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LETHABO PHOTOVOLTAIC SOLAR ENERGY FACILITY
132KV POWER LINE GRID CONNECTION
AVIFAUNAL IMPACT ASSESSMENT REPORT

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PROFESSIONAL EXPERIENCE

Ms. Megan Diamond completed a Bachelor of Science degree in Environmental Management from the University of South Africa and has been involved in conservation for 20 years. She has 16 years' worth of experience in the field of bird interactions with electrical infrastructure and during this time has completed impact assessments for over 140 projects. During her tenure at the Endangered Wildlife Trust's Wildlife & Energy Programme and the Programme's primary project (i.e. the Eskom-EWT Strategic Partnership) from 2006 to 2013, Megan was responsible for assisting the energy industry and the national utility in minimising the negative impacts, associated with the construction and operation of electrical infrastructure, on wildlife through the provision of strategic guidance, risk and impact assessments, training and research. Megan (SACNASP Environmental Science Registration number 300022/14) currently owns and manages *Feathers Environmental Services* and is tasked with providing guidance to industry through the development of best practice procedures and avifaunal specialist studies for various developments including renewable energy facilities, power lines, power stations and substation infrastructure in addition to railway infrastructure and residential properties within South Africa and elsewhere within Africa. Megan has attended and presented at several conferences and facilitated workshops, as a subject expert, since 2007. Megan has authored and co-authored several academic papers, research reports and energy industry related guidelines, including the *BirdLife South Africa/ Endangered Wildlife Trust best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa* and the *Avian Wind Farm Sensitivity Map for South Africa* (2015), and played an instrumental role in facilitating the endorsement of these two products by the South African Wind Energy Association (SAWEA), IAIAsa (International Association for Impact Assessment South Africa) and Eskom. She chaired the Birds and Wind Energy Specialist Group in South Africa (2011/2012) and the IUCN/SSC Crane Specialist Group's Crane and Power line Network (2013-2015), a working group comprised of subject matter experts from across the world, working in partnership to share lessons, develop capacity, pool resources, and accelerate collective learning towards finding innovative solutions to mitigate this impact on threatened crane populations. She is currently a member of the IUCN Stork, Ibis and Spoonbill Specialist Group and the Eskom-EWT Strategic Partnership Ludwig's Bustard Working Group.

DECLARATION OF INDEPENDENCE

I, Megan Diamond, in my capacity as a specialist consultant, hereby declare that I:

- * Act as an independent specialist to *DIGES Group* for this project.
- * Do not have any personal or financial interest in the project except for financial compensation for specialist investigations completed in a professional capacity as specified by the Amendment to Environmental Impact Assessment Regulations, 2017.
- * Will not be affected by the outcome of the environmental process, of which this report forms part of.
- * Do not have any influence over the decisions made by the governing authorities.
- * Do not object to or endorse the proposed development, but aim to present facts and our best scientific and professional opinion with regard to the impacts of the development.
- » Undertake to disclose to the relevant authorities any information that has or may have the potential to influence its decision or the objectivity of any report, plan, or document required in terms of the Amendment to Environmental Impact Assessment Regulations, 2017.

INDEMNITY

- * This report is based on a desktop investigation using the available information and data related to the site to be affected and a one-day, single season site visit to the project area on 24 February 2023. No long-term investigation or monitoring has been conducted.
- * The Precautionary Principle has been applied throughout this assessment.
- * The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information at the time of study.
- * Additional information may become known or available during a later stage of the process for which no allowance could have been made at the time of this report.
- * The specialist investigator reserves the right to modify this report, recommendations and conclusions at any stage should additional information become available.
- * Information, recommendations and conclusions in this report cannot be applied to any other area without proper investigation.
- * This report, in its entirety or any portion thereof, may not be altered in any manner or form or for any purpose without the specific and written consent of the specialist investigator as specified above.
- * Acceptance of this report, in any physical or digital form, serves to confirm acknowledgment of these terms and liabilities.



31 March 2023

EXECUTIVE SUMMARY

Eskom Holdings SOC (Ltd) intends to establish a 75MW photovoltaic (PV) solar energy facility (SEF) within the immediate vicinity of the Lethabo Power Station. The Environmental Authorisation was issued by the national Department of Forestry, Fisheries and Environment (DFFE) on the 3 November 2016 with DEA reference number: 14/12/16/3/3/2/753. The authorised SEF requires the construction of an 132kV power line to evacuate the generated electricity from the SEF to the existing national power grid, one additional 88kV bay, inclusive of busbar extension and control plant extension at the existing Rand Water Board (RWB) Substation. The proposed 132kV power line will extend from the authorised step-up substation and switching station to the existing that RWB Substation. Both the proposed 132kV power line (approximately 4.5km in length) and the RWB Substation are located within the Metsimaholo Local Municipality, in vicinity of the provincial boundary between Gauteng and the Free State provinces.

A screening report for the proposed grid connection was generated on 23 February 2023. A small portion of the broader Project Area Of Influence (PAOI) is considered to have a HIGH Animal Species sensitivity, based on the possible occurrence of African Grass Owl *Tyto capensis*, African Marsh Harrier *Circus ranivorus*, Caspian Tern *Hydroprogne caspia* and Yellow-billed Stork *Mycteria ibis* and a MEDIUM Animal Species sensitivity based on the possible occurrence of three of the aforementioned species. verification was conducted through the use of a desktop analysis and a field survey, the results of which determine the sensitivity to be MEDIUM to LOW within the proposed development corridor. A large proportion of the PAOI is subject to significant levels of disturbance, this is particularly true for the proposed development corridor. Although each of the aforementioned species have been recorded within the broader PAOI, during the 15-year SABAP2 survey period, densities are low with between one and five individuals being recorded. While the aforementioned species may traverse across the proposed development footprint and occasionally forage in the area, it is highly unlikely that area earmarked for the proposed 132kV power line alignment will support the breeding requirements of these species, owing to the significant levels of anthropogenic disturbance within the proposed PAOI.

A total of 246 bird species have been recorded within the proposed 132kV power line PAOI pentads during the SABAP2 atlassing period to date. The presence of these species in the broader area provides an indication of the diversity of species that could potentially occur along the proposed power line alignment. Of the 246 species, 13 are regional Species of Conservation Concern (SCC). Relevant to this development, 72 species are classified as power line sensitive species. Of the power line sensitive species, 38 are likely to occur regularly within the PAOI and are largely comprised of water dependent species that may traverse across the PAOI. Only 12 of these species are likely to occur regularly within the proposed 132kV power line corridor. It is important to note that with the exception of Greater Flamingo (n=23) and Lesser Flamingo (n=11), the SCC

have been recorded in very low numbers with between one and five individual birds of each species being recorded over the fourteen-year survey period. This is an accurate reflection of the diversity and abundance of SCC that are likely to be found within the area surrounding the proposed 132kV power line given the habitat present and the existing disturbance in the PAOI. No SCC were observed during the field survey.

A single summer survey was conducted on 24 February 2023, with a focused effort on the RWB Substation and areas within which the proposed 132kV power line route alignment options traverse. The site visit produced a combined list of 45 species. The majority of observations were of passerine species that are common to this area. Each of these species has the potential to be displaced by the construction of proposed 132kV power line and the construction activities associated with the RWB Substation bay and busbar extensions, as a result of habitat transformation and/or disturbance. However, these species have persisted despite existing disturbance within the PAOI. This resilience, coupled with the fact that more suitable habitat is available within the broader area, means that the displacement impact will not be of regional or national significance.

Poorly sited or designed facilities and infrastructure can negatively impact not only vulnerable species and habitats, but also entire ecological processes. The effects of any development on birds are highly variable and depend on a wide range of factors including the specification of the development, the topography of the surrounding land, the habitats affected and the number and diversity of species present. With so many variables involved, the impacts of each development must be assessed individually. Each of these potential effects can interact, either increasing the overall impact on birds or, in some cases, reducing a particular impact (for example where habitat loss and disturbance causes a reduction in birds using an area which may then reduce the risk of collision). The principal areas of concern for SCC and non-SCC substation and power line sensitive species are:

- * Displacement as a result of habitat loss or transformation
- * Displacement as a result of disturbance
- * Direct mortality as a result of construction activities
- * Mortality due to collisions with the 132kV power line conductors and/or earthwires
- * Mortality due to electrocutions on the 132kV power line infrastructure
- * Mortality due to electrocutions within the RWB Substation

Cumulative Impact in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities. The proposed 132kV power line equate to a maximum length of approximately 4.5km. There are at least 11 existing high voltage powerlines within the PAOI and significantly more transmission, distribution and reticulation lines totaling hundreds of kilometres within the 30km radius

around the proposed 132kV power line PAOI (FIGURE 7). The 132kV power line will increase the total number of existing and planned high voltage lines by a small percentage, therefore the contribution of the proposed 132kV power line to the cumulative impact of all the high voltage lines is deemed to be of LOW significance. The combined cumulative impact of the existing power lines, i.e. the 132kV power line and all future proposed power lines on avifauna within a 30km radius is considered to be of MEDIUM significance. The cumulative impact of displacement due to disturbance and habitat transformation associated with the extensions within the RWB Substation is considered to be LOW, due to the small size of the footprint, and the availability of similar habitat within the 30km radius area. The cumulative impact of potential electrocutions within the RWB Substation is also likely to be LOW as it is expected to be a rare event.

One of the objectives of this study is to determine the preferred power line route that poses the least impact to the avifaunal community, particularly SCC and non-SCC priority species present within the PAOI. The two power line route alternative options occur within the same pentad, subjected to the same land use practices and therefore likely to be identical in terms of species diversity and density too. With this in mind, the selection of a preferred 132kV power line route alignment option has been determined using observations of available micro habitat in relation to proposed infrastructure. Power line route alignment Option A is located directly adjacent to the service road. The displacement impact is likely to be less significant along this alignment, given the existing levels of disturbance associated with the vehicle traffic on this road. Option A is therefore nominated as the preferred power line route alignment option. However, neither options are fatally flawed and the power line can be constructed and operated along either of the proposed options, with appropriate mitigation.

In conclusion, the habitat within which the PAOI is located is considered to have a MODERATE to LOW sensitivity. In recent years, anthropogenic impacts, mostly in the form of industrial, urban, and peri-urban transformed the landscape resulting in a negative impact on avifaunal diversity and abundance with the PAOI. The construction of the 132kV power line and bay and busbar extensions within the RWB Substation will result in impacts of MODERATE-LOW significance to birds occurring in the vicinity of the new infrastructure, which can be reduced further through the application of mitigation measures. It is anticipated that the 132kV power line and bay and busbar extensions can be constructed with acceptable levels of impact on the resident avifauna, subject to the following recommendations:

- * The 132kV power line must be constructed using a bird friendly structure.
- * The recommendations of the biodiversity specialist study must be strictly implemented, especially as far as limitation of the construction footprint (especially the removal of natural vegetation) and rehabilitation of disturbed areas is concerned.
- * Construction activities (i.e., all staff, vehicle and machinery) should be restricted to the immediate footprint of the infrastructure.

- * Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of avifaunal species.
- * Maximum use should be made of existing roads and the construction of new roads must be kept to a minimum.
- * If collision or electrocution impacts are recorded once the 132kV power line are operational, it is recommended that a representative from the Eskom-Endangered Wildlife Trust Strategic Partnership investigate the mortalities and provide recommendations for site-specific mitigation to be applied reactively.
- * If electrocution impacts are recorded within the operational RWB Substation, it is recommended that a representative from the Eskom-Endangered Wildlife Trust Strategic Partnership investigates the mortalities and provides recommendations for site-specific mitigation to be applied reactively.
- * In addition to this, the normal suite of environmental good practices should be applied, such as ensuring strict control of staff, vehicles and machinery on site and limiting the creation of new roads as far as possible.

In accordance with the outcomes of the impact assessment detailed in Section 8, in conjunction with the baseline conditions as presented in Section 7 and the impact management measures in Section 9, the proposed 132kV power line alignment and bay and busbar extensions are not deemed to present unmitigable negative environmental issues or impacts. It is this specialist's opinion that the construction and operation of the 132kV power line and the RWB Substation will result in acceptable levels of impact on the resident avifauna subject to the aforementioned mitigation and management measures.

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1. INTRODUCTION

In order to demonstrate commitment to sustainable development and a pledge to move towards a cleaner energy future, Eskom Holdings SOC (Ltd) intends to establish a 75MW photovoltaic (PV) solar energy facility

(SEF) within the immediate vicinity of the Lethabo Power Station. An Environmental Impact Assessment (EIA) process was undertaken for the infrastructure within the PV development area. The Environmental Authorisation was issued by the national Department of Forestry, Fisheries and Environment (DFFE) on the 3 November 2016 with DEA reference number: 14/12/16/3/3/2/753. A validity extension for the SEF was issued for an additional five years on 7 July 2021. The authorised SEF requires the construction of an 132kV power line to evacuate the generated electricity from the SEF to the existing national power grid, one additional 88kV bay, inclusive of busbar extension and control plant extension at the existing Rand Water Board (RWB) Substation. The proposed 132kV power line will extend from the authorised step-up substation and switching station to the existing that Rand Water Board Lethabo Substation.

The National Environmental Management Act (NEMA) (Act 107 of 1998) requires that an impact assessment be conducted for any development which could have a significant effect on the environment, with the objective to identify, predict and evaluate the actual and potential impacts of these activities on ecological systems; identify alternatives; and provide recommendations for mitigation to minimize the negative impacts. In order to meet the Basic Assessment requirements as outlined in Regulations 19 – 20 of the Amendment to Environmental Impact Assessment Regulations of 2017, *Eskom* require detailed specialist studies that will document any potential fatal flaws and the impacts of the proposed 132kV power line, bay and busbar extensions and recommend measures to manage (maximise positive and minimise negative) and monitor those impacts associated with the proposed power line grid connection.

2. PROJECT LOCATION

Both the proposed 132kV power line (approximately 4.5km in length) and the RWB Substation are located within the Metsimaholo Local Municipality, in vicinity of the provincial boundary between Gauteng and the Free State provinces (FIGURE 1).

3. PROJECT OVERVIEW

3.1 Power Line Alternatives

Two power line alternative corridors (Option a and Option B) were assessed. Although the proposed power line has a voltage size of 88kV, the power line will be constructed using the 132kV pole/tower specifications. This assessment assumes that the power line will be constructed using steel monopole structures.

