop, Intermediate Egret, Little Egret, Little Grebe, Mallard, Marsh Owl, Northern Black Korhaan, Purple Heron, Red-billed Teal, Red-knobbed Coot, Reed Cormorant, Secretarybird, South African Shelduck, Southern Pochard, Spotted Eagle-Owl, Spur-winged Goose, Squacco Heron, Western Cattle Egret, White Stork, White-breasted Cormorant, White-faced Whistling Duck, and Yellow-billed Duck.
The impact is rated as **high** pre-mitigation and **low** post-mitigation.

3.5 Displacement of priority species due to disturbance linked to dismantling activities in the decommissioning phase

The impact is likely to be similar in nature and extent to the construction phase of the proposed Grid Connection. The impact is rated as **moderate** pre-mitigation and **low** post-mitigation.

3.6 Cumulative impacts

The total length of overhead 132kV powerlines for proposed Mukondeleli Grid Connection is approximately 8.0km. There is a functional length of >1000km of overhead high voltage (132kV / 400kV) powerlines in a 55km radius of the development area, given that several overhead powerlines run parallel for part of their respective lengths. The Mukondeleli Grid Connection therefore represents a comparatively **Low** contribution towards the total length of high voltage power lines within a 55km radius. However, this project will further increase the density of planned and existing high voltage lines within a 55km radius, and cumulative effect of all the existing and planned lines represents a potentially **Moderate** impact risk to priority avifauna.

4 Conclusion and impact statement

The proposed Mukondeleli Grid Connection could have a **high** to **moderate** impact on avifauna which, in most instances, could be reduced to a **low** through appropriate mitigation, although some **moderate** residual impacts will still be present after mitigation. No fatal flaws were discovered during the onsite investigations. The proposed Grid Connection development is therefore supported, provided the mitigation measures listed in this report are strictly implemented.

5 Environmental sensitivities

The following specific environmental sensitivities were identified from an avifaunal perspective:

- **Drainage lines, dams, pans and associated wetlands.** These habitat features are important attractions for many powerline sensitive species, particularly waterbirds, including Red List species such as Blue Crane and Maccoa Duck. Birds commuting between these areas will be at risk of collision with the earthwire if they have to cross over the grid connection. Spans crossing these areas, or situated between two or more such areas, must be identified during the walk-through inspection once the final tower positions have been determined and marked with Bird Flight Diverters.
- **Natural grassland**. The natural grassland is vital breeding, roosting and foraging habitat for a variety of Red List powerline sensitive species and will therefore be associated with significant flight activity. These include Secretarybird, Blue Korhaan, Pallid Harrier, Red-footed Falcon and Blue Crane. Spans crossing these areas, or situated between two or more such areas, must be identified during the walk-through inspection once the final tower positions have been determined and marked with Bird Flight Diverters.

See Figure (i) for the avifaunal sensitivities identified from a powerline perspective.

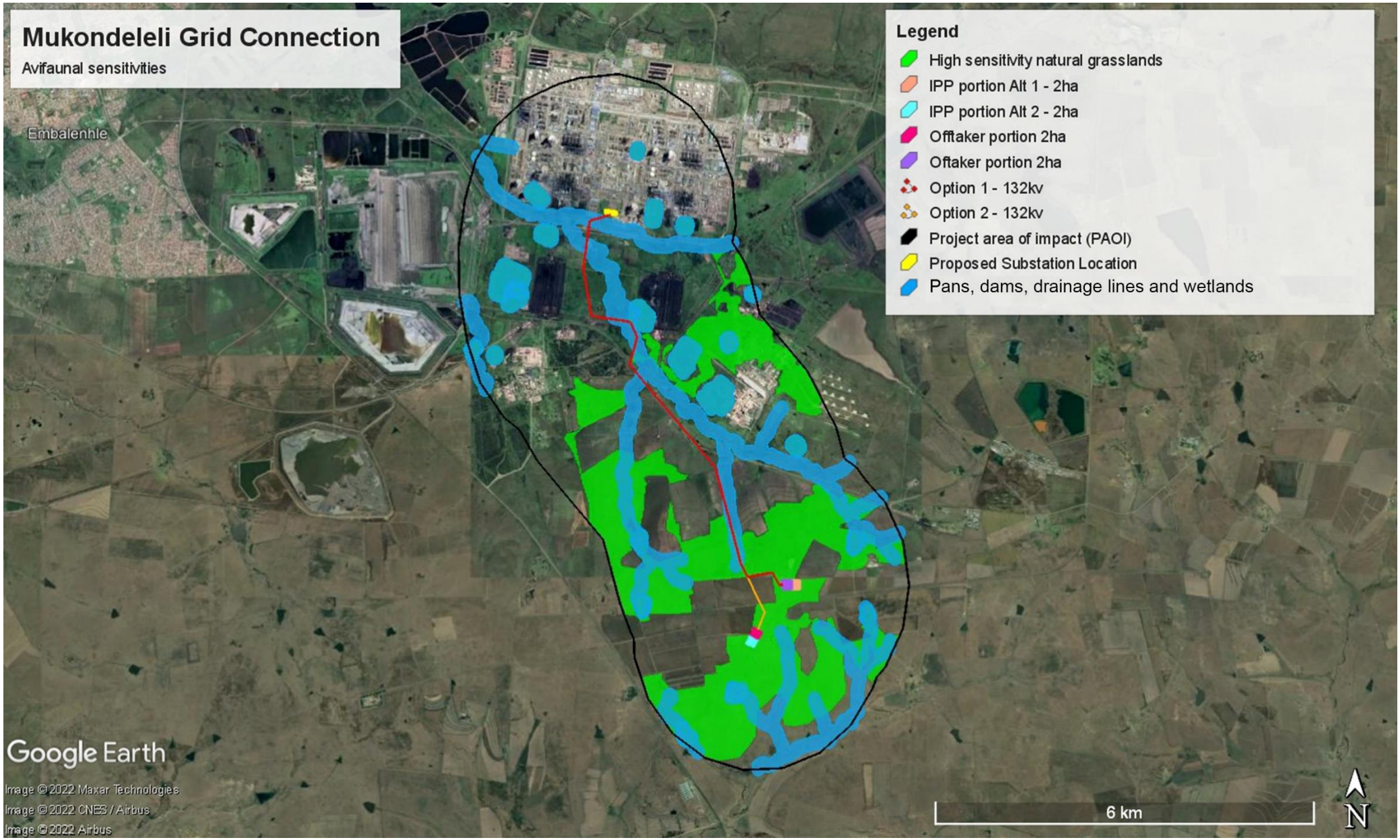

Figure (i): Avifaunal sensitivities within the Mukondeleli Grid Connection project area of impact

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Glossary of Terms

Definitions	
Wind priority species	Powerline sensitive species are defined as species which could potentially be impacted by powerline collisions or electrocutions, based on their morphology. Larger birds, particularly raptors and vultures, are more vulnerable to electrocution as they are more likely to bridge the clearances between electrical components than smaller birds. Large terrestrial species and certain waterbirds with high wing loading are less manoeuvrable than smaller species and are therefore more likely to collide with overhead lines.
Project area of impact (PAOI)	A 2km zone around the proposed on-site substation and 132kV overhead power line.
Pentad	A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8 × 7.6 km.
Broader area	A consolidated data set for a total of 6 pentads where the application sites are located.

DETAILS OF THE SPECIALIST

Chris van Rooyen (Bird Specialist)

Chris has 25 years' experience in the management of wildlife interactions with electricity infrastructure. He was head of the Eskom-Endangered Wildlife Trust (EWT) Strategic Partnership from 1996 to 2007, which has received international acclaim as a model of co-operative management between industry and natural resource conservation. He is an acknowledged global expert in this field and has worked in South Africa, Namibia, Botswana, Lesotho, New Zealand, Texas, New Mexico, and Florida. Chris also has extensive project management experience and has received several management awards from Eskom for his work in the Eskom-EWT Strategic Partnership. He is the author of 15 academic papers (some with co-authors), co-author of two book chapters and several research reports. He has been involved as ornithological consultant in numerous power line and wind generation projects. Chris is also co-author of the Best Practice for Avian Monitoring and Impact Mitigation at Wind Development Sites in Southern Africa, which is currently (2016) accepted as the industry standard. Chris also works outside the electricity industry and had done a wide range of bird impact assessment studies associated with various residential and industrial developments.

Jake Mulvaney

Jake holds PhD in Zoology from Stellenbosch University and is the author of four academic papers involving bird population assessments and GIS modelling.

Albert Froneman (Bird and GIS Specialist)

Albert has an M. Sc. in Conservation Biology from the University of Cape Town and started his career in the natural sciences as a Geographic Information Systems (GIS) specialist at Council for Scientific and Industrial Research (CSIR). In 1998, he joined the Endangered Wildlife Trust where he headed up the Airports Company South Africa – EWT Strategic Partnership, a position he held until he resigned in 2008 to work as a private ornithological consultant. Albert's specialist field is the management of wildlife, especially bird related hazards at airports. His expertise is recognized internationally; in 2005 he was elected as Vice Chairman of the International Bird Strike Committee. Since 2010, Albert has worked closely with Chris van Rooyen in developing a protocol for pre-construction monitoring at wind energy facilities, and he is currently jointly coordinating pre-construction monitoring programmes at several wind farm facilities. Albert also works outside the electricity industry and had done a wide range of bird impact assessment studies associated with various residential and industrial developments.

1. INTRODUCTION

Mukondeleli (RF) (Pty) Ltd is proposing to develop the 300 MW Mukondeleli Wind Energy Facility (WEF) with a maximum export capacity of up to 300 MW. Associated with this development is a grid connection of 132kV (hereafter referred to as the 'Mukondeleli Grid Connection'). Within this project area the extent of the buildable area is subject to a Basic Assessment process in terms of the 2014 NEMA EIA Regulations, as amended.

The Mukondeleli Grid Connection project is in the Govan Mbeki Municipality, near the town of Secunda, in the Mpumalanga Province of South Africa, with site access predominantly along the R546 road. The 132kV grid network will cover 11 farm portions of four farms (see **Error! Reference source not found.**), and will comprise a 132 kV overhead power line and a step-down substation to feed the electricity generated by the project into the proposed Green Hydrogen Electrolyser facility located at Sasol Secunda which is between 5 and 10 km from the on-site Mukondeleli Grid Connection substation. The key technical components of the Mukondeleli Grid Connection are detailed in **Error! Reference source not found.**.

Table 1: Key technical details of the Mukondeleli Grid Connection development

Component	Description / Dimensions
Site coordinates (centre point)	Transmission Line – Alternative 1 and Alternative 2: Lat 26°35'48.54"S; Long 29°10'31.07"E
Affected farm portion/s	Bosjesspruit 291 (Portions 4, 8, 9 and 10) Van Tondershoek 317 (Portions 2 and 12) Twistdraai 285 (Portions 3, 5, and 6) Brandspruit 291 (Portions 0 and 3)
Capacity	Up to 132KV (either single circuit or double circuit)
Proposed technology	Components of the transmission line typically includes: Transmission structures, conductors, substations, and transformers
Height of the on-site Substation	Approximately 7 – 10 m Up to 22 m (including lighting)
Grid connection and proximity	Connection to step-down substation (to be built at Sasol Secunda facility) Approximately 10km
Battery Energy Storage System (BESS) at Sasol Substation	The BESS and substation will have a combined footprint of up to 4 ha. The BESS storage capacity will be up to 300MW/1 200 megawatt-hour (MWh) with up to four hours of storage

See Error! Reference source not found. for the regional context of the development area, and **Figure 2** for the map of the proposed layout for the proposed Mukondeleli Grid Connection.

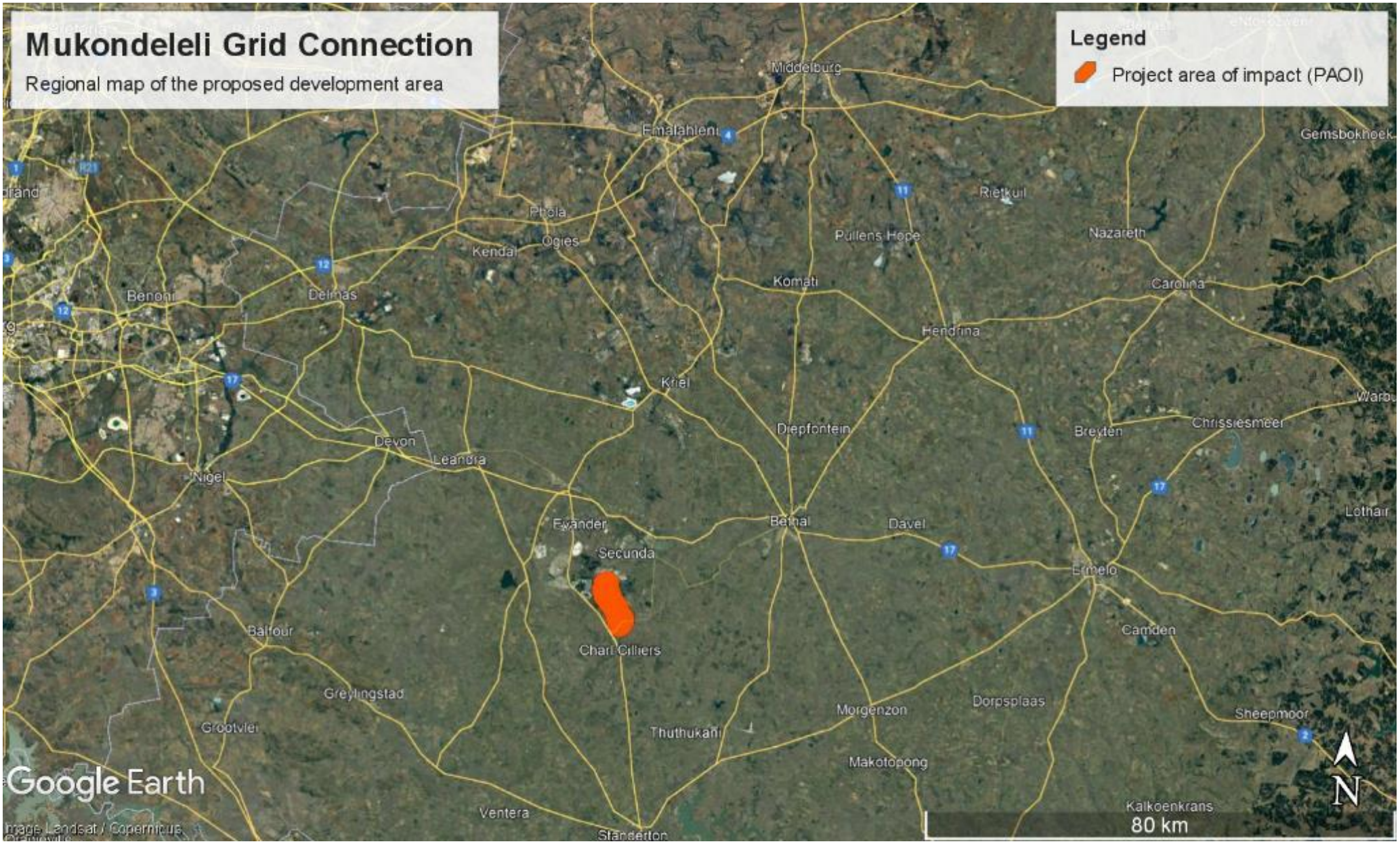


Figure 1: Regional contextualisation map of the proposed Mukondeleli wind energy grid connection in Mpumalanga, showing the project area of impact (PAOI)

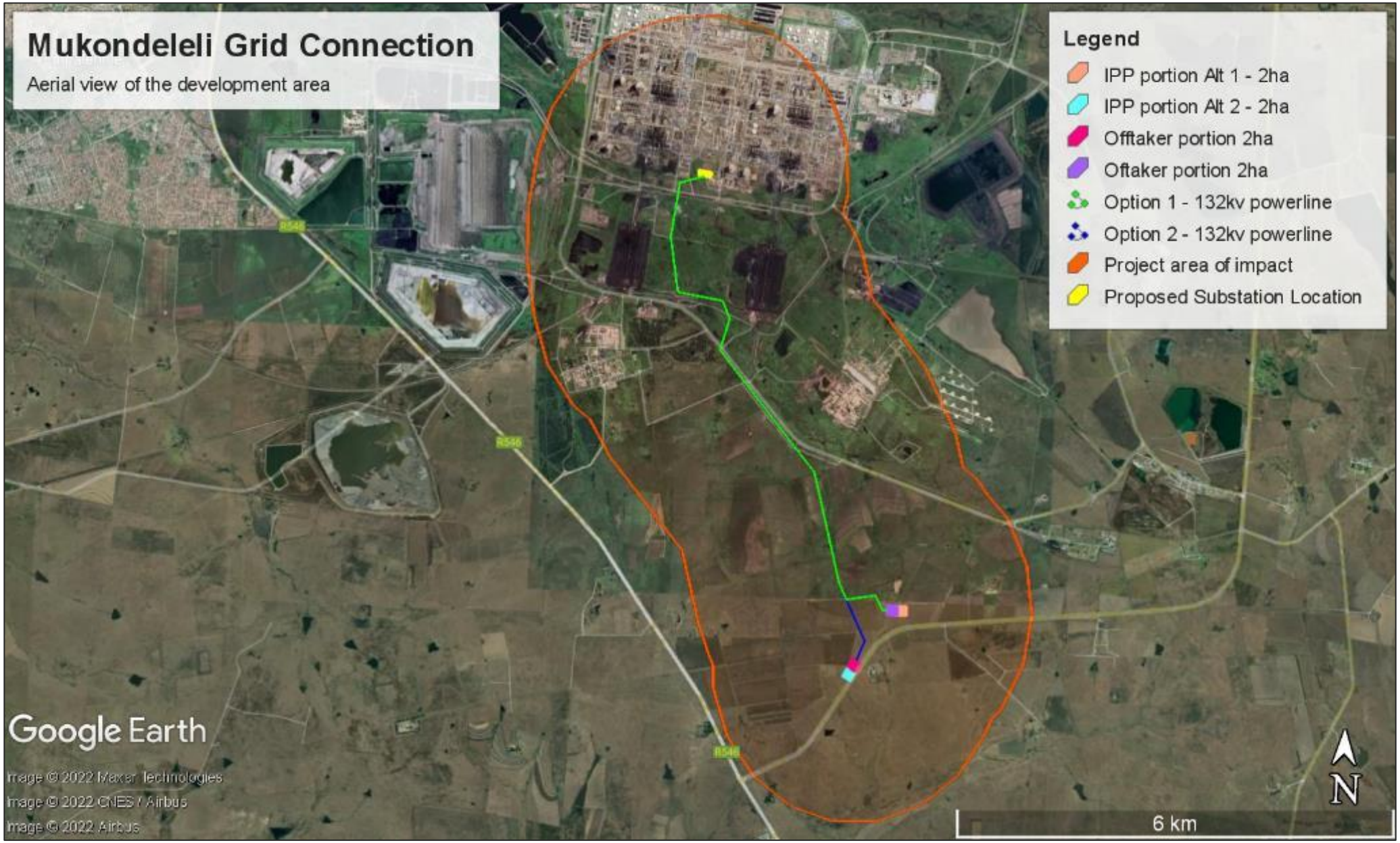


Figure 2: Aerial view of the proposed Mukondeleli 132kV Grid Connection, showing project area of impact (PAOI – orange delineation). The above map depicts two options for the overhead 132kV powerline, independent power producer (IPP) substations, and offtaker portions of either IPP substation.

