AVIFAUNAL SPECIALIST REPORT

Basic Assessment

For the Proposed Development of the Igolide Wind Energy Facility Electrical Grid Infrastructure, near Fochville, Gauteng Province

Report prepared for:	*Report prepared by:*
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Executive Summary

ENERTRAG South Africa (Pty) Ltd is proposing to develop a 132kV switching station, a 132kV single or double circuit power line, and termination point upgrades (as may be necessary), including possible expansion, to allow for the proposed new 132kV power line connection (hereafter the "Project"). The Project is intended to feed the electricity generated by the approved 100MW Igolide Wind Energy Facility ("WEF") (DFFE reference number: 14/12/16/3/3/2/2385, EA date 31 January 2024) to the national energy grid, with the point of connection being the existing East Drie Five Substation.

The Project is located approximately 6km northeast of Fochville, within the Merafong City Local Municipality in the Gauteng Province. The entire extent of the Project is located within the Central Corridor of the Strategic Transmission Corridors.

The Project includes the following components:

- Construction of 1 x 132kV power line (either single or double circuit). A corridor of up to 250m in width (125m on either side of the centre line) has been identified for the placement of the up to 132kV single or double circuit power line to allow flexibility in the design of the final power line route, and for the avoidance of sensitive environmental features (where possible).
- Construction of 1 x 132kV switching station. The switching station assessment site is ~2.5ha as the switching station will be located adjacent to the approved 33/132kV on-site IPP substation (DFFE reference number: 14/12/16/3/3/2/2385), EA dated 31 January 2024) which was assessed as part of the Igolide WEF Environmental Authorisation process. A 500m buffer around the switching station has been identified to ensure flexibility in routing the power line. The switching station will include, but is not limited to:
    - A high voltage substation yard to allow for multiple 132kV feeder bays.
    - Standard substation electrical equipment, including but not limited to, busbars, office area, operation and control room, workshop and storage area, feeder bays, stringer strain beams, insulators, isolators, conductors, circuit breakers, lightning arrestors, relays, capacitor banks, batteries, wave trappers, switchyard, metering and indication instruments, equipment for carrier current, surge protection and outgoing feeders, as may be required.
    - Control building, telecommunication infrastructure, oil dam(s), etc.
    - Workshop and office area within the switching station footprint.
    - Fencing around the switching station.
    - All the access road infrastructure to and within the switching station.
    - Associated infrastructure, including but not limited to, lighting, fencing, and buildings required for operation (ablutions, office, workshop and control room, security fencing and gating, parking area, concrete batching plant (if required), waste storage/disposal and storerooms).
- Upgrading of the East Drie Five Substation to accommodate the power line from the Igolide WEF (feeder bay and transformer upgrade), including expansion within the yard, where required, with a footprint of up to 4ha. Standard substation infrastructure will include operation and control room, transformer oil dam, and standard substation electrical equipment (feeder bays, transformers, busbars, stringer strain beams, insulators, isolators, conductors, circuit breakers, lightning arrestors, relays, capacitor banks, batteries, wave/line trappers, switchyard, metering and indication instruments, equipment for carrier current, surge protection and outgoing feeders, as may be required).

This report serves as the Avifaunal Impact Assessment Report prepared as part of the Basic Assessment for the proposed Electrical Grid Infrastructure (EGI) Project.

Avifauna

A total of 307 species could potentially occur within the Broader Area where the Project Site is located (see **Appendix E**). Of these, 81 are classified as priority species for EGI developments (i.e. EGI sensitive species). Of the 81 EGI sensitive species, 40 have a medium to high likelihood of regular occurrence within the Project Area of Influence (PAOI). The PAOI was defined as a 2km zone around the proposed EGI.

Of the 81 EGI sensitive species, 18 were recorded during the on-site field surveys. Eleven (11) EGI sensitive species recorded in the Broader Area are also Species of Conservation Concern (SCC). Two (2) SCC were recorded during the on-site surveys, namely Secretarybird (Globally Endangered and Regionally Vulnerable) and Lanner Falcon (Regionally Vulnerable). There is also confirmed habitat for African Grass Owl (Regionally Vulnerable) within the PAOI.

Identification of Potential Impacts/Risks on EGI sensitive avifauna

The potential impacts identified during the study are listed below.

Construction Phase

- Total or partial displacement due to noise disturbance and habitat transformation associated with the construction of the EGI.

Operational Phase

- Total or partial displacement due to habitat transformation associated with the presence of the EGI.
- Electrocutions at the on-site substation and on the 132kV power line.
- Collisions with 132kV power line.

Decommissioning Phase

- Total or partial displacement due to disturbance associated with the decommissioning of the EGI.

Cumulative Impacts

- Total or partial displacement due to disturbance and habitat transformation associated with the construction and decommissioning of the EGI.
- Displacement due to habitat transformation associated with the presence of the EGI.
- Electrocutions at the on-site substation.
- Collisions with 132kV power line.

Sensitivities identified by the National Web-Based Environmental Screening Tool

The PAOI contains confirmed habitat for Species of Conservation Concern (SCC), primarily for African Grass Owl and Secretarybird (Globally Endangered and Regionally Vulnerable), 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). During the on-site surveys, two SCC were recorded.

These SCC were: Lanner Falcon (Regionally Vulnerable), and Secretarybird (Globally Endangered and Regionally Vulnerable).

Based on the Site Sensitivity Verification survey (conducted in April 2024) and the integrated pre-construction monitoring conducted at the associated authorised Igolide WEF (2020–2022), the classification of **High Sensitivity** for avifauna is advocated for the Igolide WEF Electrical Grid Infrastructure PAOI.

Specialist Sensitivity Analysis and Verification

- ***High Sensitivity***

Due to the potential presence of several EGI sensitive species, including SCC, which could utilise the whole PAOI and Broader Area, including the Igolide WEF EGI Development Area, for foraging, roosting, and nesting, the entire PAOI has been assessed to be a high sensitivity zone (**Figure 13, Section 5.6**) from a collision impact perspective and an electrocution risk perspective.

Collision Risk Zones:

Natural grassland. Development in the remaining natural grassland in the PAOI must be limited as far as possible. Where possible, infrastructure must be located near margins, with the shortest routes taken from the existing roads. The grassland is a potential breeding, roosting and foraging habitat for a variety of SCC. These include African Grass Owl (Globally Least Concern, Regionally Vulnerable), and Secretarybird (Globally Endangered, Regionally Vulnerable). The entire 132kV power line should be marked with Bird Flight Diverters according to the applicable Eskom Standard to reduce the risk of collisions.

There are **wetlands, dams, and drainage lines** within the PAOI. Wetlands (including dam margins) are important breeding, roosting and foraging habitat for a variety of Species of Conservation Concern (SCC), most notably for African Grass Owl (Regionally Vulnerable), Greater Flamingo (Regionally Near Threatened), Maccoa Duck (Globally Vulnerable, Regionally Near Threatened), and Yellow-billed Stork (Regionally Endangered). These SCC have all been recorded in the Broader Area through the Southern African Bird Atlas Project (SABAP2). It should also be noted that any road and/or grid line crossings across these features should be restricted to what is unavoidable. **EGI sensitive species moving between these habitat features would be at risk of colliding with the 132kV power line, therefore the entire 132kV power line should be marked with Bird Flight Diverters (BFDs) according to the applicable Eskom Standard**.

Electrocution Risk Zone:

Cape Vultures have been recorded in the Broader Area (SABAP2 Data). Cape Vultures would be at risk of electrocutions on the 132kV power line as they are large enough to bridge the gap between the live components of the power line. **A vulture-friendly pole design must be used to minimise the electrocution risk. The final pole design must be signed off by an avifaunal specialist**.

Impact Assessment Summary

The overall impact significance is provided in the table below, in terms of pre- and post-mitigation.

Executive Summary Table: Summary of avifaunal impact significances anticipated for the proposed Igolide WEF Electrical Grid Infrastructure (overall average of impacts per phase)

Phase	Overall Impact Significance (Pre-Mitigation)	Overall Impact Significance (Post Mitigation)
Construction	Moderate	Moderate
Operational	High	Moderate
Decommissioning	Moderate	Moderate

Conclusions

The proposed Igolide WEF Electrical Grid Infrastructure will have medium and high impacts on avifauna which, in most instances, could be reduced to a low impact through the appropriate mitigation measures. No fatal flaws were discovered. **The development is supported, provided the mitigation measures listed in this report (Section 7.7 and Appendix F) are strictly applied and adhered to. See Figure 13, Section 5.6 for a map of the avifaunal sensitivities.**

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List of Abbreviations

BLSA	BirdLife South Africa
DFFE	Department of Forestry, Fisheries and Environment
EGI	Electrical Grid Infrastructure
IUCN	International Union for the Conservation of Nature
NEMA	National Environmental Management Act 107 of 1998 (as amended)
PAOI	Project Area of Influence
REDZ	Renewable Energy Development Zone
S&EIA	Scoping and Environmental Impact Assessment
SABAP	Southern African Bird Atlas Project
SACNASP	South African Council for Natural and Scientific Professions
SANBI	South African National Biodiversity Institute
SCC	Species of Conservation Concern
WEF	Wind Energy Facility

Table 1: Definitions of key terminology in this impact assessment report

Definitions	
EGI (electrical grid infrastructure) sensitive species	**EGI sensitive species** were defined as follows: Species which could potentially be impacted by power line collisions or electrocutions (power line or substation yard), based on specific morphological and/or behavioural characteristics. Species classes which fall under these categories are raptors, large terrestrial birds, waterbirds, crows, and certain ground nesting birds (vulnerable to displacement due to disturbance/habitat loss.
Broader Area	The area encompassed by the four pentads where the Project Site is located.
Project Site	The area covered by the land parcels where the project will be located, totalling approximately 680 hectares. This is where the actual development will be located, i.e., the footprint containing the wind turbines and associated infrastructure.
Project Area of Impact (PAOI)	The primary impact zone of the electrical grid infrastructure, encompassing the project development footprint (where the 132kV power line and substations are located) and a 2km buffer around it.
Pentad	A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8 × 9 km.

1. Project Description

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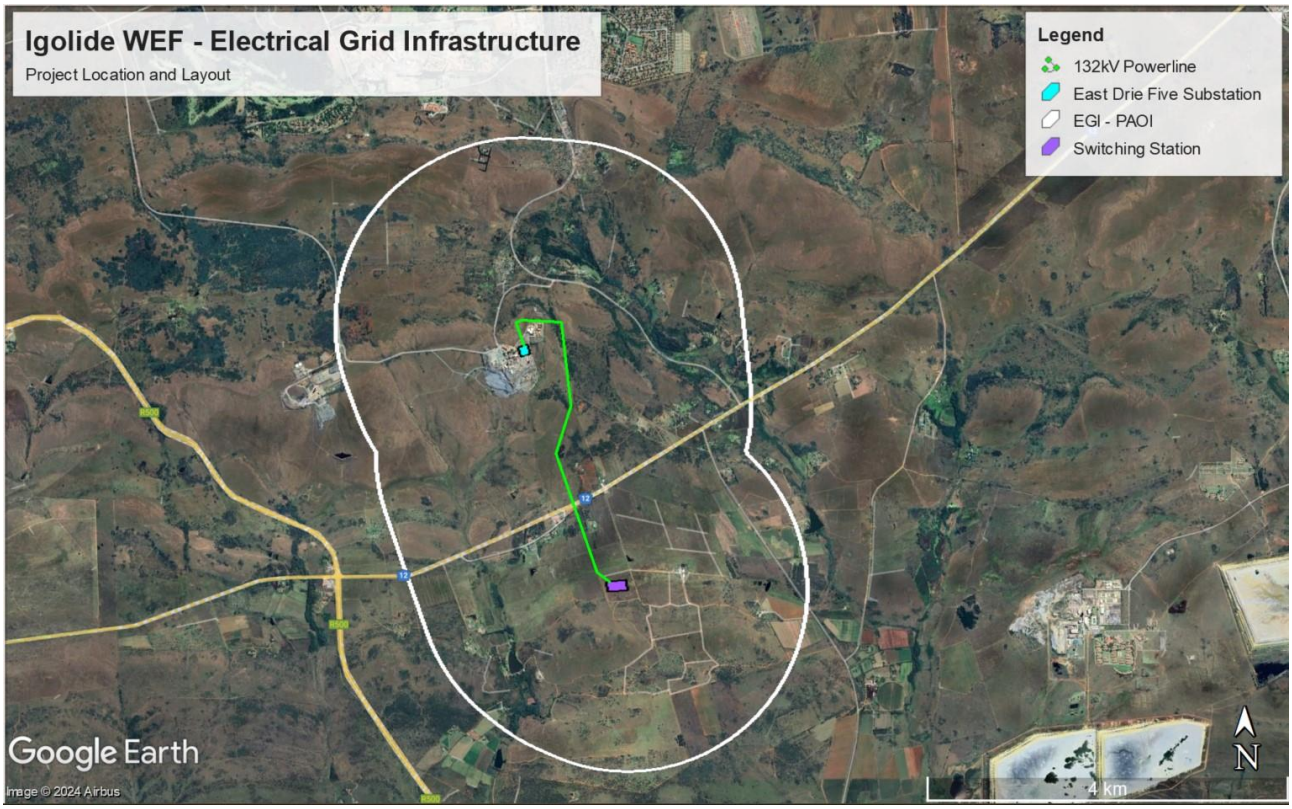

Figure 1: Igolide WEF – EGI Locality Map. Project Area of Influence (PAOI) outlined in white.

The key project details for the Igolide WEF Electrical Grid Infrastructure are in Table 2 below:

Table 2: Technical details for the Igolide WEF Electrical Grid Infrastructure.

Facility Name:	Igolide WEF Electrical Grid Infrastructure
Applicant:	ENERTRAG South Africa (Pty) Ltd
Municipalities:	Merafong City Local Municipality in the Gauteng Province of South Africa
132kV Power line (single or double circuit):	- Single or double circuit 132kV between the proposed switching station and the existing East Drie Five Substation. The power line design may include: o Intermediate self-supporting monopole; o Inline or angle-strain self-supporting monopole; o Suspension self-supporting monopole; o Triple pole structure; o Steel lattice structure; or o Similar power line design at 132kV specification. - The above designs may require anchors with guy-wires or be anchorless. For up to 132kV structures, concrete foundation sizes may vary depending on design type up to 80m^2, with depths reaching up to 3.5m typically in a rectangular 'pad' shape. - A working area of approximately 100m x 100m is needed for each of the proposed structures to be constructed. - Gridline length: approximately 4km - Height of power line: up to 40m - Width of gridline servitude: 32m

	A 250m wide corridor (125m on either side of the centre line) has been identified for the assessment and micro-siting of the power line to avoid sensitivities and ensure technical feasibility.
Switching Station:	- Development footprint (permanent infrastructure area): approximately 2.5ha as the switching station will be located adjacent to the approved 33/132kV on-site IPP substation (DFFE reference number: 14/12/16/3/3/2/2385), EA dated 31 January 2024) which was assessed as part of the Igolide WEF Environmental Authorisation process. - Capacity: 132kV - Standard substation electrical equipment, including, but not limited to, busbars, control building, telecommunication infrastructure, office area, operation and control room, workshop and storage area, feeder bays, stringer strain breams, insulators, arrestors, relays, capacitor banks, batteries, wave trappers, switchyard, metering and indication instruments, equipment for carrier current, surge protection and outgoing feeders, as may be required. - Associated infrastructure, including, but not limited to, lighting, fencing (~2m high), gating, parking area, and buildings required for operation (ablutions, office, workshop and control room, concrete batching plant (if required), waste storage/disposal and storerooms).
Termination Point Upgrades:	Upgrades to the existing East Drie Five Substation will also be required, including possible expansion within the yard, where required, with a footprint of up to 4ha. This includes the installation of additional feeder bays to accommodate the power being evacuated from the proposed Igolide WEF and transformer upgrades.
Access Roads:	- During construction, a permanent access road along the length of the power line corridor, between 4 – 6m wide will be established to allow for large crane movement. This track will then be utilised for maintenance during operation. - Permanent access roads to and within the substation, up to 8m wide, will be established.
Affected Farm Portion/s	- Portion 20 of Kraalkop 147 IQ - Portion 31 of Kraalkop 147 IQ - Portion 45 of Kraalkop 147 IQ - Porton 46 of Kraalkop 147 IQ - Portion 53 of Kralskop 147 IQ - Portion 68 of Kraalkop 147 IQ - Portion 11 of Leeuwpoort 356 IQ - Portion 77 of Leeuwpoort 356 IQ

2. Legislative Context

2.1.Agreements and Conventions

Table 3 below lists agreements and conventions which South Africa is party to, and which is directly relevant to the conservation of avifauna (BirdLife International 2021).

Table 3: below lists agreements and conventions which South Africa is party to, and which is relevant to the conservation of avifauna[1].

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 conservation community to establish coordinated conservation and management of migratory waterbirds throughout their entire migratory range.	Regional
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

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

Convention Name	Description	Geographic Scope
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

2.3. National Legislation

2.3.1. 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

(iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

2.3.2. The National Environmental Management Act 107 of 1998, as amended (NEMA)

The National Environmental Management Act 107 of 1998, as amended, (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 or basic 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.

The Protocol for the specialist assessment and minimum report content requirements for environmental impacts avifaunal species by onshore wind energy generation facilities where the electricity output is 20MW or more (Government Gazette No. 43110 – 20 March 2020) is applicable in the case of wind developments.

2.3.3. 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 (as amended) (NEMBA) 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.

2.3.4. Provincial Legislation

The current legislation applicable to the conservation of fauna and flora in Gauteng is the Gauteng Nature Conservation Bill, 2014. The purpose of the Bill is to provide for the sustainable utilization and protection of biodiversity within Gauteng; to provide for the protection of wild and the management of alien animals; protected plants; aquatic biota and aquatic systems; to provide for the protection of invertebrates and the management of alien invertebrates; to provide for professional hunters, hunting outfitters and trainers; to provide for the preservation of caves, cave formations, cave biota and karst systems; to provide for the establishment of zoos; to provide for the powers and establishment of Nature Conservators; to provide for administrative matters and general powers; and to provide for matters connected therewith.

3. Assumptions and Limitations

This study assumed that the sources of information used in this report are reliable. In this respect, the following must be noted:

- The SABAP2 data are regarded as an adequate indicator of the avifauna which could occur at the PAOI, and it was further supplemented by data collected during the on-site surveys.
- The focus of the study was on the potential impacts of the proposed EGI on EGI sensitive species.
- **EGI sensitive species** were defined as follows: Species which could potentially be impacted by power line collisions or electrocutions (power line or substation yard), based on specific morphological and/or behavioural characteristics. Species classes which fall under these categories are raptors, large terrestrial birds, waterbirds, crows, and certain ground nesting birds (vulnerable to displacement due to disturbance/habitat loss).
- Despite the growing body of peer reviewed literature investigating the collision risks of birds with overhead power lines in South Africa (Section 6), relevant information for many individual species remains limited. The precautionary principle was therefore applied throughout. The World Charter for Nature, which was adopted by the UN General Assembly in 1982, was the first international endorsement of the precautionary principle. The principle was implemented in an international treaty as early as the 1987 Montreal Protocol and, among other international treaties and declarations, is reflected in the 1992 Rio Declaration on Environment and Development. Principle 15 of the 1992 Rio Declaration states that: “to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall be not used as a reason for postponing cost-effective measures to prevent environmental degradation.”
- The assessment of impacts is based on the baseline environment as it currently exists at the PAOI.
- 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.
- The **Broader Area** is defined as the area encompassed by the four pentads where the project is located (**Figure 2**).
- The **Project Area of Impact** (PAOI) is defined as the area within a 2km radius of the EGI where the primary impacts on avifauna are expected.
- The **Project Site** is the where the actual development will be located, i.e., the footprint containing the EGI.