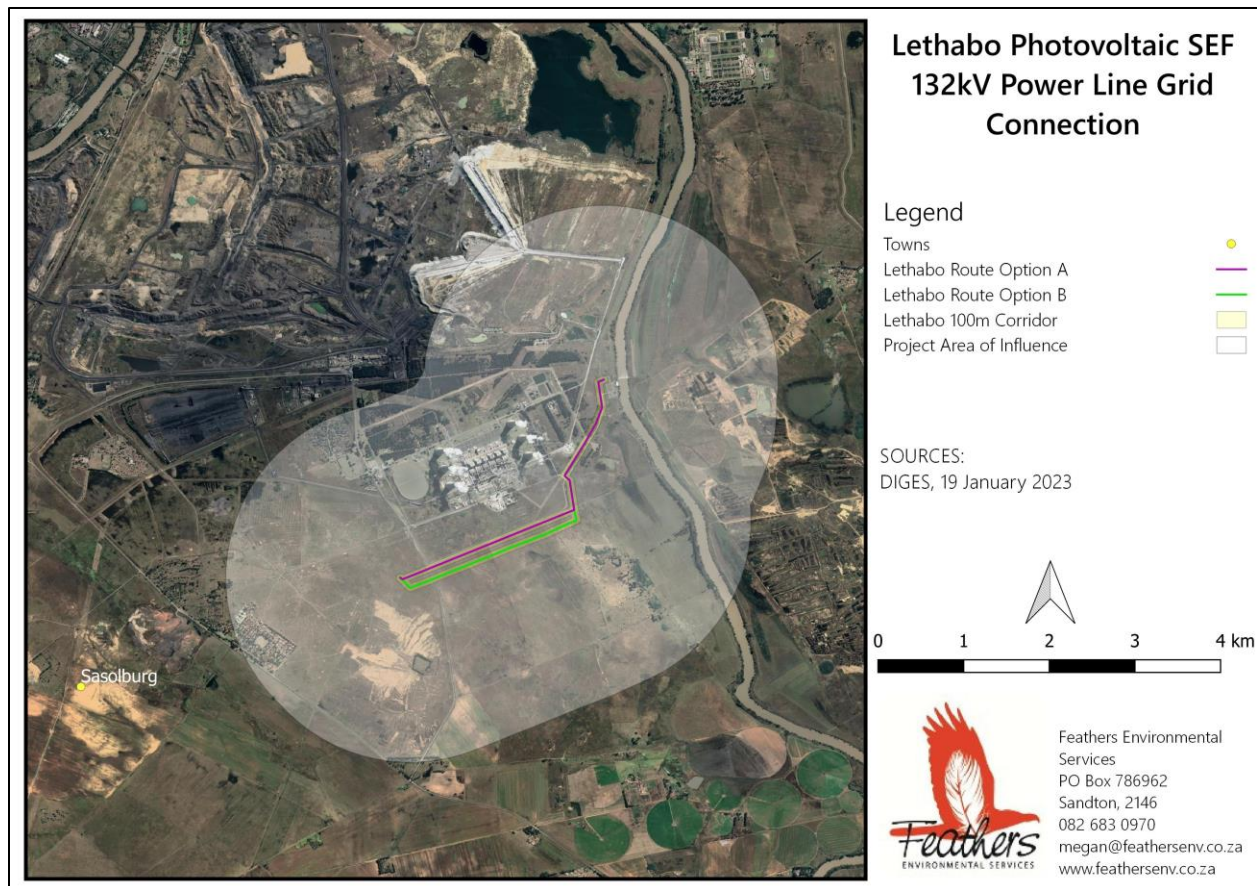


FIGURE 1: Regional map detailing the location of the proposed Lethabo PV SEF 132kV Power Line Grid Connection route options located within the Free State Province.

4. THIS REPORT

4.1 Scope of Work

Feathers Environmental Services CC (hereafter referred to as *Feathers*) was appointed by *DIGES Group (Pty) Ltd* (hereafter referred to as *DIGES*) to perform a specialist avifaunal assessment for the proposed 132kV power line grid connection project. This report is based on a desktop review and a single season (austral summer) field survey conducted over a one-day period, which uses a set methodology and various data sets to determine which avian species regularly occur within the proposed study area, the availability of bird micro habitats (i.e. avifaunal sensitive areas), the possible impacts, of the proposed grid connection and their significance and the provision of recommendations for the mitigation of the anticipated impacts.

Feathers has conducted this avifaunal impact assessment according to the following terms of reference provided by *DIGES* on 19 January 2023 and in accordance with the minimum report requirements listed 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):

- * Conduct a site sensitivity verification through the use of a desk top analysis, using satellite imagery and other available and relevant information, in addition to an on-site field inspection;
- * Assess various avifaunal datasets, including but not limited to Important Bird Areas (IBAs) and describe the avifaunal communities (particularly with reference to Species of Conservation Concern (SCC) most likely to impacted on by the 132kV power line and the proposed infrastructure within the existing RWB Substation;
- * Identify and confirm avifaunal micro-habitats within the along the 132kV power line alignment and assess these for their suitability to support SCC and non-SCC priority (power line-sensitive) species, in terms of breeding, roosting and foraging;
- * Describe the avifaunal communities (both SCC and non-SCC priority species) most likely to be impacted, based on primary occurrence data collected during the site survey;
- * Provide a detailed description of the impacts associated with the construction and operation of the 132kV power line and infrastructure within the RWB Substation;
- * Assess the significance (rated according to a pre-determined set of criteria of the identified direct, indirect and cumulative impacts, during the construction and operation phases of the 132kV power line and the infrastructure within the RWB Substation, based on data collected in-field;
- * Consider the two route alignments and advise possible changes to the alternatives (if necessary);
- * Recommend practical mitigation measures for the management of the identified impacts, at each stage of the development process, for inclusion in the draft Environmental Management Programme (EMPr);
- * Propose a monitoring programme for the sensitive areas, species or receptors (if necessary); and
- * Describe the gaps in baseline data and an indication of the confidence levels.

4.2 Structure of this report

In terms of the NEMA 2014 EIA Regulations contained in GN R982 of 04 December 2014 (as amended) all specialist studies must comply with Appendix 6 of the NEMA 2014 EIA Regulations GN R982 of 04 December 2014 (TABLE 1) and in accordance with 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) (TABLE 2).

TABLE 1: Information to be included in specialist reports

Legal Requirement		Relevant Section in Specialist study
(1)	A specialist report prepared in terms of these Regulations must contain-	
(a)	details of-	

Legal Requirement		Relevant Section in Specialist study
	(i) the specialist who prepared the report; and	Professional Experience and Appendix 5
	(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae	Professional Experience and Appendix 5
(b)	a declaration that the specialist is independent in a form as may be specified by the competent authority;	Declaration of Independence
(c)	an indication of the scope of, and the purpose for which, the report was prepared;	Section 3 & 4
(cA)	an indication of the quality and age of base data used for the specialist report;	Section 5
(cB)	a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 7
(d)	the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 5 & 12
(e)	a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 5
(f)	details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 8
(g)	an identification of any areas to be avoided, including buffers;	N/A
(h)	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	N/A
(i)	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 12
(j)	a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 7 & 8
(k)	any mitigation measures for inclusion in the EMP;;	Section 9
(l)	any conditions for inclusion in the environmental authorisation;	Section 10 Section 11
(m)	any monitoring requirements for inclusion in the EMP or environmental authorisation;	Section 10
(n)	a reasoned opinion	Section 11
	whether the proposed activity, activities or portions thereof should be authorised;	Section 11
	regarding the acceptability of the proposed activity or activities; and	Section 11

Legal Requirement		Relevant Section in Specialist study
	if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMP, and where applicable, the closure plan;	Section 9 Section 10 Section 11
(o)	a description of any consultation process that was undertaken during the course of preparing the specialist report;	Not Applicable
(p)	a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Not Applicable
(q)	any other information requested by the competent authority.	Not Applicable
(2)	Where a government notice <i>gazetted</i> by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Section 4, Table 2, Section 5 and Section 7

TABLE 2: Minimum report requirements listed 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)

HIGH SENSITIVITY RATING FOR TERRESTRIAL ANIMAL SPECIES	
SITE SENSITIVITY VERIFICATION	
The site sensitivity verification must be undertaken by an environmental assessment practitioner or specialist.	Professional Experience and Appendix 5
The site sensitivity verification must be undertaken through the use of: (a) a desk top analysis, using satellite imagery; (b) a preliminary on-site inspection; and (c) any other available and relevant information.	Section 5 & 7
The outcome of the site sensitivity verification must be recorded in the form of a report that: (a) confirms or disputes the current use of the land and environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc.; (b) contains a motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity; and (c) is submitted together with the relevant assessment report prepared in accordance with the requirements of the Environmental Impact Assessment Regulations	Section 7.1 and Appendix 2
SPECIALIST ASSESSMENT & MINIMUM REPORT CONTENT REQUIREMENTS	
Contact details and relevant experience as well as the SACNASP Registration number of the specialist preparing the assessment including a curriculum vitae;	Professional Experience and Appendix 5

A signed statement of independence by the specialist;	Declaration of Independence
A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	Section 5.2 & 12
A description of the methodology used to undertake the site sensitivity verification, impact assessment and site inspection, including equipment and modelling used where relevant;	Section 5.1
A description of the mean density of observations/number of sample sites per unit area and the site inspection observations;	Section 7
A description of the assumptions made and any uncertainties or gaps in knowledge or data;	Section 12
details of all SCC found or suspected to occur on site, ensuring sensitive species are appropriately reported;	Section 7
the online database name, hyperlink and record accession numbers for disseminated evidence of SCC found within the PAOI;	N/A
The location of areas not suitable for development and to be avoided during construction where relevant;	N/A
a discussion on the cumulative impacts;	Section 8
Impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	Section 9
A reasoned opinion, based on the findings of the specialist assessment, regarding the acceptability or not of the development and if the development should receive approval or not, related to the specific theme being considered, and any conditions to which the opinion is subjected if relevant; and	Section 10 & 11
A motivation must be provided if there were any development footprints identified as per paragraph 2.2.12 above that were identified as having "low" or "medium" terrestrial animal species sensitivity and were not considered. appropriate.	N/A

5. APPROACH AND METHODOLOGY

5.1 Methodology

The following methods were employed to compile this avifaunal impact assessment report:

- * The focus of this assessment is primarily on the potential impacts of the proposed 132kV power line and infrastructure within the RWB Substation on priority species. Priority species are defined as those species which could potentially be impacted by displacement through habitat transformation and/or disturbance as well as collision and electrocution based on specific morphological and/or behavioural characteristics. These include both Species of Conservation Concern (SCC) as defined by the *Species Environmental Assessment Guideline: Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa (2020)* i.e. those species listed on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered, Vulnerable, Near Threatened and Data Deficient, as well as certain other impact susceptible species.
- * By virtue of their mobility, the identification of bird presence and abundance cannot be confined to the RWB Substation and 132kV power line servitude, therefore the Project Area of Influence (PAOI) is defined as a 2km zone around the existing substation and proposed alignment options. Avifaunal sensitivity has been defined for this PAOI.
- * The proposed 132kV power line is located across two South African Bird Atlas Project 2 (SABAP2) pentad grid cells (i.e. 2640_2755 and 2645_2755). A larger area (comprised of four pentads) is necessary to obtain a dataset that is large enough to ensure that reasonable conclusions about species diversity and densities, in a particular habitat type, can be drawn (FIGURE 2). A total of 129 full protocol lists and 98 ad hoc protocol lists have been completed, which provides an accurate snapshot of the avifauna in the study area;
- * Collected and examined various avifaunal data sets (detailed in section 5.2) at a desktop level to determine the presence of species, that may be vulnerable to the impacts associated with the construction and operation of the 132kV power line and the proposed infrastructure within the RWB Substation;
- * Suitable avifaunal habitats and potential sensitive areas within the proposed 132kV power line route alignment options, where impacts are likely to occur, were identified using various Geographic Information System (GIS) layers and Google Earth imagery and confirmed based on personal observations made during the field survey on 24 February 2023;
- * Primary avifaunal diversity and occurrence data collected during a single spring season, one-day field survey to the RWB Substation and 132kV power line route alignment options, conducted on 24 February 2023. Data was collected by means of incidental counts to ground truth the information gleaned from secondary data sources and to collect primary bird occurrence data at the RWB Substation, along the 132kV power line route alignment options and the immediate surrounds;
- * The potential impacts, associated with the construction and operation of the infrastructure within the RWB Substation and the 132kV power line on the avifaunal community and their significance were predicted and assessed according to quantitative criteria (APPENDIX 3); and

- * Practical recommendations for the management and mitigation of impacts, related to the construction and operation of the 132kV power line are provided in Section 9 for inclusion in the draft EMPr.

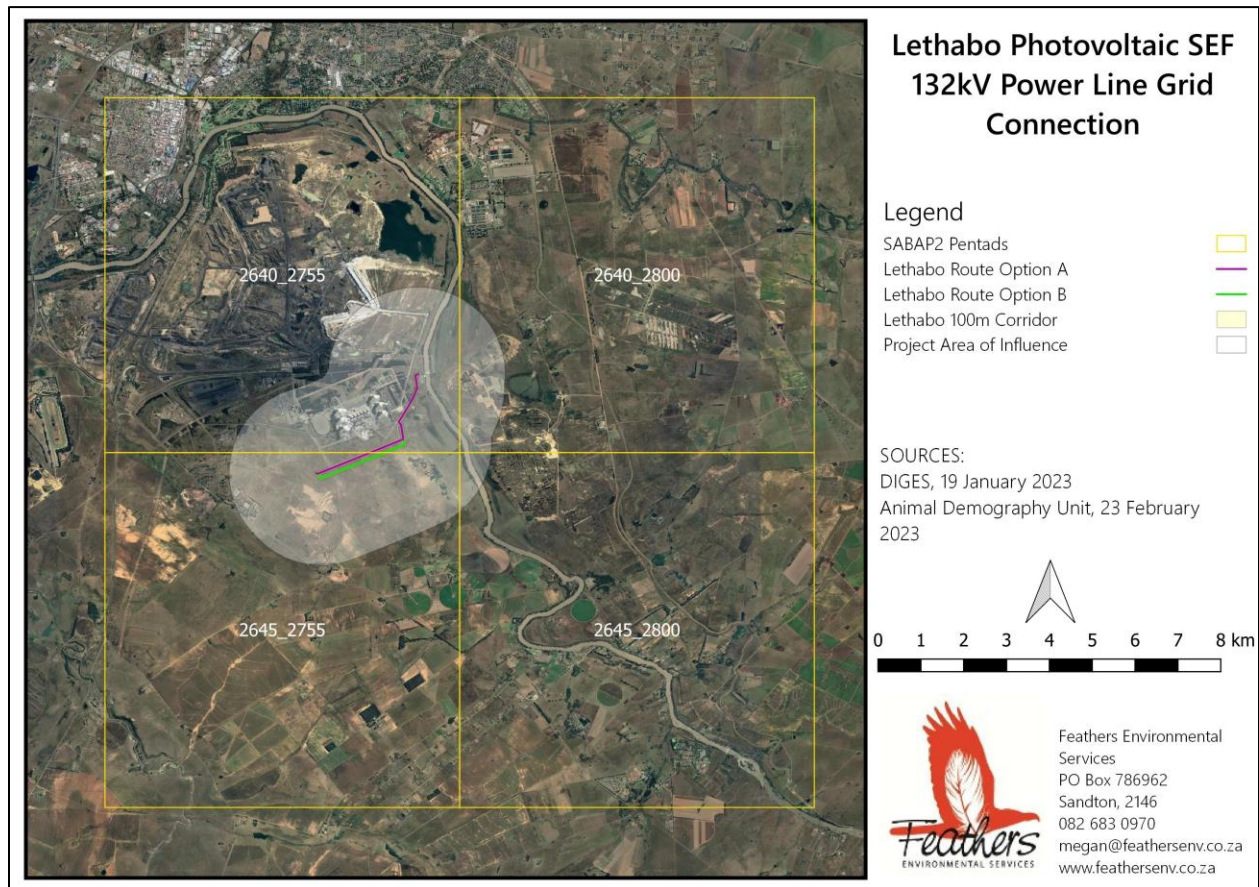


FIGURE 2: Location of the three South African Bird Atlas Project 2 (SABAP2) pentad grid cells that were considered for the Lethabo PV SEF 132kV Power Line Grid Connection route options