2. TERMS OF REFERENCE

The Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020) is applicable. The purpose of the specialist report is to determine the main issues and potential impacts of the proposed project based by the on existing information and field assessments, according to the said protocol. In summary, the protocol requires the following:

- Describe the affected environment from an avifaunal perspective.
- Discuss gaps in baseline data and other limitations and describe the expected impacts associated with the Project.
- Identify potential sensitive environments and receptors that may be impacted on by the proposed Project and the types of impacts (i.e. direct, indirect and cumulative) that are most likely to occur.
- Determine the nature and extent of potential impacts during the construction and operational phases.
- Identify 'No-Go' areas, where applicable.
- Recommend mitigation measures to reduce the impact of the expected impacts.
- Provide an impact statement on whether the project should be approved or not.

3. OUTLINE OF METHODOLOGY AND INFORMATION REVIEWED

The following information sources were consulted to conduct this study:

- Bird distribution data of the South African Bird Atlas 2 (SABAP 2) was obtained from the University of Cape Town, to ascertain which species occurs within the broader area i.e., within a block consisting of six pentad grid cells each within which the proposed projects are situated (see **Figure 3**). A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8 × 7.6 km. To date, a total of 82 full protocol lists (i.e., surveys lasting a minimum of two hours each) have been completed for this area. In addition, 34 *ad hoc* protocol lists (i.e., surveys lasting less than two hours but still yielding valuable data) have been completed. The SABAP2 data was therefore regarded as a reliable reflection of the avifauna which occurs in the area, but the data was also supplemented by data collected during the site surveys and general knowledge of the area.
- 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).
- The global threatened status of all priority species was determined by consulting the (2022.1) International Union for Conservation of Nature (IUCN) Red List of Threatened Species (http://www.iucnredlist.org/).

- The project area of impact (PAOI) was defined as a 2km buffer zone around the proposed 132kV powerline infrastructure.
- A classification of the habitat in the PAOI was obtained from the Atlas of Southern African Birds 1 (SABAP 1) (Harrison et al., 1997a, 1997b) and the National Vegetation Map (2018) from the South African National Biodiversity Institute (SANBI) BGIS map viewer (http://bgisviewer.sanbi.org) (Mucina & Rutherford, 2006; SANBI, 2018).
- 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 ©2022) was used to view the PAOI and broader area on a landscape level and to help identify sensitive bird habitat.
- Powerline sensitive species are defined as species which could potentially be impacted by powerline collisions or electrocutions, based on their morphology. Larger birds, particularly raptors and vultures, are more vulnerable to electrocution as they are more likely to bridge the clearances between electrical components than smaller birds. Large terrestrial species and certain waterbirds with high wing loading are less manoeuvrable than smaller species and are therefore more likely to collide with overhead lines.
- The 2022 South Africa Protected Areas Database compiled by the Department of the Environment, Forestry and Fisheries (DFFE) was used to identify Nationally Protected Areas, National Protected Areas Expansion Strategy (NPAES) near the PAOI (DFFE, 2022).
- The DFFE National Screening Tool was used to determine the assigned avian sensitivity of the PAOI.
- Data collected during previous site visits to the broader area was also considered as far as habitat classes and the occurrence of priority species are concerned.
- The following sources were 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)
    - The Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020).
- The main source of information on the avifaunal diversity and abundance at the PAOI and broader area is an integrated pre-construction monitoring programme which was implemented from 2021 – 2022 over a period of four seasons for the proposed Mukondeleli WEF, which is also relevant for the proposed grid connection.

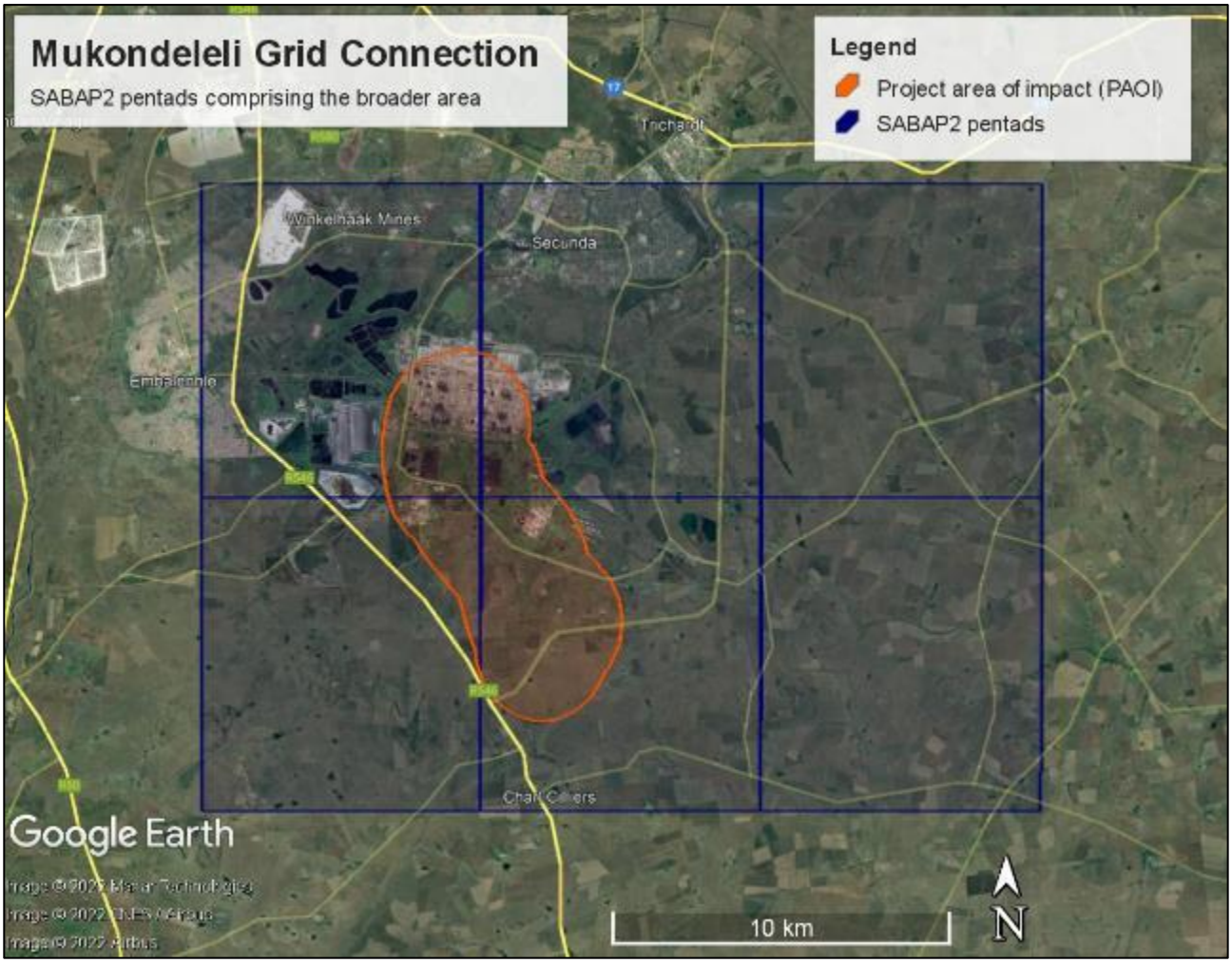


Figure 3: The SABAP2 pentads (dark blue shaded grid cells) comprising the broader area wherein the proposed Mukondeleli Wind Energy facility is located (project area of impact – orange shaded area).

4. ASSUMPTIONS AND LIMITATIONS

This study made the basic assumption that the sources of information used are reliable and accurate. The following must be noted:

- The focus of the study was primarily on the potential impacts of the proposed on-site substation and 132kV overhead power line on powerline sensitive species.
- Powerline sensitive species were defined as species which could potentially be impacted by powerline collisions or electrocutions, based on their morphology. Larger birds, particularly raptors and vultures, are more vulnerable to electrocution as they are more likely to bridge the clearances between electrical components than smaller birds. Large terrestrial species and certain waterbirds with high wing loading are less manoeuvrable than smaller species and are therefore more likely to collide with overhead lines.
- The assessment of impacts is based on the baseline environment as it currently exists in the PAOI, as well as the broader are comprising the six SABAP2 pentads associated with the Mukondeleli Grid Connection project site (see **Figure 3**).

- The SABAP2 dataset is a comprehensive dataset which provides a reasonably accurate snapshot of the avifauna that could occur at the proposed site. For purposes of completeness, the list of species that could be encountered was supplemented with personal observations, general knowledge of the area, and the results of the pre-construction monitoring which was conducted over 12 months.
- Conclusions in this study are based on experience of these and similar species in different parts of South Africa. Bird behaviour can never be entirely reduced to formulas that will be valid under all circumstances.
- Information on the proposed grid connections of renewable energy projects within a 30km radius around the project was sourced from public documents available on the internet. In some instances, information was not readily available, or specifications may have changed, therefore the confidence in the information is moderate.
- Conclusions drawn in this study are based on experience of the specialists on the species found on site and similar species in different parts of South Africa. Bird behaviour can never be entirely reduced to formulas that will be valid under all circumstances.

5. LEGISLATIVE CONTEXT

5.1. Agreements and conventions

Table 2 below lists agreements and conventions which South Africa is party to, and which are relevant to the conservation of avifauna[1].

Table 2: Agreements and conventions which South Africa is party to and which are relevant to the conservation of avifauna.

Convention name	Description	Geographic scope
African-Eurasian Waterbird Agreement (AEWA)	The Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) is an intergovernmental treaty dedicated to the conservation of migratory waterbirds and their habitats across Africa, Europe, the Middle East, Central Asia, Greenland, and the Canadian Archipelago. Developed under the framework of the Convention on Migratory Species (CMS) and administered by the United Nations Environment Programme (UNEP), AEWA brings together countries and the wider international	Regional

[1] (BirdLife International (2021) Country profile: South Africa. Available from: http://www.birdlife.org/datazone/country/south_africa. Checked: 2021-09-20).

Convention name	Description	Geographic scope
	conservation community to establish coordinated conservation and management of migratory waterbirds throughout their entire migratory range.	
Convention on Biological Diversity (CBD), Nairobi, 1992	The Convention on Biological Diversity (CBD) entered into force on 29 December 1993. It has 3 main objectives: The conservation of biological diversity The sustainable use of the components of biological diversity The fair and equitable sharing of the benefits arising out of the utilization of genetic resources.	Global
Convention on the Conservation of Migratory Species of Wild Animals, (CMS), Bonn, 1979	As an environmental treaty under the aegis of the United Nations Environment Programme, CMS provides a global platform for the conservation and sustainable use of migratory animals and their habitats. CMS brings together the States through which migratory animals pass, the Range States, and lays the legal foundation for internationally coordinated conservation measures throughout a migratory range.	Global
Convention on the International Trade in Endangered Species of Wild Flora and Fauna, (CITES), Washington DC, 1973	CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.	Global
Ramsar Convention on Wetlands of International Importance, Ramsar, 1971	The Convention on Wetlands, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.	Global
Memorandum of Understanding on the Conservation of Migratory Birds of Prey in Africa and Eurasia	The Signatories will aim to take co-ordinated measures to achieve and maintain the favourable conservation status of birds of prey throughout their range and to reverse their decline when and where appropriate.	Regional

5.2. National legislation

5.2.1. Constitution of the Republic of South Africa, 1996

The Constitution of the Republic of South Africa provides in the Bill of Rights that: Everyone has the right –

a) to an environment that is not harmful to their health or well-being; and
b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that –
    i. prevent pollution and ecological degradation;
    ii. promote conservation; and
    iii. secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

5.2.2. The National Environmental Management Act 107 of 1998 (NEMA)

The National Environmental Management Act 107 of 1998 (NEMA) creates the legislative framework for environmental protection in South Africa and is aimed at giving effect to the environmental right in the Constitution. It sets out several guiding principles that apply to the actions of all organs of state that may significantly affect the environment. Sustainable development (socially, environmentally, and economically) is one of the key principles, and internationally accepted principles of environmental management, such as the precautionary principle and the polluter pays principle, are also incorporated. NEMA also provides that a wide variety of listed developmental activities, which may significantly affect the environment, may be performed only after an environmental impact assessment has been done and authorization has been obtained from the relevant authority. Many of these listed activities can potentially have negative impacts on bird populations in a variety of ways. The clearance of natural vegetation, for instance, can lead to a loss of habitat and may depress prey populations, while erecting structures needed for generating and distributing energy, communication, and so forth can cause mortalities by collision or electrocution.

NEMA makes provision for the prescription of procedures for the assessment and minimum criteria for reporting on identified environmental themes (Sections 24(5)(a) and (h) and 44) when applying for environmental authorisation. In the case of wind energy developments. The Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020) is applicable in the case of powerline developments.

5.2.3. The National Environmental Management: Biodiversity Act 10 of 2004 (NEMBA) and the Threatened or Protected Species Regulations, February 2007 (TOPS Regulations)

The most prominent statute containing provisions directly aimed at the conservation of birds is the National Environmental Management: Biodiversity Act 10 of 2004 read with the Threatened or Protected Species Regulations, February 2007 (TOPS Regulations). Chapter 1 sets out the objectives of the Act, and they are aligned with the objectives of the Convention on Biological Diversity, which are the conservation of biodiversity, the sustainable use of its components, and the fair and equitable sharing of the benefits of the use of genetic resources. The Act also gives effect to CITES, the Ramsar Convention, and the Bonn Convention on Migratory Species of Wild Animals. The State is endowed with the trusteeship of biodiversity and has the responsibility to manage, conserve and sustain the biodiversity of South Africa.

5.3. Provincial Legislation

The current legislation applicable to the conservation of fauna and flora in Mpumalanga is the Mpumalanga Nature Conservation Act 10 of 1998. It consolidated and amended the laws relating to nature conservation within the province and provides for matters connected therewith. All birds are classified as Protected Game (Section 4 (1) (b)), except those listed in Schedule 3, which are classified as Ordinary Game (Section 4 (1)(c)).

6. BASELINE ASSESSMENT

6.1. Important Bird Areas

The PAOI is not located in an Important Bird Area (IBA). The closest IBAs are the Amersfoort-Bethal-Carolina IBA SA018 – approximately 27km east of the Mukondeleli Grid Connection – and the Devon Grasslands IBA SA130 – approximately 27.5km west of the Mukondeleli Grid Connection (Marnewick et al., 2015). It is not envisaged that the proposed Grid Connection will impact on avifauna in either of the IBAs due to the distance from the PAOI.

6.2. DFFE National Screening Tool

The PAOI and project site is classified as **Low, Medium and High Sensitivity** for terrestrial animals according to the Terrestrial Animal Species Theme. The high sensitivity classification is linked to the potential occurrence of Caspian Tern (Globally Least Concern, Regionally Vulnerable). The Medium sensitivity is linked to African Marsh Harrier (Globally Least Concern, Regionally Endangered), Caspian Tern (Globally Least Concern, Regionally Vulnerable), White-bellied Bustard (Globally Least Concern, Regionally Vulnerable), Secretarybird (Globally Endangered, Regionally Vulnerable) and African Grass Owl (Globally Least Concern, Regionally Vulnerable) (Error! Reference source not found.**3**).

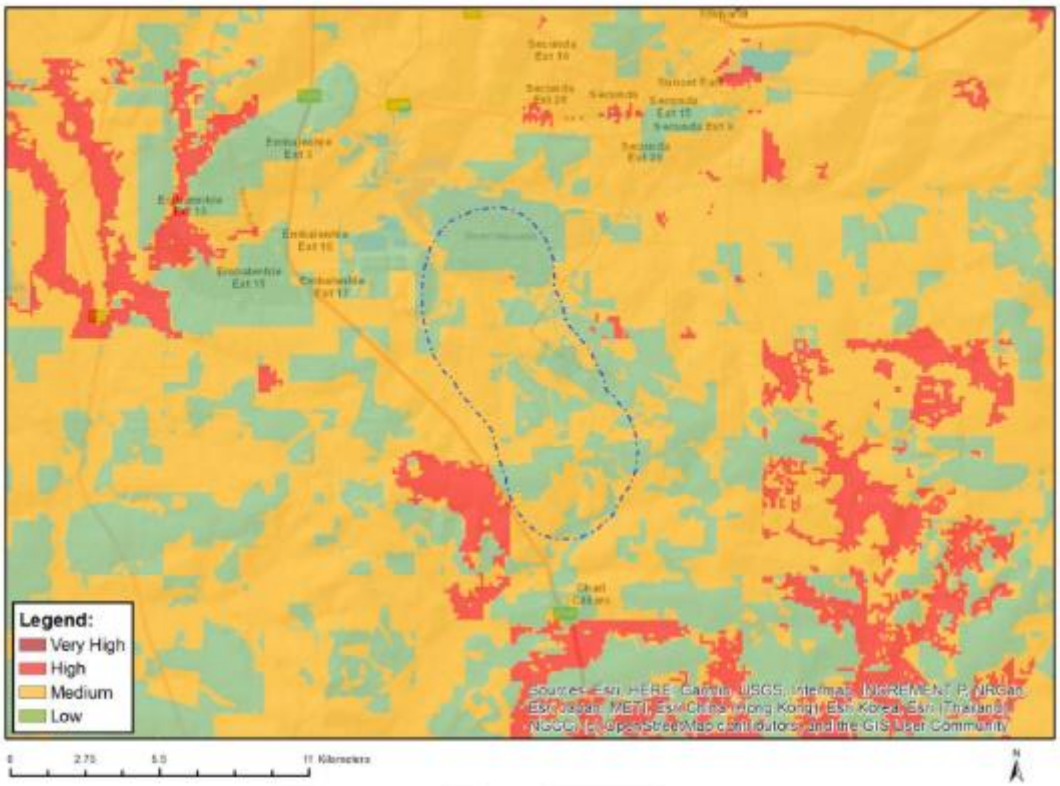
The project site contains confirmed habitat for these species of conservation concern (SCC) as defined in the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020), namely listed on the IUCN Red

List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered, Vulnerable, Near Threatened, and Data Deficient species.