4. Description of Methodology

4.1. Scope and Objectives of This Specialist Input to The BA Report

The purpose of the report is to determine the main issues and potential impacts of the proposed project/s on avifauna, through a combination of desktop analysis and field work. The report was prepared to provide inputs to the Basic Assessment Report for the Project as required by the EIA Regulations promulgated in terms of the National Environmental Management Act 107 of 1998, as amended, (NEMA).

4.2. Details of Specialists

This specialist assessment has been undertaken by Albert Froneman and Megan Loftie-Eaton of AfriAvian Environmental (Formerly Chris van Rooyen Consulting). Albert Froneman is registered with the South African Council for Natural and Scientific Professions (SACNASP), with Registration Number 400177/09 in the field of Zoological Science. Megan Loftie-Eaton is also registered with SACNASP in the field of Ecology (Registration Number 135161). Curriculum Vitae are included in Appendix A of this specialist input report.

4.3. Terms of Reference

The terms of reference for this impact assessment report are as follows:

- Describe the affected environment from an avifaunal perspective
- Discuss gaps in baseline data and other limitations and describe the expected impacts associated with the EGI
- Identify potential sensitive environments and receptors that may be impacted on by the proposed EGI
- Determine the nature and extent of potential impacts
- Identify 'No-Go' areas, where applicable
- Identification and assessment of the potential impacts of the proposed EGI development on avifauna including cumulative impacts.
- Provision of sufficient mitigation measures to include in the Environmental Management Programme (EMPr).
- Conclusion with an impact statement whether the EGI is fatally flawed or may be authorised.

4.4.Approach and Methodology

The following methods were used to compile this report:

- Bird distribution data of the Second Southern African Bird Atlas (SABAP2) was obtained from the University of Cape Town, to ascertain which species occur within the Broader Area of four pentad grid cells within which the proposed Project is located (**Figure 2**). A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8 × 9 km. From 2007–present, a total of 551 full protocol lists (i.e., surveys of at least two hours each) have been completed for this area. In addition, 133 *ad hoc* protocol lists (i.e., surveys lasting less than two hours but still yielding valuable data) have been completed.
- **EGI sensitive species** were defined as follows: Species which could potentially be impacted by power line collisions or electrocutions (power line or substation yard), based on specific morphological and/or behavioural characteristics. Species classes which fall under these categories are raptors, large terrestrial birds, waterbirds, crows, and certain ground nesting birds (vulnerable to displacement due to disturbance/habitat loss).

- The national threatened status of all EGI sensitive 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 EGI sensitive species was determined by consulting the (2023) International Union for Conservation of Nature (IUCN) Red List of Threatened Species (http://www.iucnredlist.org/).
- A classification of the habitat in the PAOI was obtained from the First Atlas of Southern African Birds (SABAP1) (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 PAOI is the area where the primary impacts on avifauna are expected.
- 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 ©2023) was used to view the PAOI and Broader Area on a landscape level and to help identify sensitive bird habitat.
- The 2022 South Africa Protected Areas Database compiled by the Department of Environment, Forestry and Fisheries (DFFE) was used to identify Nationally Protected Areas, National Protected Areas Expansion Strategy (NPAES) near the PAOI (DFFE, 2022).
- The Department of Forestry, Fisheries, and the Environment (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 as far as habitat classes and the occurrence of EGI sensitive species are concerned was also considered.
- The following sources were used to determine the investigation protocol that is required for the site:
    - Protocol for the specialist assessment and minimum report content requirements for environmental impacts on avifaunal species by onshore wind energy generation facilities where the electricity output is 20MW or more (Government Gazette No. 43110–20 March 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 at the Igolide WEF Project Site during 2020–2022 over a period of four seasons. Four sets of surveys were conducted.

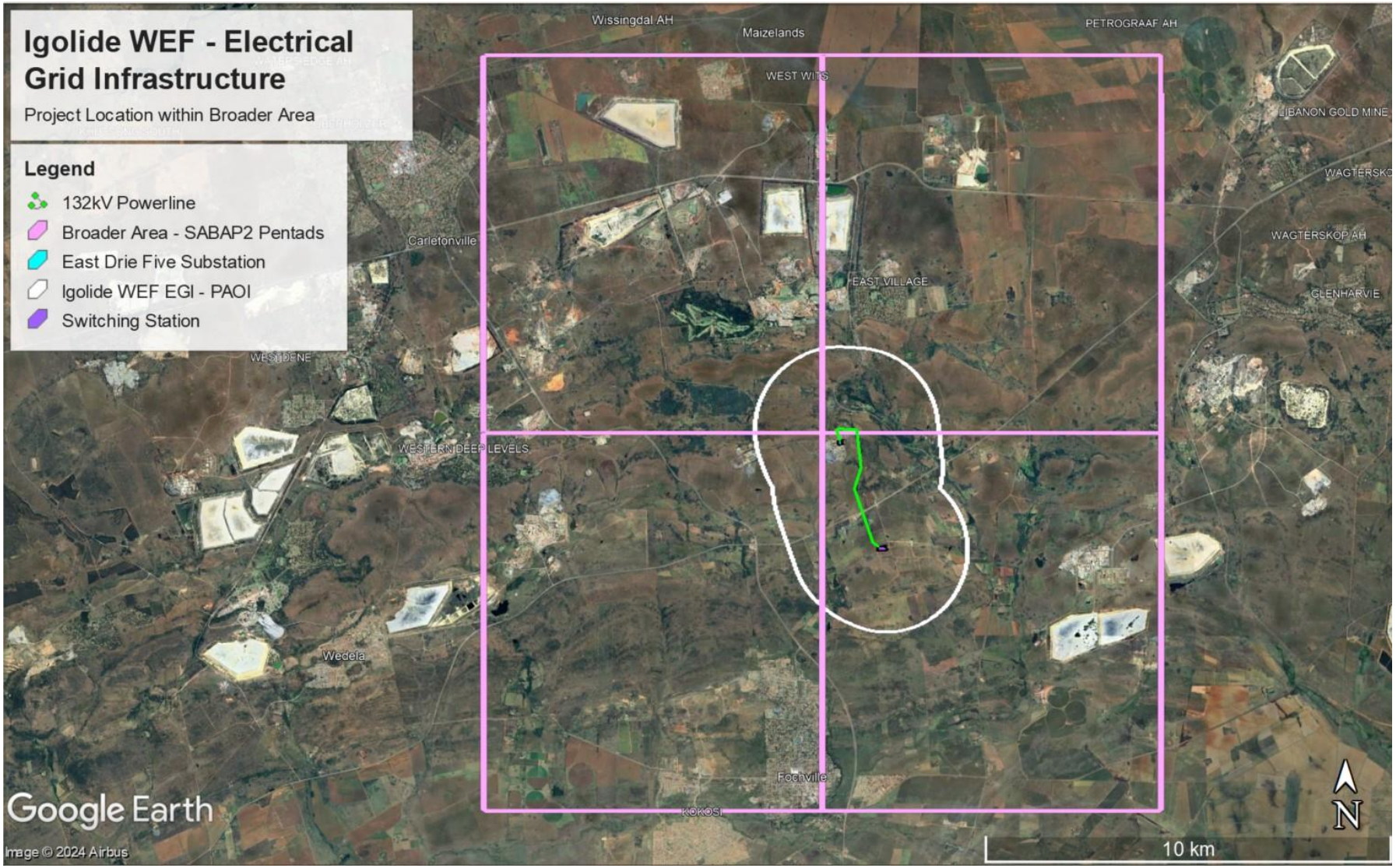

Figure 2: Project location within the four SABAP2 Pentads (the Broader Area).

4.5. Information Sources

The following data sources were used to compile this report:

Table 4: Data sources employed in the avifaunal impact assessment report for the proposed Igolide WEF Electrical Grid Infrastructure

Data / Information	Source	Date	Type	Description
South African Protected Areas Database (SAPAD)	Department of Forestry, Fisheries, and the Environment (DFFE)	2022, Q3	Spatial	Spatial delineation of protected areas in South Africa. Updated quarterly
First Atlas of Southern African Birds (SABAP1)	University of Cape Town	1987-1991	Spatial, reference	SABAP1, which took place from 1987-1991.
Second Southern African Bird Atlas Project (SABAP2)	University of Cape Town	May 2023	Spatial, database	SABAP2 is the follow-up project to the SABAP1. The second bird atlas project started on 1 July 2007 and is still growing. The project aims to map the distribution and relative abundance of birds in southern Africa.
National Vegetation Map	South African National Biodiversity Institute (SANBI) (BGIS)	2018	Spatial	The National Vegetation Map Project (VEGMAP) is a large collaborative project established to classify, map, and sample the vegetation of South Africa, Lesotho, and Swaziland.
Red Data Book of Birds of South Africa, Lesotho, and Swaziland	BirdLife South Africa	2015	Reference	The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland is an updated and peer-reviewed conservation status assessment of the 854 bird species occurring in South Africa undertaken in collaboration between BirdLife South Africa, the Animal Demography Unit of the University of Cape Town, and the SANBI.
IUCN Red List of Threatened Species (2023)	IUCN	2023	Online reference source	Established in 1964, the International Union for Conservation of Nature's Red List of Threatened Species is the world's most comprehensive information source on the global extinction risk status of animal, fungus, and plant species.
Important Bird and Biodiversity Areas of South Africa	BirdLife South Africa	2015	Reference work	Important Bird and Biodiversity Areas (IBAs), as defined by BirdLife International, constitute a global network of over 13 500 sites, of which 112 sites are found in South Africa. IBAs are sites of

Data / Information	Source	Date	Type	Description
				global significance for bird conservation, identified nationally through multi-stakeholder processes using globally standardized, quantitative, and scientifically agreed criteria.
Strategic Environmental Assessment for wind and solar photovoltaic energy in South Africa	Department of Environmental Affairs, 2015. Strategic Environmental Assessment for wind and solar photovoltaic energy in South Africa. CSIR Report Number: CSIR/CAS/EMS/ER/2015/0001/B. Stellenbosch.	2015	SEA	The SEA identifies areas where large scale wind and solar energy facilities can be developed in terms of Strategic Infrastructure Project (SIP) and in a manner that limits significant negative impacts on the natural environment, while yielding the highest possible socio-economic benefits to the country. These areas are referred to as Renewable Energy Development Zones (REDZs).
The National Screening Tool	Department of Forestry, Fisheries and Environment	March 2024	Spatial	The National Web based Environmental Screening Tool is a geographically based web-enabled application which allows a proponent intending to apply for environmental authorisation in terms of the Environmental Impact Assessment (EIA) Regulations 2014, as amended to screen their proposed site for any environmental sensitivity.
National Protected Areas and National Protected Areas Expansion Strategy (NPAES)	DFFE	2016	Spatial	The goal of NPAES is to achieve cost effective protected area expansion for ecological sustainability and adaptation to climate change. The NPAES sets targets for protected area expansion, provides maps of the most important areas for protected area expansion, and makes recommendations on mechanisms for protected area expansion.
Results of the pre-construction monitoring according to the best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa. Produced by the	AfriAvian Environmental	June 2020 – January 2022.		The data set consists of the results of the pre-construction monitoring conducted over four seasons between June 2020 and January 2022. Data was collected by means of transect counts, vantage point watches and focal point inspections

Data / Information	Source	Date	Type	Description
Wildlife & Energy Programme of the Endangered Wildlife Trust & BirdLife South Africa. Jenkins, A.R., Van Rooyen, C.S., Smallie, J.J., Anderson, M.D., & A.H. Smit. 2015.				

5. Description of Baseline Environment – including Sensitivity Mapping

5.1. Biomes and Vegetation Types

The PAOI is situated along an ecotone between the Savanna and Grassland Biomes but falls mainly within the Grassland Biome (Mucina & Rutherford 2006) (**Figure 3**). According to the 2018 SANBI Vegetation Map, the PAOI falls within the Central Bushveld Bioregion (northern half of PAOI) and the Mesic Highveld Grassland Bioregion (southern half of PAOI). The natural vegetation at the PAOI consists predominantly of Gauteng Shale Mountain Bushveld and Rand Highveld Grassland (**Figure 4**).

The typical landscape associated with Rand Highveld Grassland is highly variable, containing extensive sloping plains and a series of ridges slightly elevated over undulating surrounding plains. The vegetation is species-rich, wiry, sour grassland alternating with low, sour shrubland on rocky outcrops and steeper slopes. Most of the grasses on the plains belong to the genera *Themeda*, *Eragrostis*, *Heteropogon* and *Elionurus*. A high diversity of herbs, many of which belong to the Asteraceae, is also a typical feature. Rocky hills and ridges consist of open woodlands with *Protea caffra* subsp. *caffra*, *Protea welwitschii*, *Senegalia caffra* and *Celtis africana*, accompanied by a rich suite of shrubs among which the genus *Searsia* is most prominent (Mucina and Rutherford 2006). The Gauteng Shale Mountain Bushveld is represented by woody vegetation and a grass dominated herbaceous layer. Depending on local conditions, trees form semi-open to closed thickets or woodlands, and can range from short deciduous bush cover to a medium-tall +5m tree cover of mostly *Senegalia sp.* and *Vachellia sp.* trees.

Fochville, which is the closest town to the PAOI, has a temperate climate. Summers are warm and winters are cold and dry. The mean annual rainfall is around 600–800 mm, most of which falls in the summer months. The mean annual temperature is around 20C° (Schulze, 2009).

The First Southern African Bird Atlas Project (SABAP1) recognises six primary vegetation divisions (biomes) within South Africa, namely (1) Fynbos (2) Succulent Karoo (3) Nama Karoo (4) Grassland (5) Savanna and (6) Forest (Harrison *et al.* 1997). The criteria used by the authors to amalgamate botanically defined vegetation units, or to keep them separate were (1) the existence of clear differences in vegetation structure, likely to be relevant to birds, and (2) the results of published community studies on bird/vegetation associations. Using this classification system, the natural vegetation in the PAOI is classified as Grassland (Harrison *et al*. 1997).

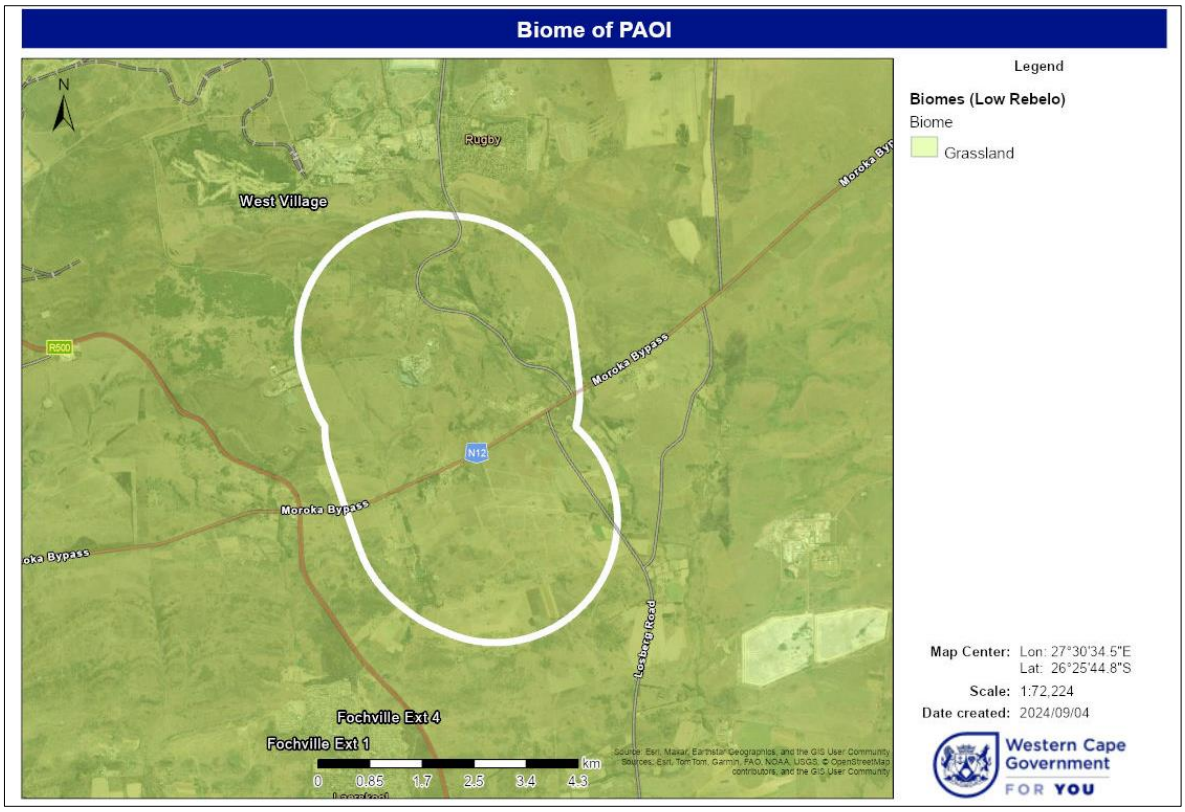

Figure 3: The Igolide WEF Electrical Grid Infrastructure PAOI (outlined in white) falls within the Grassland Biome.

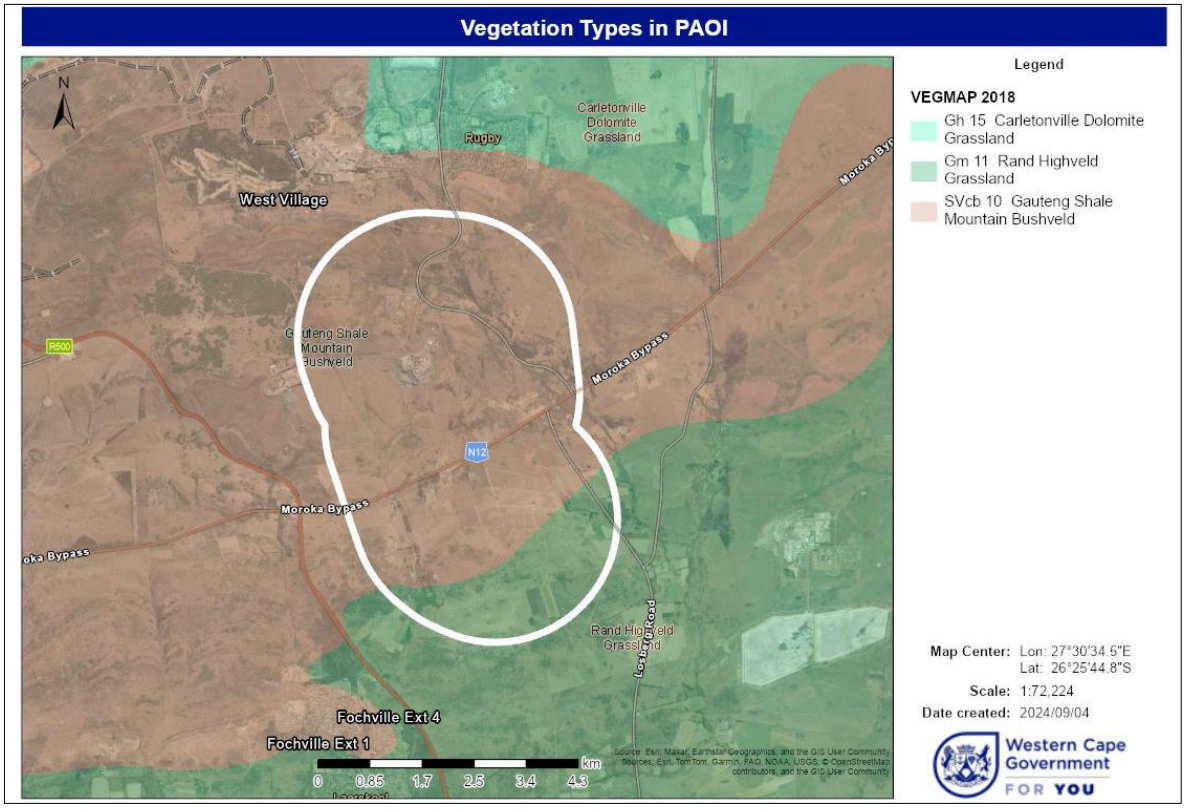

Figure 4: Vegetation Map of the Igolide WEF Electrical Grid Infrastructure PAOI (outlined in white).