5.2 Data sources used

The following data sources and reports were used in varying levels of detail for this study:

- * Procedures for the Assessment and Minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of NEMA when applying for Environmental Authorisation (Gazetted October 2020);
- * Guidelines for the Implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for EIAs in South Africa produced by the South African National Biodiversity Institute on behalf of the Department of Environment, Forestry and Fisheries (2020) were consulted to determine the applicable protocol to be used;

- * Screening Report for an Environmental Authorisation as required by the 2014 EIA Regulations - Proposed Site Environmental Sensitivity: Proposed Lethabo PV SEF 132kV Power Line Grid Connection, compiled by *Feathers* on 23 February 2023;
- * Final Environmental Impact Assessment Report: Lethabo PV Solar Energy Facility Near Sasolburg, Free State Province, June 2016;
- * Ecological Assessment Report: Lethabo PV Solar Energy Facility next to the Lethabo Power Station, Free State Province, March 2015;
- * Avifaunal Impact Assessment: Lethabo Solar Photovoltaic Facility, February 2016;
- * Bird distribution data of the South African Bird Atlas 2 (SABAP 2) (Animal Demography Unit, 23 February 2023);
- * The Important Bird Areas (IBAs) report (Marnewick et al. 2015). The Suikerbosrand Nature Reserve (SA022) occurs within a 50km radius of the PAOI;
- * Co-ordinated Waterbird Count Database (CWAC – Taylor et al. 1999). The Vaal Dam East and Vaal Dam West CWAC sites occur within a 50km radius of the PAOI;
- * Coordinated Avifaunal Roadcount project database (CAR – Young et al, 2003) - was consulted to obtain relevant data on large terrestrial bird report rates in the area. GH03 CAR routes is located 2kms east of the PAOI;
- * The global and regional conservation status and endemism information of all bird species (Taylor et al. 2015) and the latest (2022-1) IUCN Red List of Threatened Species (<http://www.iucnredlist.org>);
- * The power line - bird mortality incident database of the Eskom/Endangered Wildlife Trust Strategic Partnership (1996 to 2013) was consulted to determine which of the species occurring in the PAOI are typically impacted upon by power lines, and the extent of the impact;
- * The latest vegetation classification described in the Vegetation Map of South Africa (South African National Biodiversity Institute, 2012 and Mucina & Rutherford, 2006);
- * High-resolution Google Earth ©2023 imagery was used to examine the micro-habitats within the PAOI;
- * KMZ. shapefiles detailing the location of the 132kV power line, provided by *DIGES* on 19 January 2023; and
- * A one-day field survey of the 132kV power line corridor and the two power line alternative options contained within and PAOI conducted on 24 February 2023 (summer survey) to form a first-hand impression of avifaunal species presence and micro-habitat occurring within the larger PAOI surrounding the 132kV power line (FIGURE 3). This information, together with the SABAP2 data was used to compile a comprehensive list of species that could occur in the PAOI.

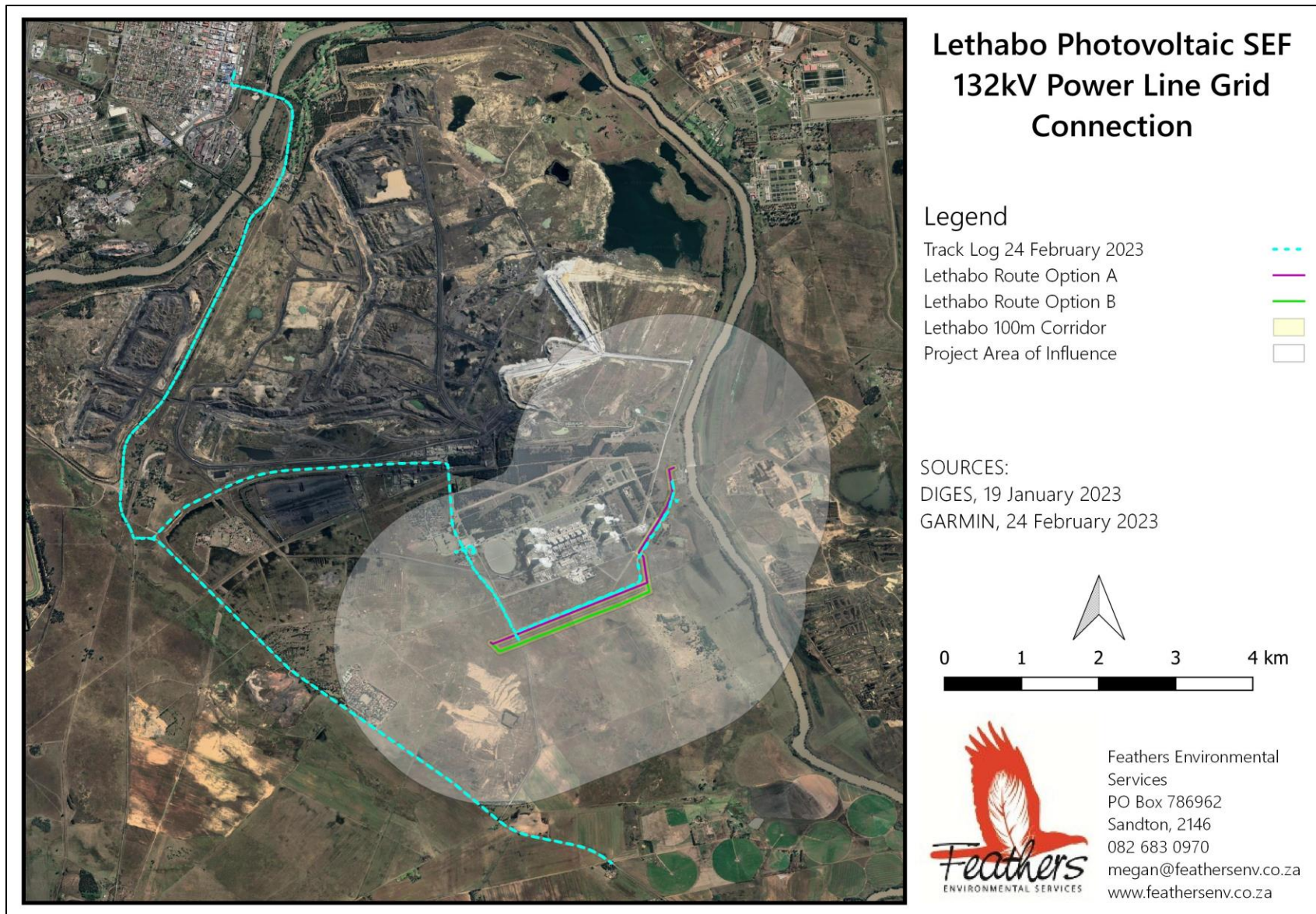


FIGURE 3: Regional map detailing the routes surveyed during the site survey of the PAOI and Lethabo PV SEF 132kV Power Line Grid Connection route options conducted on 24 February 2023

6. APPLICABLE LEGISLATION, POLICIES AND GUIDELINES

The following pieces of legislation are applicable to this assessment:

6.1 The Convention on Biological Diversity

The Convention on Biological Diversity (CBD) is an international convention (to which South Africa is a signatory) and represents a commitment to sustainable development. The Convention has three main objectives: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources (<http://www.cbd.int/convention/guide/>). The convention makes provision (in a general policy guideline) for keeping and restoring biodiversity. In addition to this the CBD is an ardent supporter of thorough assessment procedures (Strategic Environmental Assessments (SEAs) and Environmental Impact Assessments (EIAs)) and requires that Parties apply these processes when planning activities that will have a biodiversity impact. An important principle encompassed by the CBD is the precautionary principle which essentially states that where serious threats to the environment exist, lack of full scientific certainty should not be used as a reason for delaying management of these risks. The burden of proof that the impact will *not* occur lies with the proponent of the activity posing the threat. In addition, the Aichi Biodiversity Targets (CBD 2011) address several priority issues i.e. the loss of biodiversity and its causes; reducing direct pressure on biodiversity; safeguarding ecosystems, species and genetic diversity and participatory planning to enhance implementation of biodiversity conservation. Each of these is relevant in the case of energy infrastructure and bird conservation through all project phases from planning to the implementation of mitigation measures for existing developments.

6.2 The Convention on the Conservation of Migratory Species of Wild Animals

The Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or the Bonn Convention) is an intergovernmental treaty and is the most appropriate instrument to deal with the conservation of terrestrial, aquatic and avian migratory species. The convention includes policy and guidelines with regards to the impacts associated with man-made infrastructure. CMS requires that Parties (South Africa is a signatory) take measures to avoid migratory species from becoming endangered (Art II, par. 1 and 2) and to make every effort to prevent the adverse effects of activities and obstacles that seriously impede or prevent the migration of migratory species (Art III, par. 4b and 4c). At CMS/CoP7 (2002) Res. 7.2 on Impact Assessment and Migratory Species was accepted, requesting Parties to apply appropriate SEA and EIA procedures for all proposed developments. An agreement developed in the framework of CMS, in force since November 1999, brings the 119 Range States of the Africa Eurasian Waterbird Agreement (AEWA) region together in a common policy to protect migratory waterbirds that use the flyway from the Arctic to southern Africa. The agreement contains a number of obligations that are relevant to migratory waterbirds and energy infrastructure. AEWA has also published a series of practical guidelines that enable Parties to effectively address conservation issues influencing the status of migratory waterbirds. The most relevant guideline for migratory birds and energy

infrastructure is the *Guideline on how to avoid, minimise or mitigate impact of infrastructural developments and related disturbance affecting waterbirds* (Tucker & Treweek, 2008).

6.3 The Agreement on the Conservation of African-Eurasian Migratory Water Birds

The Agreement on the Conservation of African-Eurasian Migratory Water birds (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. The AEWA covers 255 species of birds ecologically dependent on wetlands for at least part of their annual cycle, including many species of divers, grebes, pelicans, cormorants, herons, storks, rails, ibises, spoonbills, flamingos, ducks, swans, geese, cranes, waders, gulls, terns, tropic birds, auks, frigate birds and even the South African penguin. The core activities carried out under AEWA are described in its Action Plan, which is legally binding for all countries that have joined the Agreement. The AEWA Action Plan details the various measures to be undertaken by Contracting Parties (South Africa included) to guarantee the conservation of migratory waterbirds within their national boundaries. These include species and habitat protection, and the management of human activities, as well as legal and emergency measures.

6.4 The National Environmental Management Act 107 of 1998 (NEMA)

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

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

The National Environmental Management: Biodiversity Act (No. 10 of 2004), (NEMBA) regulations on Threatened and Protected Species (TOPS) provides for the consolidation of biodiversity legislation through establishing national norms and standards for the management of biodiversity across all sectors and by different management authorities. The national Act provides for among other things, the management and

conservation of South Africa's biodiversity; protection of species and ecosystems that necessitate national protection and the sustainable use of indigenous biological resources.

6.6 The National Environmental Management: Protected Areas Act 57 of 2003

The National Environmental Management: Protected Areas Act (No. 57 of 2003), as amended in 2014, provides for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes. The Act also provides for the establishment of a national register of all national, provincial and local protected areas that are managed in accordance with national norms and standards; and to endure intergovernmental co-operation and public consultation in matters concerning protected areas. Protected areas are declared in order to regulate the area as a buffer zone for protection of a special nature reserve, world heritage site or nature reserve; to enable owners of land to take collective action to conserve biodiversity on their land and to seek legal recognition therefor; to protect the area if the area is sensitive to development due to its- (i) biological diversity; (ii) natural characteristics; (iii) scientific, cultural, historical, archaeological or geological value; (iv) scenic and landscape value; or (v) provision of environmental goods and services; to protect a specific ecosystem outside of a special nature reserve, world heritage site or nature reserve; to ensure that the use of natural resources in the area is sustainable. This Act explicitly states that no development, construction or farming may be permitted in a nature reserve or world heritage site without the prior written approval of the management authority.

6.7 The National Environmental Management Act 107 of 1998 (NEMA) Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal and or Avifaunal Species

This protocol provides the criteria for the specialist assessment and minimum report content requirements for impacts on terrestrial animal and/or avifaunal species for activities requiring environmental authorisation. This protocol replaces the requirements of Appendix 6 of the Environmental Impact Assessment Regulations. The assessment and reporting requirements of this protocol are associated with a level of environmental sensitivity identified by the national web based environmental screening tool (screening tool) for terrestrial animal species. The relevant terrestrial animal species data in the screening tool has been provided by the South African National Biodiversity Institute (SANBI).

7. DESCRIPTION OF THE BASELINE CONDITIONS

7.1 Site Sensitivity Verification

A screening report for the proposed grid connection was generated on 23 February 2023. A small portion of the broader PAOI is considered to have a HIGH Animal Species sensitivity, based on the possible occurrence of African Grass Owl *Tyto capensis*, African Marsh Harrier *Circus ranivorus*, Caspian Tern *Hydroprogne caspia* and Yellow-billed Stork *Mycteria ibis* and a MEDIUM Animal Species sensitivity based on the possible occurrence of three of the aforementioned species. Site verification was conducted through the use of a desktop analysis and a field survey, the results of which determine the sensitivity to be MEDIUM to LOW within the proposed development corridor. A large proportion of the PAOI is subject to significant levels of disturbance, this is particularly true for the proposed 132kV development corridor. Although each of the aforementioned species have been recorded within the broader PAOI, during the 15-year SABAP2 survey period, densities are low with between one and five individuals being recorded. While the species may traverse across the proposed development footprint and occasionally forage in the area, it is highly unlikely that area earmarked for the proposed 132kV power line alignment will support the breeding requirements of these species, owing to the significant levels of anthropogenic disturbance at the RWB Substation and within the proposed power line PAOI.

7.2 Relevant Bird Populations

7.2.1 Important Bird Areas

Some sites are exceptionally important for maintaining the taxa dependent upon the habitats and ecosystems in which they occur. Vigorous protection of the most critical sites is one important approach to conservation. Many species may be effectively conserved by this means. Patterns of bird distribution are such that, in most cases, it is possible to select sites that support many species. These sites, carefully identified on the basis of the bird numbers and species complements they hold (i.e. globally threatened, range restricted and or migratory or congregatory species) are termed Important Bird Areas (IBAs). IBAs are selected such that, taken together, they form a network throughout the species' biogeographic distributions. IBAs are key sites for conservation – small enough to be conserved in their entirety and often already part of a protected-area network. The proposed 132kV power line is located within 50km of the Suikerbosrand Nature Reserve IBA (SA022) (FIGURE 3).