The occurrence of Secretarybird (Globally Endangered, Regionally Vulnerable) and additional SCC was confirmed during the surveys i.e., Black-winged Pratincole (Globally Near Threatened, Regionally, Near Threatened), Blue Crane (Globally, Vulnerable, Regionally Near Threatened), Blue Korhaan (Globally, Vulnerable, Regionally Least Concern), Greater Flamingo (Globally Least Concern, Regionally Near Threatened), and Lanner Falcon (Globally Least Concern, Regionally Vulnerable) were recorded in the project site.

In summary, based on the Site Sensitivity Verification field surveys conducted, habitat within the PAOI is suitable for Black-winged Pratincole, Blue Crane, Blue Korhaan, Greater Flamingo, Lanner Falcon, and Secretarybird. Therefore, a classification of **High Sensitivity** for avifauna tool for the Terrestrial Animal Species theme is suggested for the PAOI.

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Hydroprogne caspia
Low	Subject to confirmation
Medium	Aves-Hydroprogne caspia
Medium	Aves-Sagittarius serpentarius
Medium	Aves-Eupodotis senegalensis
Medium	Aves-Tyto capensis
Medium	Aves-Circus ranivorus
Medium	Insecta-Lepidochrysops procera
Medium	Mammalia-Crocidura maquassiensis

Figure 4: The national web-based environmental screening tool map of the project site, indicating sensitivities for the terrestrial animal species theme. The high sensitivity classification is linked to Caspian Tern (*Hydroprogne caspia*). Medium sensitivity classification is linked to Caspian tern, as well as Secretarybird (*Sagittaius serpentarius*), White-bellied Bustard (*Eupodotis senegalensis*), African Grass Owl (*Tyto capensis*), and African Marsh Harrier (*Circus ranivorus*).

6.3. Protected Areas

According to the South African Protected Areas database (SAPAD), the closest protected area is the Devon Protected Area, which is located approximately 38km north-west of the proposed development area. No further information could be obtained about the nature reserve. However, from an avifaunal perspective the state of the habitat and land use at the development area is more important than the legal status.

6.4. Biomes and vegetation types

The PAOI is located within the Soweto Highveld Grassland (Gm8) vegetation ecotype within the Mesic Highveld Grassland Bioregion (SANBI, 2018). This vegetation type covers 14 513 km² of Mpumalanga and Gauteng (and to a very small extent also in the neighbouring Free State and North-West provinces) and occurs at an altitude ranging from 1420 m to 1760 m above sea level (Mucina et al., 2006). The site does not fall within any Centre of Endemism (Van Wyk & Smith, 2001).

Soweto Highveld Grassland is a summer rainfall vegetation (662 mm per annum, mostly September to April), which experiences a cool-temperate climate (mean annual temperature 14.8°C) with thermic continentality. Temperature ranges between 28°C (January) to -0.6°C (July). Frost and frequent grass fires during winter play an important role in limiting the occurrence of trees and shrubs in the region (Mucina et al., 2006). The landscape is gently to moderately undulating on the Highveld plateau, supporting dense tufted grassland dominated by *Themeda triandra*, with a notable herbaceous forb component (see **APPENDIX 2**: HABITAT FEATURES AT THE PROPOSED DEVELOPMENT AREA). In places which have not been disturbed, scattered wetlands, narrow stream alluvia, pans and occasional ridges interrupt the grassland cover.

The conservation status of this vegetation type was listed as “Endangered” by (Mucina & Rutherford (2006). Very few statutorily conserved areas occur in this vegetation type and almost half has been transformed mostly by cultivation, plantations, mining, and urbanisation.

6.5. Bird habitat

Whilst much of the distribution and abundance of the bird species in the development areas can be explained by the dominant biomes and vegetation types, it is also important to examine the modifications which have changed the natural landscape, and which may influence the distribution of avifauna. These are sometimes evident at a much smaller spatial scale than the biome or vegetation types and are determined by a host of factors such as topography, land use and man-made infrastructure.

The following bird habitat classes were identified in the development areas (see **APPENDIX 2**: HABITAT FEATURES AT THE PROPOSED DEVELOPMENT AREA for examples of the habitat classes):

6.5.1. Grassland

There are large areas of natural grassland remaining in the development area (see **Figure 5**). The grassland varies from dense stands of relatively high grass to areas of heavily grazed short grass. The powerline priority species which could have the potential to use the natural grassland in the development are listed in **Table 3**.

Table 3: Powerline priority species which may use the natural grasslands in the development area. Red List species are highlighted in red.

Species Name	Global Status	Regional Status	Occurrence likelihood
African Sacred Ibis	Least Concern	Least Concern	High
Amur Falcon	Least Concern	Least Concern	High
Black-headed Heron	Least Concern	Least Concern	High
Black-winged Kite	Least Concern	Least Concern	High
Blue Crane	Vulnerable	Near Threatened	Medium
Blue Korhaan	Near Threatened	Least Concern	Medium
Cape Crow	Least Concern	Least Concern	Medium
Common Buzzard	Least Concern	Least Concern	Medium
Egyptian Goose	Least Concern	Least Concern	High
Greater Kestrel	Least Concern	Least Concern	Medium
Hadada Ibis	Least Concern	Least Concern	High
Helmeted Guineafowl	Least Concern	Least Concern	High
Jackal Buzzard	Least Concern	Least Concern	Medium
Lanner Falcon	Least Concern	Vulnerable	Medium
Long-crested Eagle	Least Concern	Least Concern	Medium
Marsh Owl	Least Concern	Least Concern	High
Northern Black Korhaan	Least Concern	Least Concern	Medium
Pallid Harrier	Near Threatened	Near Threatened	Medium
Pied Crow	Least Concern	Least Concern	High
Rock Kestrel	Least Concern	Least Concern	Medium
Secretarybird	Endangered	Vulnerable	Medium
Spotted Eagle-Owl	Least Concern	Least Concern	Medium
Spur-winged Goose	Least Concern	Least Concern	High
Western Cattle Egret	Least Concern	Least Concern	High
White Stork	Least Concern	Least Concern	Medium
Red-footed Falcon	Near Threatened	Near Threatened	Low
Western Barn Owl	Least Concern	Least Concern	Low

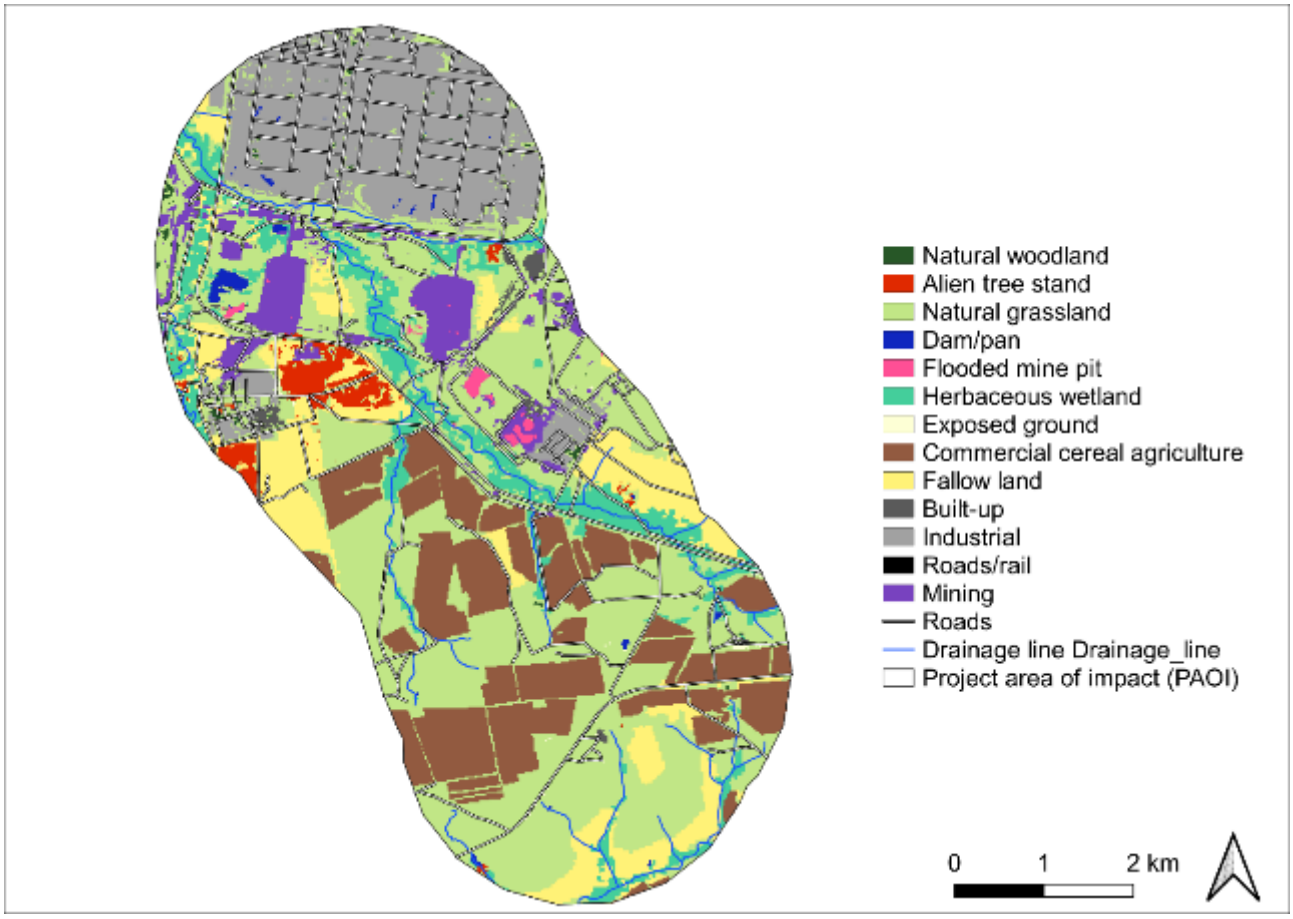


Figure 5: Land-cover and land-use within the Project Site Development Area according to the 2018 national land-cover surveys (DEA & DALRRD, 2019)

6.5.2. Drainage lines and wetlands

There are several streams, floodplains, and associated wetlands throughout the PAOI, and grasslands are prone to inundation during the summer wet season (see **APPENDIX 2**: HABITAT FEATURES AT THE PROPOSED DEVELOPMENT AREA). Surface rocks are present in some places along the streams. The alluvial soils are mostly deep dark brown to black clayey soils. The powerline priority species which could have the potential to use the drainage lines and wetlands in the development are listed in **Table 4.**

Table 4: Powerline priority species which may use the drainage lines and wetlands in the development area. Red List species are highlighted in red.

Species Name	Global Status	Regional Status	Occurrence likelihood
African Black Duck	Least Concern	Least Concern	Medium
African Darter	Least Concern	Least Concern	High
African Sacred Ibis	Least Concern	Least Concern	High

Species Name	Global Status	Regional Status	Occurrence likelihood
African Spoonbill	Least Concern	Least Concern	High
African Swamphen	Least Concern	Least Concern	Medium
Blue Crane	Vulnerable	Near Threatened	Medium
Cape Shoveler	Least Concern	Least Concern	High
Common Moorhen	Least Concern	Least Concern	High
Egyptian Goose	Least Concern	Least Concern	High
Glossy Ibis	Least Concern	Least Concern	High
Goliath Heron	Least Concern	Least Concern	Medium
Great Egret	Least Concern	Least Concern	Medium
Grey Heron	Least Concern	Least Concern	High
Hadada Ibis	Least Concern	Least Concern	High
Hamerkop	Least Concern	Least Concern	Medium
Intermediate Egret	Least Concern	Least Concern	High
Little Egret	Least Concern	Least Concern	High
Long-crested Eagle	Least Concern	Least Concern	Medium
Mallard	Least Concern	Least Concern	Medium
Marsh Owl	Least Concern	Least Concern	High
Purple Heron	Least Concern	Least Concern	Medium
Red-billed Teal	Least Concern	Least Concern	High
Reed Cormorant	Least Concern	Least Concern	High
South African Shelduck	Least Concern	Least Concern	Medium
Southern Pochard	Least Concern	Least Concern	Medium
Spur-winged Goose	Least Concern	Least Concern	High
Squacco Heron	Least Concern	Least Concern	Medium
White-breasted Cormorant	Least Concern	Least Concern	High
White-faced Whistling Duck	Least Concern	Least Concern	High
Yellow-billed Duck	Least Concern	Least Concern	High
African Marsh Harrier	Least Concern	Endangered	Low
African Openbill	Least Concern	Least Concern	Low
Black Heron	Least Concern	Least Concern	Low
Black-crowned Night Heron	Least Concern	Least Concern	Low
Blue-billed Teal	Least Concern	Least Concern	Low
Cape Teal	Least Concern	Least Concern	Low
Fulvous Whistling Duck	Least Concern	Least Concern	Low
Great Crested Grebe	Least Concern	Least Concern	Low
Knob-billed Duck	Least Concern	Least Concern	Low
Maccoa Duck	Vulnerable	Near Threatened	Low

Species Name	Global Status	Regional Status	Occurrence likelihood
White-backed Duck	Least Concern	Least Concern	Low

6.5.3. Dams and pans

There are several small and moderately sized dams, as well as a few small pans, mostly associated with the Klipspruit River and its tributaries (see **Figure 5**). The powerline priority species which could have the potential to use the dams and pans in the development are listed in **Table 5**.

Table 5: Powerline priority species which may use the dams and pans in the development area. Red List species are highlighted in red.

Species Name	Global Status	Regional Status	Occurrence likelihood
African Black Duck	Least Concern	Least Concern	Medium
African Darter	Least Concern	Least Concern	High
African Sacred Ibis	Least Concern	Least Concern	High
African Spoonbill	Least Concern	Least Concern	High
Blue Crane	Vulnerable	Near Threatened	Medium
Cape Shoveler	Least Concern	Least Concern	High
Common Moorhen	Least Concern	Least Concern	High
Egyptian Goose	Least Concern	Least Concern	High
Glossy Ibis	Least Concern	Least Concern	High
Goliath Heron	Least Concern	Least Concern	Medium
Great Egret	Least Concern	Least Concern	Medium
Greater Flamingo	Least Concern	Near Threatened	Medium
Grey Heron	Least Concern	Least Concern	High
Hamerkop	Least Concern	Least Concern	Medium
Intermediate Egret	Least Concern	Least Concern	High
Little Egret	Least Concern	Least Concern	High
Little Grebe	Least Concern	Least Concern	High
Mallard	Least Concern	Least Concern	Medium
Purple Heron	Least Concern	Least Concern	Medium
Red-billed Teal	Least Concern	Least Concern	High
Red-knobbed Coot	Least Concern	Least Concern	High
Reed Cormorant	Least Concern	Least Concern	High
South African Shelduck	Least Concern	Least Concern	Medium
Southern Pochard	Least Concern	Least Concern	Medium
Spur-winged Goose	Least Concern	Least Concern	High

Species Name	Global Status	Regional Status	Occurrence likelihood
Squacco Heron	Least Concern	Least Concern	Medium
White-breasted Cormorant	Least Concern	Least Concern	High
White-faced Whistling Duck	Least Concern	Least Concern	High
Yellow-billed Duck	Least Concern	Least Concern	High
African Fish Eagle	Least Concern	Least Concern	Low
African Openbill	Least Concern	Least Concern	Low
Black Heron	Least Concern	Least Concern	Low
Blue-billed Teal	Least Concern	Least Concern	Low
Cape Teal	Least Concern	Least Concern	Low
Great Crested Grebe	Least Concern	Least Concern	Low
Knob-billed Duck	Least Concern	Least Concern	Low
Maccoa Duck	Vulnerable	Near Threatened	Low
White-backed Duck	Least Concern	Least Concern	Low

6.5.4. Agriculture

Agricultural activity present within the Mukondeleli Grid Connection comprises cultivated commercial annuals non-pivot cropland (see **Figure 5**), predominately dedicated towards maize production (see **APPENDIX 2**: HABITAT FEATURES AT THE PROPOSED DEVELOPMENT AREA). Some fields are lying fallow or are in the process of being re-vegetated by grass. The powerline priority species which could have the potential to use the agricultural habitats in the development are listed in **Table 6**.

Table 6: powerline priority species which may use the agricultural habitats in the development area. Red List species are highlighted in Red

Species Name	Global Status	Regional Status	Occurrence likelihood
African Sacred Ibis	Least Concern	Least Concern	High
Amur Falcon	Least Concern	Least Concern	High
Black-headed Heron	Least Concern	Least Concern	High
Black-winged Kite	Least Concern	Least Concern	High
Blue Crane	Vulnerable	Near Threatened	Medium
Cape Crow	Least Concern	Least Concern	Medium
Common Buzzard	Least Concern	Least Concern	Medium
Egyptian Goose	Least Concern	Least Concern	High
Greater Kestrel	Least Concern	Least Concern	Medium
Hadada Ibis	Least Concern	Least Concern	High
Helmeted Guineafowl	Least Concern	Least Concern	High

Species Name	Global Status	Regional Status	Occurrence likelihood
Jackal Buzzard	Least Concern	Least Concern	Medium
Lanner Falcon	Least Concern	Vulnerable	Medium
Marsh Owl	Least Concern	Least Concern	High
Pied Crow	Least Concern	Least Concern	High
Rock Kestrel	Least Concern	Least Concern	Medium
Spotted Eagle-Owl	Least Concern	Least Concern	Medium
Spur-winged Goose	Least Concern	Least Concern	High
Western Cattle Egret	Least Concern	Least Concern	High
Red-footed Falcon	Near Threatened	Near Threatened	Low
Western Barn Owl	Least Concern	Least Concern	Low

6.5.5. Alien trees

The development area contains few trees (see **Figure 5**). Most trees are alien species, particularly Eucalyptus, Australian Acacia (Wattle), and Salix (Willow) species (see **APPENDIX 2**: HABITAT FEATURES AT THE PROPOSED DEVELOPMENT AREA). Trees are often planted as wind breaks next to agricultural lands and around homesteads. Some of the drainage lines also have trees growing in them. The powerline priority species which could have the potential to use the alien trees in the development are listed in **Table 7**.

Table 7: Powerline priority species which may use the alien trees in development area. Red list species are highlighted in red.