5.2. Habitat Classes and Land-use within the PAOI

The proposed Igolide WEF Electrical Grid Infrastructure PAOI is situated on the gently undulating plains of the Gauteng Highveld countryside. The avian habitat features in the PAOI were identified as:

(i) Natural Grassland
(ii) Disturbed Grassland (including fallow agriculture fields)
(iii) Open Woodland
(iv) Drainage Lines and Wetlands
(v) Dams
(vi) Agriculture
(vii) High Voltage Power lines

5.2.1. Natural Grassland

This habitat feature is described above under Section 5.1 (**Figure 5**).

Figure 5: Natural Grassland habitat within the PAOI.

EGI sensitive species that could utilise this habitat are listed in Table 5 (Section 5.4).

5.2.2. Disturbed Grassland

The PAOI contains fallow land and old agricultural fields that have converted back to grassland. Vegetative composition is generally characterised by lower cover and is comprised of pioneer grass, forbs, and other herbaceous plant species. Avian use is generally limited to habitat generalist species.

Figure 6: Disturbed grassland habitat within the PAOI.

EGI sensitive species that could utilise this habitat are listed in Table 5 (Section 5.4).

5.2.3. Open Woodland

The PAOI contains Gauteng Shale Mountain Bushveld which is represented by woody vegetation (trees and shrubs) and a grass-dominated herbaceous layer (**Figure 7**). Depending on local conditions, trees form semi-open to closed thickets or woodlands, and can range from short deciduous bush cover to a medium-tall *Senegalia sp.* and *Vachellia sp.* trees.

Figure 7: Open woodland habitat within the PAOI.

EGI sensitive species that could utilise this habitat are listed in Table 5 (Section 5.4).

5.2.4. Drainage Lines and Wetlands

Drainage lines and wetlands are important habitats, especially for several EGI sensitive species. Raptors may also use these areas to hunt other bird species and the African Grass Owl could potentially be attracted to some of the grass in the wetland areas. There are drainage lines with associated wetlands and farm dams that transect the PAOI. The Broader Area also contains several drainage lines, seeps, and wetlands (**Figure 8**).

Figure 8: Drainage line within the PAOI.

EGI sensitive species that could utilise this habitat are listed in Table 5 (Section 5.4).

5.2.5. Dams

Surface water is important to several avifauna for drinking, bathing, and foraging. There are six dams located within or near the PAOI (**Figure 9**).

Figure 9: Large dam near the PAOI.

EGI sensitive species that could utilise this habitat are listed in Table 5 (Section 5.4).

5.2.6. Agriculture

Agricultural activity present within the PAOI comprises cultivated commercial annuals crops (DEA & DALRRD, 2020), predominately dedicated towards planted pastures (**Figure 10**). Avian species richness in these areas is likely to be low. However, periods of ploughing, seeding, and harvesting are likely to create foraging opportunities for certain avian species.

Figure 10: Agricultural activities, cultivated land, within the PAOI.

EGI sensitive species that could utilise this habitat are listed in Table 5 (Section 5.4).

5.2.7 High Voltage Power lines

High voltage power lines are present within the northern section of the PAOI (**Figure 11**). Birds often use HV power lines as perching and/or roosting sites, and some birds may even construct their nests on HV power line structures (e.g., Pied Crow).

Figure 11: High voltage overhead power line within the PAOI.

EGI sensitive species that could utilise this habitat are listed in Table 5 (Section 5.4).

5.3. Protected areas in/around the PAOI

5.3.1. Important Bird Areas (IBAs)

The PAOI does not fall within an Important Bird Area (IBA). The closest IBA, the Suikerbosrand Nature Reserve (SA022), lies 63km east of the Igolide WEF Electrical Grid Infrastructure PAOI. It is not expected that the avifauna in the Suikerbosrand Nature Reserve (SA022) will be impacted by the development due to the distance from the PAOI.

5.3.2. National Protected Areas and National Protected Areas Expansion Strategy (NPAES) Focus Areas

The PAOI does not fall within a protected area or an NPAES focus area.

5.3.3. The Renewable Energy Development Zones (REDZ)

The PAOI is not located in a REDZ.

5.4. Avifauna within the PAOI

A total of 307 species could potentially occur within the Broader Area where the Project Site is located (see **Appendix E**). Of these, 81 are classified as priority species for EGI developments (i.e. EGI sensitive species). Of the 81 EGI sensitive species, 40 have a medium to high likelihood of regular occurrence within the Project Area of Influence (PAOI). The PAOI was defined as a 2km zone around the proposed EGI.

Of the 81 EGI sensitive species, 18 were recorded during the on-site field surveys. Eleven (11) EGI sensitive species recorded in the Broader Area are also Species of Conservation Concern (SCC). Two (2) SCC were recorded during the on-site surveys, namely Secretarybird (Globally Endangered and Regionally Vulnerable) and Lanner Falcon (Regionally Vulnerable). There is also confirmed habitat for African Grass Owl (Regionally Vulnerable) within the PAOI.

See **Appendix E** for a list of species potentially occurring within the Broader Area. The likelihood of EGI sensitive species occurring in the PAOI, habitat classes, and potential long-term impacts of the proposed EGI are listed in **Table 5** below.

Table 5: EGI sensitive species which could occur in the PAOI, habitat classes within the PAOI, and the potential impacts of the EGI Project on avifauna.

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

Species Name	Scientific Name	SABAP2 Reporting Rate %		Global Conservation Status	Regional Conservation Status	Recorded During Monitoring	Likelihood Of Regular Occurrence	Natural Grassland	Disturbed Grassland	Open Woodland	Drainage Lines and Wetlands	Dams	Agriculture	HV Lines	Displacement - Habitat Transformation	Displacement - Disturbance (Breeding)	Electrocution - Substation	Electrocution - 132kv Power Line	Collision – 132kV Power Line
		Full Protocol	Ad Hoc Protocol																
Abdim's Stork	*Ciconia abdimii*	0,00	0,75	-	NT		L	x				x	x						x
African Black Duck	*Anas sparsa*	21,60	1,50	-	-	x	H				x	x							x
African Darter	*Anhinga rufa*	28,31	0,75	-	-		H				x	x							x
African Fish Eagle	*Haliaeetus vocifer*	1,45	0,75	-	-		M				x	x					x		
African Grass Owl	*Tyto capensis*	0,00	0,75	-	VU		L	x			x				x	x	x		x
African Harrier-Hawk	*Polyboroides typus*	0,73	0,75	-	-		L			x		x			x	x	x		
African Hawk-eagle	*Aquila spilogaster*	0,36	0,00	-	-		L			x		x			x		x		
African Sacred Ibis	*Threskiornis aethiopicus*	26,32	3,01	-	-	x	H				x	x	x				x		x
African Spoonbill	*Platalea alba*	7,08	0,75	-	-		M				x	x							x
African Swamphen	*Porphyrio madagascariensis*	6,72	1,50	-	-		M				x	x							
Amur Falcon	*Falco amurensis*	1,63	2,26	-	-	x	M	x	x				x	x	x		x		
Black Harrier	*Circus maurus*	0,18	0,00	EN	EN		L	x							x		x		
Black Heron	*Egretta ardesiaca*	0,73	0,75	-	-		L				x	x							x
Black Kite	*Milvus migrans*	0,00	0,75	-	-		L			x		x	x		x	x	x		
Black Sparrowhawk	*Accipiter melanoleucus*	1,45	0,00	-	-	x	M			x					x	x	x		
Black-chested Snake Eagle	*Circaetus pectoralis*	0,18	0,00	-	-		L	x	x	x		x	x	x	x	x	x		
Black-crowned Night Heron	*Nycticorax nycticorax*	2,36	0,75	-	-		L				x	x							x

Species Name	Scientific Name	SABAP2 Reporting Rate %		Global Conservation Status	Regional Conservation Status	Recorded During Monitoring	Likelihood Of Regular Occurrence	Natural Grassland	Disturbed Grassland	Open Woodland	Drainage Lines and Wetlands	Dams	Agriculture	HV Lines	Displacement - Habitat Transformation	Displacement - Disturbance (Breeding)	Electrocution - Substation	Electrocution - 132kv Power Line	Collision – 132kV Power Line
		Full Protocol	Ad Hoc Protocol																
Black-headed Heron	*Ardea melanocephala*	30,31	1,50	-	-	x	H	x	x		x	x	x				x		x
Black-winged Kite	*Elanus caeruleus*	47,19	13,53	-	-	x	H	x	x	x			x	x	x	x	x		
Blue-billed Teal	*Spatula hottentota*	0,18	0,00	-	-		L				x	x							x
Booted Eagle	*Hieraaetus pennatus*	0,36	0,75	-	-		L	x	x	x		x		x	x		x		
Cape Shoveler	*Spatula smithii*	0,36	0,75	-	-		L				x	x							x
Cape Teal	*Anas capensis*	0,00	0,75	-	-	x	L				x	x							x
Cape Vulture	*Gyps coprotheres*	0,18	0,00	VU	EN		L	x	x	x		x		x	x		x	x	x
Common Buzzard	*Buteo buteo*	7,80	2,26	-	-	x	M	x	x	x		x	x	x	x		x		
Common Moorhen	*Gallinula chloropus*	66,79	2,26	-	-		H				x	x							
Egyptian Goose	*Alopochen aegyptiaca*	51,36	4,51	-	-		H				x	x	x	x			x		x
European Honey-buzzard	*Pernis apivorus*	0,91	0,00	-	-		L	x	x				x	x			x		
Gabar Goshawk	*Micronisus gabar*	5,99	0,00	-	-		M	x	x				x	x			x		
Glossy Ibis	*Plegadis falcinellus*	22,69	1,50	-	-		H				x	x							x
Goliath Heron	*Ardea goliath*	0,36	0,75	-	-		L				x	x							x
Great Crested Grebe	*Podiceps cristatus*	0,00	0,75	-	-		L				x	x							x
Great Egret	*Ardea alba*	0,91	0,75	-	-		L				x	x							x
Greater Flamingo	*Phoenicopterus roseus*	0,00	0,75	-	NT		L					x							x
Greater Kestrel	*Falco rupicoloides*	1,09	0,75	-	-		L	x	x					x	x	x	x		
Grey Heron	*Ardea cinerea*	13,79	0,75	-	-		H				x	x							x

Species Name	Scientific Name	SABAP2 Reporting Rate %		Global Conservation Status	Regional Conservation Status	Recorded During Monitoring	Likelihood Of Regular Occurrence	Natural Grassland	Disturbed Grassland	Open Woodland	Drainage Lines and Wetlands	Dams	Agriculture	HV Lines	Displacement - Habitat Transformation	Displacement - Disturbance (Breeding)	Electrocution - Substation	Electrocution - 132kv Power Line	Collision – 132kV Power Line
		Full Protocol	Ad Hoc Protocol																
Hadada Ibis	*Bostrychia hagedash*	94,74	14,29	-	-		H	x	x		x	x	x				x		x
Hamerkop	*Scopus umbretta*	19,24	1,50	-	-		H				x	x					x		x
Helmeted Guineafowl	*Numida meleagris*	82,03	14,29	-	-	x	H	x	x				x				x		
Indian Peafowl	*Pavo cristatus*	0,36	1,50	-	-		L		x				x				x		x
Intermediate Egret	*Ardea intermedia*	0,18	0,75	-	-		L				x	x							x
Jackal Buzzard	*Buteo rufofuscus*	0,54	0,75	-	-		L	x	x	x		x	x	x	x	x	x		
Lanner Falcon	*Falco biarmicus*	0,36	0,75	-	VU	x	M	x	x	x		x	x	x	x	x	x		
Lesser Kestrel	*Falco naumanni*	1,27	0,00	-	-		L	x	x				x	x	x		x		
Little Egret	*Egretta garzetta*	9,26	0,75	-	-		M				x	x							x
Little Grebe	*Tachybaptus ruficollis*	39,02	1,50	-	-		H				x	x							x
Little Sparrowhawk	*Accipiter minullus*	1,45	0,75	-	-		L	x	x								x		
Long-crested Eagle	*Lophaetus occipitalis*	0,73	0,75	-	-		L	x		x		x		x	x	x	x		
Maccoa Duck	*Oxyura maccoa*	0,00	0,75	EN	NT		L				x	x							x
Mallard	*Anas platyrhynchos*	47,91	0,75	-	-		H				x	x							x
Marsh Owl	*Asio capensis*	1,27	1,50	-	-	x	M	x			x				x	x	x		x
Martial Eagle	*Polemaetus bellicosus*	0,00	0,75	EN	EN		L	x	x	x		x		x	x		x		
Northern Black Korhaan	*Afrotis afraoides*	54,08	4,51	-	-	x	H	x	x						x	x			x
Ovambo Sparrowhawk	*Accipiter ovampensis*	1,81	0,75	-	-		L			x							x		
Pale Chanting Goshawk	*Melierax canorus*	3,81	0,75	-	-	x	M	x	x	x		x		x	x	x	x		

Species Name	Scientific Name	SABAP2 Reporting Rate %		Global Conservation Status	Regional Conservation Status	Recorded During Monitoring	Likelihood Of Regular Occurrence	Natural Grassland	Disturbed Grassland	Open Woodland	Drainage Lines and Wetlands	Dams	Agriculture	HV Lines	Displacement - Habitat Transformation	Displacement - Disturbance (Breeding)	Electrocution - Substation	Electrocution - 132kv Power Line	Collision – 132kV Power Line
		Full Protocol	Ad Hoc Protocol																
Pied Crow	*Corvus albus*	57,53	14,29	-	-	x	H		x				x	x			x		
Purple Heron	*Ardea purpurea*	25,77	1,50	-	-		H				x	x							x
Red-billed Teal	*Anas erythrorhyncha*	21,42	1,50	-	-		H				x	x							x
Red-knobbed Coot	*Fulica cristata*	69,33	3,01	-	-		H				x	x							x
Reed Cormorant	*Microcarbo africanus*	66,79	3,76	-	-		H				x	x							x
Rock Kestrel	*Falco rupicolus*	0,36	0,75	-	-		L	x	x					x			x		
Secretarybird	*Sagittarius serpentarius*	0,18	0,00	EN	VU	x	L	x	x	x		x			x	x			x
Shikra	*Accipiter badius*	0,18	0,75	-	-		L			x	x						x		
South African Shelduck	*Tadorna cana*	4,54	0,75	-	-	x	M				x	x							x
Southern Pochard	*Netta erythrophthalma*	0,36	0,75	-	-		L				x	x							x
Spotted Eagle-Owl	*Bubo africanus*	11,98	0,75	-	-	x	H	x	x	x		x	x		x	x	x		x
Spur-winged Goose	*Plectropterus gambensis*	19,24	0,75	-	-		H				x	x	x						x
Squacco Heron	*Ardeola ralloides*	3,45	0,75	-	-		L				x	x							x
Striated Heron	*Butorides striata*	2,72	0,00	-	-		L				x	x							x
Verreaux's Eagle	*Aquila verreauxii*	3,09	2,26	-	VU		L	x	x	x		x		x	x		x		
Verreaux's Eagle-Owl	*Bubo lacteus*	0,00	0,75	-	-		L			x		x			x	x	x		
Western Barn Owl	*Tyto alba*	9,80	0,75	-	-		M	x	x				x				x		x
Western Cattle Egret	*Bubulcus ibis*	61,71	9,02	-	-		H	x	x				x				x		x
Western Osprey	*Pandion haliaetus*	0,18	0,75	-	-		L					x					x		

Species Name	Scientific Name	SABAP2 Reporting Rate %		Global Conservation Status	Regional Conservation Status	Recorded During Monitoring	Likelihood Of Regular Occurrence	Natural Grassland	Disturbed Grassland	Open Woodland	Drainage Lines and Wetlands	Dams	Agriculture	HV Lines	Displacement - Habitat Transformation	Displacement - Disturbance (Breeding)	Electrocution - Substation	Electrocution - 132kv Power Line	Collision – 132kV Power Line
		Full Protocol	Ad Hoc Protocol																
White Stork	*Ciconia ciconia*	1,63	1,50	-	-	x	M	x	x				x		x				x
White-backed Duck	*Thalassornis leuconotus*	0,00	0,75	-	-		L				x	x							x
White-breasted Cormorant	*Phalacrocorax lucidus*	6,53	0,75	-	-		M				x	x							x
White-faced Whistling Duck	*Dendrocygna viduata*	8,35	2,26	-	-		M				x	x							x
Yellow-billed Duck	*Anas undulata*	61,71	3,01	-	-		H				x	x							x
Yellow-billed Kite	*Milvus aegyptius*	0,18	0,75	-	-		L	x	x				x	x			x		
Yellow-billed Stork	*Mycteria ibis*	0,00	0,75	-	EN		L				x	x							x

5.5. Identification of Environmental Sensitivities

The PAOI and immediate environment is classified as **Medium Sensitivity** for bird species according to the Animal Species Theme (**Figure 12**). The Medium sensitivity classification is linked to the potential occurrence of African Grass Owl *Tyto capensis* (Regionally Vulnerable), White-bellied Bustard *Eupodotis senegalensis* (Regionally Vulnerable), and Caspian Tern *Hydroprogne caspia* (Regionally Vulnerable).

The PAOI contains confirmed habitat for Species of Conservation Concern (SCC), primarily for African Grass Owl and Secretarybird (Globally Endangered and Regionally Vulnerable), 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). During the on-site surveys, two SCC were recorded. These SCC were: Lanner Falcon (Regionally Vulnerable), and Secretarybird (Globally Endangered and Regionally Vulnerable).

Based on the Site Sensitivity Verification survey (conducted in April 2024) and the integrated pre-construction monitoring conducted at the associated authorised Igolide WEF (2020–2022), the classification of **High Sensitivity** for avifauna is advocated for the Igolide WEF Electrical Grid Infrastructure PAOI.