The diversity of habitats within the Suikerbosrand Nature Reserve supports a fairly significant diversity of bird species with more than 270 species being recorded in SABAP2 to date. Several species of conservation concern occur within this IBA. These include the globally threatened Melodious Lark *Mirafraga cheniana*, Blue Korhaan *Eupodotis caerulescens* and Secretarybird *Sagittarius serpentarius* (two pairs). Regionally threatened species include African Grass Owl *Tyto capensis* (12–30 individuals) and White-bellied Korhaan *Eupodotis senegalensis*.

In addition, Kalahari Scrub Robin *Erythropygia paena* and White-bellied Sunbird *Cinnyris talatala* are the only biome-restricted species in this IBA. Sentinel Rock Thrush *Monticola explorator* occurs in the east and Kalahari Scrub Robin, Red-headed Finch *Amadina erythrocephala*, Black-faced Waxbill *Estrilda erythronotos* and Violet-eared Waxbill *Uraeginthus granatinus* are regularly reported (Marnewick *et al.* 2015).

Although the IBA is located a distance from the proposed 132kV power line route alignment options, the presence (based on SABAP2 records) of five IBA trigger species i.e. African Grass Owl, White-bellied Korhaan, Secretarybird, Kalahari Scrub Robin and White-bellied Sunbird within the broader study area, is worthy of consideration. However the existing levels of disturbance and the fragmented nature of the grassland within the assessed power line corridor is likely to preclude the occurrence of the aforementioned SCC, in particular White-bellied Korhaan and Secretarybird.

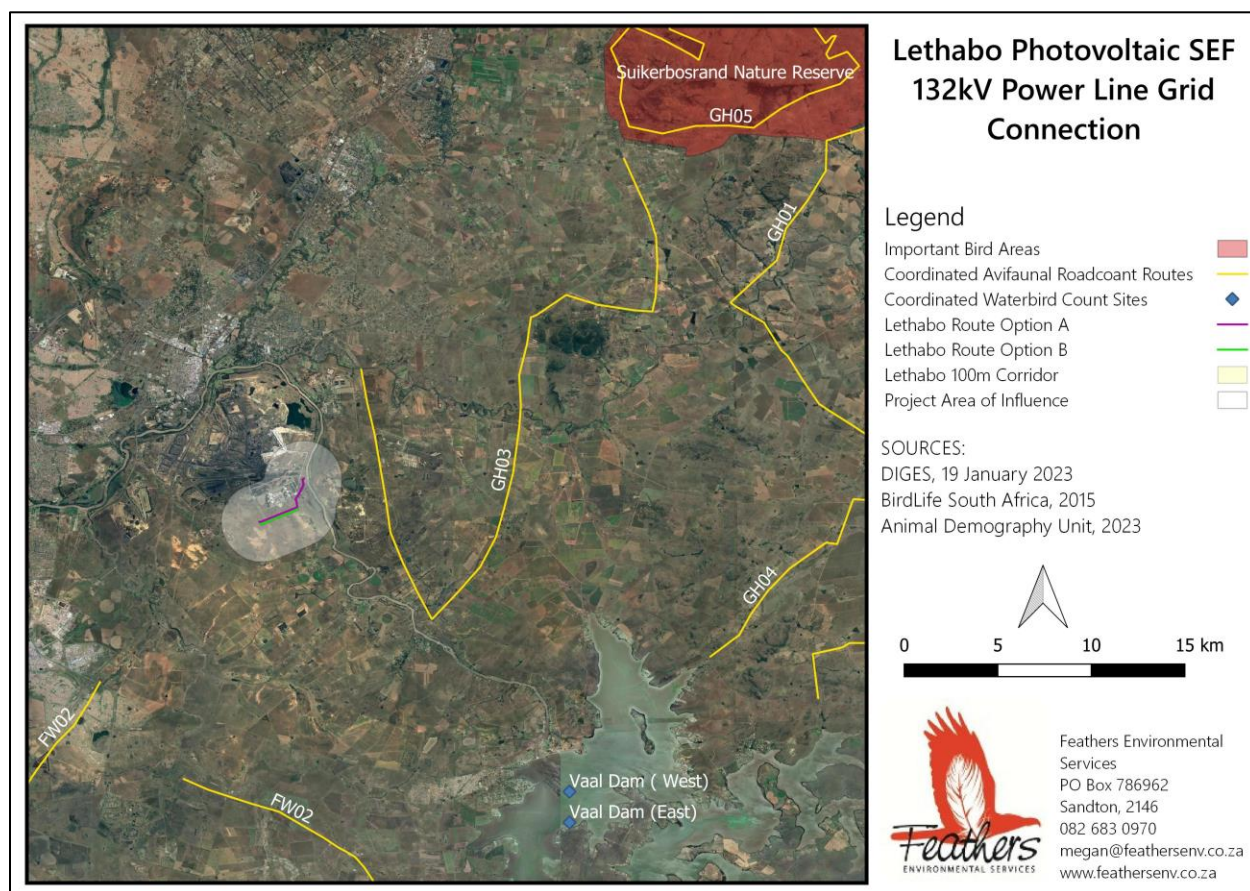


FIGURE 4: Regional map detailing the location of the Lethabo PV SEF 132kV Power Line Grid Connection route options in relation to Important Bird Areas, Coordinated Waterbird Count sites and Coordinated Avifaunal Roadcount routes.

7.2.2. Coordinated Avifaunal Roadcount (CAR) Routes

Cranes, bustards, storks and other large birds that spend most of their time on the ground, need wide, open spaces and are certainly not restricted to protected areas. Agricultural habitats are used extensively for feeding, roosting and breeding, often because no natural, pristine habitats are available, and sometimes because the agricultural habitats are especially attractive to birds. Because of their size and conspicuous nature, these birds can be monitored using a relatively simple technique i.e. the road count. The Coordinated Avifaunal Roadcounts (CAR) project monitors the populations of 36 species of large terrestrial birds in agricultural habitats, in addition to gamebirds, raptors and corvids along 350 fixed routes covering over 19 000km (<http://car.adu.org.za/>). Although CAR road counts do not give an absolute count of all the individuals in a population, they do provide a measure of relative abundance in a particular area. CAR route GH03 is located 2kms east of the PAOI. Data collected over a five-year period (2014-2018) yielded significant numbers of Helmeted Guineafowl *Numida meleagris* and smaller densities of Black-headed Heron and Northern Black Korhaan *Afrotis afraoides*. A single Secretarybird was recorded during the 2016 winter survey. Helmeted Guineafowl, Black-headed Heron and Northern Black Korhaan are common to the assessment area and were along the proposed 132kV power line route alternative options during the field survey.

7.2.3. Coordinated Waterbird Count (CWAC) Sites

A CWAC site is any body of water, other than the oceans, which supports a significant number (set at approximately 500 individual waterbirds, irrespective of the number of species) of birds which use the site for feeding, and/or breeding and roosting (Harrison et al, 2004). This definition includes natural pans, vleis, marshes, lakes, rivers, as well as a range of manmade impoundments (i.e. sewage works). The presence of a CWAC site within the PAOI is an indication of a large number of waterbird species occurring there and the overall sensitivity of the area. The Vaal Dam East and Vaal Dam West CWAC sites are located within 50km of the development and broader PAOI. These sites support a wide variety of waterbirds including large numbers (in excess of 100 individuals per species on average) of Red-knobbed Coot *Fulica cristata*, White-breasted Cormorant *Phalacrocorax carbo*, Yellow-billed Duck *Anas undulata*, Western Cattle Egret *Bubulcus ibis*, Egyptian Goose *Alopochen aegyptiacus*, Grey-headed Gull *Larus cirrocephalus*, Glossy Ibis *Plegadis falcinellus*, Blacksmith Lapwing *Vanellus armatus*, Black-winged Pratincole *Glareola nordmanni*, Ruff *Philomachus pugnax*, Little Stint *Calidris minuta* and Caspian Tern (Animal Demography Unit, 2023).

The aforementioned species have been recorded in the broader PAOI in varying abundances during SABAP2 surveys and are an indication of the potential importance and avifaunal sensitivity of the Vaal River, particularly with regards to its proximity to the proposed 132kV PAOI. Western Cattle Egret, White-breasted Cormorant, Egyptian Goose and Blacksmith Lapwing were recorded during the February field survey.

7.2.4. *South African Bird Atlas Project 2 Data (SABAP2)*

A total of 246 bird species have been recorded within the proposed 132kV power line PAOI pentads during the SABAP2 atlassing period to date (APPENDIX 1). The presence of these species in the broader area provides an indication of the diversity of species that could potentially occur along the proposed power line alignment. Of the 246 species, 13 are regional Red List species (i.e. SCC) (Taylor et al, 2015). Relevant to this development, 72 species are classified as power line sensitive species (see definition of power line sensitive species in section 5). Of the power line sensitive species, 38 are likely to occur regularly within the PAOI and are largely comprised of water dependent species that may traverse across the PAOI. Only 12 of these species are likely to occur regularly within the proposed 132kV power line corridor. It is important to note that with the exception of Greater Flamingo (n=23) and Lesser Flamingo (n=11), the SCC have been recorded in very low numbers with between one and five individual birds of each species being recorded over the fourteen-year survey period. This is an accurate reflection of the diversity and abundance of SCC that are likely to be found within the area surrounding the proposed 132kV power line given the habitat present and the existing disturbance in the PAOI. No SCC were observed during the field survey.

Although this report focuses on SCC, since the impacts associated with the construction and operation of the proposed 132kV power line are likely to be more biologically significant for these species, the impact on non-SCC power line sensitive species is also assessed. Furthermore, SCC can often be used as surrogate species for the others in terms of impacts and the necessary mitigation. Each power line sensitive species' potential for occurring in a specific habitat class is indicated in TABLE 3, in addition to the type of impact that could potentially affect each species, specific to the location of this project.

TABLE 3: Annotated list of SCC and priority power line species that have been recorded in the relevant SABAP2 pentads, with a high likelihood of occurrence within the proposed 132kV power line PAOI

Species name	Scientific name	Full protocol	Ad hoc protocol	Red List Global	Red List Regional	Powerline priority	Recorded during surveys	Likelihood of regular occurrence in PAOI	Grassland	River	Wetland	Alien Trees	Electrocution	Powerline - Collision	Displacement Disturbance	Displacement Habitat transformation
Abdim's Stork	<i>Ciconia abdimii</i>	0.8	0.0	-	NT	x		L	x					x		
African Black Duck	<i>Anas sparsa</i>	15.7	7.1	-	-	x		H		x				x		
African Darter	<i>Anhinga rufa</i>	28.3	5.1	-	-	x		H		x				x		
African Fish Eagle	<i>Haliaeetus vocifer</i>	4.7	2.0	-	-	x	x	H				x	x			
African Grass Owl	<i>Tyto capensis</i>	0.8	0.0	-	VU	x		L	x		x			x		
African Marsh Harrier	<i>Circus ranivorus</i>	0.8	0.0	-	EN	x		L	x		x			x		x
African Sacred Ibis	<i>Threskiornis aethiopicus</i>	38.6	2.0	-	-	x	x	H		x	x	x		x	x	x
Amur Falcon	<i>Falco amurensis</i>	21.3	7.1	-	-	x		H	x			x				x
Black-headed Heron	<i>Ardea melanocephala</i>	64.6	12.2	-	-	x		H	x	x	x	x		x	x	x
Black-winged Kite	<i>Elanus caeruleus</i>	78.0	21.4	-	-	x	x	H	x			x			x	x
Blue-billed Teal	<i>Spatula hottentota</i>	13.4	1.0	-	-	x		H		x				x		
Cape Shoveler	<i>Spatula smithii</i>	19.7	5.1	-	-	x		H		x				x		
Cape Teal	<i>Anas capensis</i>	15.7	2.0	-	-	x		H		x				x		
Common Buzzard	<i>Buteo buteo</i>	29.9	5.1	-	-	x		H	x			x	x			x
Common Moorhen	<i>Gallinula chloropus</i>	28.3	3.1	-	-	x	x	H		x						
Egyptian Goose	<i>Alopochen aegyptiaca</i>	81.1	19.4	-	-	x	x	H	x	x	x	x		x	x	x
Fulvous Whistling Duck	<i>Dendrocygna bicolor</i>	5.5	0.0	-	-	x		H		x				x		
Glossy Ibis	<i>Plegadis falcinellus</i>	22.8	3.1	-	-	x		H	x	x	x	x		x	x	x
Goliath Heron	<i>Ardea goliath</i>	14.2	6.1	-	-	x		H		x				x		
Greater Flamingo	<i>Phoenicopterus roseus</i>	18.1	4.1	-	NT	x		M		x				x		
Grey Heron	<i>Ardea cinerea</i>	34.6	7.1	-	-	x	x	H		x				x		
Hadada Ibis	<i>Bostrychia hagedash</i>	90.6	20.4	-	-	x	x	H	x		x	x		x	x	x
Hamerkop	<i>Scopus umbretta</i>	12.6	1.0	-	-	x		H		x				x		
Helmeted Guineafowl	<i>Numida meleagris</i>	87.4	20.4	-	-	x	x	H	x			x		x	x	x
Intermediate Egret	<i>Ardea intermedia</i>	5.5	2.0	-	-	x		H		x				x		
Lanner Falcon	<i>Falco biarmicus</i>	0.8	1.0	-	VU	x		M	x							x
Lesser Flamingo	<i>Phoeniconaias minor</i>	8.7	3.1	NT	NT	x		M		x				x		
Little Egret	<i>Egretta garzetta</i>	18.9	4.1	-	-	x		H		x				x		
Little Grebe	<i>Tachybaptus ruficollis</i>	40.9	7.1	-	-	x		H		x				x		
Maccoa Duck	<i>Oxyura maccoa</i>	3.9	1.0	VU	NT	x		M		x				x		

Species name	Scientific name	Full protocol	Ad hoc protocol	Red List Global	Red List Regional	Powerline priority	Recorded during surveys	Likelihood of regular occurrence in PAOI	Grassland	River	Wetland	Alien Trees	Electrocution	Powerline - Collision	Displacement Disturbance	Displacement Habitat transformation
Martial Eagle	<i>Polemaetus bellicosus</i>	0.0	1.0	EN	EN	x		L	x			x	x			
Northern Black Korhaan	<i>Afrotis afraoides</i>	54.3	8.2	-	-	x	x	H	x					x	x	x
Pied Crow	<i>Corvus albus</i>	19.7	5.1	-	-	x	x	H	x			x			x	x
Purple Heron	<i>Ardea purpurea</i>	13.4	0.0	-	-	x		H		x				x		
Red-billed Teal	<i>Anas erythrorhyncha</i>	41.7	6.1	-	-	x		H		x				x		
Red-footed Falcon	<i>Falco vespertinus</i>	1.6	1.0	NT	NT	x		M	x							x
Red-knobbed Coot	<i>Fulica cristata</i>	51.2	8.2	-	-	x	x	H		x				x		
Reed Cormorant	<i>Microcarbo africanus</i>	58.3	7.1	-	-	x		H		x				x		
Secretarybird	<i>Sagittarius serpentarius</i>	3.1	0.0	EN	VU	x		L	x					x	x	x
South African Shelduck	<i>Tadorna cana</i>	15.0	3.1	-	-	x		H		x				x		
Southern Pochard	<i>Netta erythrophthalma</i>	12.6	2.0	-	-	x		H		x				x		
Spur-winged Goose	<i>Plectropterus gambensis</i>	44.9	7.1	-	-	x		H	x		x			x		
Squacco Heron	<i>Ardeola ralloides</i>	10.2	3.1	-	-	x		H		x				x		
Western Cattle Egret	<i>Bubulcus ibis</i>	64.6	17.3	-	-	x	x	H	x		x	x		x	x	x
White-backed Duck	<i>Thalassornis leuconotus</i>	6.3	2.0	-	-	x		H		x				x		
White-breasted Cormorant	<i>Phalacrocorax lucidus</i>	20.5	4.1	-	-	x	x	H		x				x		
White-faced Whistling Duck	<i>Dendrocygna viduata</i>	20.5	2.0	-	-	x		H		x				x		
Yellow-billed Duck	<i>Anas undulata</i>	66.9	6.1	-	-	x		H		x				x		
Yellow-billed Stork	<i>Mycteria ibis</i>	1.6	0.0	-	EN	x		M		x				x		

7.2.5. Primary Data Collection

A single summer survey was conducted on 24 February 2023, with a focused effort on the RWb Substation and the areas within the proposed 132kV power line route alignment options traverse. In order to describe the avifaunal community present, a concerted effort was made to sample the avifauna in all of the primary habitats that were available within the PAOI. All species encountered (observed and heard) during the site survey were noted and are indicated (highlighted in grey) in APPENDIX 1.