Species Name	Global Status	Regional Status	Occurrence likelihood
African Sacred Ibis	Least Concern	Least Concern	High
African Spoonbill	Least Concern	Least Concern	High
Amur Falcon	Least Concern	Least Concern	High
Black Sparrowhawk	Least Concern	Least Concern	Medium
Black-headed Heron	Least Concern	Least Concern	High
Black-winged Kite	Least Concern	Least Concern	High
Cape Crow	Least Concern	Least Concern	Medium
Common Buzzard	Least Concern	Least Concern	Medium
Egyptian Goose	Least Concern	Least Concern	High
Greater Kestrel	Least Concern	Least Concern	Medium
Grey Heron	Least Concern	Least Concern	High
Hadada Ibis	Least Concern	Least Concern	High
Hamerkop	Least Concern	Least Concern	Medium
Helmeted Guineafowl	Least Concern	Least Concern	High
Jackal Buzzard	Least Concern	Least Concern	Medium
Lanner Falcon	Least Concern	Vulnerable	Medium

Species Name	Global Status	Regional Status	Occurrence likelihood
Long-crested Eagle	Least Concern	Least Concern	Medium
Pied Crow	Least Concern	Least Concern	High
Reed Cormorant	Least Concern	Least Concern	High
Rock Kestrel	Least Concern	Least Concern	Medium
Secretarybird	Endangered	Vulnerable	Medium
Spotted Eagle-Owl	Least Concern	Least Concern	Medium
Spur-winged Goose	Least Concern	Least Concern	High
Western Cattle Egret	Least Concern	Least Concern	High
White Stork	Least Concern	Least Concern	Medium
White-breasted Cormorant	Least Concern	Least Concern	High
African Fish Eagle	Least Concern	Least Concern	Low
Red-footed Falcon	Near Threatened	Near Threatened	Low
Western Barn Owl	Least Concern	Least Concern	Low

See **APPENDIX 2**: HABITAT FEATURES AT THE PROPOSED DEVELOPMENT AREA for photographic record of habitat features in the development area and immediate surroundings.

7. AVIFAUNA

7.1. South African Bird Atlas Project 2

A total of 189 species could potentially occur within the broader area where the project site is located (see **APPENDIX 1**: SPECIES LIST FOR THE BROADER AREA). Sixty-six (66) of these bird species are classified as powerline priority species, of which fifty-two (52) are considered to regularly occur in the development PAOI, with thirty-seven (37) such species having been recorded during the field surveys.

Fifteen Red Data List species are associated with the broader area. Three Red List species have a medium to high probability of occurrence within the PAOI - Blue Korhaan, Greater Flamingo, and Secretarybird. The remaining twelve Red List species have a low probability of occurrence – African Marsh Harrier, Black-winged Pratincole, Blue Crane, Caspian Tern, Curlew Sandpiper, European Roller, Greater Painted-snipe, Lanner Falcon, Maccoa Duck, Pallid Harrier, Red-footed Falcon, and Sentinel Rock Thrush.

See **APPENDIX 1**: SPECIES LIST FOR THE BROADER AREA for a list of species potentially occurring in the broader area. The possibility of priority species occurring in the PAOI, and potential long-term impacts are listed in Table 8 below.

Table 8: Powerline priority species which could occur in the broader area

Global and Regional (South African) Red List status: CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least concern

Occurrence likelihood: L = Low, M = Medium, H = High

Species name	Scientific name	Global status	Regional status	Full protocol	Ad hoc protocol	Recorded during monitoring	Occurrence likelihood	Grassland	Drainage lines and wetlands	Dams and pans	Agriculture	Alien trees	Grid - habitat transformation	Grid - disturbance (breeding)	Grid - substation	Grid – Collision HV lines
African Black Duck	*Anas sparsa*	LC	LC	8.54	0.00		M		x	x						x
African Darter	*Anhinga rufa*	LC	LC	26.83	11.76	x	H		x	x		x				x
African Fish Eagle	*Haliaeetus vocifer*	LC	LC	1.22	0.00		L			x		x		x	x	
African Marsh Harrier	*Circus ranivorus*	LC	EN	1.22	0.00		L		x					x		
African Openbill	*Anastomus lamelligerus*	LC	LC	1.22	0.00		L		x	x						x
African Sacred Ibis	*Threskiornis aethiopicus*	LC	LC	63.41	23.53	x	H	x	x	x	x	x			x	x
African Spoonbill	*Platalea alba*	LC	LC	21.95	5.88	x	H		x	x		x				x
African Swamphen	*Porphyrio madagascariensis*	LC	LC	6.10	0.00		M		x							
Amur Falcon	*Falco amurensis*	LC	LC	34.15	2.94	x	H	x			x	x	x		x	
Black Heron	*Egretta ardesiaca*	LC	LC	3.66	2.94		L		x	x						x
Black Sparrowhawk	*Accipiter melanoleucus*	LC	LC	0.00	0.00	x	M					x		x	x	
Black-crowned Night Heron	*Nycticorax nycticorax*	LC	LC	1.22	0.00		L		x							x

Species name	Scientific name	Global status	Regional status	Full protocol	Ad hoc protocol	Recorded during monitoring	Occurrence likelihood	Grassland	Drainage lines and wetlands	Dams and pans	Agriculture	Alien trees	Grid - habitat transformation	Grid - disturbance (breeding)	Grid - substation	Grid – Collision HV lines
Black-headed Heron	*Ardea melanocephala*	LC	LC	81.71	23.53	x	H	x			x	x	x	x	x	x
Black-winged Kite	*Elanus caeruleus*	LC	LC	70.73	23.53	x	H	x			x	x	x	x	x	
Blue Crane	*Grus paradisea*	VU	NT	1.22	2.94	x	M	x	x	x	x		x	x		x
Blue Korhaan	*Eupodotis caerulescens*	NT	LC	17.07	2.94	x	M	x					x	x		x
Blue-billed Teal	*Spatula hottentota*	LC	LC	1.22	0.00		L		x	x						x
Cape Crow	*Corvus capensis*	LC	LC	13.41	5.88	x	M	x			x	x		x	x	
Cape Shoveler	*Spatula smithii*	LC	LC	29.27	11.76	x	H		x	x						x
Cape Teal	*Anas capensis*	LC	LC	2.44	0.00		L		x	x						x
Common Buzzard	*Buteo buteo*	LC	LC	8.54	0.00	x	M	x			x	x	x		x	
Common Moorhen	*Gallinula chloropus*	LC	LC	36.59	11.76		H		x	x						
Egyptian Goose	*Alopochen aegyptiaca*	LC	LC	73.17	38.24	x	H	x	x	x	x	x		x	x	x
Fulvous Whistling Duck	*Dendrocygna bicolor*	LC	LC	2.44	0.00		L		x							x
Glossy Ibis	*Plegadis falcinellus*	LC	LC	36.59	5.88		H		x	x						x
Goliath Heron	*Ardea goliath*	LC	LC	6.10	2.94		M		x	x				x		x
Great Crested Grebe	*Podiceps cristatus*	LC	LC	2.44	0.00		L		x	x						x

Species name	Scientific name	Global status	Regional status	Full protocol	Ad hoc protocol	Recorded during monitoring	Occurrence likelihood	Grassland	Drainage lines and wetlands	Dams and pans	Agriculture	Alien trees	Grid - habitat transformation	Grid - disturbance (breeding)	Grid - substation	Grid – Collision HV lines
Great Egret	*Ardea alba*	LC	LC	6.10	2.94		M		x	x						x
Greater Flamingo	*Phoenicopterus roseus*	LC	NT	4.88	5.88	x	M			x						x
Greater Kestrel	*Falco rupicoloides*	LC	LC	6.10	2.94	x	M	x			x	x	x	x	x	
Grey Heron	*Ardea cinerea*	LC	LC	34.15	14.71	x	H		x	x		x		x		x
Hadada Ibis	*Bostrychia hagedash*	LC	LC	79.27	35.29	x	H	x	x		x	x		x	x	x
Hamerkop	*Scopus umbretta*	LC	LC	9.76	0.00		M		x	x		x		x		x
Helmeted Guineafowl	*Numida meleagris*	LC	LC	69.51	20.59	x	H	x			x	x	x	x	x	
Intermediate Egret	*Ardea intermedia*	LC	LC	23.17	2.94		H		x	x						x
Jackal Buzzard	*Buteo rufofuscus*	LC	LC	4.88	0.00		M	x			x	x	x	x	x	
Knob-billed Duck	*Sarkidiornis melanotos*	LC	LC	1.22	0.00		L		x	x						x
Lanner Falcon	*Falco biarmicus*	LC	VU	4.88	0.00	x	M	x			x	x	x	x	x	
Little Egret	*Egretta garzetta*	LC	LC	23.17	14.71	x	H		x	x						x
Little Grebe	*Tachybaptus ruficollis*	LC	LC	64.63	17.65	x	H			x						x
Long-crested Eagle	*Lophaetus occipitalis*	LC	LC	3.66	0.00		M	x	x			x	x	x	x	
Maccoa Duck	*Oxyura maccoa*	VU	NT	3.66	0.00		L		x	x						x
Mallard	*Anas platyrhynchos*	LC	LC	8.54	2.94		M		x	x						x

Species name	Scientific name	Global status	Regional status	Full protocol	Ad hoc protocol	Recorded during monitoring	Occurrence likelihood	Grassland	Drainage lines and wetlands	Dams and pans	Agriculture	Alien trees	Grid - habitat transformation	Grid - disturbance (breeding)	Grid - substation	Grid – Collision HV lines
Marsh Owl	*Asio capensis*	LC	LC	24.39	2.94	x	H	x	x		x		x	x	x	x
Northern Black Korhaan	*Afrotis afraoides*	LC	LC	0.00	0.00	x	M	x					x	x		x
Pallid Harrier	*Circus macrourus*	NT	NT	1.22	0.00		M	x					x		x	
Pied Crow	*Corvus albus*	LC	LC	31.71	2.94	x	H	x			x	x		x	x	
Purple Heron	*Ardea purpurea*	LC	LC	10.98	0.00		M		x	x						x
Red-billed Teal	*Anas erythrorhyncha*	LC	LC	35.37	2.94	x	H		x	x						x
Red-footed Falcon	*Falco vespertinus*	NT	NT	1.22	0.00		L	x			x	x	x		x	
Red-knobbed Coot	*Fulica cristata*	LC	LC	74.39	29.41	x	H			x						x
Reed Cormorant	*Microcarbo africanus*	LC	LC	75.61	20.59	x	H		x	x		x				x
Rock Kestrel	*Falco rupicolus*	LC	LC	2.44	2.94	x	M	x			x	x	x	x	x	
Secretarybird	*Sagittarius serpentarius*	EN	VU	8.54	0.00	x	M	x				x	x	x		x
South African Shelduck	*Tadorna cana*	LC	LC	8.54	2.94	x	M		x	x						x
Southern Pochard	*Netta erythrophthalma*	LC	LC	12.20	0.00	x	M		x	x						x
Spotted Eagle-Owl	*Bubo africanus*	LC	LC	6.10	0.00	x	M	x			x	x	x	x	x	x
Spur-winged Goose	*Plectropterus gambensis*	LC	LC	40.24	8.82	x	H	x	x	x	x	x			x	x

Species name	Scientific name	Global status	Regional status	Full protocol	Ad hoc protocol	Recorded during monitoring	Occurrence likelihood	Grassland	Drainage lines and wetlands	Dams and pans	Agriculture	Alien trees	Grid - habitat transformation	Grid - disturbance (breeding)	Grid - substation	Grid – Collision HV lines
Squacco Heron	*Ardeola ralloides*	LC	LC	7.32	0.00		M		x	x						x
Western Barn Owl	*Tyto alba*	LC	LC	0.00	2.94		L	x			x	x	x	x	x	x
Western Cattle Egret	*Bubulcus ibis*	LC	LC	70.73	23.53	x	H	x			x	x			x	x
White Stork	*Ciconia ciconia*	LC	LC	3.66	0.00	x	M	x				x				x
White-backed Duck	*Thalassornis leuconotus*	LC	LC	3.66	0.00		L		x	x						x
White-breasted Cormorant	*Phalacrocorax lucidus*	LC	LC	25.61	11.76	x	H		x	x		x				x
White-faced Whistling Duck	*Dendrocygna viduata*	LC	LC	14.63	0.00		H		x	x						x
Yellow-billed Duck	*Anas undulata*	LC	LC	70.73	26.47	x	H		x	x						x

7.2. Field surveys

A total of 37 powerline priority species were observed during pre-construction monitoring at the proposed Mukondeleli WEF, which also included the grid PAOI (see **Table** 9**9**).

Table 9: Powerline priority species observed during preconstruction monitoring at the Mukondeleli Grid Connection development area.

Species name	Scientific name
African Darter	*Anhinga rufa*
African Sacred Ibis	*Threskiornis aethiopicus*
African Spoonbill	*Platalea alba*
Amur Falcon	*Falco amurensis*
Black Sparrowhawk	*Accipiter melanoleucus*
Black-headed Heron	*Ardea melanocephala*
Black-winged Kite	*Elanus caeruleus*
Blue Crane	*Grus paradisea*
Blue Korhaan	*Eupodotis caerulescens*
Cape Crow	*Corvus capensis*
Cape Shoveler	*Spatula smithii*
Common Buzzard	*Buteo buteo*
Egyptian Goose	*Alopochen aegyptiaca*
Greater Flamingo	*Phoenicopterus roseus*
Greater Kestrel	*Falco rupicoloides*
Grey Heron	*Ardea cinerea*
Hadada Ibis	*Bostrychia hagedash*
Helmeted Guineafowl	*Numida meleagris*
Lanner Falcon	*Falco biarmicus*
Little Egret	*Egretta garzetta*
Little Grebe	*Tachybaptus ruficollis*
Marsh Owl	*Asio capensis*
Northern Black Korhaan	*Afrotis afraoides*
Pied Crow	*Corvus albus*
Red-billed Teal	*Anas erythrorhyncha*
Red-knobbed Coot	*Fulica cristata*
Reed Cormorant	*Microcarbo africanus*
Rock Kestrel	*Falco rupicolus*
Secretarybird	*Sagittarius serpentarius*
South African Shelduck	*Tadorna cana*
Southern Pochard	*Netta erythrophthalma*
Spotted Eagle-Owl	*Bubo africanus*

Spur-winged Goose	*Plectropterus gambensis*
Western Cattle Egret	*Bubulcus ibis*
White Stork	*Ciconia ciconia*
White-breasted Cormorant	*Phalacrocorax lucidus*
Yellow-billed Duck	*Anas undulata*

8. IMPACT ASSESSMENT

Negative impacts on avifauna by electricity infrastructure generally take two main forms namely electrocution and collisions (Hobbs & Ledger, 1986b, 1986a; Jenkins et al., 2010; Kruger, 1999; Kruger & Van Rooyen, 1998; Ledger, 1983, 1984; Ledger et al., 1992; Ledger & Annegarn, 1981; van Rooyen, 2004; Van Rooyen, 2000; van Rooyen, 2000; Van Rooyen & Taylor, 1999; Verdoorn, 1996). Displacement due to habitat destruction and disturbance associated with the construction of the electricity infrastructure are also impacts that could potentially affect avifauna.

8.1. Displacement due to habitat transformation

During the construction of power lines, service roads (jeep tracks) and substations, habitat destruction/transformation inevitably takes place. The construction activities will constitute the following:

- Site clearance and preparation
- Construction of the infrastructure (i.e., the on-site substation and overhead power line)
- Transportation of personnel, construction material and equipment to the site, and personnel away from the site
- Removal of vegetation for the proposed on-site substation and overhead power line, stockpiling of topsoil and cleared vegetation
- Excavations for infrastructure

Beyond the increased mortality risks to local bird populations posed by such infrastructure, the resulting habitat loss and fragmentation can degrade adjacent habitats, causing either temporary or permanent displacement of bird species from breeding, roosting, and/or foraging habitats (Fletcher et al., 2018). It remains disputed whether habitat fragmentation is always an environmental detriment (Fahrig et al., 2019), yet the impacts of this landscape change are observable in birds. Lane et al. (2001) noted that Great Bustard flocks in Spain were significantly larger further from power lines than at control points. Shaw (2013) found that Ludwig's Bustard in South Africa generally avoid the immediate proximity of roads within a 500m buffer. Bidwell (2004) found that Blue Cranes in South Africa select nesting sites away from roads.

The physical encroachment increases the disturbance and barrier effects that contribute to the overall habitat fragmentation effect of the infrastructure (Raab et al., 2011). It has been shown that fragmentation of natural grassland in Mpumalanga (in that case by afforestation) has had a detrimental impact on the densities and diversity of grassland species (Allan et al., 1997).

The loss of habitat for powerline sensitive species due to direct habitat transformation associated with the construction of the proposed Mukondeleli Grid Connection is likely to be moderate due to the small size of the footprint, but ideally high-quality grassland should be avoided if possible.

Table 100 presents the powerline priority species occurring in the development area are vulnerable to displacement due to habitat transformation associated with the construction of the grid infrastructure.

Table 10: Powerline priority species which are vulnerable to displacement due to habitat transformation associated with the construction of the Mukondeleli Grid Connection

Species	Global status	Regional status	Occurrence likelihood
Black-headed Heron	Least Concern	Least Concern	High
Black-winged Kite	Least Concern	Least Concern	High
Blue Crane	Vulnerable	Near Threatened	Medium
Blue Korhaan	Near Threatened	Least Concern	Medium
Common Buzzard	Least Concern	Least Concern	Medium
Greater Kestrel	Least Concern	Least Concern	Medium
Helmeted Guineafowl	Least Concern	Least Concern	High
Jackal Buzzard	Least Concern	Least Concern	Medium
Lanner Falcon	Least Concern	Vulnerable	Medium
Long-crested Eagle	Least Concern	Least Concern	Medium
Marsh Owl	Least Concern	Least Concern	High
Northern Black Korhaan	Least Concern	Least Concern	Medium
Pallid Harrier	Near Threatened	Near Threatened	Medium
Rock Kestrel	Least Concern	Least Concern	Medium
Secretarybird	Endangered	Vulnerable	Medium
Spotted Eagle-Owl	Least Concern	Least Concern	Medium
Red-footed Falcon	Near Threatened	Near Threatened	Low
Western Barn Owl	Least Concern	Least Concern	Low

8.2. Displacement due to disturbance

Apart from direct habitat destruction, the above-mentioned activities also impact on birds through **disturbance**; this could lead to breeding failure if the disturbance happens during a critical part of the breeding cycle. Construction activities near breeding locations could be a source of disturbance and could lead to temporary breeding failure or even permanent abandonment of nests. A potential mitigation measure is the timeous identification of nests and the timing of the construction activities to avoid disturbance during a critical phase of the breeding cycle, although in practice that can admittedly be very challenging to implement. Terrestrial species and owls are most likely to be affected by displacement due to disturbance in the PAOI.

Table 111 presents the powerline priority species occurring in the development area which are vulnerable to displacement due to disturbances associated with construction and decommissioning of the Mukondeleli Grid Connection.