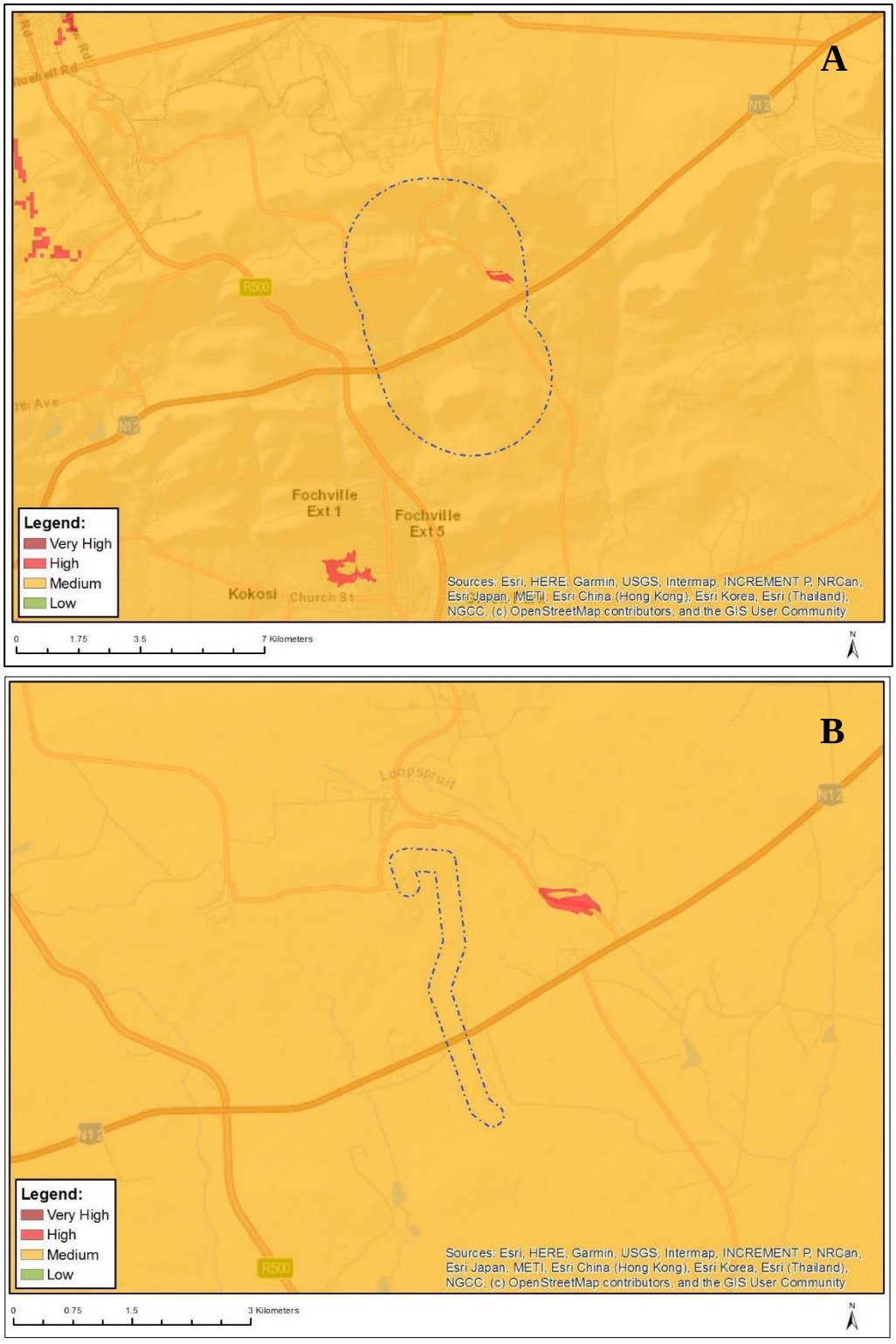

Figure 12: The National Web-Based Environmental Screening Tool map of the PAOI (A) and the Grid Corridor only (B), indicating sensitivities for the Animal Species Theme. The Medium sensitivity classification is linked to African Grass Owl *Tyto capensis*, White-bellied Bustard *Eupodotis senegalensis*, and Caspian Tern *Hydroprogne caspia*.

5.6. Specialist Sensitivity Analyses and Verification

5.6.1. High Sensitivity

Due to the potential presence of several EGI sensitive species, including SCC, which could utilise the whole PAOI and Broader Area, including the Igolide WEF EGI Development Area, for foraging, roosting, and nesting, the entire PAOI has been assessed to be a **High Sensitivity** zone (**Figure 13**) from a collision impact perspective and an electrocution risk perspective. Although the PAOI is classified as High sensitivity it is not considered a No-Go zone, however, the mitigation measures as outlined in this report should be strictly implemented (**Section 7.7 and Appendix F**).

Collision Risk Zones:

Natural grassland. Development in the remaining natural grassland in the PAOI must be limited as far as possible. Where possible, infrastructure must be located near margins, with the shortest routes taken from the existing roads. The grassland is a potential breeding, roosting and foraging habitat for a variety of SCC. These include African Grass Owl (Globally Least Concern, Regionally Vulnerable), and Secretarybird (Globally Endangered, Regionally Vulnerable). The entire 132kV power line should be marked with Bird Flight Diverters according to the applicable Eskom Standard to reduce the risk of collisions.

There are **wetlands, dams, and drainage lines** within the PAOI. Wetlands (including dam margins) are important breeding, roosting and foraging habitat for a variety of Species of Conservation Concern (SCC), most notably for African Grass Owl (Regionally Vulnerable), Greater Flamingo (Regionally Near Threatened), Maccoa Duck (Globally Vulnerable, Regionally Near Threatened), and Yellow-billed Stork (Regionally Endangered). These SCC have all been recorded in the Broader Area through the Southern African Bird Atlas Project (SABAP2). It should also be noted that any road and/or grid line crossings across these features should be restricted to what is unavoidable. **EGI sensitive species moving between these habitat features would be at risk of colliding with the 132kV power line, therefore the entire 132kV power line should be marked with Bird Flight Diverters (BFDs) according to the applicable Eskom Standard**.

Electrocution Risk Zones:

Cape Vultures have been recorded in the Broader Area (SABAP2 Data). Cape Vultures would be at risk of electrocutions on the 132kV power line as they are large enough to bridge the gap between the live components of the power line. **A vulture-friendly pole design must be used to minimise the electrocution risk. The final pole design must be signed off by an avifaunal specialist.**

Figure 13 below is a sensitivity map, indicating sensitivity areas identified for development.

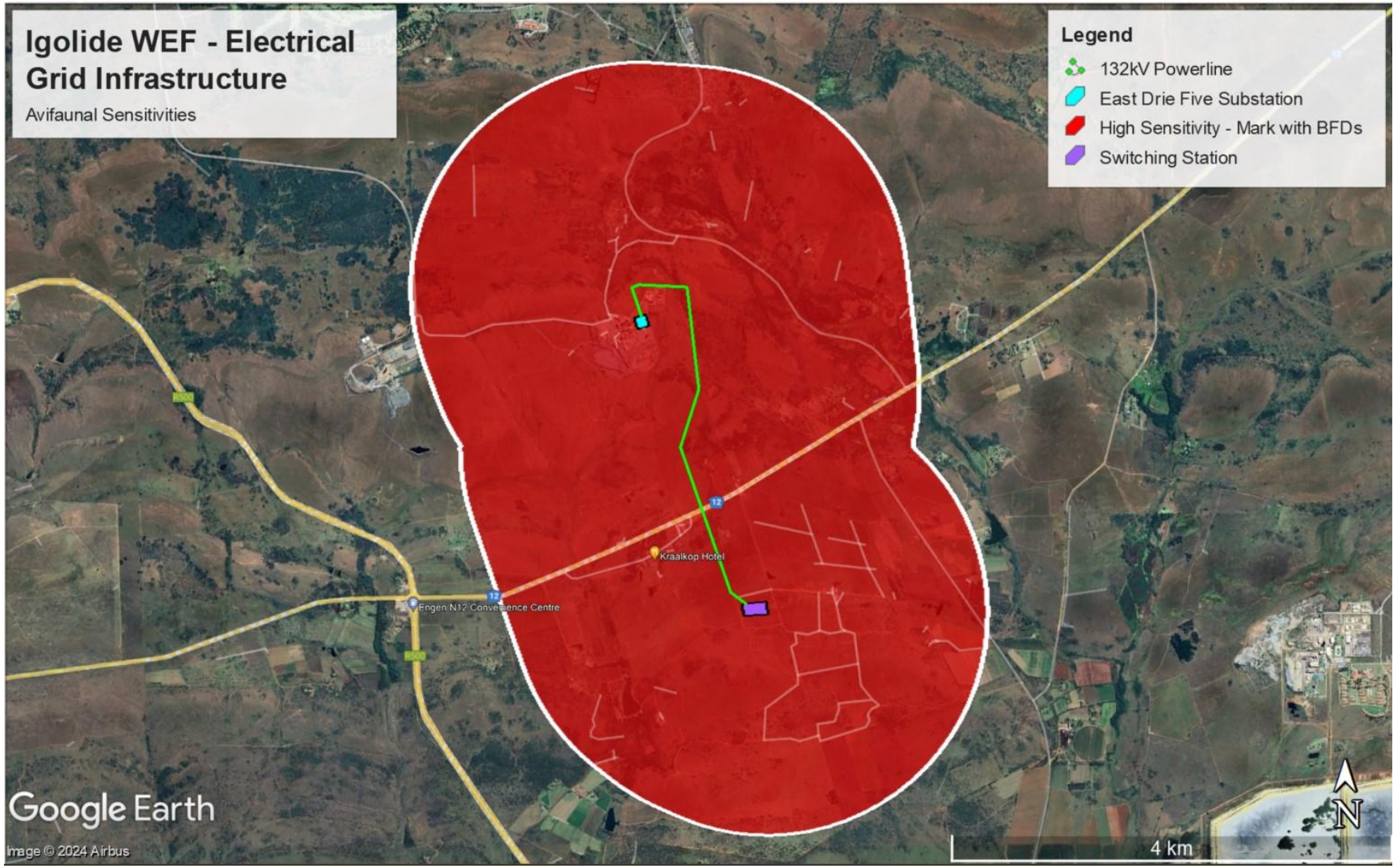

Figure 13: Avifaunal Sensitivities Map for the Igolide WEF Electrical Grid Infrastructure. The entire PAOI is considered a high sensitivity zone from a collision impact and electrocution impact perspective. BFD = Bird Flight Diverters.

5.7. Sensitivity Analysis Summary Statement

Based on the Site Sensitivity Verification survey and the integrated pre-construction monitoring conducted at the associated WEF, a classification of **High sensitivity** for avifauna is suggested for the EGI PAOI. Although the PAOI is classified as High sensitivity it is not considered a No-Go zone, however, the mitigation measures as outlined in this report should be strictly implemented (**Section 7.7 and Appendix F**).

6. Identification of Impacts

The potential impacts identified during the study are listed below.

6.1 Construction Phase

- Total or partial displacement due to noise disturbance and habitat transformation associated with the construction of the EGI.

6.2 Operational Phase

- Total or partial displacement due to habitat transformation associated with the presence of the EGI.
- Electrocutions at the on-site substation and on the 132kV power line.
- Collisions with 132kV power line.

6.3 Decommissioning Phase

- Total or partial displacement due to disturbance associated with the decommissioning of the EGI.

6.4 Cumulative Impacts

- Total or partial displacement due to disturbance and habitat transformation associated with the construction and decommissioning of the EGI.
- Displacement due to habitat transformation associated with the presence of the EGI.
- Electrocutions at the on-site substation.
- Collisions with 132kV power line.

7. Impact Assessment

It should be noted that environmental impact assessments are localised to the present-day pre-construction conditions of a given development site. Impacts on the regional landscape are not considered as the extent and nature of future developments are unknown at this stage. It is**,** however**,** highly unlikely that the land use will change in the near future due to climatic limitations.

7.1. Construction Phase: displacement due to disturbance associated with the construction of the EGI.

Construction activities 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. As far as EGI sensitive species are concerned, terrestrial species and raptors are most likely to be affected by displacement due to disturbance associated with the construction of the proposed power lines and substations.

Beyond the increased mortality risks to local bird populations posed by such infrastructure, the resulting habitat fragmentation can degrade adjacent habitats, potentially changing the way birds interact within the immediate environment (Fletcher et al., 2018). Lane et al. (2001) noted that Great Bustard *Otis tarda* flocks in Spain were significantly larger further from power lines than at control points. Shaw (2013) found that Ludwig's Bustard *Neotis ludwigii* 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 Gauteng (in that case by afforestation) has had a detrimental impact on the densities and diversity of grassland species (Allan et al., 1997).

The species that could be most affected by this impact are listed in **Table 5 (Section 5.4).** The recommended mitigation measures are detailed in Table 8 in Section 7.7 below.

7.2. Operational Phase: total or partial displacement of avifauna due to habitat transformation associated with the construction and operation of the EGI.

This impact relates to the total or partial displacement of avifauna due to habitat transformation associated with the presence of the EGI. This impact is rated as negative, with a site-specific spatial extent and a long-term duration due to the extended timeframe of the operational phase (lifetime estimated at 20 years).

The displacement of birds away from areas in and around EGI due to visual intrusion and airspace disturbance can be considered functional habitat loss. This disturbance can be detrimental to migratory bird populations if EGI disrupts migration routes (Marques et al., 2020, 2021).

During the construction of 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, OHL, and service road);
- Transportation of personnel, construction material and equipment to the site, and personnel away from the site;
- Removal of vegetation for the proposed substation and stockpiling of topsoil and cleared vegetation;
- Excavations for infrastructure;

These activities could impact on birds breeding, foraging, and roosting in or in close proximity of the proposed on-site substation through transformation of habitat, which could result in temporary or permanent displacement of a range of species. 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 substation yard is unavoidable.

The potential impact is allocated a medium impact magnitude and highly likely probability, which will render the impact significance as moderate without the implementation of mitigation measures. With the implementation of mitigation measures, the significance of the impact is reduced to low.

The species that could be most affected by this impact are listed in **Table 5 (Section 5.4).** The recommended mitigation measures are detailed in **Table 8 in Section 7.7** below.

7.3. Operational Phase: electrocution of EGI sensitive species in the on-site substations and on the 132kV power line

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 voltage size of the proposed power line and the pole/tower design.

If the proposed power lines are constructed at a voltage of 132kV, using the steel lattice or standard steel monopole structure, the significance of the electrocution impact on most EGI sensitive species will be low. The only EGI sensitive species capable of bridging the clearance distances of the proposed power line infrastructure at this voltage are vultures. Cape Vultures have been recorded in and near the PAOI. The impact of electrocutions of Cape Vultures, a wide-ranging species, would have a regional extent and very high consequence due to the vulnerability (slow breeding) of the Cape Vulture population. Since the PAOI is frequented by other wide-ranging birds and regional migrants that may be electrocuted when moving through the area and perching on these power lines, this impact would have a regional extent.

Electrocutions within the proposed substations are possible, however, the likelihood of this impact on the more sensitive Red List EGI sensitive species is remote, as these species are unlikely to regularly utilise the infrastructure within the substation yard for perching or roosting. The hardware within the proposed substation yard is too complex to warrant any mitigation for electrocution at this stage. It is recommended that if on-going impacts are recorded once operational, site-specific mitigation (insulation of live components) be applied reactively. This is an acceptable approach because Red List EGI sensitive species are unlikely to frequent the substation and be electrocuted.

The potential impact is allocated a severe consequence and high probability, which will result in a high impact significance, without the implementation of mitigation measures. With the implementation of mitigation measures (i.e., reactive insulation of electrical hardware and a vulture friendly pole design), the significance of the impact is reduced to low.

The raptors that could be most affected by this impact are listed in **Table 5 (Section 5.4).** The recommended mitigation measures are detailed in **Table 8 in Section 7.7** below.

7.4. Operational Phase: collisions of EGI sensitive species with 132kV power line

Overhead line collisions are arguably the greatest threat posed by overhead 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 (Shaw et al., 2010; van Rooyen, 2004). 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).

Power line collisions are generally accepted as a key threat to bustards (Barrientos et al., 2012; Jenkins et al., 2010; Raab et al., 2009, 2011; Shaw, 2013). In one study, carcass surveys were performed under high voltage transmission lines in the Karoo for two years, and low voltage distribution lines for one year (Shaw, 2013). Ludwig's Bustard *Neotis ludwigii* was the most common collision victim (69% of carcasses), with bustards generally comprising 87% of mortalities recovered. Karoo Korhaan *Eupodotis vigorsii* was also recorded, but to a much lesser extent than Ludwig's Bustard. The reasons for the relatively low collision risk of this species probably include their smaller size (and hence greater agility in flight) as well as their more sedentary lifestyles, as local birds are familiar with their territory and are less likely to collide with power lines (Shaw, 2013).

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 400kV transmission lines near Hydra substation in the Karoo (Shaw et al., 2018). Marking was highly effective for Blue Cranes *Grus paradisea*, 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., 2018).

The potential impact is allocated a severe consequence and high probability, which will result in a high impact significance, without the implementation of mitigation measures. With the implementation of mitigation measures (i.e., marking the line with Bird Flight Diverters), the significance of the impact is reduced to moderate.

The species that could be most affected by this impact are listed in **Table 5 (Section 5.4)**. The recommended mitigation measures are detailed in **Table 8 in Section 7.7** below.

7.5. Decommissioning Phase: displacement due to disturbance associated with the decommissioning of the EGI.

The noise and movement associated with the potential decommissioning activities will be a source of disturbance which would lead to the displacement of avifauna from the area. This impact is rated as negative, with a site-specific spatial extent and a short-term duration. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a substantial consequence and highly likely probability, which will render the impact significance as moderate, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance of the impact is reduced to low.

The species that could be most affected by this impact are listed in **Table 5 (Section 5.4)**. The recommended mitigation measures are detailed in **Table 8 in Section 7.7** below.

7.6. Cumulative Impacts

Cumulative effects are commonly understood to be impacts from different projects that combine to result in significant change, which could be larger than the sum of all the individual impacts. The assessment of cumulative effects therefore needs to consider all renewable energy projects within a 30 km radius that have received an EA at the time of starting the environmental impact process, as well as the proposed Igolide WEF Project. There is currently only one (1) renewable energy project authorised within a 30 km radius of the proposed Igolide WEF. This project was identified using the DFFE's Renewable Energy EIA Application Database for South Africa in conjunction with information provided by Independent Power Producers (IPPs) operating in the broader region. It should be noted that this list is based on information available at the time of writing this report and as such there may be other renewable energy projects proposed within the 30 km radius. The localities of renewable projects (affected properties) which are authorised are displayed in **Figure 14**.

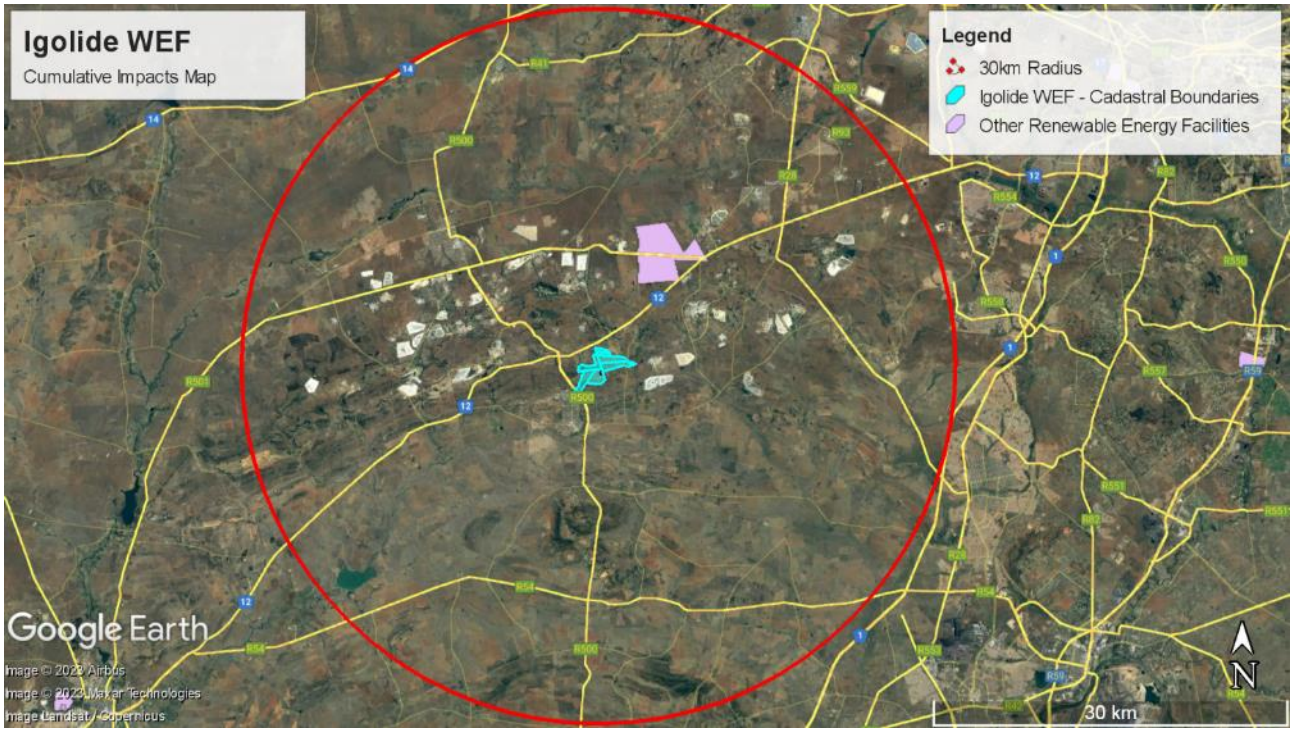

Figure 14: Regional EA applications for renewable energy projects located within a 30 km radius of the proposed Igolide WEF (Source: DFFE – Q1, 2023).