The site visit produced a combined list of 45 species. The majority of observations were of passerine species that are common to this area. Each of these species has the potential to be displaced by the construction of proposed 132kV power line and the construction activities associated with the RWB Substation bay and busbar extensions, as a result of habitat transformation and/or disturbance. However, these species have persisted despite existing disturbance within the PAOI. This resilience, coupled with the fact that more suitable habitat is available within the broader area, means that the displacement impact will not be of regional or national significance.

7.3 Avifaunal Habitats

Vegetation is one of the primary factors determining bird species distribution and abundance in an area. It is widely accepted within ornithological circles that vegetation structure is more important in determining which bird species will occur there. The classification of vegetation types is from Mucina & Rutherford (2006 and 2012), while from an avifaunal perspective, the Atlas of southern African Birds (SABAP1) recognises six primary vegetation divisions or biomes within South Africa, namely (1) Fynbos (2) Succulent Karoo (3) Nama Karoo (4) Grassland (5) Savanna and (6) Forest (Harrison et al. 1997). Whilst much of the distribution and abundance of bird species can be attributed to the broad vegetation types present in an area, it is the smaller spatial scale habitats (micro habitats) that support the requirements of a particular bird species that need to be examined in greater detail. Micro habitats are shaped by factors other than vegetation, such as topography, land use, food availability, and various anthropogenic factors all of which will either attract or deter birds and are critically important in mapping the site in terms of avifaunal sensitivity and ultimately informing mitigation requirements. Assessment of the 132kV power line PAOI revealed the following broadly described avifaunal micro habitats i.e. grassland (FIGURE 5), the Vaal river, surface waterbodies, wetlands, cultivation, alien tree stands, mines, quarries, industrial and residential areas. APPENDIX 2 provides a photographic record of the bird habitats within the proposed 132kV power line corridor and its immediate surrounds.

TABLE 3 details the micro habitats that each of the power line sensitive bird species (recorded by SABAP2) will typically frequent in the PAOI. It must be stressed that birds can and will, by virtue of their mobility, utilise almost any areas in a landscape from time to time. However, the analysis in TABLE 3 represents each species' most preferred habitats. These locations are where most of the birds of that species will spend most of their time which in turn provides an indication of where impacts on those species will be most significant.

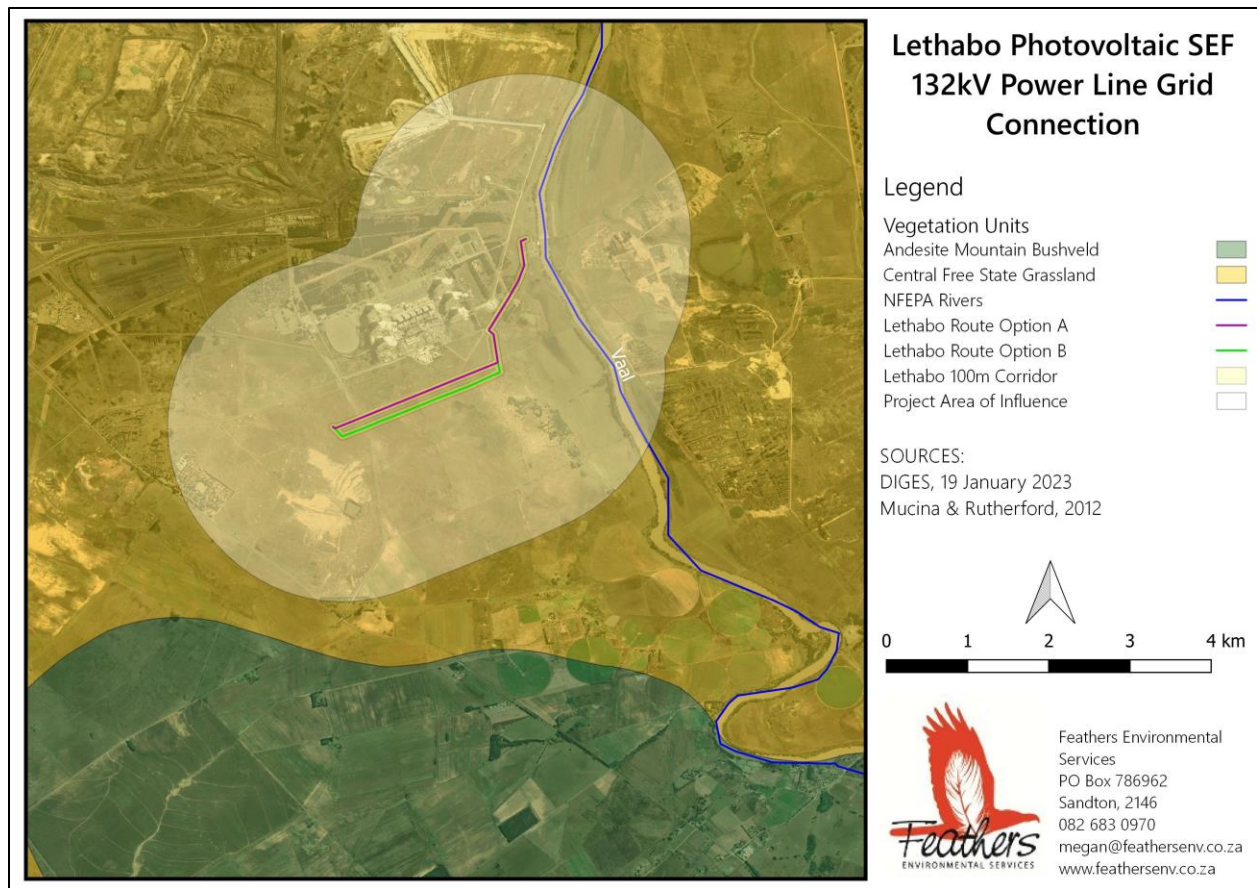


FIGURE 5: Regional map detailing the location of the Lethabo PV SEF 132kV Power Line Grid Connection route options in relation to the vegetation units within the PAOI.

8. IMPACT ASSESSMENT

Poorly sited or designed facilities and infrastructure can negatively impact not only vulnerable species and habitats, but also entire ecological processes. The effects of any development on birds are highly variable and depend on a wide range of factors including the specification of the development, the topography of the surrounding land, the habitats affected and the number and diversity of species present. With so many variables involved, the impacts of each development must be assessed individually. Each of these potential effects can interact, either increasing the overall impact on birds or, in some cases, reducing a particular impact (for example where habitat loss and disturbance causes a reduction in birds using an area which may then reduce the risk of collision). The principal areas of concern for SCC and non-SCC power line sensitive species are detailed below.

8.1 Construction Phase

8.1.1. *Displacement as a result of habitat loss or transformation*

During the construction of powerlines, service roads and other associated infrastructure, habitat destruction/transformation inevitably takes place. This impact is dependent on various factors i.e., the location and the scale of the facility, the amount of habitat affected; the uniqueness of the habitat; and the sensitivity and conservation status of the bird species utilizing that habitat. A very small proportion of habitat will be cleared to accommodate the 132kV tower/pylon footprints, reducing the amount of habitat available to birds for foraging, roosting and breeding (Smallie, 2013) which could result in temporary or permanent displacement.

Relevant to this assessment, the risk of displacement of SCC species due to habitat transformation is likely to be fairly limited given the low reporting rate for SCC species in the PAOI. The biggest potential impact would be the removal of large trees i.e. the *Eucalyptus sp.* that could potentially serve as nesting substrate for priority raptors such as African Fish Eagle, Black Sparrowhawk, Ovambo Sparrowhawk, Common Buzzard and the various ibis species. In the case of the proposed 132kV power line, the direct habitat transformation will be limited to the tower footprints and the narrow access road/track under the power line. The habitat in the study area is highly uniform and largely transformed in places, with low SCC abundances. If the removal of large trees can be avoided, the displacement impact as a result of habitat transformation will not be of regional or national significance. The species that are most likely to be affected by the loss of habitat are the smaller, non-threatened passerines that are currently potentially resident in the area earmarked for the development of the power line. It is not envisaged that any SCC will be displaced by the habitat transformation that will take place as a result of the construction of the proposed 132kV power line.

8.1.2. *Displacement as a result of disturbance*

Excavation and construction activities are a source of significant disturbance particularly as a result of the machinery and construction personnel that are present on site for the duration of the construction of the 132kV power line. For most bird species, construction activities are likely to be a cause of temporary disturbance impacting on foraging, and roosting behaviours but in more extreme cases, construction may impact on the breeding success of certain species particularly if the disturbance happens during a critical part of the breeding cycle, resulting in temporary breeding failure or permanent nest abandonment. The development area is already subjected to a significant degree of disturbance. Construction activities within the PAOI are likely to result in the temporary displacement as opposed to permanent displacement of species from the area. Many of the power line priority species have persisted despite existing disturbance within the PAOI. This resilience, coupled with the fact that similar habitat is available throughout the broader area, means that the displacement impact will not be of regional or national significance.

8.1.3. Direct mortality as a result of construction activities

Bird mortality as a result of construction activities is improbable because birds are incredibly mobile and able to move out of harm's way. If mortality does occur, it is likely to be confined to a localised area and restricted to immobile species e.g. nestlings. No terrestrial bird species (ground) nest locations were observed during the site survey.

8.2 Operational Phase

8.2.1. Mortality due to collisions with the 132kV power line conductors/earthwires

Collisions are the biggest single threat posed by power lines to birds in southern Africa (van Rooyen 2004). Most heavily impacted upon are bustards, storks, cranes and various species of waterbirds. These species are mostly heavy-bodied birds with limited maneuverability, which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines (van Rooyen 2004, Anderson 2001). Unfortunately, many of the collision sensitive species are considered threatened in southern Africa. Quantifying this impact in terms of the likely number of birds that will be impacted, is very difficult because a number of variables play a role in determining the risk, for example weather, rainfall, wind, age, flocking behaviour, power line height, light conditions, topography, population density and so forth. However, from incidental record keeping by the Endangered Wildlife Trust: Wildlife & Energy Programme it is possible to give a measure of what species are likely to be impacted upon (see FIGURE 7 below - Jenkins et al. 2010). This only gives a measure of the general susceptibility of the species to power line collisions, and not an absolute measurement for any specific line.

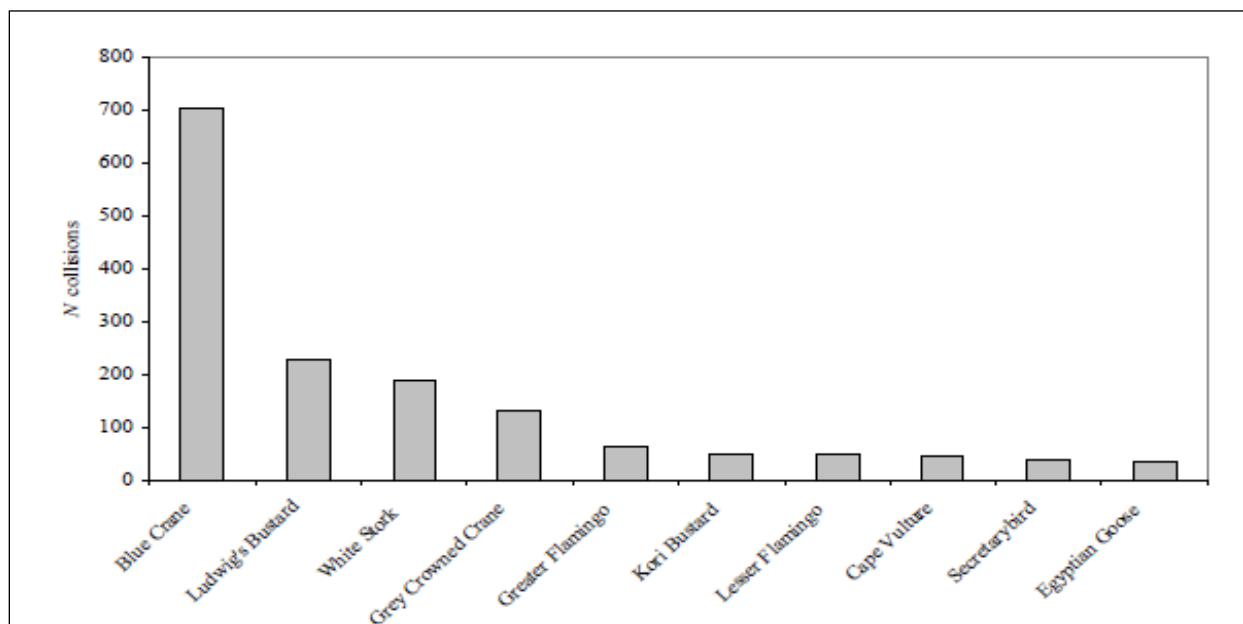


FIGURE 6: The top ten collision prone bird species in South Africa, in terms of reported incidents contained in the Eskom/EWT Strategic Partnership central incident register 1996 - 2007 (Jenkins et al. 2010)

Relevant to the proposed 132kV power line, potential candidates for collision mortality are the water dependent species that may traverse across the power line in addition to the more common heavily-bodied grassland species i.e. Northern Black Korhaan.

8.2.2. Mortality due to electrocutions on the 132kV power line infrastructure

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). Electrocution risk is strongly influenced by the power line voltage and design of the tower/pole structure and mainly affects larger, perching species that are capable of spanning the spaces between energized components. This is particularly likely when more than one bird attempts to sit on the same pole, a behaviour that is typical of gregarious vulture species when perching or roosting. Vultures are unlikely to occur regularly within the study area. The clearance distances between the live components and/or live and earthed components of the 132kV tower structure will be sufficient to reduce the risk of electrocutions for most raptor species. The best possible mitigation is the construction of the power line using an Eskom approved bird friendly pole/tower design accordance with the Distribution Technical Bulletin relating to bird friendly structures (APPENDIX 4).