Table 11: powerline priority species which are vulnerable to displacement due to disturbances associated with construction and decommissioning of the Grid Connection

Species	Global status	Regional status	Occurrence likelihood
Black Sparrowhawk	Least Concern	Least Concern	Medium
Black-headed Heron	Least Concern	Least Concern	High
Black-winged Kite	Least Concern	Least Concern	High
Blue Crane	Vulnerable	Near Threatened	Medium
Blue Korhaan	Near Threatened	Least Concern	Medium
Cape Crow	Least Concern	Least Concern	Medium
Egyptian Goose	Least Concern	Least Concern	High
Goliath Heron	Least Concern	Least Concern	Medium
Greater Kestrel	Least Concern	Least Concern	Medium
Grey Heron	Least Concern	Least Concern	High
Hadada Ibis	Least Concern	Least Concern	High
Hamerkop	Least Concern	Least Concern	Medium
Helmeted Guineafowl	Least Concern	Least Concern	High
Jackal Buzzard	Least Concern	Least Concern	Medium
Lanner Falcon	Least Concern	Vulnerable	Medium
Long-crested Eagle	Least Concern	Least Concern	Medium
Marsh Owl	Least Concern	Least Concern	High
Northern Black Korhaan	Least Concern	Least Concern	Medium
Pied Crow	Least Concern	Least Concern	High
Rock Kestrel	Least Concern	Least Concern	Medium
Secretarybird	Endangered	Vulnerable	Medium
Spotted Eagle-Owl	Least Concern	Least Concern	Medium
African Fish Eagle	Least Concern	Least Concern	Low
African Marsh Harrier	Least Concern	Endangered	Low
Western Barn Owl	Least Concern	Least Concern	Low

8.3. Electrocution of priority species in substations in the operational phase

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 (van Rooyen, 2004). The electrocution risk is largely determined by the pole/tower design. In the case of the proposed 132kV grid connection, the electrocution risk is envisaged to be negligible because of the clearance distances between the live and earthed components inherent in the design of such powerlines. The 132kV grid connection power line should not pose an electrocution threat to the powerline sensitive species which are likely to occur in the PAOI and immediate surrounding environment.

Electrocutions within the proposed on-site substation yard are possible but should not affect the more sensitive Red List bird species, as these species are unlikely to use the infrastructure within the substation yard for perching or roosting. Species that are more vulnerable to this impact are corvids, owls, and certain species of waterbirds.

Table 122 presents the powerline priority species occurring in the development area which are more vulnerable to mortality risks resulting from electrocution on the Mukondeleli Grid Connection.

Table 12: Powerline priority species occurring in the development area which are vulnerable to mortality risks resulting from electrocution in the on-site substations

Species	Global status	Regional status	Occurrence likelihood
African Sacred Ibis	Least Concern	Least Concern	High
Amur Falcon	Least Concern	Least Concern	High
Black Sparrowhawk	Least Concern	Least Concern	Medium
Black-headed Heron	Least Concern	Least Concern	High
Black-winged Kite	Least Concern	Least Concern	High
Cape Crow	Least Concern	Least Concern	Medium
Common Buzzard	Least Concern	Least Concern	Medium
Egyptian Goose	Least Concern	Least Concern	High
Greater Kestrel	Least Concern	Least Concern	Medium
Hadada Ibis	Least Concern	Least Concern	High
Helmeted Guineafowl	Least Concern	Least Concern	High
Jackal Buzzard	Least Concern	Least Concern	Medium
Lanner Falcon	Least Concern	Vulnerable	Medium
Long-crested Eagle	Least Concern	Least Concern	Medium
Marsh Owl	Least Concern	Least Concern	High
Pallid Harrier	Near Threatened	Near Threatened	Medium
Pied Crow	Least Concern	Least Concern	High
Rock Kestrel	Least Concern	Least Concern	Medium
Spotted Eagle-Owl	Least Concern	Least Concern	Medium
Spur-winged Goose	Least Concern	Least Concern	High
Western Cattle Egret	Least Concern	Least Concern	High
African Fish Eagle	Least Concern	Least Concern	Low
Red-footed Falcon	Near Threatened	Near Threatened	Low
Western Barn Owl	Least Concern	Least Concern	Low

8.4. Collision mortality of priority species with the overhead 132kV powerlines

Collisions are arguably the biggest threat posed by transmission lines to birds in southern Africa (van Rooyen, 2004). Most heavily impacted upon are bustards, storks, cranes, and various species of waterbirds, and to a lesser extent, vultures. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with transmission lines (van Rooyen, 2004). In a PhD study, Shaw (2013) provides a concise summary of the phenomenon of avian collisions with transmission lines:

"The collision risk posed by power lines is complex and problems are often localised. While any bird flying near a power line is at risk of collision, this risk varies greatly between different groups of birds, and depends on the interplay of a wide range of factors described these factors in four main groups – biological, topographical, meteorological, and technical. Birds at highest risk are those that are both susceptible to collisions and frequently exposed to power lines, with waterbirds, gamebirds, rails, cranes, and bustards usually the most numerous reported victims.

The proliferation of man-made structures in the landscape is relatively recent, and birds are not evolved to avoid them. Body size and morphology are key predictive factors of collision risk, with large-bodied birds with high wing loadings (the ratio of body weight to wing area) most at risk. These birds must fly fast to remain airborne, and do not have sufficient manoeuvrability to avoid unexpected obstacles. Vision is another key biological factor, with many collision-prone birds principally using lateral vision to navigate in flight, when it is the lower-resolution, and often restricted, forward vision that is useful to detect obstacles. Behaviour is important, with birds flying in flocks, at low levels and in crepuscular or nocturnal conditions at higher risk of collision. Experience affects risk, with migratory and nomadic species that spend much of their time in unfamiliar locations also expected to collide more often. Juvenile birds have often been reported as being more collision-prone than adults.

Topography and weather conditions affect how birds use the landscape. Power lines in sensitive bird areas (e.g., those that separate feeding and roosting areas, or cross flyways) can be very dangerous. Lines crossing the prevailing wind conditions can pose a problem for large birds that use the wind to aid take-off and landing. Inclement weather can disorient birds and reduce their flight altitude, and strong winds can result in birds colliding with power lines that they can see but do not have enough flight control to avoid.

The technical aspects of power line design and siting also play a big part in collision risk. Grouping similar power lines on a common servitude or locating them along other features such as tree lines, are both approaches thought to reduce risk. In general, low lines with short span lengths (i.e., the distance between two adjacent pylons) and flat conductor configurations are thought to be the least dangerous. On many higher voltage lines, there is a thin earth (or ground) wire above the conductors, protecting the system from lightning strikes. Earth wires are widely accepted to cause most collisions on power lines with this configuration because they are

difficult to see, and birds flaring to avoid hitting the conductors often put themselves directly in the path of these wires."

From incidental record keeping by the Endangered Wildlife Trust, it is possible to give a measure of what species are generally susceptible to power line collisions in South Africa (see **Figure** 6**6**).

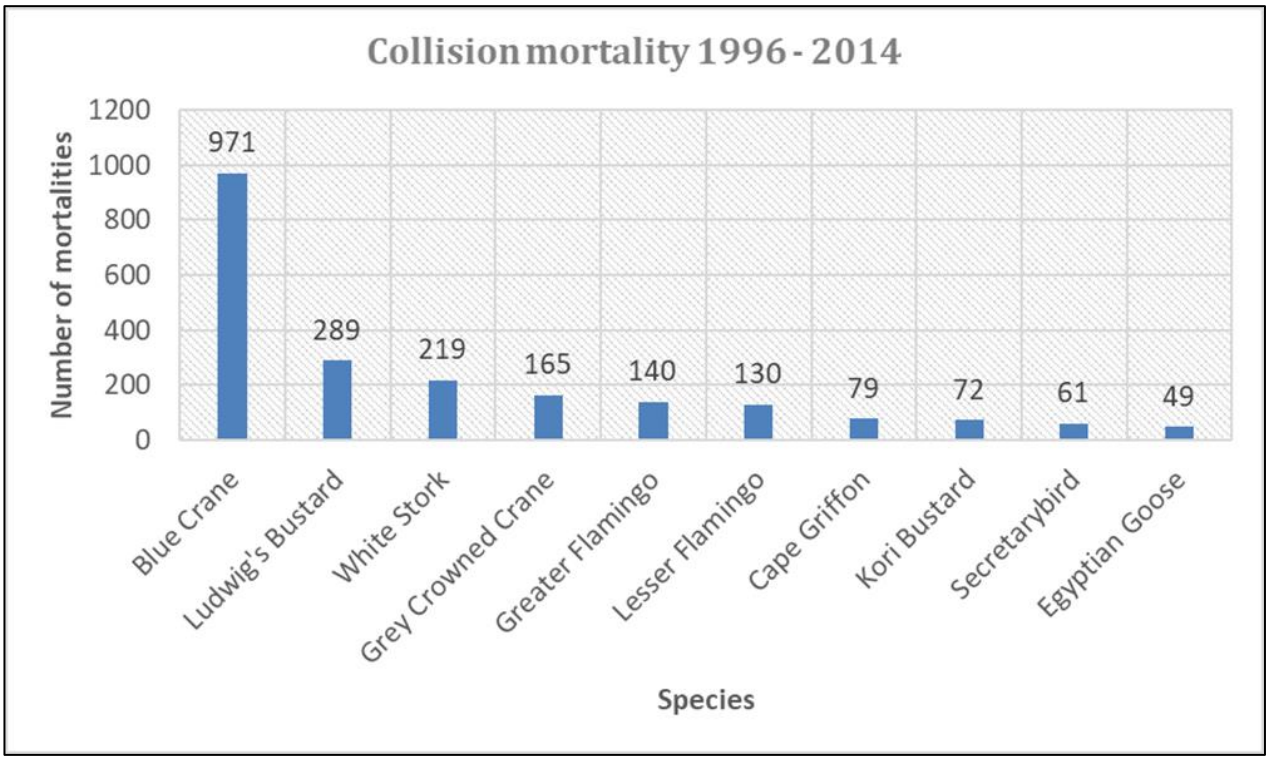


Figure 6: The top 10 collision prone bird species in South Africa, in terms of reported incidents contained in the Eskom/Endangered Wildlife Trust strategic partnership central incident register 1996 - 2014 (EWT unpublished data)

Several factors are thought to influence avian collisions, including the manoeuvrability of the bird, topography, weather conditions and power line configuration. An important additional factor that previously has received little attention is the visual capacity of birds, i.e., whether they are able to see obstacles such as power lines, and whether they are looking ahead to see obstacles with enough time to avoid a collision. In addition to helping explain the susceptibility of some species to collision, this factor is key to planning effective mitigation measures. Recent research provides the first evidence that birds can render themselves blind in the direction of travel during flight through voluntary head movements (Martin et al., 2010). Visual fields were determined in three bird species representative of families known to be subject to high levels of mortality associated with power lines i.e. Kori Bustards *Ardeotis kori*, Blue Cranes and White Storks *Ciconia ciconia*. In all species the frontal visual fields showed narrow and vertically long binocular fields typical of birds that take food items directly in the bill under visual guidance. However, these species differed markedly in the vertical extent of their binocular fields and in the extent of the blind areas which project above and below the binocular fields in the forward-facing hemisphere. The importance of these blind areas is that when in flight, head movements in the vertical plane (pitching the head to look downwards) will render the bird blind in the direction of travel. Such movements may frequently occur when birds are scanning below them (for foraging or roost sites, or for conspecifics). In bustards

and cranes pitch movements of only 25° and 35°, respectively, are sufficient to render the birds blind in the direction of travel; in storks, head movements of 55° are necessary. That flying birds can render themselves blind in the direction of travel has not been previously recognised and has important implications for the effective mitigation of collisions with human artefacts including wind turbines and power lines. These findings have applicability to species outside of these families especially raptors (A*ccipitridae*) which are known to have small binocular fields and large blind areas like those of bustards and cranes and are also known to be vulnerable to power line collisions.

Despite doubts about the efficacy of line marking to reduce the collision risk for bustards (Jenkins et al., 2010; Martin et al., 2010), there are numerous studies which prove that marking a line with PVC spiral type Bird Flight Diverters (BFDs) generally reduce mortality rates (Alonso & Alonso, 1999; Barrientos et al., 2011; Bernardino et al., 2018; Jenkins et al., 2010; Koops & De Jong, 1982; Sporer et al., 2013), including to some extent for bustards (Barrientos et al., 2012; Hoogstad 2015 pers.comm). Beaulaurier (1981) summarised the results of 17 studies that involved the marking of earth wires and found an average reduction in mortality of 45%. Barrientos et al. (2011) reviewed the results of 15 wire marking experiments in which transmission or distribution wires were marked to examine the effectiveness of flight diverters in reducing bird mortality. The presence of flight diverters was associated with a decrease of 55–94% in bird mortalities. Koops and De Jong (1982) found that the spacing of the BFDs was critical in reducing the mortality rates - mortality rates are reduced up to 86% with a spacing of 5m, whereas using the same devices at 10m intervals only reduces the mortality by 57%. Barrientos et al. (2012) found that larger BFDs were more effective in reducing Great Bustard collisions than smaller ones. Line markers should be as large as possible, and highly contrasting with the background. Colour is probably less important as during the day the background will be brighter than the obstacle with the reverse true at lower light levels (e.g. at twilight, or during overcast conditions). Black and white interspersed patterns are likely to maximise the probability of detection (Martin et al., 2010).

Using a controlled experiment spanning a period of nearly eight years (2008 to 2016), the Endangered Wildlife Trust (EWT) and Eskom tested the effectiveness of two types of line markers in reducing power line collision mortalities of large birds on three up to 400kV transmission lines near Hydra substation in the Karoo. Marking was highly effective for Blue Cranes, with a 92% reduction in mortality, and large birds in general with a 56% reduction in mortality, but not for bustards, including the endangered Ludwig's Bustard. The two different marking devices were approximately equally effective, namely spirals and bird flappers, they found no evidence supporting the preferential use of one type of marker over the other (Shaw et al., 2017).

Table 133 presents the powerline priority species occurring in the development area which are more vulnerable to mortality risks resulting from collisions with the Mukondeleli Grid Connection overhead powerline.

Table 13: Powerline priority species occurring in the development area which are vulnerable to mortality risks resulting from electrocution on the Mukondeleli Grid Connection

Species	Global status	Regional status	Occurrence likelihood
African Sacred Ibis	Least Concern	Least Concern	High
African Spoonbill	Least Concern	Least Concern	High

Species	Global status	Regional status	Occurrence likelihood
Black-headed Heron	Least Concern	Least Concern	High
Blue Crane	Vulnerable	Near Threatened	Medium
Blue Korhaan	Near Threatened	Least Concern	Medium
Cape Shoveler	Least Concern	Least Concern	High
Egyptian Goose	Least Concern	Least Concern	High
Glossy Ibis	Least Concern	Least Concern	High
Goliath Heron	Least Concern	Least Concern	Medium
Great Egret	Least Concern	Least Concern	Medium
Greater Flamingo	Least Concern	Near Threatened	Medium
Grey Heron	Least Concern	Least Concern	High
Hadada Ibis	Least Concern	Least Concern	High
Hamerkop	Least Concern	Least Concern	Medium
Intermediate Egret	Least Concern	Least Concern	High
Little Egret	Least Concern	Least Concern	High
Little Grebe	Least Concern	Least Concern	High
Mallard	Least Concern	Least Concern	Medium
Marsh Owl	Least Concern	Least Concern	High
Northern Black Korhaan	Least Concern	Least Concern	Medium
Purple Heron	Least Concern	Least Concern	Medium
Red-billed Teal	Least Concern	Least Concern	High
Red-knobbed Coot	Least Concern	Least Concern	High
Reed Cormorant	Least Concern	Least Concern	High
Secretarybird	Endangered	Vulnerable	Medium
South African Shelduck	Least Concern	Least Concern	Medium
Southern Pochard	Least Concern	Least Concern	Medium
Spotted Eagle-Owl	Least Concern	Least Concern	Medium
Spur-winged Goose	Least Concern	Least Concern	High
Squacco Heron	Least Concern	Least Concern	Medium
Western Cattle Egret	Least Concern	Least Concern	High
White Stork	Least Concern	Least Concern	Medium
White-breasted Cormorant	Least Concern	Least Concern	High
White-faced Whistling Duck	Least Concern	Least Concern	High
Yellow-billed Duck	Least Concern	Least Concern	High
African Openbill	Least Concern	Least Concern	Low
Black Heron	Least Concern	Least Concern	Low
Black-crowned Night Heron	Least Concern	Least Concern	Low
Blue-billed Teal	Least Concern	Least Concern	Low
Cape Teal	Least Concern	Least Concern	Low

Species	Global status	Regional status	Occurrence likelihood
Fulvous Whistling Duck	Least Concern	Least Concern	Low
Great Crested Grebe	Least Concern	Least Concern	Low
Knob-billed Duck	Least Concern	Least Concern	Low
Maccoa Duck	Vulnerable	Near Threatened	Low
Western Barn Owl	Least Concern	Least Concern	Low
White-backed Duck	Least Concern	Least Concern	Low

9. IMPACT RATING

9.1. Impact criteria

See **APPENDIX** 3: ASSESSMENT CRITERIA**3** for the assessment criteria employed to assess the impacts of the proposed Grid Connection.

9.2. Impact tables

Construction phase

Table 14**14**, **Table** 15**15**, and **Table** 16**16** contain a summary of the impact assessment and proposed mitigation measures for the identified impacts:

Construction phase

- Displacement due to disturbance associated with the construction of the onsite substation and grid connection power line.
- Displacement due to habitat transformation associated with the construction of the onsite substation and grid connection power line.

Operational phase

- Collisions with the up to 132kV grid connection power line.
- Electrocutions within the onsite substation.

Decommissioning phase

- Displacement due to disturbance associated with the decommissioning of the onsite substation and grid connection power line.