The total affected land parcel area taken up by other authorised renewable energy projects within a 30 km radius is approximately 19 km² (1900 ha). The total land parcel area affected by the Igolide Wind Energy Facility equates to approximately 6.8 km² (680 ha). The combined land parcel area affected by authorised renewable energy developments within a 30 km radius of similar habitat around the proposed Igolide Wind Energy Facility, inclusive of the Igolide Wind Energy Facility, thus equals approximately 25.8 km² (2580 ha). Of this, the proposed Igolide WEF project constitutes ~26%. The cumulative impact of the proposed Igolide WEF is thus anticipated to be **low to moderate** after mitigation.

The total area within a 30km radius around the proposed projects equates to about 2827.4 km² of similar habitat. The total combined size of the land parcels potentially affected by renewable energy projects will equate to ~0.9% of the available habitat in a 30km radius. The actual physical footprint of the renewable energy facilities will be smaller than the land parcel areas themselves. Furthermore, each of these projects must still be subject to a competitive bidding process where only the most competitive projects will win a power purchase agreement

required for the project to proceed to construction. The cumulative impact of all the proposed renewable energy projects is estimated to be **low to moderate**.

In terms of EGI, there are several existing high voltage overhead lines (OHLs) within a 30 km radius around the proposed Igolide WEF Electrical Grid Infrastructure of which about 400–500 km of OHLs are contained within the 30 km radius (**Figure 15**). The proposed Igolide WEF Electrical Grid Infrastructure will add an additional 4 km of OHL, bringing the total length of high voltage OHLs within a 30 km radius to approximately 500 km. Conservatively assuming that the other (1) authorised renewable energy project in the 30 km radius will have on average a high voltage OHL of about 10 km (depending on the distance to the nearest grid connection), this brings the total amount of existing and planned OHLs in the 30 km radius to about 510 km.

The Igolide WEF Electrical Grid Infrastructure could contribute roughly 1% of the total number of planned and existing OHLs, therefore its contribution to the cumulative impact of all the planned and existing OHLs is considered low. **<u>However, the combined cumulative impact of all the existing and planned OHLs (~510 km) is considered high, especially from a collision mortality perspective.</u>**

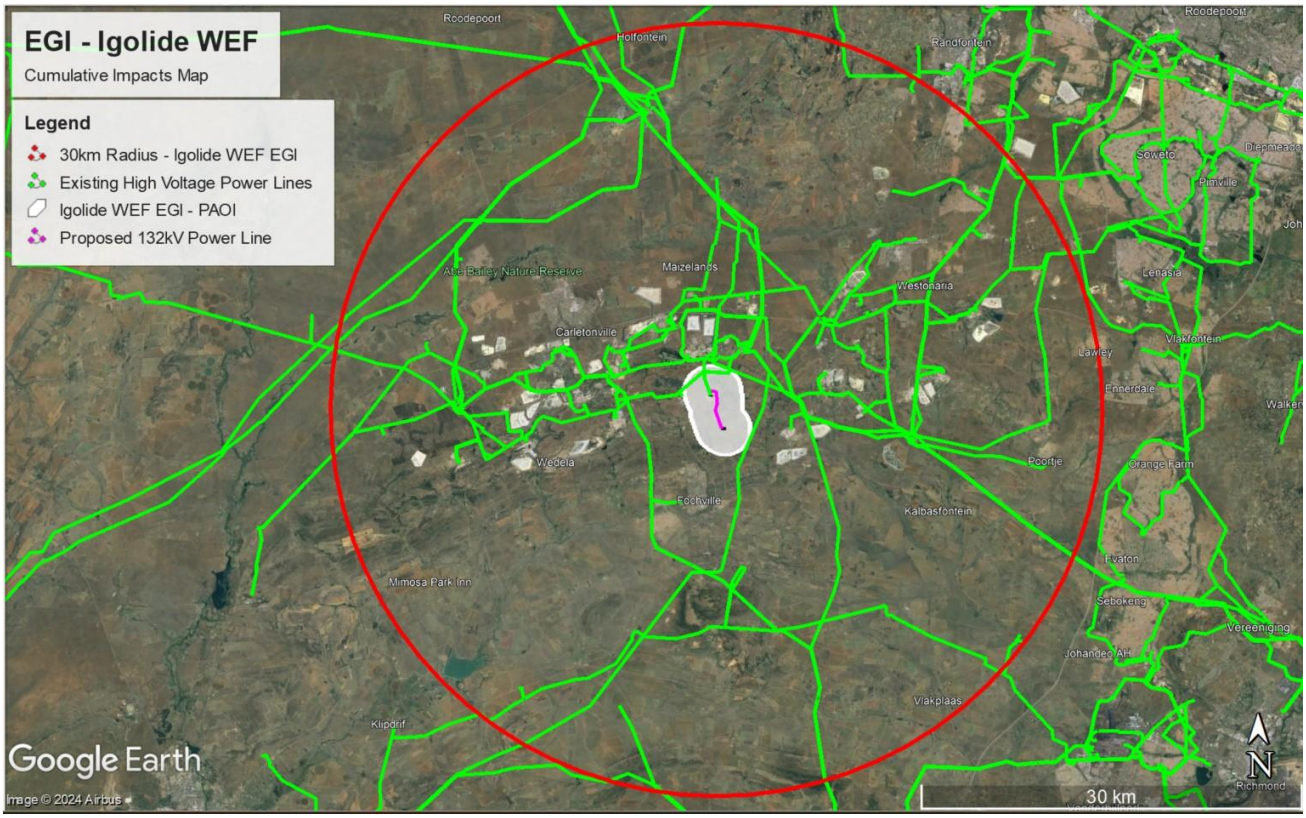

Figure 15: Existing high voltage overhead lines (OHLs), in green, within a 30km radius of the proposed Igolide WEF 132kV power line.

7.7. Environmental Impact Scores and Impact Mitigation Recommendations

<u>Pre-mitigation</u> assessment scores of expected environmental impacts from the proposed Igolide WEF Electrical Grid Infrastructure within the PAOI are detailed below in **Table 6.** The **<u>post-mitigation</u>** impact assessments are detailed in **Table 7**. **The impact assessment methodology (i.e. scoring criteria of impacts) is listed in Appendix D.**

<u>Mitigation recommendations for each expected environmental impact are detailed below in **Table 8**.</u>

Table 6: Assessment of pre-mitigation environmental impacts of the Igolide WEF Electrical Grid Infrastructure during construction, operation, and decommissioning phases (Refer to Appendix D for Impact Assessment Methodology).

Phase	Impact	Consequence	Status	Impact Magnitude (M)	Impact Extent (E)	Impact Reversibility (R)	Impact Duration (D)	Occurrence Probability (P)	Impact Significance (S)
Construction	Noise pollution and environmental disruption from construction activity	Displacement of EGI sensitive species from breeding/feeding/roosting areas	Negative (-ve)	High (4)	Site only (1)	Recoverable (3)	Short-term 0-5 years (2)	Definite (5)	Moderate (50)
Operation	Habitat transformation resulting from the EGI	Displacement of EGI sensitive species from breeding/feeding/roosting areas	Negative (-ve)	Medium (3)	Local (2)	Recoverable (3)	Long term Project life (4)	Highly probable (4)	Moderate (48)
Operation	Electrocution of EGI sensitive species in the on-site sub-stations and on the 132kV power line.	Population reduction of EGI sensitive species	Negative (-ve)	High (4)	International (migrants) (5)	Reversible (1)	Long term Project life (4)	Definite (5)	High (70)
Operation	Collisions of EGI sensitive species with the 132kV power line.	Population reduction of EGI sensitive species	Negative (-ve)	High (4)	International (migrants) (5)	Reversible (1)	Long term Project life (4)	Definite (5)	High (70)
Decommission	Noise pollution and environmental disruption during the decommissioning phase.	Total/partial displacement of EGI sensitive species from breeding/feeding/roosting areas	Negative (-ve)	High (4)	Site only (1)	Recoverable (3)	Short-term 0-5 years (2)	Definite (5)	Moderate (50)

Table 7: Assessment of post-mitigation environmental impacts of the Igolide WEF Electrical Grid Infrastructure during construction, operation, and decommissioning phases (Refer to Appendix D for Impact Assessment Methodology).

Phase	Impact	Consequence	Status	Impact Magnitude (M)	Impact Extent (E)	Impact Reversibility (R)	Impact Duration (D)	Occurrence Probability (P)	Impact Significance (S)
Construction	Noise pollution and environmental disruption from construction activity	Displacement of EGI sensitive species from breeding/feeding/roosting areas	Negative (-ve)	High (4)	Site only (1)	Reversible (1)	Short-term 0-5 years (2)	Highly probable (4)	Moderate (32)
Operation	Habitat transformation resulting from the EGI	Displacement of EGI sensitive species from breeding/feeding/roosting areas	Negative (-ve)	Medium (3)	Site only (1)	Recoverable (3)	Long term Project life (4)	Highly probable (4)	Moderate (44)
Operation	Electrocution of EGI sensitive species in the on-site sub-stations and on the 132kV power line.	Population reduction of EGI sensitive species	Negative (-ve)	Medium (3)	International (migrants) (5)	Reversible (1)	Long term Project life (4)	Low Probability (2)	Low (26)
Operation	Collisions of EGI sensitive species with the 132kV power line.	Population reduction of EGI sensitive species	Negative (-ve)	Medium (3)	International (migrants) (5)	Reversible (1)	Long term Project life (4)	Highly probable (4)	Moderate (52)
Decommission	Noise pollution and environmental disruption during the decommissioning phase.	Total/partial displacement of EGI sensitive species from breeding/feeding/roosting areas	Negative (-ve)	High (4)	Site only (1)	Reversible (1)	Short-term 0-5 years (2)	Highly probable (4)	Moderate (32)

Table 8: Proposed mitigation measures for the identified environmental disturbances.

Phase	Impact	Consequence	Initial impact score	Post-mitigation impact score	Mitigation Measures	Confidence level
Construction	Noise pollution and habitat loss during construction	Total/partial displacement of EGI sensitive species from breeding/feeding/ roosting areas	Moderate (50)	Moderate (32)	1. Restrict construction to the immediate infrastructural footprint. Access to remaining areas should be strictly controlled to minimise disturbance of EGI sensitive species. 2. Minimise removal of natural vegetation and rehabilitate natural vegetation post-construction where possible. 3. Prioritise upgrading existing roads (where the requisite roads authority permission has been issued) over constructing new roads. 4. Apply noise and dust control measures according to best practice in the industry. 5. Strictly implement the recommendations of ecological and botanical specialists to reduce the level of habitat loss.	High
Operational	Habitat transformation resulting from the EGI	Total/partial displacement of EGI sensitive species from breeding/feeding/ roosting areas	Moderate (48)	Moderate (44)	1. Restrict construction to the immediate infrastructural footprint where possible. Access to remaining areas should be strictly controlled to minimise disturbance of EGI sensitive species. Rehabilitate natural vegetation post-construction where possible. 2. Once operational, vehicle and pedestrian access to the site should be controlled and restricted to the facility footprint as much as possible to prevent unnecessary destruction of vegetation.	High

Phase	Impact	Consequence	Initial impact score	Post-mitigation impact score	Mitigation Measures	Confidence level
Operational	Electrocution of EGI sensitive species in the on-site substations and on the 132kV power line.	Population reduction of EGI sensitive species	High (70)	Low (26)	1. A vulture-friendly pole design should be used, with appropriate mitigation measures for complicated pole structures (e.g., insulation of live components to prevent electrocutions on terminal structures and pole transformer), as recommended by the Avifaunal Specialist. 2. Apply insulation reactively in the substation if significant electrocutions of avifauna are recorded.	High
Operational	Collisions of EGI sensitive species with the 132kV power line.	Population reduction of EGI sensitive species	High (70)	Moderate (52)	1. Bird flight diverters should be installed on the 132kV overhead line on the full span length of the earth wire (according to Eskom guidelines - five metres apart). Light and dark colour devices must be alternated to provide contrast against both dark and light backgrounds, respectively. These devices must be installed as soon as the conductors are strung	High
Decommissioning	Noise pollution and environmental disruption during the decommissioning phase.	Total/partial displacement of EGI sensitive species from breeding/feeding/ roosting areas	Moderate (50)	Moderate (32)	1. Restrict dismantling to the immediate infrastructural footprint where possible. Access to remaining areas should be strictly controlled to minimise disturbance of EGI sensitive species. 2. Apply noise and dust control measures according to best practice in the industry. 3. Prioritise the use of existing access roads during the decommissioning phase and avoid construction of new roads where feasible. 4. The recommendations of the ecological and botanical specialist studies must be strictly implemented,	High

Phase	Impact	Consequence	Initial impact score	Post-mitigation impact score	Mitigation Measures	Confidence level
					especially as far as limitation of the activity footprint is concerned.	

7.8. Impact Statement

The overall impact significance is provided in this section, in terms of pre- and post-mitigation.

Table 9: Summary of avifaunal impact significances anticipated for the proposed Igolide WEF Electrical Grid Infrastructure (overall average of impacts per phase).

Phase	Overall Impact Significance (Pre-Mitigation)	Overall Impact Significance (Post Mitigation)
Construction	Moderate	Moderate
Operational	High	Moderate
Decommissioning	Moderate	Moderate

8. Conclusions

The proposed Igolide WEF Electrical Grid Infrastructure will have medium and high impacts on avifauna which, in most instances, could be reduced to a low impact through the appropriate mitigation measures. No fatal flaws were discovered. **The development is supported, provided the mitigation measures listed in this report (Section 7.7 and Appendix F) are strictly applied and adhered to. See Figure 13, Section 5.6 for a map of the avifaunal sensitivities.**

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Appendix A – Specialist Expertise

Curriculum Vitae: Albert Froneman

Profession/Specialisation	:	Avifaunal Specialist
Highest Qualification	:	MSc (Conservation Biology)
Nationality	:	South African
Years of experience	:	25 years

Key Qualifications

Albert Froneman **(**Pr.Sci.Nat) has more than 25 years' experience in the management of avifaunal interactions with industrial infrastructure. He holds a M.Sc. degree in Conservation Biology from the University of Cape Town. He managed the Airports Company South Africa (ACSA) – Endangered Wildlife Trust Strategic Partnership from 1999 to 2008 which has been internationally recognized for its achievements in addressing airport wildlife hazards in an environmentally sensitive manner at ACSA's airports across South Africa. Albert is recognized worldwide as an expert in the field of bird hazard management on airports and has worked in South Africa, Swaziland, Botswana, Namibia, Kenya, Israel, and the USA. He has served as the vice chairman of the International Bird Strike Committee and has presented various papers at international conferences and workshops. At present, he is consulting to ACSA with wildlife hazard management on all their airports. He also an accomplished specialist ornithological consultant outside the aviation industry and has completed a wide range of bird impact assessment studies. He has co-authored many avifaunal specialist studies and pre-construction monitoring reports for proposed renewable energy developments across South Africa. He also has vast experience in using Geographic Information Systems to analyse and interpret avifaunal data spatially and derive meaningful conclusions. Since 2009 Albert has been a registered Professional Natural Scientist (reg. nr 400177/09) with The South African Council for Natural Scientific Professions, specialising in Zoological Science.

Key Project Experience

Renewable Energy Facilities – avifaunal monitoring projects in association with AfriAvian Environmental

1. Jeffrey's Bay Wind Farm – 12-months preconstruction avifaunal monitoring project
2. Oyster Bay Wind Energy Project – 12-months preconstruction avifaunal monitoring project
3. Ubuntu Wind Energy Project near Jeffrey's Bay – 12-months preconstruction avifaunal monitoring project
4. Bana-ba-Pifu Wind Energy Project near Humansdorp – 12-months preconstruction avifaunal monitoring project
5. Excelsior Wind Energy Project near Caledon – 12-months preconstruction avifaunal monitoring project
6. Laingsburg Spitskolakte Wind Energy Project – 12-months preconstruction avifaunal monitoring project
7. Loeriesfontein Wind Energy Project Phase 1, 2 & 3 – 12-months preconstruction avifaunal monitoring project
8. Noupoort Wind Energy Project – 12-months preconstruction avifaunal monitoring project
9. Vleesbaai Wind Energy Project – 12-months preconstruction avifaunal monitoring project
10. Port Nolloth Wind Energy Project – 12-months preconstruction avifaunal monitoring project
11. Langhoogte Caledon Wind Energy Project – 12-months preconstruction avifaunal monitoring project
12. Lunsklip – Stilbaai Wind Energy Project – 12-months preconstruction avifaunal monitoring project

13. Indwe Wind Energy Project – 12-months preconstruction avifaunal monitoring project
14. Zeeland St Helena bay Wind Energy Project – 12-months preconstruction avifaunal monitoring project
15. Wolseley Wind Energy Project – 12-months preconstruction avifaunal monitoring project
16. Renosterberg Wind Energy Project – 12-months preconstruction avifaunal monitoring project
17. De Aar – North (Mulilo) Wind Energy Project – 12-months preconstruction avifaunal monitoring project (2014)
18. De Aar – South (Mulilo) Wind Energy Project – 12-months bird monitoring
19. Namies – Aggenys Wind Energy Project – 12-months bird monitoring
20. Pofadder - Wind Energy Project – 12-months bird monitoring
21. Dwarsrug Loeriesfontein - Wind Energy Project – 12-months bird monitoring
22. Waaihoek – Utrecht Wind Energy Project – 12-months bird monitoring
23. Amathole – Butterworth Utrecht Wind Energy Project – 12-months bird monitoring & EIA specialist study
24. De Aar and Droogfontein Solar Pre- and Post-construction avifaunal monitoring
25. Makambako Wind Energy Facility (Tanzania) 12-month bird monitoring & EIA specialist study (Windlab)
26. R355 Wind Energy Facility 12-month bird monitoring (Mainstream)
27. Groenekloof Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mulilo)
28. Tsitsikamma Wind Energy Facility 24-months post-construction monitoring (Cennergi)
29. Noupoort Wind Energy Facility 24-months post-construction monitoring (Mainstream)
30. Kokerboom Wind Energy Facility 12-month bird monitoring & EIA specialist study (Business Venture Investments)
31. Kuruman Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mulilo)
32. Mañhica Wind Energy Facility 12-month bird monitoring & EIA specialist study (Windlab)
33. Kwagga Wind Energy Facility, Beaufort West, 12-months pre-construction monitoring (ABO)
34. Pienaarspoort Wind Energy Facility, Touws River, Western Cape, 12-months pre-construction monitoring (ABO). Koup 1 and 2 Wind Energy Facilities, Beaufort West, Western Cape, 12 months pre-construction monitoring (Genesis Eco-energy)
35. Duiker Wind Energy Facility, Vredendal, Western Cape 12 months pre-construction monitoring (ABO)
36. Perdekraal East Wind Energy Facility, Touws River, Western Cape, 18 months construction phase monitoring (Mainstream).
37. Swellendam Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (Veld Renewables)
38. Lombardskraal Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (Enertrag SA)
39. Mainstream Kolkies & Heuweltjies Wind Energy Facilities, Western Cape, 12-month pre-construction monitoring (Mainstream)
40. Great Karoo Wind Energy Facility, Northern Cape, 12-month pre-construction monitoring (African Green Ventures).
41. Gauteng & Gauteng Wind and Hybrid Energy Facilities (6x), pre-construction monitoring (Enertrag SA)
42. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (Enertrag SA)
43. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (ACED)
44. Nanibees North & South Wind Energy Facilities, Northern Cape, Screening Report (juwi)
45. Sutherland Wind Energy Facilities, Northern Cape, Screening Report (WKN Windcurrent)
46. Pofadder Wind Energy Facility, Northern Cape, Screening Report (Atlantic Energy)

47. Haga Haga Wind Energy Facility, Eastern Cape, Amendment Report (WKN Windcurrent)
48. Banken Wind Energy Facility, Northern Cape, Screening Report (Atlantic Energy)
49. Hartebeest Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (juwi).