8.2.3. Mortality due to electrocutions within the RWB Substation

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

8.2.4. Impact on the quality of electrical supply

Although this does not form part of the brief, it is important to mention that birds could have an impact on the proposed power line infrastructure. Both bird streamers and bird pollution occur as a result of birds perching and defecating on the pole tops and, often directly above live conductors causing electrical faults on power lines. The more faults that occur on a line, the poorer the quality of electrical supply to the end users. The construction of the power line using the steel monopole structure will minimise this impact in that limited perching space on the structure is available to the vultures that will readily utilise the power line towers on which to roost. Site specific mitigation can be applied reactively should this impact occur post construction.

Bird nests may also cause faults through nest material, protruding into the air gap between live components on the substation and power line infrastructure. Crows in particular often incorporate wire and other conductive material into their nests. When nests cause flashovers, the nesting material may catch fire. This in turn can lead to equipment damage or a general veld fire. Apart from the cost of replacing damaged equipment, the resultant veld fire can lead to claims for damages from landowners. Power line poles/towers

in turn provide nesting substrate for certain bird species, some of which might benefit through the increased availability of nesting substrates on the substation and power line infrastructure. Site specific mitigation (i.e. bird guards) can be applied reactively should this impact occur.

8.3 Closure Activity Phase

8.3.1. *Displacement as a result of disturbance*

The PAOI is already subjected to a degree of disturbance associated with the industrial, urban and peri-urban, activities. While the closure of the RWB Substation and 132kV power line in this area will undoubtedly displace some species, the fact that similar habitat is available within the broader PAOI, the displacement impact as a result of disturbance is unlikely to be permanent and of national significance.

8.4 Identification of a Preferred Power Line Alternative

One of the objectives of this study is to determine the preferred power line route that poses the least impact to the avifaunal community, particularly SCC and non-SCC priority species present within the PAOI. The two power line route alternative options occur within the same pentad, subjected to the same land use practices and therefore likely to be identical in terms of species diversity and density too. With this in mind, the selection of a preferred 132kV power line route alignment option has been determined using observations of available micro habitat in relation to proposed infrastructure.

Power line route alignment Option A is located directly adjacent to the service road. The displacement impact is likely to be less significant along this alignment, given the existing levels of disturbance associated with the vehicle traffic on this road. Option A is therefore nominated as the preferred power line route alignment option. However, neither options are fatally flawed and the power line can be constructed and operated along either of the proposed options, with appropriate mitigation.

8.5 Impact Significance

A quantitative methodology was used to describe, evaluate and rate the significance of the aforementioned impacts associated with the construction and operation of the 132kV power line. This assessment is presented in tabular format below (TABLES 4 - 7) for both pre- and post-mitigation according to set criteria described in APPENDIX 3.

TABLE 4: Assessment of the displacement impact associated with habitat loss and/or transformation caused by the construction of the proposed 132kV power line

Activity:	Construction of the 132kV power line					
Impact:	Displacement of SCC and non-SCC priority species as a result of habitat loss & transformation					
Status	Negative					
Significance rating:	Duration	Extent	Reversibility	Magnitude	Probability	Significance
Pre-Mitigation	3	1	3	3	4	40 Moderate - Low
Post-Mitigation	3	1	3	2	3	36 Moderate - Low

TABLE 5: Assessment of the displacement impact associated with habitat loss and/or transformation caused by the construction of the proposed 132kV power line

Activity:	Construction of the 132kV power line					
Impact:	Displacement of SCC and non-SCC priority species as a result disturbance					
Status	Negative					
Significance rating:	Duration	Extent	Reversibility	Magnitude	Probability	Significance
Pre-Mitigation	2	2	3	3	4	40 Moderate - Low
Post-Mitigation	2	2	1	2	3	21 Moderate - Low

TABLE 6: Assessment of mortality due to collision with the 132kV power line conductors/earthwires

Activity:	Operation of the 132kV power line					
Impact:	Mortality of SCC and non-SCC priority species due to collision with the 132kV power line conductors/earthwires					
Status	Negative					
Significance rating:	Duration	Extent	Reversibility	Magnitude	Probability	Significance
Pre-Mitigation	3	3	3	4	3	39 Moderate - Low
Post-Mitigation	3	3	1	3	2	20 Low

TABLE 7: Assessment of mortality due to electrocution on the 132kV power line infrastructure

Activity:	Operation of the 132kV power line					
Impact:	Mortality of SCC and non-SCC priority species as a result of electrocution on the 132kV power line infrastructure					
Status	Negative					
Significance rating:	Duration	Extent	Reversibility	Magnitude	Probability	Significance
Pre-Mitigation	3	3	3	4	2	26 Moderate - Low
Post-Mitigation	1	3	1	2	1	7 Low

TABLE 8: Assessment of mortality due to electrocution on the proposed infrastructure within the RWB Substation

Activity:	Operation of the 132kV power line					
Impact:	Mortality of SCC and non-SCC priority species as a result of electrocution on the infrastructure within the RWB Substation					
Status	Negative					
Significance rating:	Duration	Extent	Reversibility	Magnitude	Probability	Significance
Pre-Mitigation	3	3	3	3	2	24 Moderate - Low
Post-Mitigation	2	2	1	2	1	7 Low

8.6 Cumulative Impact

Cumulative Impact in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities. The role of the cumulative impact assessment is to determine if such impacts are relevant to the proposed project (i.e. whether the addition of the proposed project in the proposed areas will increase the impact). This section addresses whether the construction of the proposed development will result in unacceptable risk or loss, complete or whole-scale changes to the environment and/or unacceptable increase in impact.

The proposed 132kV power line equate to a maximum length of approximately 4.5km. There are at least 11 existing high voltage powerlines within the PAOI and significantly more transmission, distribution and reticulation lines totaling hundreds of kilometres within the 30km radius around the proposed 132kV power line PAOI (FIGURE 7). The 132kV power line will increase the total number of existing and planned high voltage lines by a small percentage, therefore the contribution of the proposed 132kV power line to the cumulative impact of all the high voltage lines is deemed to be of LOW significance. The combined cumulative impact of the existing power lines, i.e. the 132kV power line and all future proposed power lines on avifauna within a

30km radius is considered to be of MEDIUM significance. The cumulative impact of displacement due to disturbance and habitat transformation associated with the extensions within the RWB Substation is considered to be LOW, due to the small size of the footprint, and the availability of similar habitat within the 30km radius area. The cumulative impact of potential electrocutions within the RWB Substation is also likely to be LOW as it is expected to be a rare event.

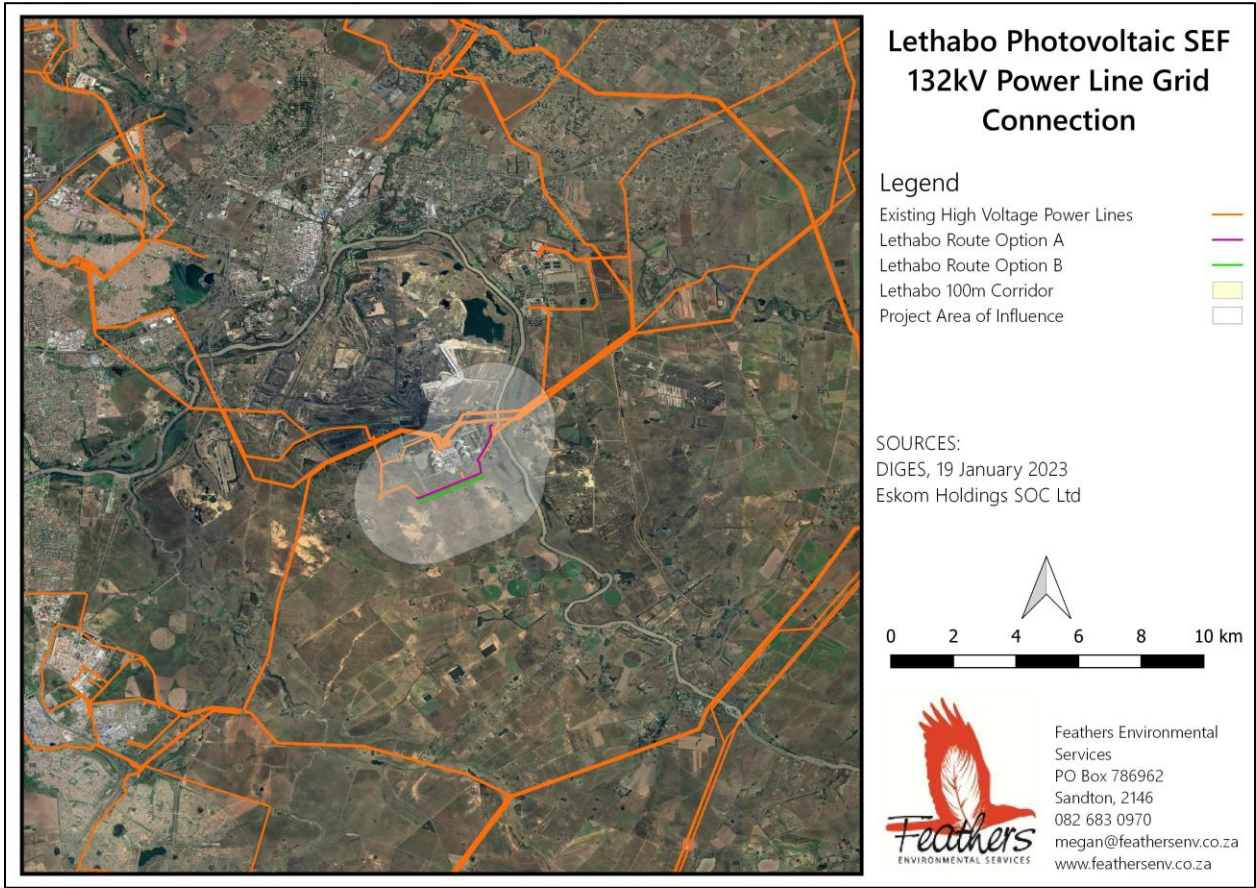


FIGURE 7: Existing high voltage power lines within 30km of the 132kV Power Line PAOI

9. PROPOSED IMPACT MITIGATION ACTIONS

Based on the anticipated impacts described above, the following recommendations are provided regarding practical mitigation measures for potentially significant impacts to be included in the Environmental Management Programme (EMPr) detailed in TABLE 8 below.

TABLE 9: Recommendations for the anticipated impacts associated with the construction and operation of the 132kV power line

OBJECTIVE: Mitigate the displacement and direct mortality impacts caused by the construction and operation of the 132kV power line and infrastructure within the existing RWB Substation

Project component/s	Lethabo PV SEF grid connection
Potential Impact	Permanent displacement and mortality of local populations of SCC and non-SCC power line sensitive species caused by habitat loss, disturbance, collisions with the overhead conductors and electrocutions on the power line infrastructure and electrocutions within the RWB Substation.
Activity/risk source	<ul style="list-style-type: none"> * Construction of the 132kV power line within sensitive avifaunal habitat. * Unmitigated construction and operational activities.
Mitigation: Target/Objective	Limit avifaunal mortality and displacement as far as practically possible for the duration of the operational life span of the 132kV power line and RWB Substation

Mitigation: Action/control	Responsibility	Timeframe
CONSTRUCTION PHASE		
<p><i>Displacement as a result of habitat loss:</i></p> <ul style="list-style-type: none"> * Avoid removal of sensitive vegetation types. The recommendations of the biodiversity study must be strictly implemented, especially as far as limitation of the construction footprint and rehabilitation of disturbed areas is concerned. * Construction activity should be restricted to the immediate footprint of the infrastructure. * All construction activities should be strictly managed according to generally accepted environmental best practice standards, so as to avoid any unnecessary impact on the receiving environment. * All temporary disturbed areas should be rehabilitated according to the site's rehabilitation plan, following construction. * Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum. 	Construction Manager and Environmental Control Officer	From the commencement of construction (inclusive of all project components to the completion of construction.
<p><i>Displacement as a result of disturbance:</i></p> <ul style="list-style-type: none"> * Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species. 	Construction Manager and Environmental Control Officer	From the commencement of construction (inclusive of all project components to the completion of construction.

<ul style="list-style-type: none"> * Measures to control noise should be applied according to current best practice in the industry. 		
<p><i>Mortality as a result of electrocutions on the 132kV power line infrastructure</i></p> <ul style="list-style-type: none"> * The 132kV power line must be constructed using a bird friendly structure. 	Eskom Environmental Manager, Line and Servitude Manager, Environmental Control Officer and Eskom-Endangered Wildlife Trust Strategic Partnership	From the commencement of construction (inclusive of all project components to the completion of construction.
OPERATIONAL PHASE		
<p><i>Mortality as a result of electrocutions on the 132kV power line infrastructure</i></p> <ul style="list-style-type: none"> * Eskom line and servitude managers are requested to report all bird electrocutions encountered during routine inspections and line patrols of the 132kV power line to the Eskom-Endangered Wildlife Trust Strategic Partnership. * Insulating material (if applied) to be maintained during the operational life span of the 132kV power line. 	Eskom Environmental Manager, Line and Servitude Manager, Environmental Control Officer, and Eskom-Endangered Wildlife Trust Strategic Partnership	For the duration of the operational life-span of the 132kV power line
<p><i>Mortality as a result of collision with the overhead conductors and/or earthwires of the 132kV power line</i></p> <ul style="list-style-type: none"> * Eskom line and servitude managers are requested to report all bird collisions encountered during routine line patrols of the 132kV power line to the Eskom-Endangered Wildlife Trust Strategic Partnership. * Bird flight diverters to be maintained on sections of power line during the operational life span of the 132kV power line 	Eskom Environmental Manager, Line and Servitude Manager, Environmental Control Officer and Eskom-Endangered Wildlife Trust Strategic Partnership.	For the duration of the operational life-span of the 132kV power line
<p><i>Mortality as a result of electrocution on the infrastructure within the RWB Substation</i></p> <p>Eskom substation managers are requested to report all bird electrocutions encountered during routine inspections of the RWB</p>	Eskom Environmental Manager, Line and Servitude Manager, Environmental Control Officer and	For the duration of the operational life-span of the RWB Substation

Substation to the Eskom-Endangered Wildlife Trust Strategic Partnership	Eskom-Endangered Wildlife Trust Strategic Partnership.	
<i>Nest building on the 132kV power line and substation infrastructure:</i> <ul style="list-style-type: none"> * If on-going impacts are recorded once the substation and 132kV power line are operational, it is recommended that these impacts be assessed by Eskom-Endangered Wildlife Trust Strategic Partnership and site-specific mitigation be applied reactively. * While it is not illegal to remove an unoccupied nest that is posing a quality of supply risk, the removal of nests that contain eggs or chicks will require a permit to do so. Nest management strategies to be identified and implemented reactively, if required. 	Eskom Environmental Manager, Line and Servitude Manager, Environmental Control Officer and Eskom-Endangered Wildlife Trust Strategic Partnership.	For the duration of the operational life-span of the 132kV power line
Performance Indicator	<ul style="list-style-type: none"> * The size and extent of sensitive habitat present at the start of construction remains intact at end of construction phase. * Sustainable levels of mortalities are reported on a monthly basis and the necessary mitigation measures are implemented timeously. 	