9.2.1. Construction phase

Table 14: [Construction phase] Displacement of priority avifauna due to disturbance associated with the construction of the grid infrastructure

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation						
						M	E	R	D	P	S	Rating	M	E	R	D	P	S	Rating
Impact 1:	Construction of the 132kV powerline grid infrastructure	Displacement of priority avifauna due to disturbance associated with the construction of the overhead powerline grid infrastructure	Construction	Negative	Moderate	4	1	1	2	5	**40**	**N3**	3	1	1	2	4	**28**	**N2**
Significance						**N3 - Moderate**							**N2 - Low**						
Impact 2:	Construction of the 132kV powerline grid infrastructure	Displacement of priority species due to habitat transformation as a result of the construction of the overhead	Construction	Negative	Moderate	3	1	3	2	4	**36**	**N3**	2	1	1	2	4	**24**	**N2**

		powerline grid infrastructure																					
Significance													**N3 - Moderate**								**N2 - Low**		

9.2.2. Operational phase

Table 15: [Operational phase]: Mortality risks of powerline priority bird species associated with the operational phase of the grid infrastructure

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation						
						M	E	R	D	P	S	Rating	M	E	R	D	P	S	Rating
Impact 2:	High voltage overhead lines	Electrocution mortality in the substations	Operational	Negative	Moderate	5	2	3	4	4	**56**	**N3**	5	2	3	4	1	**14**	**N1**
Significance						**N3 - Moderate**							**N1 - Very Low**						
Impact 3:	High voltage overhead lines	Bird mortality and injury resulting from collisions with the 132kV powerline	Operational	Negative	Moderate	5	2	3	4	4	**56**	**N4**	5	2	3	4	2	**28**	**N2**
Significance						**N4 - High**							**N2 - Low**						

9.2.3. Decommissioning phase

Table 16: [Decommissioning phase]: Displacement of priority avifauna due to disturbance associated with the dismantling of the grid infrastructure.

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation						
						M	E	R	D	P	S	Rating	M	E	R	D	P	S	Rating
Impact 1:	Dismantling of the 132kV powerline grid infrastructure	Displacement of priority avifauna due to disturbance associated with the dismantling of the 132kV grid infrastructure.	Construction	Negative	moderate	5	2	3	4	5	**40**	**N3**	3	1	1	2	4	**28**	**N2**
					Significance	**N3 - Moderate**							**N2 - Low**						

9.3. Cumulative impacts

“Cumulative Impact”, in relation to an activity, means the past, current, and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities.

The role of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location (i.e., whether the addition of the proposed project in the area will increase the impact). This section addresses whether the construction of the proposed development will result in:

- Unacceptable risk
- Unacceptable loss
- Complete or whole-scale changes to the environment
- Unacceptable increase in impact

The potentially low impact of this development should be contextualised alongside related local/regional developments. According to the official database of DFFE and other documents in the public domain, there are currently at least three planned wind and solar energy facilities within a 30km radius around the proposed development (see Error! Reference source not found.). These are the following:

- The authorised Tutuka 65.9 MW Solar Photovoltaic (PV) Energy Facility and its associated infrastructure (Ref: 14/12/16/3/3/2/754) located 23km southeast of the site;
- The authorised Forzando North Coal Mine Solar PV Facility, 9.5MW, (Ref: 14/12/16/3/3/1/452) is located 55km northeast of the site; and
- The proposed Impumelelo WEF to be located approximately 25km west of the site.
- The proposed Vhuvhili Solar Energy Facility (NEAS No. MPP/EIA/0001063/2022) located approximately 10km east of the site.

The total length of overhead 132kV powerlines for proposed Mukondeleli Grid Connection is approximately 8.0km. There is a functional length of approximately >1000km of overhead high voltage (132kV / 400kV) powerlines in a 55km radius of the development area, given that several overhead powerlines run parallel for part of their respective lengths.

The Mukondeleli Grid Connection therefore represents a comparatively **Low** contribution towards the total length of high voltage power lines within a 55km radius. However, this project will further increase the density of planned and existing high voltage lines within a 55km radius, and the combined cumulative effect of all the existing and planned high voltage lines represents a potentially **Moderate** impact risk to priority avifauna.

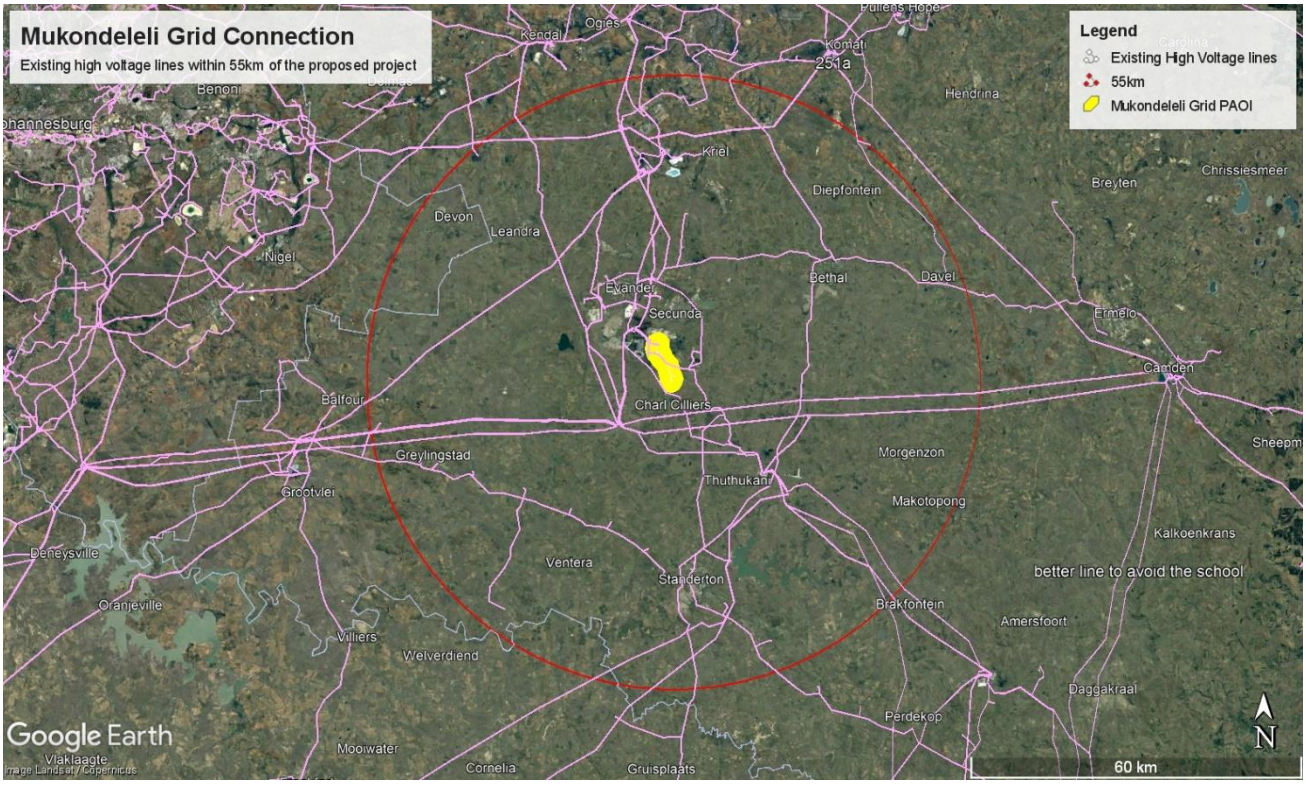


Figure 7: The existing high voltage liens within a 55km radius around the proposed grid connection

10. MITIGATION MEASURES

The impact significance without mitigation measures is assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the proposed Project. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this report.

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five (5) different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any

ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

The mitigation sequence/hierarchy is shown in **Figure** 8**8**.

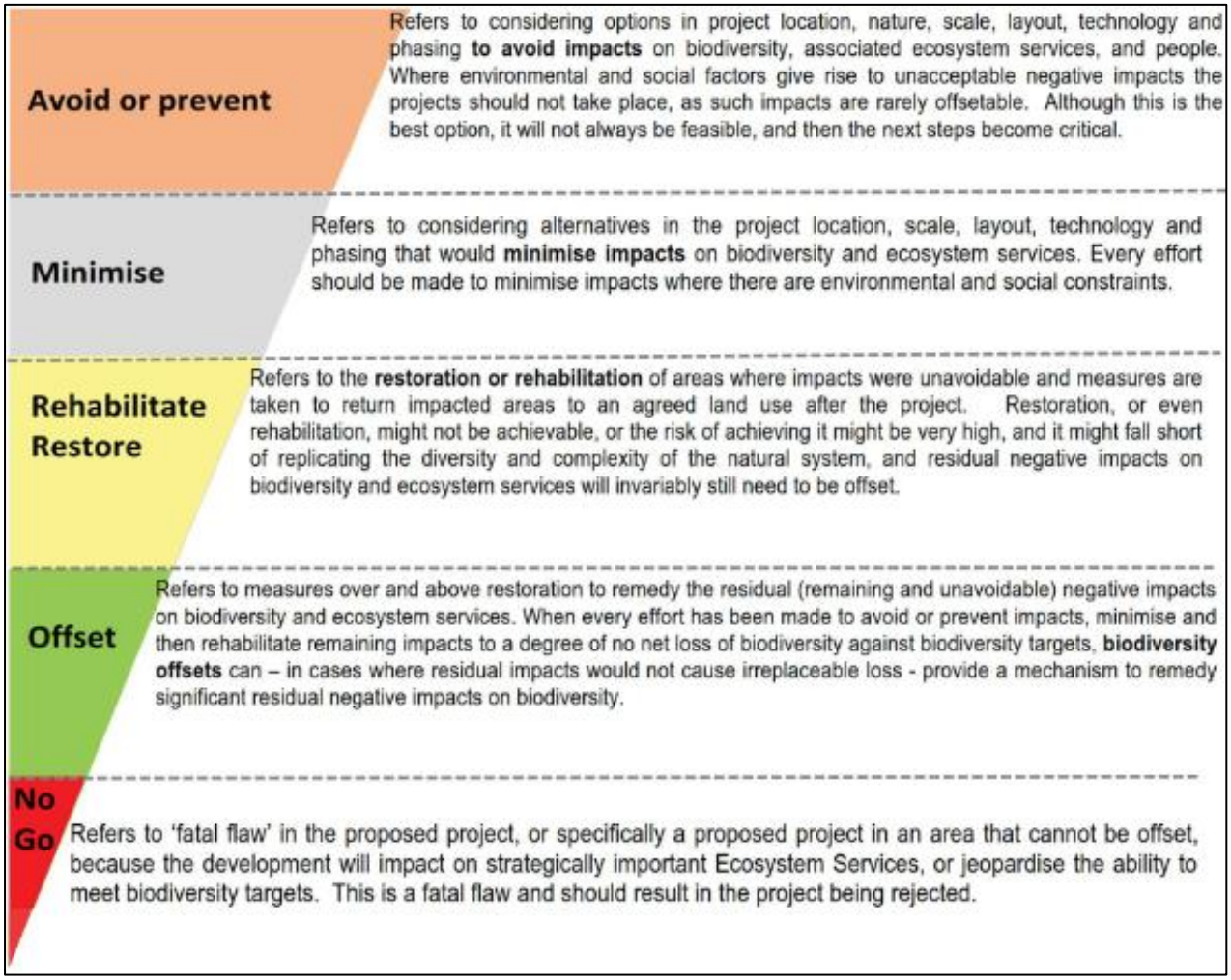


Figure 8: Mitigation sequence/hierarchy

The mitigation measures that are proposed for the Project are listed below.

10.1.Pre-construction phase

- Conduct a pre-construction inspection to identify Red List species that may be breeding within the project footprint to ensure that the impacts to breeding species (if any) are adequately managed.
- The authorised alignment must be inspected by an avifaunal specialist by means of a “walk-through” inspection i.e., through a combination of satellite imagery supplemented with in situ inspections by vehicle and where necessary, on foot, once the pole positions have been finalised. The objective would be to demarcate the sections of the powerline that need to be fitted with Bird Flight Diverters.

10.2. Construction phase

- Once the relevant spans have been identified, Bird Flight Diverters must be fitted according to the applicable Eskom Engineering Instruction (Eskom Unique Identifier 240 – 93563150: The utilisation of Bird Flight Diverters on Eskom Overhead Lines).
- Conduct a pre-construction inspection to identify Red List species that may be breeding within the project footprint to ensure that the impacts to breeding species (if any) are adequately managed.
- Construction activity should be restricted to the immediate footprint of the infrastructure as far as possible.
- Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of powerline sensitive species.
- Measures to control noise and dust should be applied according to current best practice in the industry.
- Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.
- Vegetation clearance should be limited to what is necessary.
- The mitigation measures proposed by the biodiversity specialist must be strictly enforced.

10.3. Operational phase

- The hardware within the proposed substation yard is too complex and the risk too low to warrant any mitigation for electrocution at this stage. It is recommended that if on-going impacts are recorded by the maintenance staff once operational, site-specific mitigation (insulation) be applied reactively if need be. This is an acceptable approach because Red List powerline sensitive species are unlikely to frequent the substation, although some more common powerline sensitive species might well be present more often and exposed to the electrocution risk.

10.4. De-commissioning phase

- Decommissioning activity should be restricted to the immediate footprint of the infrastructure as far as possible.
- Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of powerline sensitive species.
- Measures to control noise and dust should be applied according to current best practice in the industry.
- Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.

11. ENVIRONMENTAL SENSITIVITIES

The following specific environmental sensitivities were identified from an avifaunal perspective:

- **Drainage lines, dams, pans and associated wetlands.** These habitat features are important attractions for many powerline sensitive species, particularly waterbirds, including Red List species such as Blue Crane and Maccoa Duck. Birds commuting between these areas will be at risk of collision with the earthwire if they have to cross over the grid connection. Spans crossing these areas, or situated between two or more such areas, must be identified during the walk-through inspection once the final tower positions have been determined and marked with Bird Flight Diverters.
- **Natural grassland**. The natural grassland is vital breeding, roosting and foraging habitat for a variety of Red List powerline sensitive species and will therefore be associated with significant flight activity. These include Secretarybird, Blue Korhaan, Pallid Harrier, Red-footed Falcon and Blue Crane. Spans crossing these areas, or situated between two or more such areas, must be identified during the walk-through inspection once the final tower positions have been determined and marked with Bird Flight Diverters.

See **Figure** 9**9** for the avifaunal sensitivities identified from a wind energy perspective.

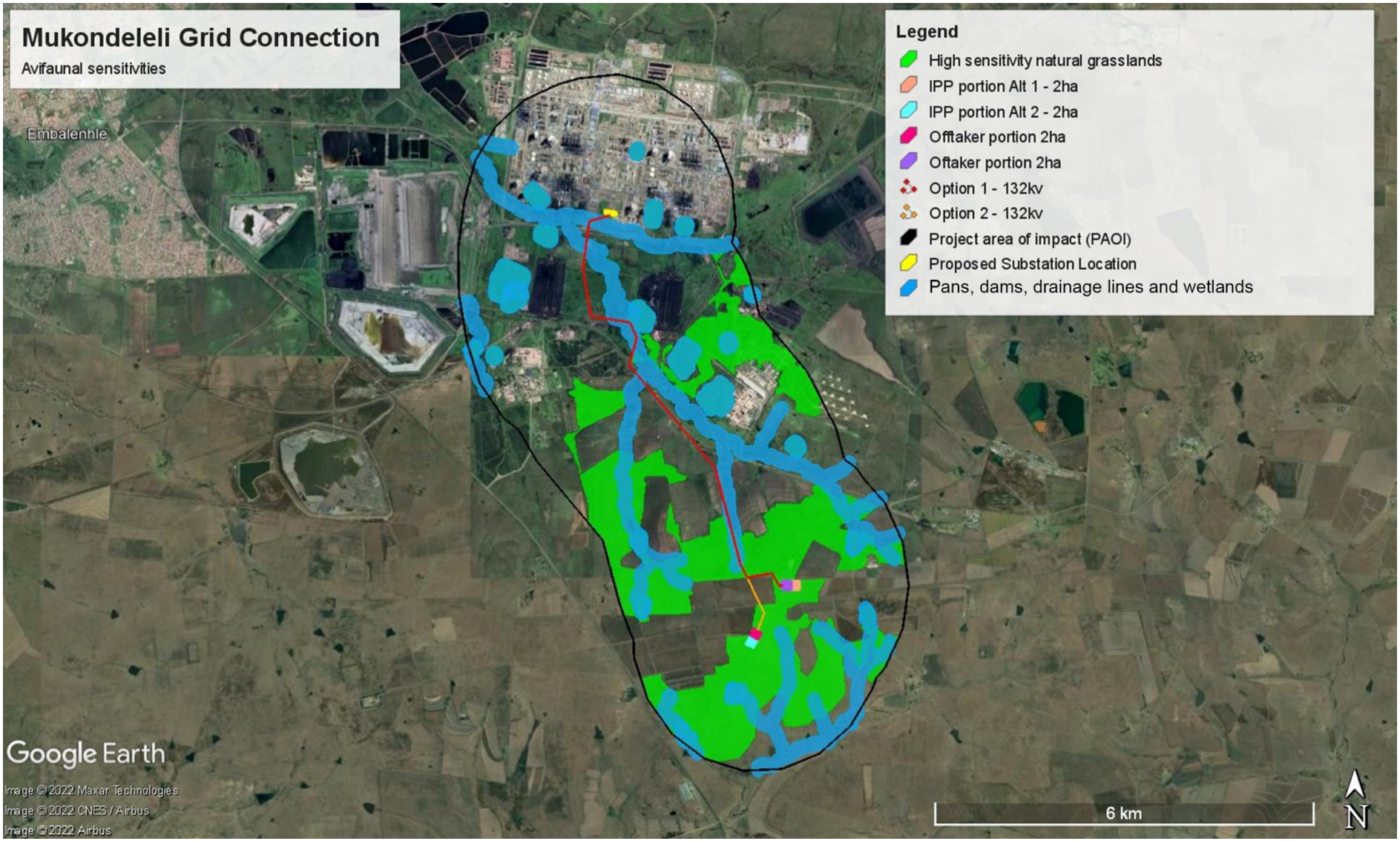


Figure 9: Avifaunal sensitivities within the Mukondeleli Grid Connection project area of impact.

12. CONDITIONS FOR INCLUSION IN THE EMPr

Please see

APPENDIX 4: ENVIRONMENTAL MANAGEMENT PROGRAMME**4** for the monitoring requirements to be included in the EMPr for the Mukondeleli Grid Connection project.

13. ‘NO-GO’ ALTERNATIVES

The ‘no-go’ alternative is the option of not constructing the Mukondeleli Grid Connection and associated infrastructure, where the *status quo* of the current status and/or activities on the project sites would prevail. This alternative would result in no additional impact on the receiving environment.
Should the ‘no-go’ alternative be considered, there would be no impact on the existing environmental baseline and no benefits to the local economy and affected communities. The alternative also bears the opportunity cost of missed socio-economic benefits to the local community that would otherwise realise from establishing the farms which form part of the project sites. The option of not developing also entails that the bid to provide renewable/clean energy to the national grid and contribute to meeting the country’s energy demands will be forfeited.

However, from a strictly avifaunal perspective, the ‘no-go’ alternative will result in the current *status quo* being maintained. The ‘no-go’ option would eliminate any additional impact on the ecological integrity of the proposed 132kV grid infrastructure development site, as far as avifauna is concerned.