Bird Impact Assessment studies and / or GIS analysis:

1. Aviation Bird Hazard Assessment Study for the proposed Madiba Bay Leisure Park adjacent to Port Elizabeth Airport.
2. Extension of Runway and Provision of Parallel Taxiway at Sir Seretse Khama Airport, Botswana Bird / Wildlife Hazard Management Specialist Study
3. Maun Airport Improvements Bird / Wildlife Hazard Management Specialist Study
4. Bird Impact Assessment Study - Bird Helicopter Interaction – The Bitou River, Western Cape Province South Africa
5. Proposed La Mercy Airport – Bird Aircraft interaction specialists study using bird detection radar to assess swallow flocking behaviour.
6. KwaZulu Natal Power Line Vulture Mitigation Project – GIS analysis
7. Perseus-Zeus Power Line EIA – GIS Analysis
8. Southern Region Pro-active GIS Blue Crane Collision Project.
9. Specialist advisor ~ Implementation of a bird detection radar system and development of an airport wildlife hazard management and operational environmental management plan for the King Shaka International Airport
10. Matsapha International Airport – bird hazard assessment study with management recommendations
11. Evaluation of aviation bird strike risk at candidate solid waste disposal sites in the Ekurhuleni Metropolitan Municipality
12. Gateway Airport Authority Limited – Gateway International Airport, Polokwane: Bird hazard assessment; Compile a bird hazard management plan for the airport
13. Bird Specialist Study - Evaluation of aviation bird strike risk at the Mwakirunge Landfill site near Mombasa Kenya
14. Bird Impact Assessment Study - Proposed Weltevreden Open Cast Coal Mine Belfast, Gauteng
15. Avian biodiversity assessment for the Mafube Colliery Coal mine near Middelburg Gauteng
16. Avifaunal Specialist Study - SRVM Volspruit Mining project – Mokopane Limpopo Province
17. Avifaunal Impact Assessment Study (with specific reference to African Grass Owls and other Red List species) Stone Rivers Arch
18. Airport bird and wildlife hazard management plan and training to Swaziland Civil Aviation Authority (SWACAA) for Matsapha and Sikhupe International Airports
19. Avifaunal Impact Scoping & EIA Study - Renosterberg Wind Farm and Solar site
20. Bird Impact Assessment Study - Proposed 60-year Ash Disposal Facility near to the Kusile Power Station
21. Avifaunal pre-feasibility assessment for the proposed Montrose dam, Gauteng
22. Bird Impact Assessment Study – Proposed ESKOM Phantom Substation near Knysna, Western Cape
23. Habitat sensitivity map for Denham's Bustard, Blue Crane, and White-bellied Korhaan in the Kouga Municipal area of the Eastern Cape Province
24. Swaziland Civil Aviation Authority – Sikhuphe International Airport – Bird hazard management assessment
25. Avifaunal monitoring – extension of Specialist Study - SRVM Volspruit Mining project –

Mokopane Limpopo Province

26. Avifaunal Specialist Study – Rooikat Hydro Electric Dam – Hope Town, Northern Cape
27. The Stewards Pan Reclamation Project – Bird Impact Assessment study
28. Airports Company South Africa – Avifaunal Specialist Consultant – Airport Bird and Wildlife Hazard Mitigation

Geographic Information System analysis & maps

1. ESKOM Power line Makgalakwena EIA – GIS specialist & map production
2. ESKOM Power line Benficosa EIA – GIS specialist & map production
3. ESKOM Power line Riversong EIA – GIS specialist & map production
4. ESKOM Power line Waterberg NDP EIA – GIS specialist & map production
5. ESKOM Power line Bulge Toulon EIA – GIS specialist & map production
6. ESKOM Power line Bulge DORSET EIA – GIS specialist & map production
7. ESKOM Power lines Marblehall EIA – GIS specialist & map production
8. ESKOM Power line Grootpan Lesedi EIA – GIS specialist & map production
9. ESKOM Power line Tanga EIA – GIS specialist & map production
10. ESKOM Power line Bokmakierie EIA – GIS specialist & map production
11. ESKOM Power line Rietfontein EIA – GIS specialist & map production
12. Power line Anglo Coal EIA – GIS specialist & map production
13. ESKOM Power line Camcoll Jericho EIA – GIS specialist & map production
14. Hartbeespoort Residential Development – GIS specialist & map production
15. ESKOM Power line Mantsole EIA – GIS specialist & map production
16. ESKOM Power line Nokeng Flourspar EIA – GIS specialist & map production
17. ESKOM Power line Greenview EIA – GIS specialist & map production
18. Derdepoort Residential Development – GIS specialist & map production
19. ESKOM Power line Boynton EIA – GIS specialist & map production
20. ESKOM Power line United EIA – GIS specialist & map production
21. ESKOM Power line Gutshwa & Malelane EIA – GIS specialist & map production
22. ESKOM Power line Ohrigstad EIA – GIS specialist & map production
23. Zilkaatsnek Development Public Participation –map production
24. Belfast – Paarde Power line - GIS specialist & map production
25. Solar Park Solar Park Integration Project Bird Impact Assessment Study – avifaunal GIS analysis.
26. Kappa-Omega-Aurora 765kV Bird Impact Assessment Report – Avifaunal GIS analysis.
27. Gamma – Kappa 2nd 765kV – Bird Impact Assessment Report – Avifaunal GIS analysis.
28. ESKOM Power line Kudu-Dorstfontein Amendment EIA – GIS specialist & map production.
29. Proposed Heilbron filling station EIA – GIS specialist & map production
30. ESKOM Lebatlhane EIA – GIS specialist & map production
31. ESKOM Pienaars River CNC EIA – GIS specialist & map production
32. ESKOM Lemara Phiring Ohrigstad EIA – GIS specialist & map production
33. ESKOM Pelly-Warmbad EIA – GIS specialist & map production
34. ESKOM Rosco-Bracken EIA – GIS specialist & map production
35. ESKOM Ermelo-Uitkoms EIA – GIS specialist & map production
36. ESKOM Wisani bridge EIA – GIS specialist & map production
37. City of Tshwane – New bulk feeder pipeline projects x3 Map production
38. ESKOM Lebohang Substation and 132kV Distribution Power Line Project Amendment GIS specialist & map production
39. ESKOM Geluk Rural Power Line GIS & Mapping
40. Eskom Kimberley Strengthening Phase 4 Project GIS & Mapping

41. ESKOM Kwaggafontein - Amandla Amendment Project GIS & Mapping
42. ESKOM Lephalale CNC – GIS Specialist & Mapping
43. ESKOM Marken CNC – GIS Specialist & Mapping
44. ESKOM Lethabong substation and power lines – GIS Specialist & Mapping
45. ESKOM Magopela- Pitsong 132kV line and new substation – GIS Specialist & Mapping

Professional affiliations

South African Council for Natural Scientific Professions (SACNASP) registered Professional Natural Scientist (reg. nr 400177/09) – specialist field: Zoological Science. Registered since 2009.

Curriculum Vitae: Megan Loftie-Eaton

FORMAL EDUCATION

UNIVERSITY OF CAPE TOWN – (PhD – Biological Sciences)

- Completed PhD in Biological Sciences, Animal Demography Unit, Department of Biological Sciences, UCT (December 2018) Thesis: The impacts of bush encroachment on bird distributions in the Savanna Biome of South Africa

UNIVERSITY OF CAPE TOWN – (MSc - Zoology)

- Completed MSc in Zoology, Animal Demography Unit, Department of Biological Sciences, UCT (June 2014)

UNIVERSITY OF ALBERTA – (BSc in Environmental and Conservation Sciences)

- Completed with Distinction. June 2011

PROFESSIONAL REGISTRATIONS AND INDUSTRY AFFILIATIONS

- **Professional Natural Scientist in Ecology (Member #135161)** registered with the South African Council for Natural Scientific Professions (SACNASP)
- **Environmental Assessment Practitioner (Number 2021/3690)** registered with the Environmental Assessment Practitioners Association of South Africa (EAPASA)
- **Member** of the Zoological Society of Southern Africa (ZSSA)

EXPERIENCE AND QUALIFICATIONS

2022-2023:

- Environmental Assessment Practitioner for Resource Management Services, Durbanville
- Avifaunal Specialist with AfriAvian Environmental
- Citizen Science Projects Coordinator and Social Media Manager at The Biodiversity and Development Institute

2021:

- Environmental Assessment Practitioner for Resource Management Services, Durbanville (Part-time)
- Completed Avifaunal Impact Assessment for Robben Island Museum (Blue Stone Quarry Wall Restoration)
- Conducted avifaunal field work for proposed wind farms near Laingsburg, Karoo
- OdonataMAP (African Atlas of Odonata) Project Coordinator and Social Media Manager at The Biodiversity and Development Institute (contracted by the Freshwater Research Centre)
- Senior Environmental Consultant with Terramanzi Group Pty Ltd.
- SACNASP Registered Professional Natural Scientist in Ecology (Member #135161)

2020:

- Senior Environmental Consultant with Terramanzi Group Pty Ltd.
- Completed Global Environmental Management - an online course authorized by Technical University of Denmark (DTU) and offered through Coursera
- Ecologist and Researcher (contracted by Hoedspruit Hub) for Kruger To Canyons Biosphere Reserve, conducting sustainable agriculture research in the village of Phiring, Limpopo as part of the "Agroecology as a Climate Change Adaptation Strategy" output of the Dinkwanyane Water Stewardship Project

2019:

- Participated in the Karkloof 50 Miler trail run, where I placed third, and raised funds (R30,000) for ReWild NPC (a wildlife rehabilitation and conservation organization)
- OdonataMAP (African Atlas of Odonata) Project Coordinator at The Biodiversity and Development Institute (contracted by the Freshwater Research Centre)
- Ecologist and Researcher and Social Media Manager at Hoedspruit Hub
- Communications, Social Media, and Citizen Science Project Coordinator at The Biodiversity & Development Institute - ongoing
- Organized, planned, and orchestrated the Hoedspruit Hub's Open Day event
- Obtained qualification for NQF Level 5, Unit Standard 115753, Conduct Outcomes-based Assessment through Ndzalama Training (Pty) Ltd

2017-2018:

- Completed contract projects for the Hoedspruit Hub's Agroecology Division in partnership with Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ). I built, installed, and provided training materials for pollinator stations, artificial bat roosts and earthworm composting bins
- Awarded PhD in Biological Sciences, University of Cape Town (December 2018)
- Ecologist for WildArk on Pridelands Conservancy (Hoedspruit, Limpopo), conducting biodiversity surveys and ecological monitoring, as well as creating content for WildArk's social media
- Project coordinator and communications officer of the Atlas of African Odonata (OdonataMAP), Animal Demography Unit (funded by JRS Biodiversity Foundation).
- Facilitated and assessed a four-day Ecology Course for students at Tsakane Conservation in Balule Nature Reserve (Limpopo Province, South Africa) as part of the EcoLife student programme (University of Pretoria)
- Presented several biodiversity mapping and bird atlasing workshops (SABAP2, Southern African Bird Atlas Project) across South Africa, Nigeria, Tanzania, and Europe (Poland, Finland, Germany)

2016-2018:

- Presented and assessed bird atlasing (http://sabap2.adu.org.za/) and BioMAPping (http://vmus.adu.org.za) workshops to field guide students at Bushwise Field Guide Training Academy, Limpopo Province, South Africa
- Attended a Snake Awareness and Venomous Snake Handling Course as well as an Introductory Course to Scorpions (accredited by FGASA and HPCSA), hosted by the African Snakebite Institute in Hoedspruit (12-13 November 2016)

2014−2018:

- Completed doctoral (PhD) studies in Biological Sciences at the University of Cape Town (Animal Demography Unit). Research title: The impacts of bush encroachment on bird distributions in the savanna biome of South Africa
- Project coordinator and communications officer of the Atlas of African Lepidoptera (LepiMAP): LepiMAP is a project aimed at determining the distribution and conservation priorities of butterflies and moths on the African continent. It is a joint project of the Animal Demography Unit (Department of Biological Sciences, University of Cape Town) and LepSoc, The Lepidopterists' Society of Africa
- BirdMAP Assistant: helping with the Animal Demography Unit's bird atlas project in African countries north of South Africa, assisting the project teams in Kenya, Nigeria, Zimbabwe, Namibia, Zambia, and Rwanda with everything from observer queries to social media aspects

2014:

- Obtained MSc in Zoology through the Department of Biological Sciences, University of Cape Town. Thesis title: Geographic Range Dynamics of South Africa's Bird Species. PDF of thesis: http://adu.org.za/pdf/Loftie-Eaton_M_2014_MSc_thesis.pdf.
- Attended an International Wildlife Trapping Course in Hoedspruit, South Africa to learn about humane live capture methods of mammals for research purposes

2013:

- Started coordinating LepiMAP, The Atlas of African Lepidoptera
- Obtained FGASA (Field Guides Association of Southern Africa) Level One Nature Guide qualification (membership number 18574) through Ulovane Environmental Training in South Africa. Obtained First Aid Level One qualification

2011–2018:

- Social Media Manager for the Animal Demography Unit
- Data technician for the ADU's Virtual Museum. I am on the Expert Panel for the MammalMAP, FrogMAP, ReptileMAP, and BirdPix citizen science projects. The Expert Panel has the important task of identifying the records submitted to the Virtual Museum

2011:

- Assistant Researcher on the African Penguin EarthWatch Research Team on Robben Island, South Africa. Conducted population surveys on penguins and other seabirds to determine their breeding success and survival - http://earthwatch.org/expeditions/south-african-penguins
- Obtained BSc in Environmental and Conservation Sciences, with Distinction, through the Faculty of Agriculture, Life and Environmental Sciences, University of Alberta, Edmonton, Canada. Major: Conservation Biology.

Appendix B – Specialist Statement of Independence

Appendix C – Site Sensitivity Verification

Prior to commencing with the specialist assessment in accordance with Appendix 6 of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) Environmental Impact Assessment (EIA) Regulations of 2014, a site sensitivity verification was undertaken to confirm the current land use and environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tool (Screening Tool). The Protocol for the specialist assessment and minimum report content requirements for environmental impacts avifaunal species by onshore wind energy generation facilities where the electricity output is 20MW or more (Government Gazette No. 43110 – 20 March 2020) is applicable in the case of wind developments.

The details of the site sensitivity verification (SSV) are noted below:

Date of Site Visits	06 April 2024
Supervising Specialist Name	Albert Froneman
Professional Registration Number	MSc Conservation Biology (SACNASP Zoological Science Registration number 400177/09)
Specialist Affiliation / Company	AfriAvian Environmental

C1. Methodology

The following methods were used to compile this report:

- Bird distribution data of the Second Southern African Bird Atlas (SABAP2) was obtained from the University of Cape Town, to ascertain which species occur within the Broader Area of four pentad grid cells within which the proposed Project is located. A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8 × 9 km. From 2007–present, a total of 551 full protocol lists (i.e., surveys of at least two hours each) have been completed for this area. In addition, 133 *ad hoc* protocol lists (i.e., surveys lasting less than two hours but still yielding valuable data) have been completed.
- **EGI sensitive species** were defined as follows: Species which could potentially be impacted by power line collisions or electrocutions (power line or substation yard), based on specific morphological and/or behavioural characteristics. Species classes which fall under these categories are raptors, large terrestrial birds, waterbirds, crows, and certain ground nesting birds (vulnerable to displacement due to disturbance/habitat loss.
- The national threatened status of all EGI sensitive 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 EGI sensitive species was determined by consulting the (2023) International Union for Conservation of Nature (IUCN) Red List of Threatened Species (http://www.iucnredlist.org/).
- A classification of the habitat in the PAOI was obtained from the First Atlas of Southern African Birds (SABAP1) (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 PAOI is the area where the primary impacts on avifauna are expected.
- 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 ©2023) was used to view the PAOI and Broader Area on a landscape level and to help identify sensitive bird habitat.
- The 2022 South Africa Protected Areas Database compiled by the Department of Environment, Forestry and Fisheries (DFFE) was used to identify Nationally Protected Areas, National Protected Areas Expansion Strategy (NPAES) near the PAOI (DFFE, 2022).
- The Department of Forestry, Fisheries, and the Environment (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 as far as habitat classes and the occurrence of EGI sensitive species are concerned was also considered.
- The following sources were used to determine the investigation protocol that is required for the site:
    - Protocol for the specialist assessment and minimum report content requirements for environmental impacts on avifaunal species by onshore wind energy generation facilities where the electricity output is 20MW or more (Government Gazette No. 43110–20 March 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 at the Igolide WEF Project Site during 2020–2022 over a period of four seasons. Four sets of surveys were conducted.

C2. Results of Site Assessment

The PAOI is situated along an ecotone between the Savanna and Grassland Biomes but falls mainly within the Grassland Biome (Mucina & Rutherford 2006). According to the 2018 SANBI Vegetation Map the PAOI falls within the Central Bushveld Bioregion (northern half of PAOI) and the Mesic Highveld Grassland Bioregion (southern half of PAOI). The natural vegetation at the PAOI consists predominantly of Gauteng Shale Mountain Bushveld and Rand Highveld Grassland.

The typical landscape associated with Rand Highveld Grassland is highly variable, containing extensive sloping plains and a series of ridges slightly elevated over undulating surrounding plains. The vegetation is species-rich, wiry, sour grassland alternating with low, sour shrubland on rocky outcrops and steeper slopes. Most of the grasses on the plains belong to the genera *Themeda*, *Eragrostis*, *Heteropogon* and *Elionurus*. A high diversity of herbs, many of which belong to the Asteraceae, is also a typical feature. Rocky hills and ridges consist of open woodlands with *Protea caffra* subsp. *caffra*, *Protea welwitschii*, *Senegalia caffra* and *Celtis africana*, accompanied by a rich suite of shrubs among which the genus *Searsia* is most prominent (Mucina and Rutherford (2006). The Gauteng Shale Mountain Bushveld is represented by woody vegetation and a grass dominated herbaceous layer. Depending on local conditions, trees form semi-open to closed thickets or woodlands, and can range from short deciduous bush cover to a medium-tall +5m tree cover of mostly *Senegalia sp.* and *Vachellia sp.* trees.