10. PROPOSED MONITORING ACTIONS

Eskom Environmental officials and/or line servitude staff to include avifaunal monitoring during routine inspections of the RWB Substation and 132kV power line and record the number of mortalities, nesting activity and faecal matter fouling and determine the effectiveness of the mitigation actions taken.

11. ENVIRONMENTAL IMPACT STATEMENT

11.1 Conditions to be included in the Environmental Authorisation

In conclusion, the habitat within which the PAOI is located is considered to have a MODERATE to LOW sensitivity. In recent years, anthropogenic impacts, mostly in the form of industrial, urban, and peri-urban transformed the landscape resulting in a negative impact on avifaunal diversity and abundance with the PAOI. The construction of the 132kV power line and bay and busbar extensions within the RWB Substation will result

in impacts of MODERATE-LOW significance to birds occurring in the vicinity of the new infrastructure, which can be reduced further through the application of mitigation measures. It is anticipated that the 132kV power line and bay and busbar extensions can be constructed with acceptable levels of impact on the resident avifauna, subject to the following recommendations:

- * The 132kV power line must be constructed using a bird friendly structure.
- * The recommendations of the biodiversity specialist study must be strictly implemented, especially as far as limitation of the construction footprint (especially the removal of natural vegetation) and rehabilitation of disturbed areas is concerned.
- * Construction activities (i.e. all staff, vehicle and machinery) should be restricted to the immediate footprint of the infrastructure.
- * Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of avifaunal species.
- * Maximum use should be made of existing roads and the construction of new roads must be kept to a minimum.
- * If collision or electrocution impacts are recorded once the 132kV power line are operational, it is recommended that a representative from the Eskom-Endangered Wildlife Trust Strategic Partnership investigate the mortalities and provide recommendations for site-specific mitigation to be applied reactively.
- * If electrocution impacts are recorded within the operational RWB Substation, it is recommended that a representative from the Eskom-Endangered Wildlife Trust Strategic Partnership investigates the mortalities and provides recommendations for site-specific mitigation to be applied reactively.
- * In addition to this, the normal suite of environmental good practices should be applied, such as ensuring strict control of staff, vehicles and machinery on site and limiting the creation of new roads as far as possible.

11.2 Specialist Opinion

In accordance with the outcomes of the impact assessment detailed in Section 8, in conjunction with the baseline conditions as presented in Section 7 and the impact management measures in Section 9, the proposed 132kV power line alignment and bay and busbar extensions are not deemed to present unmitigable negative environmental issues or impacts. It is this specialist's opinion that the construction and operation of the 132kV power line and the RWB Substation will result in acceptable levels of impact on the resident avifauna subject to the aforementioned mitigation and management measures.

12. ASSUMPTIONS, UNCERTAINTIES & GAPS IN KNOWLEDGE

The avifaunal specialist assumed that the sources of information used for this assessment are reliable. However, it must be noted that there are limiting factors and these may potentially detract from the accuracy of the predicted results.

- * The report is the result of a short-term study and is based on a one-day field survey of the PAOI. No long-term, seasonal monitoring was conducted by the avifaunal specialist. This assessment relies upon secondary data sources with regards to bird occurrence and abundance such as the SABAP2 and IBA projects. These comprehensive datasets provide a valuable baseline against which any changes in species presence, abundance, and distribution can be monitored. However, primary information on bird habitat and avifaunal species occurrence collected during the site visit and together with professional judgement, based on extensive field experience since 2006, was used directly in determining which species of conservation importance are likely to occur within suitable avifaunal habitat types within the PAOI. Based on these findings, the specialist was able to identify and assess the anticipated impacts and provide recommendations for mitigation;
- * The focus of this assessment is primarily on the potential impacts on regional SCC and non-SCC power line sensitive species i.e., species that are vulnerable to the displacement, collision and electrocution impacts associated with the construction and operation of the 132kV power line; and
- * Predictions in this study are based on experience of these and similar species in different parts of South Africa, through the authors' experience working in the avifaunal specialist field since 2006. However, bird behaviour can't be reduced to formulas that will hold true under all circumstances. It must also be noted that, it is often not possible to entirely eliminate the risk of the disturbance and displacement impacts associated with the construction and operational activities. Our best possible efforts can probably not ensure zero impact on birds. Assessments such as this attempt to minimise the risk as far as possible, and although the displacement impacts, associated with the construction and operation of the 132kV power line, will be unavoidable, they are likely to be temporary and of moderate to low significance.

The above limitations need to be stated as part of this assessment so that the reader fully understands the complexities. However, they do not detract from the confidence that this author has in the findings of this impact assessment report and subsequent recommendations for this project.

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APPENDIX 1: SOUTH AFRICAN BIRD ATLAS PROJECT DATA (SABAP2) FOR THE LETHABO PV SOLAR ENERGY FACILITY 132KV POWER LINE GRID CONNECTION PAOI

Species name	Scientific name	Full protocol	Ad hoc protocol	Red List Global	Red List Regional	Endemic (SA)	Endemic (SA) - detail
Abdim's Stork	<i>Ciconia abdimii</i>	0.8	0.0	-	NT		
Acacia Pied Barbet	<i>Tricholaema leucomelas</i>	11.8	1.0	-	-		
African Black Duck	<i>Anas sparsa</i>	15.7	7.1	-	-		
African Black Swift	<i>Apus barbatus</i>	0.8	1.0	-	-		
African Darter	<i>Anhinga rufa</i>	28.3	5.1	-	-		
African Fish Eagle	<i>Haliaeetus vocifer</i>	4.7	2.0	-	-		
African Grass Owl	<i>Tyto capensis</i>	0.8	0.0	-	VU		
African Hoopoe	<i>Upupa africana</i>	21.3	2.0	-	-		
African Marsh Harrier	<i>Circus ranivorus</i>	0.8	0.0	-	EN		
African Olive Pigeon	<i>Columba arquatrix</i>	1.6	0.0	-	-		
African Palm Swift	<i>Cypsiurus parvus</i>	28.3	6.1	-	-		
African Paradise Flycatcher	<i>Terpsiphone viridis</i>	7.1	0.0	-	-		
African Pipit	<i>Anthus cinnamomeus</i>	54.3	4.1	-	-		
African Red-eyed Bulbul	<i>Pycnonotus nigricans</i>	48.0	5.1	-	-		
African Reed Warbler	<i>Acrocephalus baeticatus</i>	12.6	3.1	-	-		
African Sacred Ibis	<i>Threskiornis aethiopicus</i>	38.6	2.0	-	-		
African Snipe	<i>Gallinago nigripennis</i>	14.2	3.1	-	-		
African Spoonbill	<i>Platalea alba</i>	15.0	1.0	-	-		
African Stonechat	<i>Saxicola torquatus</i>	91.3	20.4	-	-		
African Swampphen	<i>Porphyrio madagascariensis</i>	6.3	0.0	-	-		
African Wattled Lapwing	<i>Vanellus senegallus</i>	11.8	2.0	-	-		
Amethyst Sunbird	<i>Chalcomitra amethystina</i>	3.1	0.0	-	-		
Amur Falcon	<i>Falco amurensis</i>	21.3	7.1	-	-		
Ant-eating Chat	<i>Myrmecocichla formicivora</i>	37.8	2.0	-	-		
Banded Martin	<i>Riparia cincta</i>	3.1	0.0	-	-		
Barn Swallow	<i>Hirundo rustica</i>	37.8	7.1	-	-		
Bar-throated Apalis	<i>Apalis thoracica</i>	1.6	0.0	-	-		
Black Crake	<i>Zapornia flavirostra</i>	6.3	0.0	-	-		
Black Heron	<i>Egretta ardesiaca</i>	2.4	1.0	-	-		
Black Sparrowhawk	<i>Accipiter melanoleucus</i>	4.7	2.0	-	-		
Black-chested Prinia	<i>Prinia flavicans</i>	66.9	6.1	-	-		
Black-chested Snake Eagle	<i>Circaetus pectoralis</i>	0.8	0.0	-	-		

Species name	Scientific name	Full protocol	Ad hoc protocol	Red List Global	Red List Regional	Endemic (SA)	Endemic (SA) - detail
Black-collared Barbet	<i>Lybius torquatus</i>	20.5	0.0	-	-		
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	3.1	3.1	-	-		
Black-faced Waxbill	<i>Brunhilda erythronotos</i>	0.8	0.0	-	-		
Black-headed Heron	<i>Ardea melanocephala</i>	64.6	12.2	-	-		
Black-necked Grebe	<i>Podiceps nigricollis</i>	7.1	3.1	-	-		
Blacksmith Lapwing	<i>Vanellus armatus</i>	95.3	25.5	-	-		
Black-throated Canary	<i>Crithagra atrogularis</i>	63.8	5.1	-	-		
Black-winged Kite	<i>Elanus caeruleus</i>	78.0	21.4	-	-		
Black-winged Stilt	<i>Himantopus himantopus</i>	22.0	3.1	-	-		
Blue Waxbill	<i>Uraeginthus angolensis</i>	1.6	0.0	-	-		
Blue-billed Teal	<i>Spatula hottentota</i>	13.4	1.0	-	-		
Bokmakierie	<i>Telophorus zeylonus</i>	12.6	0.0	-	-		
Booted Eagle	<i>Hieraaetus pennatus</i>	0.8	0.0	-	-		
Brimstone Canary	<i>Crithagra sulphurata</i>	0.8	0.0	-	-		
Bronze Mannikin	<i>Spermestes cucullata</i>	1.6	0.0	-	-		
Brown-crowned Tchagra	<i>Tchagra australis</i>	0.8	0.0	-	-		
Brown-throated Martin	<i>Riparia paludicola</i>	69.3	7.1	-	-		
Burchell's Coucal	<i>Centropus burchellii</i>	2.4	0.0	-	-		
Cape Longclaw	<i>Macronyx capensis</i>	56.7	5.1	-	-		
Cape Robin-Chat	<i>Cossypha caffra</i>	47.2	9.2	-	-		
Cape Shoveler	<i>Spatula smithii</i>	19.7	5.1	-	-		
Cape Sparrow	<i>Passer melanurus</i>	83.5	16.3	-	-		
Cape Starling	<i>Lamprolornis nitens</i>	65.4	6.1	-	-		
Cape Teal	<i>Anas capensis</i>	15.7	2.0	-	-		
Cape Turtle Dove	<i>Streptopelia capicola</i>	92.1	27.6	-	-		
Cape Wagtail	<i>Motacilla capensis</i>	67.7	14.3	-	-		
Cape White-eye	<i>Zosterops virens</i>	36.2	4.1	-	-	x	Near endemic
Capped Wheatear	<i>Oenanthe pileata</i>	32.3	7.1	-	-		
Cardinal Woodpecker	<i>Dendropicos fuscescens</i>	1.6	0.0	-	-		
Caspian Tern	<i>Hydroprogne caspia</i>	3.9	2.0	-	VU		
Chestnut-backed Sparrow-Lark	<i>Eremopterix leucotis</i>	1.6	0.0	-	-		
Chestnut-vented Warbler	<i>Curruca subcoerulea</i>	21.3	1.0	-	-		
Cinnamon-breasted Bunting	<i>Emberiza tahapisi</i>	2.4	0.0	-	-		
Cloud Cisticola	<i>Cisticola textrix</i>	32.3	3.1	-	-	x	Near endemic

Species name	Scientific name	Full protocol	Ad hoc protocol	Red List Global	Red List Regional	Endemic (SA)	Endemic (SA) - detail
Common Buzzard	<i>Buteo buteo</i>	29.9	5.1	-	-		
Common Greenshank	<i>Tringa nebularia</i>	9.4	4.1	-	-		
Common House Martin	<i>Delichon urbicum</i>	0.8	0.0	-	-		
Common Moorhen	<i>Gallinula chloropus</i>	28.3	3.1	-	-		
Common Myna	<i>Acridotheres tristis</i>	80.3	23.5	-	-		
Common Ostrich	<i>Struthio camelus</i>	19.7	4.1	-	-		
Common Quail	<i>Coturnix coturnix</i>	1.6	0.0	-	-		
Common Ringed Plover	<i>Charadrius hiaticula</i>	0.8	0.0	-	-		
Common Sandpiper	<i>Actitis hypoleucos</i>	6.3	2.0	-	-		
Common Shelduck	<i>Tadorna tadorna</i>	0.8	0.0	-	-		
Common Swift	<i>Apus apus</i>	3.1	1.0	-	-		
Common Waxbill	<i>Estrilda astrild</i>	22.8	2.0	-	-		
Crested Barbet	<i>Trachyphonus vaillantii</i>	45.7	3.1	-	-		
Crowned Lapwing	<i>Vanellus coronatus</i>	91.3	21.4	-	-		
Curlew Sandpiper	<i>Calidris ferruginea</i>	3.9	0.0	NT	LC		
Dark-capped Bulbul	<i>Pycnonotus tricolor</i>	19.7	5.1	-	-		
Desert Cisticola	<i>Cisticola aridulus</i>	11.0	1.0	-	-		
Diederik Cuckoo	<i>Chrysococcyx caprius</i>	22.8	4.1	-	-		
Domestic Goose	<i>Anser anser domesticus</i>	0.8	1.0	-	-		
Double-banded Courser	<i>Rhinoptilus africanus</i>	7.1	0.0	-	-		
Eastern Clapper Lark	<i>Mirafra fasciolata</i>	11.8	0.0	-	-		
Eastern Long-billed Lark	<i>Certhilauda semitorquata</i>	1.6	0.0	-	-	x	Endemic (SA, Lesotho, Swaziland)
Egyptian Goose	<i>Alopochen aegyptiaca</i>	81.1	19.4	-	-		
European Bee-eater	<i>Merops apiaster</i>	7.1	1.0	-	-		
European Honey-buzzard	<i>Pernis apivorus</i>	1.6	1.0	-	-		
Fairy Flycatcher	<i>Stenostira scita</i>	1.6	0.0	-	-	x	Near endemic
Familiar Chat	<i>Oenanthe familiaris</i>	13.4	0.0	-	-		
Fan-tailed Widowbird	<i>Euplectes axillaris</i>	0.8	0.0	-	-		
Fiscal Flycatcher	<i>Melaenornis silens</i>	37.0	5.1	-	-	x	Near endemic
Fulvous Whistling Duck	<i>Dendrocygna bicolor</i>	5.5	0.0	-	-		
Gabar Goshawk	<i>Micronisus gabar</i>	0.8	0.0	-	-		
Giant Kingfisher	<i>Megaceryle maxima</i>	7.9	3.1	-	-		
Glossy Ibis	<i>Plegadis falcinellus</i>	22.8	3.1	-	-		