14. SUMMARY AND CONCLUSION

The proposed Mukondeleli Grid Connection could have several potential impacts on priority avifauna. These impacts are the following:

- Displacement of priority species due to disturbance linked to construction activities in the construction phase.
- Displacement due to habitat transformation in the construction phase.
- Electrocution in the onsite substations in the operational phase.
- Collisions with the 132kV HV overhead lines in the operational phase.
- Displacement of priority species due to disturbance linked to dismantling activities in the decommissioning phase.

14.1 Displacement of priority species due to habitat transformation in the construction phase

The loss of habitat for powerline sensitive species due to direct habitat transformation associated with the construction of the proposed Mukondeleli Grid Connection is likely to be moderate due to the small size of the

footprint, but ideally high-quality grassland should be avoided if possible. In summary, the powerline priority bird species which may regularly occur at the development area could be impacted by habitat transformation associated with the development of the grid infrastructure: Black-headed Heron, Black-winged Kite, Blue Crane, Blue Korhaan, Common Buzzard, Greater Kestrel, Helmeted Guineafowl, Jackal Buzzard, Lanner Falcon, Long-crested Eagle, Marsh Owl, Northern Black Korhaan, Pallid Harrier, Rock Kestrel, Secretarybird, and Spotted Eagle-Owl.

The impact is rated as **moderate** pre-mitigation and **low** post-mitigation.

14.2 Displacement of priority species due to disturbance linked to construction activities in the construction phase

It is inevitable that a measure of displacement will take place at the Mukondeleli Grid Connection development area for the priority species during the construction phase, due to the disturbance factor associated with the construction activities. This is likely to affect ground nesting species in the remaining high-quality grassland, wetlands and wetland fringes the most, as this could temporarily disrupt their reproductive cycle. Some species might be able to recolonise the area after the completion of the construction phase, but for some species, this might only be partially the case, resulting in lower densities than before. In summary, the powerline priority bird species which may regularly occur at the development area could be impacted by disturbances during the construction phase: Black Sparrowhawk, Black-headed Heron, Black-winged Kite, Blue Crane, Blue Korhaan, Cape Crow, Egyptian Goose, Goliath Heron, Greater Kestrel, Grey Heron, Hadada Ibis, Hamerkop, Helmeted Guineafowl, Jackal Buzzard, Lanner Falcon, Long-crested Eagle, Marsh Owl, Northern Black Korhaan, Pied Crow, Rock Kestrel, Secretarybird, and Spotted Eagle-Owl.

The impact is rated as **moderate** pre-mitigation and **low** post-mitigation.

14.3 Electrocution of priority species in substations in the operational phase

Electrocutions within the proposed on-site substation yard are possible but should not affect the more sensitive Red List bird species, as these species are unlikely to use the infrastructure within the substation yard for perching or roosting. Species that are more vulnerable to this impact are corvids, owls, and certain species of waterbirds. In summary, the following powerline priority bird species which may regularly occur at the development area are vulnerable to electrocution in this manner: African Sacred Ibis, Amur Falcon, Black Sparrowhawk, Black-headed Heron, Black-winged Kite, Cape Crow, Common Buzzard, Egyptian Goose, Greater Kestrel, Hadada Ibis, Helmeted Guineafowl, Jackal Buzzard, Lanner Falcon, Long-crested Eagle, Marsh Owl, Pallid Harrier, Pied Crow, Rock Kestrel, Spotted Eagle-Owl, Spur-winged Goose, and Western Cattle Egret

The impact is rated as **moderate** pre-mitigation and **very low** post-mitigation.

14.4 Collisions of priority species with the overhead 132kV powerlines in the operational phase

Collisions are arguably the biggest threat posed by transmission lines to birds in southern Africa. Most heavily impacted upon are bustards, storks, cranes, and various species of waterbirds, and to a lesser extent, vultures. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with transmission lines. In summary, the following powerline priority bird species which may regularly occur at the development area are particularly vulnerable to risk of collisions with the overhead 132kV powerlines: African Sacred Ibis, African Spoonbill, Black-headed Heron, Blue Crane, Blue Korhaan, Cape Shoveler, Egyptian Goose, Glossy Ibis, Goliath Heron, Great Egret, Greater Flamingo, Grey Heron, Hadada Ibis, Hamerkop, Intermediate Egret, Little Egret, Little Grebe, Mallard, Marsh Owl, Northern Black Korhaan, Purple Heron, Red-billed Teal, Red-knobbed Coot, Reed Cormorant, Secretarybird, South African Shelduck, Southern Pochard, Spotted Eagle-Owl, Spur-winged Goose, Squacco Heron, Western Cattle Egret, White Stork, White-breasted Cormorant, White-faced Whistling Duck, and Yellow-billed Duck.

The impact is rated as **high** pre-mitigation and **very low** post-mitigation.

14.5 Displacement of priority species due to disturbance linked to dismantling activities in the decommissioning phase

The impact is likely to be similar in nature and extent to the construction phase of the proposed Grid Connection. The impact is rated as **moderate** pre-mitigation and **low** post-mitigation.

14.6 Cumulative impacts

The total length of overhead 132kV powerlines for proposed Mukondeleli Grid Connection is approximately 8.0km. There is a functional length of >1000km of overhead high voltage (132kV / 400kV) powerlines in a 55km radius of the development area, given that several overhead powerlines run parallel for part of their respective lengths.

The Mukondeleli Grid Connection therefore represents a comparatively **Low** contribution towards the total length of high voltage power lines within a 55km radius. However, this project will further increase the density

of planned and existing high voltage lines within a 55km radius, and cumulative effect of all the existing and planned lines represents a potentially **Moderate** impact risk to priority avifauna.

15. CONCLUSION AND IMPACT STATEMENT

The proposed Mukondeleli Grid Connection could have a **high** to **moderate** impact on avifauna which, in most instances, could be reduced to **low** through appropriate mitigation, although some moderate residual impacts will still be present after mitigation. No fatal flaws were discovered during the onsite investigations. The proposed Grid Connection development is therefore supported, provided the mitigation measures listed in this report are strictly implemented.

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APPENDIX 1: SPECIES LIST FOR THE BROADER AREA

Appendix 1 Table 1: Bird species list of the broader area for the Mukondeleli Grid Connection, compiled from SABAP2 observations, alongside pre-construction monitoring observations.

Species name	Scientific name	SABAP2 Full protocol	SABAP Ad hoc protocol	Global status	Regional status
African Black Duck	*Anas sparsa*	8.537	0	Least Concern	Least Concern
African Darter	*Anhinga rufa*	26.83	11.76	Least Concern	Least Concern
African Fish Eagle	*Haliaeetus vocifer*	1.22	0	Least Concern	Least Concern
African Hoopoe	*Upupa africana*	4.878	2.941	Least Concern	Least Concern
African Marsh Harrier	*Circus ranivorus*	1.22	0	Least Concern	Endangered
African Openbill	*Anastomus lamelligerus*	1.22	0	Least Concern	Least Concern
African Palm Swift	*Cypsiurus parvus*	24.39	14.71	Least Concern	Least Concern
African Pipit	*Anthus cinnamomeus*	65.85	20.59	Least Concern	Least Concern
African Reed Warbler	*Acrocephalus baeticatus*	8.537	0	Least Concern	Least Concern
African Sacred Ibis	*Threskiornis aethiopicus*	63.41	23.53	Least Concern	Least Concern
African Snipe	*Gallinago nigripennis*	9.756	2.941	Least Concern	Least Concern
African Spoonbill	*Platalea alba*	21.95	5.882	Least Concern	Least Concern
African Stonechat	*Saxicola torquatus*	84.15	26.47	Least Concern	Least Concern
African Swamphen	*Porphyrio madagascariensis*	6.098	0	Least Concern	Least Concern
African Wattled Lapwing	*Vanellus senegallus*	13.41	0	Least Concern	Least Concern

Species name	Scientific name	SABAP2 Full protocol	SABAP Ad hoc protocol	Global status	Regional status
Amur Falcon	*Falco amurensis*	34.15	2.941	Least Concern	Least Concern
Ant-eating Chat	*Myrmecocichla formicivora*	13.41	2.941	Least Concern	Least Concern
Banded Martin	*Riparia cincta*	1.22	2.941	Least Concern	Least Concern
Barn Swallow	*Hirundo rustica*	46.34	2.941	Least Concern	Least Concern
Black Heron	*Egretta ardesiaca*	3.659	2.941	Least Concern	Least Concern
Black Sparrowhawk	*Accipiter melanoleucus*	0	0	Least Concern	Least Concern
Black-chested Prinia	*Prinia flavicans*	7.317	2.941	Least Concern	Least Concern
Black-collared Barbet	*Lybius torquatus*	12.2	0	Least Concern	Least Concern
Black-crowned Night Heron	*Nycticorax nycticorax*	1.22	0	Least Concern	Least Concern
Black-headed Heron	*Ardea melanocephala*	81.71	23.53	Least Concern	Least Concern
Blacksmith Lapwing	*Vanellus armatus*	95.12	35.29	Least Concern	Least Concern
Black-throated Canary	*Crithagra atrogularis*	36.59	0	Least Concern	Least Concern
Black-winged Kite	*Elanus caeruleus*	70.73	23.53	Least Concern	Least Concern
Black-winged Pratincole	*Glareola nordmanni*	0	0	Near Threatened	Near Threatened
Black-winged Stilt	*Himantopus himantopus*	19.51	5.882	Least Concern	Least Concern
Blue Crane	*Grus paradisea*	1.22	2.941	Vulnerable	Near Threatened
Blue Korhaan	*Eupodotis caerulescens*	17.07	2.941	Near Threatened	Least Concern
Blue-billed Teal	*Spatula hottentota*	1.22	0	Least Concern	Least Concern

Species name	Scientific name	SABAP2 Full protocol	SABAP Ad hoc protocol	Global status	Regional status
Brown-throated Martin	*Riparia paludicola*	36.59	11.76	Least Concern	Least Concern
Cape Canary	*Serinus canicollis*	1.22	0	Least Concern	Least Concern
Cape Crow	*Corvus capensis*	13.41	5.882	Least Concern	Least Concern
Cape Longclaw	*Macronyx capensis*	70.73	17.65	Least Concern	Least Concern
Cape Robin-Chat	*Cossypha caffra*	7.317	0	Least Concern	Least Concern
Cape Shoveler	*Spatula smithii*	29.27	11.76	Least Concern	Least Concern
Cape Sparrow	*Passer melanurus*	91.46	26.47	Least Concern	Least Concern
Cape Starling	*Lamprotornis nitens*	10.98	2.941	Least Concern	Least Concern
Cape Teal	*Anas capensis*	2.439	0	Least Concern	Least Concern
Cape Turtle Dove	*Streptopelia capicola*	95.12	35.29	Least Concern	Least Concern
Cape Wagtail	*Motacilla capensis*	64.63	20.59	Least Concern	Least Concern
Cape Weaver	*Ploceus capensis*	2.439	0	Least Concern	Least Concern
Cape White-eye	*Zosterops virens*	9.756	2.941	Least Concern	Least Concern
Capped Wheatear	*Oenanthe pileata*	28.05	11.76	Least Concern	Least Concern
Caspian Tern	*Hydroprogne caspia*	1.22	5.882	Least Concern	Vulnerable
Cloud Cisticola	*Cisticola textrix*	19.51	0	Least Concern	Least Concern
Common Buzzard	*Buteo buteo*	8.537	0	Least Concern	Least Concern
Common Greenshank	*Tringa nebularia*	18.29	0	Least Concern	Least Concern

Species name	Scientific name	SABAP2 Full protocol	SABAP Ad hoc protocol	Global status	Regional status
Common Moorhen	*Gallinula chloropus*	36.59	11.76	Least Concern	Least Concern
Common Myna	*Acridotheres tristis*	60.98	23.53	Least Concern	Least Concern
Common Ostrich	*Struthio camelus*	37.8	14.71	Least Concern	Least Concern
Common Quail	*Coturnix coturnix*	15.85	0	Least Concern	Least Concern
Common Sandpiper	*Actitis hypoleucos*	8.537	0	Least Concern	Least Concern
Common Waxbill	*Estrilda astrild*	36.59	11.76	Least Concern	Least Concern
Crested Barbet	*Trachyphonus vaillantii*	18.29	5.882	Least Concern	Least Concern
Crowned Lapwing	*Vanellus coronatus*	63.41	20.59	Least Concern	Least Concern
Cuckoo Finch	*Anomalospiza imberbis*	1.22	0	Least Concern	Least Concern
Curlew Sandpiper	*Calidris ferruginea*	3.659	0	Near Threatened	Least Concern
Dark-capped Bulbul	*Pycnonotus tricolor*	8.537	0	Least Concern	Least Concern
Desert Cisticola	*Cisticola aridulus*	8.537	0	Least Concern	Least Concern
Diederik Cuckoo	*Chrysococcyx caprius*	18.29	5.882	Least Concern	Least Concern
Domestic Goose	*Anser anser domesticus*	2.439	0	Least Concern	Least Concern
Egyptian Goose	*Alopochen aegyptiaca*	73.17	38.24	Least Concern	Least Concern
European Roller	*Coracias garrulus*	2.439	0	Least Concern	Near Threatened
Fan-tailed Widowbird	*Euplectes axillaris*	41.46	2.941	Least Concern	Least Concern
Fiscal Flycatcher	*Melaenornis silens*	1.22	0	Least Concern	Least Concern

Species name	Scientific name	SABAP2 Full protocol	SABAP Ad hoc protocol	Global status	Regional status
Fulvous Whistling Duck	*Dendrocygna bicolor*	2.439	0	Least Concern	Least Concern
Giant Kingfisher	*Megaceryle maxima*	2.439	0	Least Concern	Least Concern
Glossy Ibis	*Plegadis falcinellus*	36.59	5.882	Least Concern	Least Concern
Goliath Heron	*Ardea goliath*	6.098	2.941	Least Concern	Least Concern
Great Crested Grebe	*Podiceps cristatus*	2.439	0	Least Concern	Least Concern
Great Egret	*Ardea alba*	6.098	2.941	Least Concern	Least Concern
Great Reed Warbler	*Acrocephalus arundinaceus*	1.22	0	Least Concern	Least Concern
Greater Flamingo	*Phoenicopterus roseus*	4.878	5.882	Least Concern	Near Threatened
Greater Kestrel	*Falco rupicoloides*	6.098	2.941	Least Concern	Least Concern
Greater Painted-snipe	*Rostratula benghalensis*	1.22	0	Least Concern	Near Threatened
Greater Striped Swallow	*Cecropis cucullata*	47.56	5.882	Least Concern	Least Concern
Green Wood Hoopoe	*Phoeniculus purpureus*	7.317	0	Least Concern	Least Concern
Grey Heron	*Ardea cinerea*	34.15	14.71	Least Concern	Least Concern
Grey-headed Gull	*Chroicocephalus cirrocephalus*	37.8	17.65	Least Concern	Least Concern
Grey-winged Francolin	*Scleroptila afra*	1.22	0	Least Concern	Least Concern
Groundscraper Thrush	*Turdus litsitsirupa*	0	2.941	Least Concern	Least Concern
Hadada Ibis	*Bostrychia hagedash*	79.27	35.29	Least Concern	Least Concern
Hamerkop	*Scopus umbretta*	9.756	0	Least Concern	Least Concern

Species name	Scientific name	SABAP2 Full protocol	SABAP Ad hoc protocol	Global status	Regional status
Helmeted Guineafowl	*Numida meleagris*	69.51	20.59	Least Concern	Least Concern
House Sparrow	*Passer domesticus*	39.02	5.882	Least Concern	Least Concern
Intermediate Egret	*Ardea intermedia*	23.17	2.941	Least Concern	Least Concern
Jackal Buzzard	*Buteo rufofuscus*	4.878	0	Least Concern	Least Concern
Karoo Thrush	*Turdus smithi*	19.51	8.824	Least Concern	Least Concern
Kittlitz's Plover	*Charadrius pecuarius*	17.07	0	Least Concern	Least Concern
Knob-billed Duck	*Sarkidiornis melanotos*	1.22	0	Least Concern	Least Concern
Lanner Falcon	*Falco biarmicus*	4.878	0	Least Concern	Vulnerable
Laughing Dove	*Spilopelia senegalensis*	86.59	11.76	Least Concern	Least Concern
Lesser Grey Shrike	*Lanius minor*	1.22	0	Least Concern	Least Concern
Lesser Swamp Warbler	*Acrocephalus gracilirostris*	23.17	2.941	Least Concern	Least Concern
Levaillant's Cisticola	*Cisticola tinniens*	68.29	17.65	Least Concern	Least Concern
Little Bittern	*Ixobrychus minutus*	2.439	0	Least Concern	Least Concern
Little Egret	*Egretta garzetta*	23.17	14.71	Least Concern	Least Concern
Little Grebe	*Tachybaptus ruficollis*	64.63	17.65	Least Concern	Least Concern
Little Rush Warbler	*Bradypterus baboecala*	1.22	0	Least Concern	Least Concern
Little Stint	*Calidris minuta*	13.41	0	Least Concern	Least Concern
Little Swift	*Apus affinis*	36.59	2.941	Least Concern	Least Concern

Species name	Scientific name	SABAP2 Full protocol	SABAP Ad hoc protocol	Global status	Regional status
Long-crested Eagle	*Lophaetus occipitalis*	3.659	0	Least Concern	Least Concern
Long-tailed Widowbird	*Euplectes progne*	84.15	26.47	Least Concern	Least Concern
Maccoa Duck	*Oxyura maccoa*	3.659	0	Vulnerable	Near Threatened
Malachite Kingfisher	*Corythornis cristatus*	9.756	0	Least Concern	Least Concern
Mallard	*Anas platyrhynchos*	8.537	2.941	Least Concern	Least Concern
Marsh Owl	*Asio capensis*	24.39	2.941	Least Concern	Least Concern
Marsh Sandpiper	*Tringa stagnatilis*	4.878	0	Least Concern	Least Concern
Marsh Warbler	*Acrocephalus palustris*	1.22	0	Least Concern	Least Concern
Mountain Wheatear	*Myrmecocichla monticola*	6.098	0	Least Concern	Least Concern
Namaqua Dove	*Oena capensis*	1.22	0	Least Concern	Least Concern
Northern Black Korhaan	*Afrotis afraoides*	0	0	Least Concern	Least Concern
Orange River Francolin	*Scleroptila gutturalis*	19.51	5.882	Least Concern	Least Concern
Orange-breasted Waxbill	*Amandava subflava*	3.659	0	Least Concern	Least Concern
Pale-crowned Cisticola	*Cisticola cinnamomeus*	4.878	0	Least Concern	Least Concern
Pallid Harrier	*Circus macrourus*	1.22	0	Near Threatened	Near Threatened
Pied Avocet	*Recurvirostra avosetta*	6.098	2.941	Least Concern	Least Concern
Pied Crow	*Corvus albus*	31.71	2.941	Least Concern	Least Concern
Pied Kingfisher	*Ceryle rudis*	8.537	5.882	Least Concern	Least Concern