Fochville, which is the closest town to the PAOI, has a temperate climate. Summers are warm and winters are cold and dry. The mean annual rainfall is around 600–800 mm, most of which falls in the summer months. The mean annual temperature is around 20C° (Schulze, 2009).

The proposed Igolide WEF Electrical Grid Infrastructure PAOI is situated within gently undulating plains of the Gauteng Highveld countryside. The avian habitat types in the PAOI were identified as:

(i) Natural Grassland
(ii) Disturbed Grassland
(iii) Open Woodland
(iv) Drainage Lines and Wetlands

(v) Dams
(vi) Agriculture
(vii) High Voltage Power lines

The PAOI and immediate environment is classified as **Medium** sensitivity for bird species according to the Animal Species Theme (**Figure C.1**). The Medium sensitivity classification is linked to the potential occurrence of African Grass Owl *Tyto capensis* (Regionally Vulnerable), White-bellied Bustard *Eupodotis senegalensis* (Regionally Vulnerable), and Caspian Tern *Hydroprogne caspia* (Regionally Vulnerable).

The PAOI contains confirmed habitat for Species of Conservation Concern (SCC), namely African Grass Owl and Secretarybird (Globally Endangered and Regionally Vulnerable), 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). During the on-site surveys, two SCC were also recorded. These SCC were: Lanner Falcon (Regionally Vulnerable), and Secretarybird (Globally Endangered and Regionally Vulnerable).

Based on the Site Sensitivity Verification survey (conducted in April 2024) and the integrated pre-construction monitoring conducted at the associated Igolide WEF (2020–2022), the classification of **High Sensitivity** for avifauna is advocated for the Igolide WEF Electrical Grid Infrastructure PAOI.

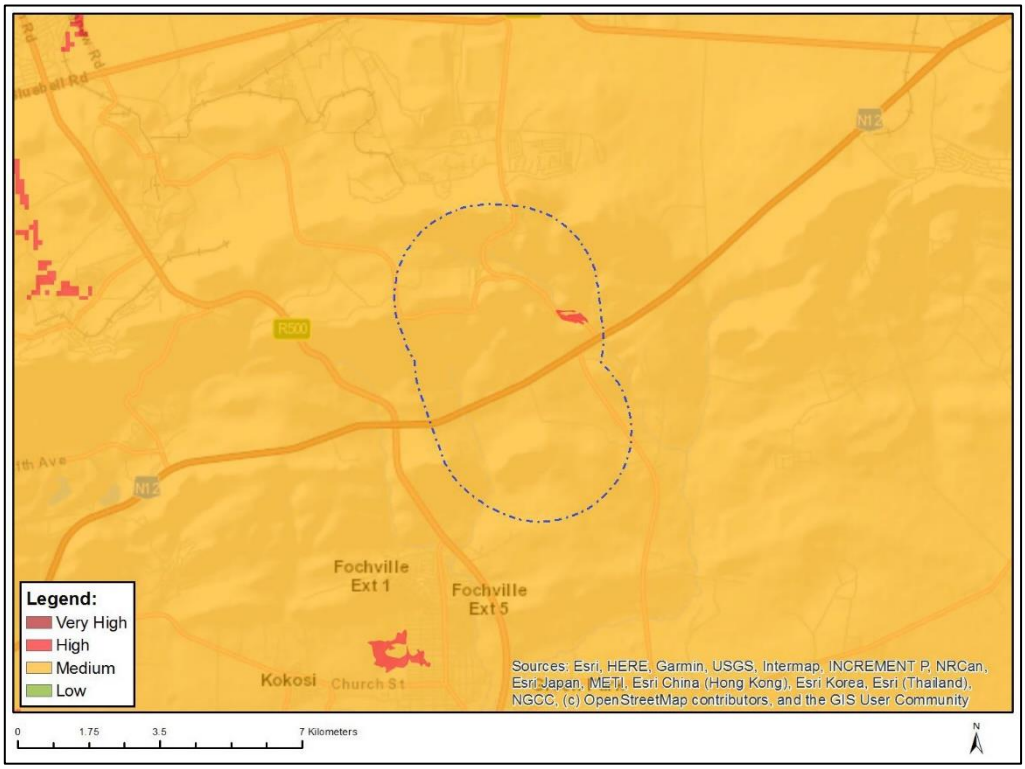

Figure C.1: The National Web-Based Environmental Screening Tool map of the PAOI, indicating sensitivities for the Animal Species Theme. The Medium sensitivity classification is linked to African Grass Owl *Tyto capensis*, White-bellied Bustard *Eupodotis senegalensis*, and Caspian Tern *Hydroprogne caspia.*

Appendix D – Impact Assessment Methodology

Appendix 2 of GNR 982, as amended, requires the identification of the significance of potential impacts during scoping. To this end, an impact screening tool has been used in the scoping phase. The screening tool is based on two criteria, namely probability (Figure D1); and consequence (Figure D2), where the latter is based on general consideration to the intensity, extent, and duration.

SCORE	DESCRIPTOR
4	**Definite**: The impact will occur regardless of any prevention measures
3	**Highly Probable**: It is most likely that the impact will occur
2	**Probable**: There is a good possibility that the impact will occur
1	**Improbable:** The possibility of the impact occurring is very low

Figure D1: Probability scores and descriptors

SCORE	NEGATIVE	POSITIVE
4	Very severe: An irreversible and permanent change to the affected system(s) or party(ies) which cannot be mitigated.	Very beneficial: A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit.
3	Severe: A long term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming or some combination of these.	Beneficial: A long term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these.
2	Moderately severe: A medium to long term impacts on the affected system(s) or party (ies) that could be mitigated.	Moderately beneficial: A medium to long term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult, expensive and time consuming (or some combination of these), as achieving them in this way.
1	Negligible: A short to medium term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary.	Negligible: A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.

Figure D2: Consequence score descriptions

The impact assessment includes:

- Impact magnitude
- Impact extent
- Impact reversibility
- Impact duration
- Probability of impact occurrence
- Impact significance

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
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) × 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**

Figure D3: Impact assessment scoring metric used in this scoping report.

As per the DFFE Guideline 5: Assessment of Alternatives and Impacts, the following methodology is applied to the prediction and assessment of impacts and risks. Potential impacts and risks have been rated in terms of the direct, indirect, and cumulative:

- Direct impacts are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.
- Indirect impacts of an activity are indirect or induced changes that may occur as a result of the activity. These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken, or which occur at a different place as a result of the activity.

- Cumulative impacts are those impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present, or reasonably near future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period and can include both direct and indirect impacts.

The impact assessment methodology includes the following aspects:
Nature of impact/risk - The type of effect that a proposed activity will have on the environment.

- Impact status - whether the impact/risk on the overall environment will be:
    - Positive - environment overall will benefit from the impact/risk
    - Negative - environment overall will be adversely affected by the impact/risk; or
    - Neutral - environment overall not be affected.
- Impact spatial extent – The size of the area that will be affected by the impact/risk:
    - Site specific
    - Local (<10 km from site)
    - Regional (<100 km of site)
    - National; or
    - International (e.g. Greenhouse Gas emissions or migrant birds).
- Impact reversibility - the ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change:
    - Reversible (recovery without pro-active rehabilitation)
    - Recoverable (recovery with pro-active rehabilitation)
    - Irreversible (not possible despite action)
- Impact duration – the timeframe during which the impact/risk will be experienced:
    - Very short term (instantaneous);
    - Short term (0-5 year);
    - Medium term (5- 15 years);
    - Long term (the impact will cease after the operational life of the activity (i.e., the impact or risk will occur for the project duration)); or
    - Permanent/indefinite (mitigation will not occur in such a way or in such a time span that the impact can be considered transient (i.e., the impact will occur beyond the project decommissioning)).
- Probability of impact occurrence:
    - Improbable (little to no chance of occurring)
    - Low Probability (<30% chance of occurring)
    - Probable (30-50% chance of occurring)
    - Highly Probability (51 – 90% chance of occurring); or
    - Definite (>90% chance of occurring regardless of prevention measures).

- Impact significance – the product of the impact occurrence probability with the sum of impact magnitude, extent, duration, and reversibility

  $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$:

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**

Figure D4: Impact significance rating

- Significance – Will the impact cause a notable alteration of the environment?
  - Very low (the risk/impact may result in very minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);
  - Low (the risk/impact may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);
  - Moderate (the risk/impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated);
  - High (the risk/impact will result in major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making); and
  - Very high (the risk/impact will result in very major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making (i.e., the project cannot be authorised unless major changes to the engineering design are carried out to reduce the significance rating)).

With the implementation of mitigation measures, the residual impacts/risks are ranked as follows in terms of significance:

- Very low = 5
- Low = 4
- Moderate = 3
- High = 2
- Very high = 1.

Confidence – The degree of confidence in predictions based on available information and specialist knowledge:

- Low
- Medium
- High.

Appendix E – Species List for the Broader Area

Species name	Scientific name	SABAP2 Reporting Rate %		Global Conservation Status	Regional Conservation Status
		Full protocol	Ad hoc protocol		
Abdim's Stork	*Ciconia abdimii*	0,00	0,75	-	NT
Acacia Pied Barbet	*Tricholaema leucomelas*	70,24	2,26	-	-
African Black Duck	*Anas sparsa*	21,60	1,50	-	-
African Crake	*Crecopsis egregia*	0,73	0,00	-	-
African Darter	*Anhinga rufa*	28,31	0,75	-	-
African Firefinch	*Lagonosticta rubricata*	6,35	0,75	-	-
African Fish Eagle	*Haliaeetus vocifer*	1,45	0,75	-	-
African Grass Owl	*Tyto capensis*	0,00	0,75	-	VU
African Green Pigeon	*Treron calvus*	0,54	0,00	-	-
African Grey Hornbill	*Lophoceros nasutus*	5,63	0,75	-	-
African Harrier-Hawk	*Polyboroides typus*	0,73	0,75	-	-
African Hawk-eagle	*Aquila spilogaster*	0,36	0,00	-	-
African Hoopoe	*Upupa africana*	84,57	6,77	-	-
African Olive Pigeon	*Columba arquatrix*	2,18	0,75	-	-
African Palm Swift	*Cypsiurus parvus*	81,67	5,26	-	-
African Paradise Flycatcher	*Terpsiphone viridis*	31,22	3,76	-	-
African Pipit	*Anthus cinnamomeus*	49,91	3,76	-	-
African Red-eyed Bulbul	*Pycnonotus nigricans*	90,38	9,02	-	-
African Reed Warbler	*Acrocephalus baeticatus*	13,61	0,75	-	-
African Sacred Ibis	*Threskiornis aethiopicus*	26,32	3,01	-	-
African Snipe	*Gallinago nigripennis*	23,59	0,00	-	-
African Spoonbill	*Platalea alba*	7,08	0,75	-	-
African Stonechat	*Saxicola torquatus*	79,31	5,26	-	-
African Swamphen	*Porphyrio madagascariensis*	6,72	1,50	-	-
African Wattled Lapwing	*Vanellus senegallus*	19,78	1,50	-	-
African Yellow Warbler	*Iduna natalensis*	0,18	0,00	-	-
Alpine Swift	*Tachymarptis melba*	0,54	0,00	-	-
Amethyst Sunbird	*Chalcomitra amethystina*	64,79	3,76	-	-
Amur Falcon	*Falco amurensis*	1,63	2,26	-	-
Ant-eating Chat	*Myrmecocichla formicivora*	3,09	0,75	-	-
Arrow-marked Babbler	*Turdoides jardineii*	0,18	0,75	-	-
Ashy Tit	*Melaniparus cinerascens*	18,33	1,50	-	-
Banded Martin	*Riparia cincta*	0,73	0,00	-	-
Barn Swallow	*Hirundo rustica*	45,01	6,77	-	-
Bar-throated Apalis	*Apalis thoracica*	46,82	2,26	-	-
Black Crake	*Zapornia flavirostra*	9,80	0,75	-	-
Black Harrier	*Circus maurus*	0,18	0,00	EN	EN
Black Heron	*Egretta ardesiaca*	0,73	0,75	-	-

Black Kite	*Milvus migrans*	0,00	0,75	-	-
Black Sparrowhawk	*Accipiter melanoleucus*	1,45	0,00	-	-
Black-backed Puffback	*Dryoscopus cubla*	6,72	1,50	-	-
Black-chested Prinia	*Prinia flavicans*	90,38	5,26	-	-
Black-chested Snake Eagle	*Circaetus pectoralis*	0,18	0,00	-	-
Black-collared Barbet	*Lybius torquatus*	90,74	10,53	-	-
Black-crowned Night Heron	*Nycticorax nycticorax*	2,36	0,75	-	-
Black-crowned Tchagra	*Tchagra senegalus*	0,00	0,75	-	-
Black-faced Waxbill	*Brunhilda erythronotos*	25,41	0,00	-	-
Black-headed Heron	*Ardea melanocephala*	30,31	1,50	-	-
Black-headed Oriole	*Oriolus larvatus*	2,54	0,75	-	-
Blacksmith Lapwing	*Vanellus armatus*	93,10	11,28	-	-
Black-throated Canary	*Crithagra atrogularis*	88,75	5,26	-	-
Black-winged Kite	*Elanus caeruleus*	47,19	13,53	-	-
Black-winged Pratincole	*Glareola nordmanni*	0,18	0,00	NT	NT
Black-winged Stilt	*Himantopus himantopus*	0,91	0,75	-	-
Blue Waxbill	*Uraeginthus angolensis*	64,61	6,02	-	-
Blue-billed Teal	*Spatula hottentota*	0,18	0,00	-	-
Bokmakierie	*Telophorus zeylonus*	79,31	5,26	-	-
Booted Eagle	*Hieraaetus pennatus*	0,36	0,75	-	-
Bronze Mannikin	*Spermestes cucullata*	58,80	5,26	-	-
Brown-backed Honeybird	*Prodotiscus regulus*	14,88	0,00	-	-
Brown-crowned Tchagra	*Tchagra australis*	44,10	0,75	-	-
Brown-hooded Kingfisher	*Halcyon albiventris*	29,40	0,75	-	-
Brown-throated Martin	*Riparia paludicola*	9,07	0,75	-	-
Brubru	*Nilaus afer*	50,45	0,75	-	-
Buffy Pipit	*Anthus vaalensis*	11,62	0,75	-	-
Burchell's Coucal	*Centropus burchellii*	6,90	0,75	-	-
Cape Bunting	*Emberiza capensis*	26,86	0,00	-	-
Cape Grassbird	*Sphenoeacus afer*	0,18	0,00	-	-
Cape Longclaw	*Macronyx capensis*	60,44	4,51	-	-
Cape Penduline Tit	*Anthoscopus minutus*	0,91	0,00	-	-
Cape Robin-Chat	*Cossypha caffra*	92,56	8,27	-	-
Cape Shoveler	*Spatula smithii*	0,36	0,75	-	-
Cape Sparrow	*Passer melanurus*	95,46	9,77	-	-
Cape Starling	*Lamprotornis nitens*	90,56	14,29	-	-
Cape Teal	*Anas capensis*	0,00	0,75	-	-
Cape Turtle Dove	*Streptopelia capicola*	87,66	13,53	-	-
Cape Vulture	*Gyps coprotheres*	0,18	0,00	VU	EN
Cape Wagtail	*Motacilla capensis*	88,75	2,26	-	-
Cape Weaver	*Ploceus capensis*	11,25	0,75	-	-
Cape White-eye	*Zosterops virens*	92,38	8,27	-	-
Capped Wheatear	*Oenanthe pileata*	10,34	0,00	-	-
Cardinal Woodpecker	*Dendropicos fuscescens*	35,93	3,76	-	-
Chestnut-backed Sparrow-Lark	*Eremopterix leucotis*	0,54	0,00	-	-
Chestnut-vented Warbler	*Curruca subcoerulea*	73,50	0,75	-	-
Chinspot Batis	*Batis molitor*	59,17	6,02	-	-
Cinnamon-breasted Bunting	*Emberiza tahapisi*	22,87	0,75	-	-
Cloud Cisticola	*Cisticola textrix*	17,06	0,00	-	-
Common Buttonquail	*Turnix sylvaticus*	1,81	0,75	-	-

Common Buzzard	*Buteo buteo*	7,80	2,26	-	-
Common Greenshank	*Tringa nebularia*	0,54	0,75	-	-
Common House Martin	*Delichon urbicum*	9,62	1,50	-	-
Common Moorhen	*Gallinula chloropus*	66,79	2,26	-	-
Common Myna	*Acridotheres tristis*	94,01	15,79	-	-
Common Ostrich	*Struthio camelus*	3,99	3,76	-	-
Common Quail	*Coturnix coturnix*	0,73	0,00	-	-
Common Sandpiper	*Actitis hypoleucos*	0,00	0,75	-	-
Common Scimitarbill	*Rhinopomastus cyanomelas*	28,68	1,50	-	-
Common Waxbill	*Estrilda astrild*	41,38	2,26	-	-
Common Whitethroat	*Curruca communis*	0,54	0,00	-	-
Coqui Francolin	*Peliperdix coqui*	9,26	0,75	-	-
Crested Barbet	*Trachyphonus vaillantii*	93,47	11,28	-	-
Crimson-breasted Shrike	*Laniarius atrococcineus*	44,10	0,75	-	-
Crowned Lapwing	*Vanellus coronatus*	96,55	12,78	-	-
Cuckoo Finch	*Anomalospiza imberbis*	0,91	0,00	-	-
Curlew Sandpiper	*Calidris ferruginea*	0,18	0,75	NT	LC
Cut-throat Finch	*Amadina fasciata*	0,18	0,75	-	-
Dark-capped Bulbul	*Pycnonotus tricolor*	81,67	6,77	-	-
Desert Cisticola	*Cisticola aridulus*	21,78	0,75	-	-
Diederik Cuckoo	*Chrysococcyx caprius*	38,29	1,50	-	-
Dusky Indigobird	*Vidua funerea*	0,36	0,00	-	-
Dusky Lark	*Pinarocorys nigricans*	0,00	0,75	-	-
Eastern Clapper Lark	*Mirafra fasciolata*	11,43	0,75	-	-
Egyptian Goose	*Alopochen aegyptiaca*	51,36	4,51	-	-
European Bee-eater	*Merops apiaster*	37,93	4,51	-	-
European Honey-buzzard	*Pernis apivorus*	0,91	0,00	-	-
European Roller	*Coracias garrulus*	0,00	0,75	-	NT
Fairy Flycatcher	*Stenostira scita*	13,61	0,75	-	-
Familiar Chat	*Oenanthe familiaris*	13,79	2,26	-	-
Fiery-necked Nightjar	*Caprimulgus pectoralis*	0,00	0,75	-	-
Fiscal Flycatcher	*Melaenornis silens*	81,49	7,52	-	-
Gabar Goshawk	*Micronisus gabar*	5,99	0,00	-	-
Garden Warbler	*Sylvia borin*	2,54	0,00	-	-
Giant Kingfisher	*Megaceryle maxima*	1,81	0,75	-	-
Glossy Ibis	*Plegadis falcinellus*	22,69	1,50	-	-
Golden-breasted Bunting	*Emberiza flaviventris*	1,45	0,00	-	-
Golden-tailed Woodpecker	*Campethera abingoni*	21,05	0,00	-	-
Goliath Heron	*Ardea goliath*	0,36	0,75	-	-
Great Crested Grebe	*Podiceps cristatus*	0,00	0,75	-	-
Great Egret	*Ardea alba*	0,91	0,75	-	-
Great Reed Warbler	*Acrocephalus arundinaceus*	2,54	0,75	-	-
Great Spotted Cuckoo	*Clamator glandarius*	0,73	0,75	-	-
Greater Double-collared Sunbird	*Cinnyris afer*	2,72	0,75	-	-
Greater Flamingo	*Phoenicopterus roseus*	0,00	0,75	-	NT
Greater Honeyguide	*Indicator indicator*	5,44	1,50	-	-
Greater Kestrel	*Falco rupicoloides*	1,09	0,75	-	-
Greater Striped Swallow	*Cecropis cucullata*	68,60	8,27	-	-
Green Wood Hoopoe	*Phoeniculus purpureus*	82,76	8,27	-	-
Green-winged Pytilia	*Pytilia melba*	36,66	0,75	-	-

Grey Go-away-bird	*Corythaixoides concolor*	61,89	4,51	-	-
Grey Heron	*Ardea cinerea*	13,79	0,75	-	-
Grey-headed Bushshrike	*Malaconotus blanchoti*	18,15	3,01	-	-
Groundscraper Thrush	*Turdus litsitsirupa*	0,36	0,75	-	-
Hadada Ibis	*Bostrychia hagedash*	94,74	14,29	-	-
Hamerkop	*Scopus umbretta*	19,24	1,50	-	-
Helmeted Guineafowl	*Numida meleagris*	82,03	14,29	-	-
Horus Swift	*Apus horus*	0,36	0,75	-	-
House Sparrow	*Passer domesticus*	88,20	12,78	-	-
Hybrid Red-eyed/Dark-capped Bulbul	*Pycnonotus nigricans/tricolor*	2,00	0,00	-	-
Icterine Warbler	*Hippolais icterina*	1,63	0,75	-	-
Indian Peafowl	*Pavo cristatus*	0,36	1,50	-	-
Intermediate Egret	*Ardea intermedia*	0,18	0,75	-	-
Jackal Buzzard	*Buteo rufofuscus*	0,54	0,75	-	-
Jacobin Cuckoo	*Clamator jacobinus*	1,45	0,75	-	-
Jameson's Firefinch	*Lagonosticta rhodopareia*	20,15	1,50	-	-
Kalahari Scrub Robin	*Cercotrichas paena*	68,42	1,50	-	-
Karoo Thrush	*Turdus smithi*	88,93	11,28	-	-
Kittlitz's Plover	*Charadrius pecuarius*	0,00	0,75	-	-
Klaas's Cuckoo	*Chrysococcyx klaas*	5,26	1,50	-	-
Kurrichane Thrush	*Turdus libonyana*	6,53	2,26	-	-
Lanner Falcon	*Falco biarmicus*	0,36	0,75	-	VU
Lark-like Bunting	*Emberiza impetuani*	0,91	0,00	-	-
Laughing Dove	*Spilopelia senegalensis*	97,82	26,32	-	-
Lazy Cisticola	*Cisticola aberrans*	0,18	0,75	-	-
Lesser Grey Shrike	*Lanius minor*	3,27	0,75	-	-
Lesser Honeyguide	*Indicator minor*	17,60	1,50	-	-
Lesser Kestrel	*Falco naumanni*	1,27	0,00	-	-
Lesser Striped Swallow	*Cecropis abyssinica*	0,36	1,50	-	-
Lesser Swamp Warbler	*Acrocephalus gracilirostris*	60,62	0,75	-	-
Levaillant's Cisticola	*Cisticola tinniens*	69,15	3,76	-	-
Lilac-breasted Roller	*Coracias caudatus*	0,18	0,75	-	-
Little Bee-eater	*Merops pusillus*	12,70	0,75	-	-
Little Bittern	*Ixobrychus minutus*	2,72	0,00	-	-
Little Egret	*Egretta garzetta*	9,26	0,75	-	-
Little Grebe	*Tachybaptus ruficollis*	39,02	1,50	-	-
Little Rush Warbler	*Bradypterus baboecala*	23,05	0,00	-	-
Little Sparrowhawk	*Accipiter minullus*	1,45	0,75	-	-
Little Swift	*Apus affinis*	66,97	3,76	-	-
Long-billed Crombec	*Sylvietta rufescens*	5,08	0,00	-	-
Long-crested Eagle	*Lophaetus occipitalis*	0,73	0,75	-	-
Long-tailed Paradise Whydah	*Vidua paradisaea*	12,16	0,75	-	-
Long-tailed Widowbird	*Euplectes progne*	37,93	6,77	-	-
Maccoa Duck	*Oxyura maccoa*	0,00	0,75	EN	NT
Malachite Kingfisher	*Corythornis cristatus*	9,44	0,75	-	-
Malachite Sunbird	*Nectarinia famosa*	5,63	1,50	-	-
Mallard	*Anas platyrhynchos*	47,91	0,75	-	-
Marsh Owl	*Asio capensis*	1,27	1,50	-	-
Marsh Sandpiper	*Tringa stagnatilis*	0,18	0,75	-	-
Marsh Warbler	*Acrocephalus palustris*	0,36	0,00	-	-

Martial Eagle	*Polemaetus bellicosus*	0,00	0,75	EN	EN
Melodious Lark	*Mirafra cheniana*	0,18	0,75	-	-
Mocking Cliff Chat	*Thamnolaea cinnamomeiventris*	2,54	1,50	-	-
Mountain Wheatear	*Myrmecocichla monticola*	44,28	2,26	-	-
Namaqua Dove	*Oena capensis*	5,99	2,26	-	-
Natal Spurfowl	*Pternistis natalensis*	6,35	0,00	-	-
Neddicky	*Cisticola fulvicapilla*	86,39	3,01	-	-
Nicholson's Pipit	*Anthus nicholsoni*	4,54	0,00	-	-
Northern Black Korhaan	*Afrotis afraoides*	54,08	4,51	-	-
Orange River Francolin	*Scleroptila gutturalis*	13,79	1,50	-	-
Orange River White-eye	*Zosterops pallidus*	14,70	0,75	-	-
Orange-breasted Bushshrike	*Chlorophoneus sulfureopectus*	0,73	0,75	-	-
Orange-breasted Waxbill	*Amandava subflava*	7,62	1,50	-	-
Ovambo Sparrowhawk	*Accipiter ovampensis*	1,81	0,75	-	-
Pale Chanting Goshawk	*Melierax canorus*	3,81	0,75	-	-
Pearl-breasted Swallow	*Hirundo dimidiata*	0,18	0,00	-	-
Pied Avocet	*Recurvirostra avosetta*	0,36	0,75	-	-
Pied Crow	*Corvus albus*	57,53	14,29	-	-
Pied Kingfisher	*Ceryle rudis*	14,70	0,75	-	-
Pied Starling	*Lamprotornis bicolor*	9,26	5,26	-	-
Pink-billed Lark	*Spizocorys conirostris*	0,91	0,00	-	-
Pin-tailed Whydah	*Vidua macroura*	64,79	7,52	-	-
Plain-backed Pipit	*Anthus leucophrys*	15,97	0,75	-	-
Purple Heron	*Ardea purpurea*	25,77	1,50	-	-
Purple Indigobird	*Vidua purpurascens*	5,81	0,00	-	-
Quailfinch	*Ortygospiza atricollis*	18,51	1,50	-	-
Rattling Cisticola	*Cisticola chiniana*	24,86	0,75	-	-
Red-backed Shrike	*Lanius collurio*	21,96	0,75	-	-
Red-billed Firefinch	*Lagonosticta senegala*	6,35	0,00	-	-
Red-billed Quelea	*Quelea quelea*	78,22	4,51	-	-
Red-billed Teal	*Anas erythrorhyncha*	21,42	1,50	-	-
Red-breasted Swallow	*Cecropis semirufa*	0,00	0,75	-	-
Red-capped Lark	*Calandrella cinerea*	17,24	4,51	-	-
Red-chested Cuckoo	*Cuculus solitarius*	19,78	0,75	-	-
Red-chested Flufftail	*Sarothrura rufa*	0,91	0,75	-	-
Red-collared Widowbird	*Euplectes ardens*	88,02	6,77	-	-
Red-eyed Dove	*Streptopelia semitorquata*	95,64	16,54	-	-
Red-faced Mousebird	*Urocolius indicus*	94,01	11,28	-	-
Red-headed Finch	*Amadina erythrocephala*	82,40	6,02	-	-
Red-knobbed Coot	*Fulica cristata*	69,33	3,01	-	-
Red-throated Wryneck	*Jynx ruficollis*	25,23	0,00	-	-
Red-winged Starling	*Onychognathus morio*	7,26	1,50	-	-
Reed Cormorant	*Microcarbo africanus*	66,79	3,76	-	-
Rock Dove	*Columba livia*	12,16	1,50	-	-
Rock Kestrel	*Falco rupicolus*	0,36	0,75	-	-
Rock Martin	*Ptyonoprogne fuligula*	51,72	4,51	-	-
Rose-ringed Parakeet	*Psittacula krameri*	0,18	0,00	-	-
Ruff	*Calidris pugnax*	0,18	0,75	-	-
Rufous-cheeked Nightjar	*Caprimulgus rufigena*	1,27	0,75	-	-
Rufous-naped Lark	*Mirafra africana*	57,71	6,77	-	-

Sabota Lark	*Calendulauda sabota*	14,70	1,50	-	-
Scaly-feathered Weaver	*Sporopipes squamifrons*	6,35	0,75	-	-
Secretarybird	*Sagittarius serpentarius*	0,18	0,00	EN	VU
Sedge Warbler	*Acrocephalus schoenobaenus*	0,36	0,75	-	-
Shaft-tailed Whydah	*Vidua regia*	4,17	0,00	-	-
Shikra	*Accipiter badius*	0,18	0,75	-	-
Short-toed Rock Thrush	*Monticola brevipes*	0,36	0,00	-	-
South African Cliff Swallow	*Petrochelidon spilodera*	7,80	0,00	-	-
South African Shelduck	*Tadorna cana*	4,54	0,75	-	-
Southern Boubou	*Laniarius ferrugineus*	7,80	1,50	-	-
Southern Fiscal	*Lanius collaris*	91,83	12,78	-	-
Southern Grey-headed Sparrow	*Passer diffusus*	80,76	4,51	-	-
Southern Masked Weaver	*Ploceus velatus*	98,37	18,05	-	-
Southern Pied Babbler	*Turdoides bicolor*	0,18	0,00	-	-
Southern Pochard	*Netta erythrophthalma*	0,36	0,75	-	-
Southern Red Bishop	*Euplectes orix*	94,74	17,29	-	-
Speckled Mousebird	*Colius striatus*	81,31	6,02	-	-
Speckled Pigeon	*Columba guinea*	93,28	16,54	-	-
Spike-heeled Lark	*Chersomanes albofasciata*	11,43	3,01	-	-
Spotted Eagle-Owl	*Bubo africanus*	11,98	0,75	-	-
Spotted Flycatcher	*Muscicapa striata*	21,23	0,00	-	-
Spotted Thick-knee	*Burhinus capensis*	58,80	2,26	-	-
Spur-winged Goose	*Plectropterus gambensis*	19,24	0,75	-	-
Squacco Heron	*Ardeola ralloides*	3,45	0,75	-	-
Streaky-headed Seedeater	*Crithagra gularis*	52,45	3,01	-	-
Striated Heron	*Butorides striata*	2,72	0,00	-	-
Striped Pipit	*Anthus lineiventris*	2,72	0,00	-	-
Swainson's Spurfowl	*Pternistis swainsonii*	67,33	4,51	-	-
Swallow-tailed Bee-eater	*Merops hirundineus*	0,54	0,00	-	-
Tawny-flanked Prinia	*Prinia subflava*	57,17	2,26	-	-
Temminck's Courser	*Cursorius temminckii*	0,73	0,75	-	-
Thick-billed Weaver	*Amblyospiza albifrons*	64,61	6,02	-	-
Three-banded Plover	*Charadrius tricollaris*	28,31	0,75	-	-
Verreaux's Eagle	*Aquila verreauxii*	3,09	2,26	-	VU
Verreaux's Eagle-Owl	*Bubo lacteus*	0,00	0,75	-	-
Village Indigobird	*Vidua chalybeata*	5,99	0,00	-	-
Village Weaver	*Ploceus cucullatus*	0,36	0,00	-	-
Violet-backed Starling	*Cinnyricinclus leucogaster*	2,00	0,75	-	-
Violet-eared Waxbill	*Granatina granatina*	6,90	0,75	-	-
Wailing Cisticola	*Cisticola lais*	37,75	0,75	-	-
Wattled Starling	*Creatophora cinerea*	55,72	2,26	-	-
Western Barn Owl	*Tyto alba*	9,80	0,75	-	-
Western Cattle Egret	*Bubulcus ibis*	61,71	9,02	-	-
Western Osprey	*Pandion haliaetus*	0,18	0,75	-	-
Whiskered Tern	*Chlidonias hybrida*	1,63	0,00	-	-
White Stork	*Ciconia ciconia*	1,63	1,50	-	-
White-backed Duck	*Thalassornis leuconotus*	0,00	0,75	-	-
White-backed Mousebird	*Colius colius*	39,93	3,76	-	-
White-bellied Sunbird	*Cinnyris talatala*	78,77	6,02	-	-
White-breasted Cormorant	*Phalacrocorax lucidus*	6,53	0,75	-	-

White-browed Sparrow-Weaver	*Plocepasser mahali*	98,55	24,06	-	-
White-faced Whistling Duck	*Dendrocygna viduata*	8,35	2,26	-	-
White-fronted Bee-eater	*Merops bullockoides*	4,90	0,75	-	-
White-rumped Swift	*Apus caffer*	66,06	6,77	-	-
White-throated Robin-Chat	*Cossypha humeralis*	0,18	0,00	-	-
White-throated Swallow	*Hirundo albigularis*	52,81	2,26	-	-
White-winged Widowbird	*Euplectes albonotatus*	34,30	2,26	-	-
Willow Warbler	*Phylloscopus trochilus*	23,41	0,75	-	-
Wing-snapping Cisticola	*Cisticola ayresii*	1,63	0,75	-	-
Wood Sandpiper	*Tringa glareola*	0,91	0,00	-	-
Yellow Canary	*Crithagra flaviventris*	59,89	0,75	-	-
Yellow-bellied Eremomela	*Eremomela icteropygialis*	8,35	0,00	-	-
Yellow-billed Duck	*Anas undulata*	61,71	3,01	-	-
Yellow-billed Kite	*Milvus aegyptius*	0,18	0,75	-	-
Yellow-billed Stork	*Mycteria ibis*	0,00	0,75	-	EN
Yellow-crowned Bishop	*Euplectes afer*	21,78	3,01	-	-
Yellow-fronted Canary	*Crithagra mozambica*	0,73	0,75	-	-
Yellow-throated Bush Sparrow	*Gymnoris superciliaris*	0,18	0,00	-	-
Zitting Cisticola	*Cisticola juncidis*	17,24	2,26	-	-

Appendix F – Avifaunal Input to the Environmental Management Plan

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 DISTIURBANCE AND HABITAT TRANSFORMATION					
Displacement of EGI sensitive avifauna due to disturbance and habitat transformation	Prevent mortality of EGI sensitive avifauna	1. Restrict construction to the immediate infrastructural footprint. Access to remaining areas should be strictly controlled to minimise disturbance of EGI sensitive species. 2. Minimise removal of natural vegetation and rehabilitate natural vegetation post-construction where possible. 3. Measures to control noise and dust should be applied according to current standard best practice in the industry. 4. Prioritise upgrading existing roads (where the requisite roads authority permission has been issued) over constructing new roads. 5. Strictly implement the recommendations of ecological and botanical specialists to reduce the level of habitat loss.	Design lay-out around the proposed buffer zones	Once-off during the planning phase.	Project Developer
AVIFAUNA: MORTALITY DUE TO ELECTROCUTION					
Electrocution of avifauna on the 132kV power line	Prevent mortality of EGI sensitive avifauna	1. A vulture-friendly pole design must be used, and the pole design must be approved by the avifaunal specialist. **Single Circuit Configuration:** Construct the power line using an Eskom approved vulture friendly pole/tower design in accordance with the Distribution	Design engineers to consult with avifaunal specialist on the final design of the poles.	Once-off during the planning phase.	Project Developer

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		Technical Bulletin or with a minimum clearance of 1.8m between the jumpers and/or insulators and the horizontal earthed component on the lattice structure. **Double Circuit Configuration:** Construct the power line with a minimum clearance of 1.8m between the jumpers and/or insulators and the horizontal earthed component on the lattice structure. Additional mitigation in the form of insulating sleeves on jumpers present on strain towers and terminal towers is also recommended (if suitable insulation material is readily available), alternatively all jumpers must be suspended below the crossarms.			

MANAGEMENT PLAN FOR THE CONSTRUCTION PHASE (INCLUDING PRE- AND POST-CONSTRUCTION ACTIVITIES)

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
AVIFAUNA: DISPLACEMENT DUE TO DISTURBANCE					

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
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 EGI sensitive avifauna by ensuring that contractors are aware of the requirements of the Construction Environmental Management Programme (CEMPr.)	A site-specific CEMPr must be implemented, which gives an appropriate and detailed description of how construction activities must be conducted. All contractors are to adhere to the CEMPr and should apply good environmental practices during construction. The CEMPr must specifically include the following: 1. No off-road driving. 2. Maximum use of existing roads as far as practically possible. 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 and biodiversity specialist reports pertaining to the limitation and rehabilitation of the footprint.	1. Implementation of the CEMPr. Oversee activities to ensure that the CEMPr 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. Construction 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 construction area is demarcated clearly 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
AVIFAUNA : DISPLACEMENT DUE TO HABITAT TRANSFORMATION					

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
Total or partial displacement of avifauna due to habitat transformation associated with the vegetation clearance and the presence of the EGI.	Prevent unnecessary displacement of avifauna by ensuring that the rehabilitation of transformed areas is implemented according to the recommendations of the biodiversity/vegetation specialist.	1. Ensure that all the recommendations for mitigation from the biodiversity/vegetation specialists, including rehabilitation of disturbed areas, are strictly implemented.	1. Appointment of specialist to coordinate and monitor the rehabilitation of the vegetation.	1. Once-off	1. Facility Operator
AVIFAUNA: MORTALITY DUE TO COLLISIONS WITH THE 132KV POWER LINE					
Bird collisions with the 132kV power line.	Prevent mortality of EGI sensitive avifauna.	1. Bird flight diverters should be installed on the 132kV overhead line on the full span length of the earth wire (according to Eskom guidelines - five metres apart). Light and dark colour devices must be alternated to provide contrast against both dark and light backgrounds, respectively. These devices must be installed as soon as the conductors are strung.	Fit Eskom approved Bird Flight Diverters on the entire overhead section of the 132kV power line.	1. Once-off	1. Contractor

MANAGEMENT PLAN FOR THE OPERATIONAL PHASE

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
AVIFAUNA: MORTALITY DUE TO ELECTROCUTIONS IN THE SUBSTATION YARD					

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
Mortality of avifauna due to electrocutions in the substation yard	Reduction of avian electrocution mortality	1. Monitor the electrocution mortality in the substations. 2. Apply mitigation when and if required.	1. Regular inspections of the substation yard	1. Monthly	1. Facility Operator

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 decommissioning activities of the EGI 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 an appropriate and detailed description of how construction activities must be conducted. All contractors are to adhere to the EMPr and should apply good environmental practice during construction. The EMPr must specifically include the following: 1. No off-road driving. 2. Maximum use of existing roads as far as practically possible. 3. Measures to control noise and dust according to latest best practice. 4. Restricted access to the rest of the property.	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	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 6. Contractor and ECO

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		5. Strict application of all recommendations in the biodiversity/vegetation specialist report pertaining to the limitation of the footprint.	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. 6. Monitor via site inspections and report non-compliance.		