Species name	Scientific name	SABAP2 Full protocol	SABAP Ad hoc protocol	Global status	Regional status
Pied Starling	*Lamprotornis bicolor*	2.439	2.941	Least Concern	Least Concern
Pink-billed Lark	*Spizocorys conirostris*	17.07	2.941	Least Concern	Least Concern
Pin-tailed Whydah	*Vidua macroura*	57.32	8.824	Least Concern	Least Concern
Plain-backed Pipit	*Anthus leucophrys*	1.22	0	Least Concern	Least Concern
Purple Heron	*Ardea purpurea*	10.98	0	Least Concern	Least Concern
Quailfinch	*Ortygospiza atricollis*	32.93	8.824	Least Concern	Least Concern
Red-backed Shrike	*Lanius collurio*	3.659	0	Least Concern	Least Concern
Red-billed Quelea	*Quelea quelea*	39.02	8.824	Least Concern	Least Concern
Red-billed Teal	*Anas erythrorhyncha*	35.37	2.941	Least Concern	Least Concern
Red-capped Lark	*Calandrella cinerea*	43.9	11.76	Least Concern	Least Concern
Red-chested Cuckoo	*Cuculus solitarius*	4.878	0	Least Concern	Least Concern
Red-eyed Dove	*Streptopelia semitorquata*	74.39	17.65	Least Concern	Least Concern
Red-faced Mousebird	*Urocolius indicus*	8.537	0	Least Concern	Least Concern
Red-footed Falcon	*Falco vespertinus*	1.22	0	Near Threatened	Near Threatened
Red-headed Finch	*Amadina erythrocephala*	7.317	0	Least Concern	Least Concern
Red-knobbed Coot	*Fulica cristata*	74.39	29.41	Least Concern	Least Concern
Red-throated Wryneck	*Jynx ruficollis*	2.439	0	Least Concern	Least Concern
Red-winged Francolin	*Scleroptila levaillantii*	1.22	0	Least Concern	Least Concern

Species name	Scientific name	SABAP2 Full protocol	SABAP Ad hoc protocol	Global status	Regional status
Reed Cormorant	*Microcarbo africanus*	75.61	20.59	Least Concern	Least Concern
Rock Dove	*Columba livia*	34.15	14.71	Least Concern	Least Concern
Rock Kestrel	*Falco rupicolus*	2.439	2.941	Least Concern	Least Concern
Rock Martin	*Ptyonoprogne fuligula*	7.317	0	Least Concern	Least Concern
Ruff	*Calidris pugnax*	10.98	0	Least Concern	Least Concern
Secretarybird	*Sagittarius serpentarius*	8.537	0	Endangered	Vulnerable
Sedge Warbler	*Acrocephalus schoenobaenus*	1.22	0	Least Concern	Least Concern
Sentinel Rock Thrush	*Monticola explorator*	1.22	0	Near Threatened	Least Concern
South African Cliff Swallow	*Petrochelidon spilodera*	29.27	2.941	Least Concern	Least Concern
South African Shelduck	*Tadorna cana*	8.537	2.941	Least Concern	Least Concern
Southern Fiscal	*Lanius collaris*	87.8	20.59	Least Concern	Least Concern
Southern Grey-headed Sparrow	*Passer diffusus*	23.17	0	Least Concern	Least Concern
Southern Masked Weaver	*Ploceus velatus*	92.68	17.65	Least Concern	Least Concern
Southern Pochard	*Netta erythrophthalma*	12.2	0	Least Concern	Least Concern
Southern Red Bishop	*Euplectes orix*	85.37	29.41	Least Concern	Least Concern
Speckled Mousebird	*Colius striatus*	23.17	5.882	Least Concern	Least Concern
Speckled Pigeon	*Columba guinea*	78.05	35.29	Least Concern	Least Concern
Spike-heeled Lark	*Chersomanes albofasciata*	21.95	0	Least Concern	Least Concern

Species name	Scientific name	SABAP2 Full protocol	SABAP Ad hoc protocol	Global status	Regional status
Spotted Eagle-Owl	*Bubo africanus*	6.098	0	Least Concern	Least Concern
Spotted Flycatcher	*Muscicapa striata*	3.659	0	Least Concern	Least Concern
Spotted Thick-knee	*Burhinus capensis*	39.02	2.941	Least Concern	Least Concern
Spur-winged Goose	*Plectropterus gambensis*	40.24	8.824	Least Concern	Least Concern
Squacco Heron	*Ardeola ralloides*	7.317	0	Least Concern	Least Concern
Swainson's Spurfowl	*Pternistis swainsonii*	64.63	8.824	Least Concern	Least Concern
Tawny-flanked Prinia	*Prinia subflava*	3.659	0	Least Concern	Least Concern
Three-banded Plover	*Charadrius tricollaris*	50	11.76	Least Concern	Least Concern
Village Weaver	*Ploceus cucullatus*	1.22	2.941	Least Concern	Least Concern
Wattled Starling	*Creatophora cinerea*	1.22	5.882	Least Concern	Least Concern
Western Barn Owl	*Tyto alba*	0	2.941	Least Concern	Least Concern
Western Cattle Egret	*Bubulcus ibis*	70.73	23.53	Least Concern	Least Concern
Whiskered Tern	*Chlidonias hybrida*	20.73	2.941	Least Concern	Least Concern
White Stork	*Ciconia ciconia*	3.659	0	Least Concern	Least Concern
White-backed Duck	*Thalassornis leuconotus*	3.659	0	Least Concern	Least Concern
White-breasted Cormorant	*Phalacrocorax lucidus*	25.61	11.76	Least Concern	Least Concern
White-browed Sparrow-Weaver	*Plocepasser mahali*	2.439	0	Least Concern	Least Concern
White-faced Whistling Duck	*Dendrocygna viduata*	14.63	0	Least Concern	Least Concern

Species name	Scientific name	SABAP2 Full protocol	SABAP Ad hoc protocol	Global status	Regional status
White-rumped Swift	*Apus caffer*	41.46	0	Least Concern	Least Concern
White-throated Swallow	*Hirundo albigularis*	45.12	14.71	Least Concern	Least Concern
White-winged Tern	*Chlidonias leucopterus*	2.439	2.941	Least Concern	Least Concern
White-winged Widowbird	*Euplectes albonotatus*	19.51	0	Least Concern	Least Concern
Willow Warbler	*Phylloscopus trochilus*	4.878	0	Least Concern	Least Concern
Wing-snapping Cisticola	*Cisticola ayresii*	10.98	0	Least Concern	Least Concern
Wood Sandpiper	*Tringa glareola*	13.41	2.941	Least Concern	Least Concern
Yellow Canary	*Crithagra flaviventris*	10.98	0	Least Concern	Least Concern
Yellow-billed Duck	*Anas undulata*	70.73	26.47	Least Concern	Least Concern
Yellow-crowned Bishop	*Euplectes afer*	37.8	2.941	Least Concern	Least Concern
Yellow-fronted Canary	*Crithagra mozambica*	2.439	0	Least Concern	Least Concern
Zitting Cisticola	*Cisticola juncidis*	40.24	0	Least Concern	Least Concern

APPENDIX 2: HABITAT FEATURES AT THE PROPOSED DEVELOPMENT AREA

Figure A2.1: Natural grassland tracts within the PAOI.

Figure A2.1: (Top) A vlei within the proposed project site; (bottom) a drainage line within the PAOI

Figure A2.3: (Top) a view taken from the earth-embankment wall of a prominent dam within the PAOI; (bottom) a smaller dam present within the project site, with a copse of alien trees in the background.

Figure A2.5: (Top) recently sown cropland that has been inundated with surface water within the PAOI; (bottom) post-harvest cropland within the project site.

Figure A2.6: Alien trees are interspersed throughout the PAOI.

APPENDIX 3: ASSESSMENT CRITERIA

EIA PHASE

REPORTING REQUIREMENTS

- Project Description
- Legislative Context (as applicable)
- Assumptions and limitations
- Description of methodology (as required)
- Update and/or confirmation of Baseline Environment – including update and / or confirmation of sensitivity mapping
- Identification and description of Impacts
- Full impact assessment (including Cumulative)
- Mitigation measures
- Impact Statement

Ensure that all reports fulfil the requirements of the relevant Protocols.

ASSESSMENT OF IMPACTS AND MITIGATION

The assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct[1], indirect[2], secondary[3] as well as cumulative[4] impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e. residual impact). The significance of environmental aspects is determined and ranked by considering the criteria[5] presented in **Table 0-5**.

Table 0-5: Impact Assessment Criteria and Scoring System

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes

[1] Impacts that arise directly from activities that form an integral part of the Project.
[2] Impacts that arise indirectly from activities not explicitly forming part of the Project.
[3] Secondary or induced impacts caused by a change in the Project environment.
[4] Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.
[5] The definitions given are for guidance only, and not all the definitions will apply to all the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				
IMPACT SIGNIFICANCE RATING					
Total Score	**4 to 15**	**16 to 30**	**31 to 60**	**61 to 80**	**81 to 100**
Environmental Significance Rating (Negative (-))	**Very low**	**Low**	**Moderate**	**High**	**Very High**
Environmental Significance Rating (Positive (+))	**Very low**	**Low**	**Moderate**	**High**	**Very High**

IMPACT MITIGATION

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this report.

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five (5) different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

The mitigation sequence/hierarchy is shown in **Figure 1** below.

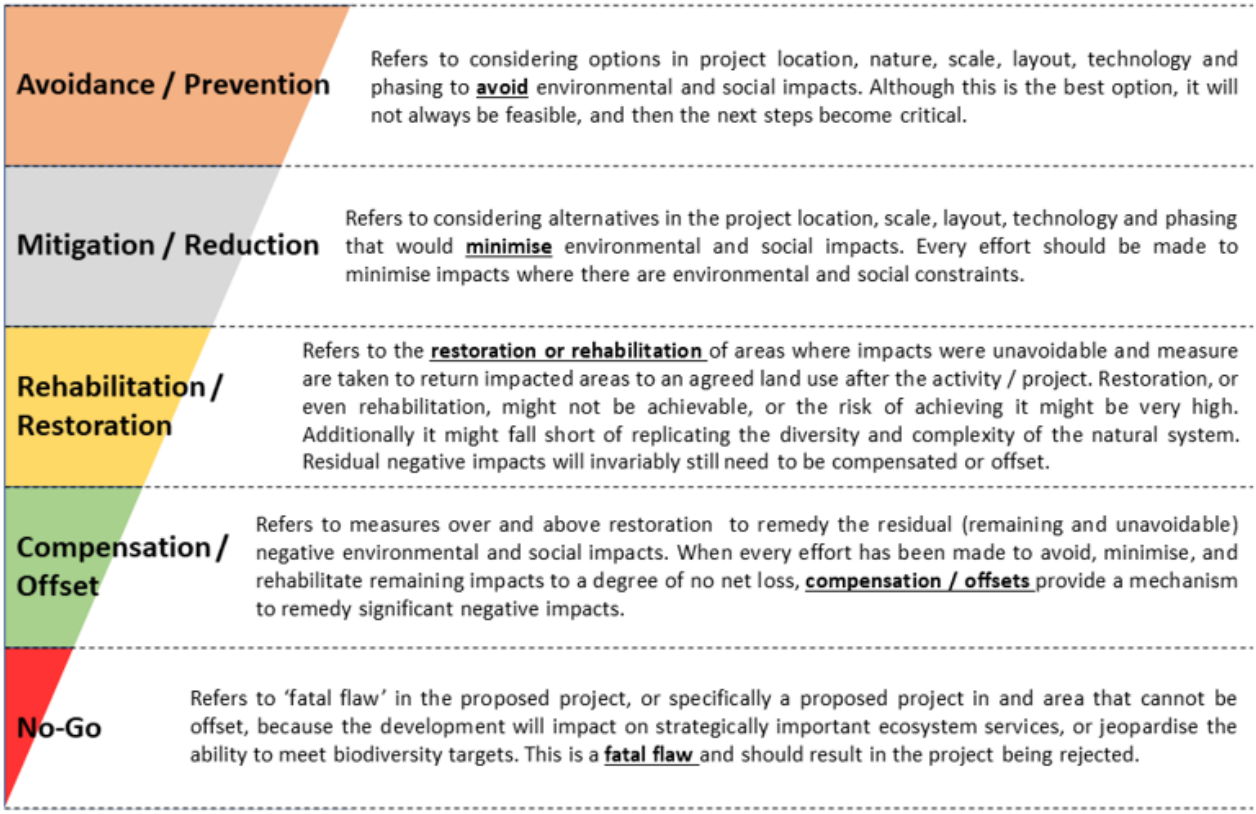

Figure 1: Mitigation Sequence/Hierarchy

APPENDIX 4: ENVIRONMENTAL MANAGEMENT PROGRAMME

Table 17: Environmental Management Programme (EMPr): High voltage grid infrastructure management plan for the planning and design phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
Avifauna: Displacement due to disturbance					
The noise and movement associated with the construction activities at the development footprint will be a source of disturbance which would lead to the displacement of avifauna from the area	Prevent unnecessary displacement of avifauna by ensuring that contractors are aware of the requirements of the Construction Environmental Management Programme (CEMPr.)	Conduct a pre-construction inspection to identify Red List species that may be breeding within the project footprint to ensure that the impacts to breeding species (if any) are adequately managed.	1. Walk-through by avifauna specialist to record any Re List species nests.	1. Once-off	1. Developer
Avifauna: Mortality due to collision with the overhead power line					
Mortality of avifauna due to collisions with the overhead power line.	Reduction of avian collision mortality	Demarcate sections of the overhead power line to be marked with Eskom approved Bird Flight Diverters (BFDs).	1. Walk-through by avifauna specialist. 2. Fit Bird Flight Diverters on th earthwire at the demarcate sections of the OHL accordin to the applicable Eskon Engineering Instruction (Eskon Unique Identifier 240 - 93563150: The utilisation o Bird Flight Diverters on Eskon Overhead Lines).	1. Once-off 2. Once-off	1. Developer 2. Contractor and ECO

Table 18: Management Plan for the Construction Phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
Avifauna: Displacement due to disturbance					
The noise and movement associated with the construction activities at the development footprint will be a source of disturbance which would lead to the displacement of avifauna from the area	Prevent unnecessary displacement of priority avifauna by ensuring that contractors are aware of the requirements of the Construction Environmental Management Programme (CEMPr.)	1. Driving is only permitted in designated roads. 2. Maximum use of existing roads. 3. Measures to control noise and dust according to latest best practice. 4. Restricted access to the rest of the property outside the designated construction area. 5. Strict application of all recommendations in the botanical specialist report pertaining to the limitation and rehabilitation of the footprint.	1. Ensure that construction personnel are made aware of the impacts relating to off-road driving. 2. Construction access roads must be demarcated clearly. Undertake site inspections to verify. 3. Monitor the implementation of noise control mechanisms via site inspections and record and report non-compliance. 4. Ensure that the construction area is demarcated clearly and that construction personnel are made aware of these demarcations. 5. Monitor via site inspections and report non-compliance	1. Daily 2. Monthly 3. Monthly 4. Monthly 5. Monthly	2. Contractor and ECO 3. Contractor and ECO 4. Contractor and ECO 5. Contractor and ECO 6. Contractor and ECO

Table 19: Management Plan for the Operational Phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
Avifauna: Displacement due to habitat transformation in the substations					
Total or partial displacement of avifauna due to habitat transformation associated with the vegetation clearance and the presence of the wind turbines and associated infrastructure.	Prevent unnecessary displacement of avifauna by ensuring that the rehabilitation of transformed areas is implemented by an appropriately qualified rehabilitation specialist, according to the recommendations of the biodiversity specialist study.	1. Develop a Habitat Rehabilitation Plan (HRP) and ensure that it is approved. 2. Monitor rehabilitation via site audits and site inspections to ensure compliance. Record and report any non-compliance.	1. Appointment of rehabilitation specialist to develop HRP. 2. Site inspections to monitor progress of HRP. 3. Adaptive management to ensure HRP goals are met.	1. Once-off 2. Once a year 3. As and when required	1. Facilities operator
Avifauna: Mortality of avifauna due to collision with the overhead 132kV power line					
Mortality of avifauna due to collisions with the overhead power line.	Reduction of avian collision mortality	1. Monitor the collision mortality on the power line. 2. Apply additional BFDs if additional collision hotspots are discovered.	1. Avifaunal specialist to conduct quarterly inspections of the power line for a period of two years. 2. Apply additional BFDs if additional collision hotspots are discovered.	1. Quarterly 2. As and when require	1. Facilities operator
Avifauna: Mortality of avifauna due to electrocution in the substations					
Mortality of avifauna due to electrocutions in the substation.	Reduction of avian electrocution mortality	1. Monitor the electrocution mortality in the substation. 3. Apply mitigation if electrocution happens regularly.	1. Regular inspections of the substation yard	1. Monthly	2. Facility operator

Table 20: Management Plan for the Decommissioning Phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
Avifauna: Displacement due to disturbance associated with the dismantling activities					
The noise and movement associated with the de-commissioning activities at the GRID CONNECTION footprint will be a source of disturbance which would lead to the displacement of avifauna from the area	Prevent unnecessary displacement of avifauna by ensuring that contractors are aware of the requirements of the EMPr.	A site-specific EMPr must be implemented, which gives appropriate and detailed description of how construction activities must be conducted. All contractors are to adhere to the EMPr and must apply good environmental practice during construction. The EMPr must specifically include the following: 1. No off-road driving. 2. Maximum use of existing roads. 3. Measures to control noise and dust according to latest best practice. 4. Restricted access to the rest of the property. 5. Strict application of all recommendations in the botanical specialist report pertaining to the limitation of the footprint.	**1.** Implementation of the EMPr. Oversee activities to ensure that the EMPr is implemented and enforced via site audits and inspections. Report and record any non-compliance. 2. Ensure that construction personnel are made aware of the impacts relating to off-road driving. 3. Access roads must be demarcated clearly. Undertake site inspections to verify. 4. Monitor the implementation of noise control mechanisms via site inspections and record and report non-compliance. 5. Ensure that the footprint area is demarcated and that construction personnel are made aware of these demarcations. Monitor via site inspections and report non-compliance.	1. On a daily basis 2. Monthly 3. Monthly 4. Monthly 5. Monthly	1. Contractor and ECO 2. Contractor and ECO 3. Contractor and ECO 4. Contractor and ECO 5. Contractor and ECO