Species name	Scientific name	Full protocol	Ad hoc protocol	Red List Global	Red List Regional	Endemic (SA)	Endemic (SA) - detail
Goliath Heron	<i>Ardea goliath</i>	14.2	6.1	-	-		
Great Crested Grebe	<i>Podiceps cristatus</i>	3.1	0.0	-	-		
Great Egret	<i>Ardea alba</i>	1.6	1.0	-	-		
Great Reed Warbler	<i>Acrocephalus arundinaceus</i>	1.6	0.0	-	-		
Greater Double-collared Sunbird	<i>Cinnyris afer</i>	0.0	1.0	-	-	x	Endemic (SA, Lesotho, Swaziland)
Greater Flamingo	<i>Phoenicopterus roseus</i>	18.1	4.1	-	NT		
Greater Honeyguide	<i>Indicator indicator</i>	3.1	0.0	-	-		
Greater Kestrel	<i>Falco rupicoloides</i>	0.8	0.0	-	-		
Greater Painted-snipe	<i>Rostratula benghalensis</i>	0.8	0.0	-	NT		
Greater Striped Swallow	<i>Cecropis cucullata</i>	50.4	9.2	-	-		
Green Wood Hoopoe	<i>Phoeniculus purpureus</i>	13.4	2.0	-	-		
Grey Heron	<i>Ardea cinerea</i>	34.6	7.1	-	-		
Grey-headed Gull	<i>Chroicocephalus cirrocephalus</i>	18.9	5.1	-	-		
Hadada Ibis	<i>Bostrychia hagedash</i>	90.6	20.4	-	-		
Hamerkop	<i>Scopus umbretta</i>	12.6	1.0	-	-		
Helmeted Guineafowl	<i>Numida meleagris</i>	87.4	20.4	-	-		
Horus Swift	<i>Apus horus</i>	0.8	1.0	-	-		
House Sparrow	<i>Passer domesticus</i>	55.1	7.1	-	-		
Icterine Warbler	<i>Hippolais icterina</i>	0.8	0.0	-	-		
Intermediate Egret	<i>Ardea intermedia</i>	5.5	2.0	-	-		
Jackal Buzzard	<i>Buteo rufofuscus</i>	1.6	1.0	-	-	x	Near endemic
Jameson's Firefinch	<i>Lagonosticta rhodopareia</i>	0.8	0.0	-	-		
Kalahari Scrub Robin	<i>Cercotrichas paena</i>	3.1	1.0	-	-		
Karoo Thrush	<i>Turdus smithi</i>	29.9	7.1	-	-	x	Near endemic
Kittlitz's Plover	<i>Charadrius pecuarius</i>	12.6	2.0	-	-		
Lanner Falcon	<i>Falco biarmicus</i>	0.8	1.0	-	VU		
Laughing Dove	<i>Spilopelia senegalensis</i>	89.0	16.3	-	-		
Lazy Cisticola	<i>Cisticola aberrans</i>	3.1	0.0	-	-		
Lesser Flamingo	<i>Phoeniconaias minor</i>	8.7	3.1	NT	NT		
Lesser Grey Shrike	<i>Lanius minor</i>	3.1	0.0	-	-		
Lesser Honeyguide	<i>Indicator minor</i>	0.8	0.0	-	-		
Lesser Kestrel	<i>Falco naumanni</i>	7.9	0.0	-	-		
Lesser Striped Swallow	<i>Cecropis abyssinica</i>	3.1	2.0	-	-		

Species name	Scientific name	Full protocol	Ad hoc protocol	Red List Global	Red List Regional	Endemic (SA)	Endemic (SA) - detail
Lesser Swamp Warbler	<i>Acrocephalus gracilirostris</i>	33.1	4.1	-	-		
Levaillant's Cisticola	<i>Cisticola tinniens</i>	70.9	8.2	-	-		
Little Bittern	<i>Ixobrychus minutus</i>	2.4	1.0	-	-		
Little Egret	<i>Egretta garzetta</i>	18.9	4.1	-	-		
Little Grebe	<i>Tachybaptus ruficollis</i>	40.9	7.1	-	-		
Little Rush Warbler	<i>Bradypterus baboecala</i>	7.1	0.0	-	-		
Little Stint	<i>Calidris minuta</i>	11.0	2.0	-	-		
Little Swift	<i>Apus affinis</i>	49.6	9.2	-	-		
Long-crested Eagle	<i>Lophaetus occipitalis</i>	7.9	1.0	-	-		
Long-tailed Paradise Whydah	<i>Vidua paradisaea</i>	1.6	0.0	-	-		
Long-tailed Widowbird	<i>Euplectes progne</i>	77.2	23.5	-	-		
Maccoa Duck	<i>Oxyura maccoa</i>	3.9	1.0	VU	NT		
Malachite Kingfisher	<i>Corythornis cristatus</i>	10.2	2.0	-	-		
Marsh Owl	<i>Asio capensis</i>	4.7	3.1	-	-		
Marsh Sandpiper	<i>Tringa stagnatilis</i>	6.3	1.0	-	-		
Marsh Warbler	<i>Acrocephalus palustris</i>	0.8	1.0	-	-		
Martial Eagle	<i>Polemaetus bellicosus</i>	0.0	1.0	EN	EN		
Mocking Cliff Chat	<i>Thamnolaea cinnamomeiventris</i>	0.0	1.0	-	-		
Mountain Wheatear	<i>Myrmecocichla monticola</i>	8.7	0.0	-	-		
Namaqua Dove	<i>Oena capensis</i>	7.9	1.0	-	-		
Neddicky	<i>Cisticola fulvicapilla</i>	48.0	4.1	-	-		
Northern Black Korhaan	<i>Afrotis afraoides</i>	54.3	8.2	-	-		
Orange River Francolin	<i>Scleroptila gutturalis</i>	8.7	0.0	-	-		
Orange River White-eye	<i>Zosterops pallidus</i>	1.6	1.0	-	-		
Orange-breasted Waxbill	<i>Amandava subflava</i>	5.5	0.0	-	-		
Ovambo Sparrowhawk	<i>Accipiter ovampensis</i>	1.6	1.0	-	-		
Pied Avocet	<i>Recurvirostra avosetta</i>	15.7	4.1	-	-		
Pied Crow	<i>Corvus albus</i>	19.7	5.1	-	-		
Pied Kingfisher	<i>Ceryle rudis</i>	7.9	2.0	-	-		
Pied Starling	<i>Lamprotornis bicolor</i>	44.1	15.3	-	-	x	Endemic (SA, Lesotho, Swaziland)
Pin-tailed Whydah	<i>Vidua macroura</i>	37.8	6.1	-	-		
Plain-backed Pipit	<i>Anthus leucophrys</i>	0.8	0.0	-	-		
Purple Heron	<i>Ardea purpurea</i>	13.4	0.0	-	-		

Species name	Scientific name	Full protocol	Ad hoc protocol	Red List Global	Red List Regional	Endemic (SA)	Endemic (SA) - detail
Purple Indigobird	<i>Vidua purpurascens</i>	2.4	1.0	-	-		
Quailfinch	<i>Ortygospiza atricollis</i>	24.4	2.0	-	-		
Red-backed Shrike	<i>Lanius collurio</i>	6.3	1.0	-	-		
Red-billed Firefinch	<i>Lagonosticta senegala</i>	1.6	0.0	-	-		
Red-billed Quelea	<i>Quelea quelea</i>	55.1	10.2	-	-		
Red-billed Teal	<i>Anas erythrorhyncha</i>	41.7	6.1	-	-		
Red-capped Lark	<i>Calandrella cinerea</i>	18.9	0.0	-	-		
Red-chested Cuckoo	<i>Cuculus solitarius</i>	3.1	1.0	-	-		
Red-chested Flufftail	<i>Sarothrura rufa</i>	0.8	0.0	-	-		
Red-collared Widowbird	<i>Euplectes ardens</i>	13.4	2.0	-	-		
Red-crested Pochard	<i>Netta rufina</i>	1.6	0.0	-	-		
Red-eyed Dove	<i>Streptopelia semitorquata</i>	71.7	19.4	-	-		
Red-faced Mousebird	<i>Urocolius indicus</i>	40.2	2.0	-	-		
Red-footed Falcon	<i>Falco vespertinus</i>	1.6	1.0	NT	NT		
Red-headed Finch	<i>Amadina erythrocephala</i>	18.1	4.1	-	-		
Red-knobbed Coot	<i>Fulica cristata</i>	51.2	8.2	-	-		
Red-throated Wryneck	<i>Jynx ruficollis</i>	5.5	1.0	-	-		
Red-winged Starling	<i>Onychognathus morio</i>	4.7	1.0	-	-		
Reed Cormorant	<i>Microcarbo africanus</i>	58.3	7.1	-	-		
Rock Dove	<i>Columba livia</i>	30.7	4.1	-	-		
Rock Kestrel	<i>Falco rupicolus</i>	5.5	0.0	-	-		
Rock Martin	<i>Ptyonoprogne fuligula</i>	17.3	3.1	-	-		
Ruff	<i>Calidris pugnax</i>	11.0	3.1	-	-		
Rufous-naped Lark	<i>Mirafrapa africana</i>	37.0	5.1	-	-		
Sand Martin	<i>Riparia riparia</i>	0.8	1.0	-	-		
Scaly-feathered Weaver	<i>Sporopipes squamifrons</i>	0.0	1.0	-	-		
Secretarybird	<i>Sagittarius serpentarius</i>	3.1	0.0	EN	VU		
Sedge Warbler	<i>Acrocephalus schoenobaenus</i>	1.6	0.0	-	-		
South African Cliff Swallow	<i>Petrochelidon spilodera</i>	42.5	5.1	-	-	x	Endemic (SA, Lesotho, Swaziland) Breeding
South African Shelduck	<i>Tadorna cana</i>	15.0	3.1	-	-		
Southern Boubou	<i>Laniarius ferrugineus</i>	2.4	0.0	-	-		
Southern Fiscal	<i>Lanius collaris</i>	89.0	20.4	-	-		
Southern Grey-headed Sparrow	<i>Passer diffusus</i>	39.4	6.1	-	-		

Species name	Scientific name	Full protocol	Ad hoc protocol	Red List Global	Red List Regional	Endemic (SA)	Endemic (SA) - detail
Southern Masked Weaver	<i>Ploceus velatus</i>	91.3	29.6	-	-		
Southern Pochard	<i>Netta erythrophthalma</i>	12.6	2.0	-	-		
Southern Red Bishop	<i>Euplectes orix</i>	83.5	32.7	-	-		
Speckled Mousebird	<i>Colius striatus</i>	25.2	2.0	-	-		
Speckled Pigeon	<i>Columba guinea</i>	79.5	13.3	-	-		
Spike-heeled Lark	<i>Chersomanes albofasciata</i>	10.2	2.0	-	-		
Spotted Eagle-Owl	<i>Bubo africanus</i>	3.1	1.0	-	-		
Spotted Flycatcher	<i>Muscicapa striata</i>	8.7	0.0	-	-		
Spotted Thick-knee	<i>Burhinus capensis</i>	16.5	1.0	-	-		
Spur-winged Goose	<i>Plectropterus gambensis</i>	44.9	7.1	-	-		
Squacco Heron	<i>Ardeola ralloides</i>	10.2	3.1	-	-		
Streaky-headed Seedeater	<i>Crithagra gularis</i>	5.5	3.1	-	-		
Striated Heron	<i>Butorides striata</i>	2.4	1.0	-	-		
Swainson's Spurfowl	<i>Pternistis swainsonii</i>	69.3	7.1	-	-		
Swallow-tailed Bee-eater	<i>Merops hirundineus</i>	1.6	1.0	-	-		
Tawny-flanked Prinia	<i>Prinia subflava</i>	25.2	2.0	-	-		
Thick-billed Weaver	<i>Amblyospiza albifrons</i>	4.7	2.0	-	-		
Three-banded Plover	<i>Charadrius tricollaris</i>	37.0	5.1	-	-		
Village Indigobird	<i>Vidua chalybeata</i>	2.4	0.0	-	-		
Village Weaver	<i>Ploceus cucullatus</i>	0.8	0.0	-	-		
Wailing Cisticola	<i>Cisticola lais</i>	2.4	0.0	-	-		
Wattled Starling	<i>Creatophora cinerea</i>	33.1	4.1	-	-		
Western Barn Owl	<i>Tyto alba</i>	9.4	0.0	-	-		
Western Cattle Egret	<i>Bubulcus ibis</i>	64.6	17.3	-	-		
Whiskered Tern	<i>Chlidonias hybrida</i>	16.5	2.0	-	-		
White Stork	<i>Ciconia ciconia</i>	2.4	0.0	-	-		
White-backed Duck	<i>Thalassornis leuconotus</i>	6.3	2.0	-	-		
White-backed Mousebird	<i>Colius colius</i>	3.9	0.0	-	-		
White-bellied Sunbird	<i>Cinnyris talatala</i>	8.7	0.0	-	-		
White-breasted Cormorant	<i>Phalacrocorax lucidus</i>	20.5	4.1	-	-		
White-browed Sparrow-Weaver	<i>Plocepasser mahali</i>	78.7	15.3	-	-		
White-faced Whistling Duck	<i>Dendrocygna viduata</i>	20.5	2.0	-	-		
White-fronted Bee-eater	<i>Merops bullockoides</i>	14.2	3.1	-	-		
White-rumped Swift	<i>Apus caffer</i>	44.9	6.1	-	-		

Species name	Scientific name	Full protocol	Ad hoc protocol	Red List Global	Red List Regional	Endemic (SA)	Endemic (SA) - detail
White-throated Swallow	<i>Hirundo albigularis</i>	34.6	10.2	-	-		
White-winged Tern	<i>Chlidonias leucopterus</i>	3.9	0.0	-	-		
White-winged Widowbird	<i>Euplectes albonotatus</i>	18.1	0.0	-	-		
Willow Warbler	<i>Phylloscopus trochilus</i>	10.2	2.0	-	-		
Wing-snapping Cisticola	<i>Cisticola ayresii</i>	3.9	0.0	-	-		
Wood Sandpiper	<i>Tringa glareola</i>	9.4	3.1	-	-		
Woodland Kingfisher	<i>Halcyon senegalensis</i>	0.0	1.0	-	-		
Yellow Bishop	<i>Euplectes capensis</i>	0.8	0.0	-	-		
Yellow Canary	<i>Crithagra flaviventris</i>	22.0	1.0	-	-		
Yellow-billed Duck	<i>Anas undulata</i>	66.9	6.1	-	-		
Yellow-billed Stork	<i>Mycteria ibis</i>	1.6	0.0	-	EN		
Yellow-crowned Bishop	<i>Euplectes afer</i>	40.9	3.1	-	-		
Yellow-fronted Canary	<i>Crithagra mozambica</i>	10.2	0.0	-	-		
Zitting Cisticola	<i>Cisticola juncidis</i>	45.7	5.1	-	-		

APPENDIX 2: AVIFAUNAL HABITAT OBSERVED WITHIN THE LETHABO PV SOLAR ENERGY FACILITY 132KV POWER LINE GRID CONNECTION PAOI



FIGURE 1: Degraded grassland habitat near the RWB Lethabo Substation



FIGURE 2: Grassland habitat along the proposed 132kV power line alignments



FIGURE 3: The Vaal River



FIGURE 4: Floodplain / wetland area associated with the Vaal River



FIGURE 5: Surface waterbody (foreground) Vall River in the background



FIGURE 6: Eucalyptus (Alien Tree) stands

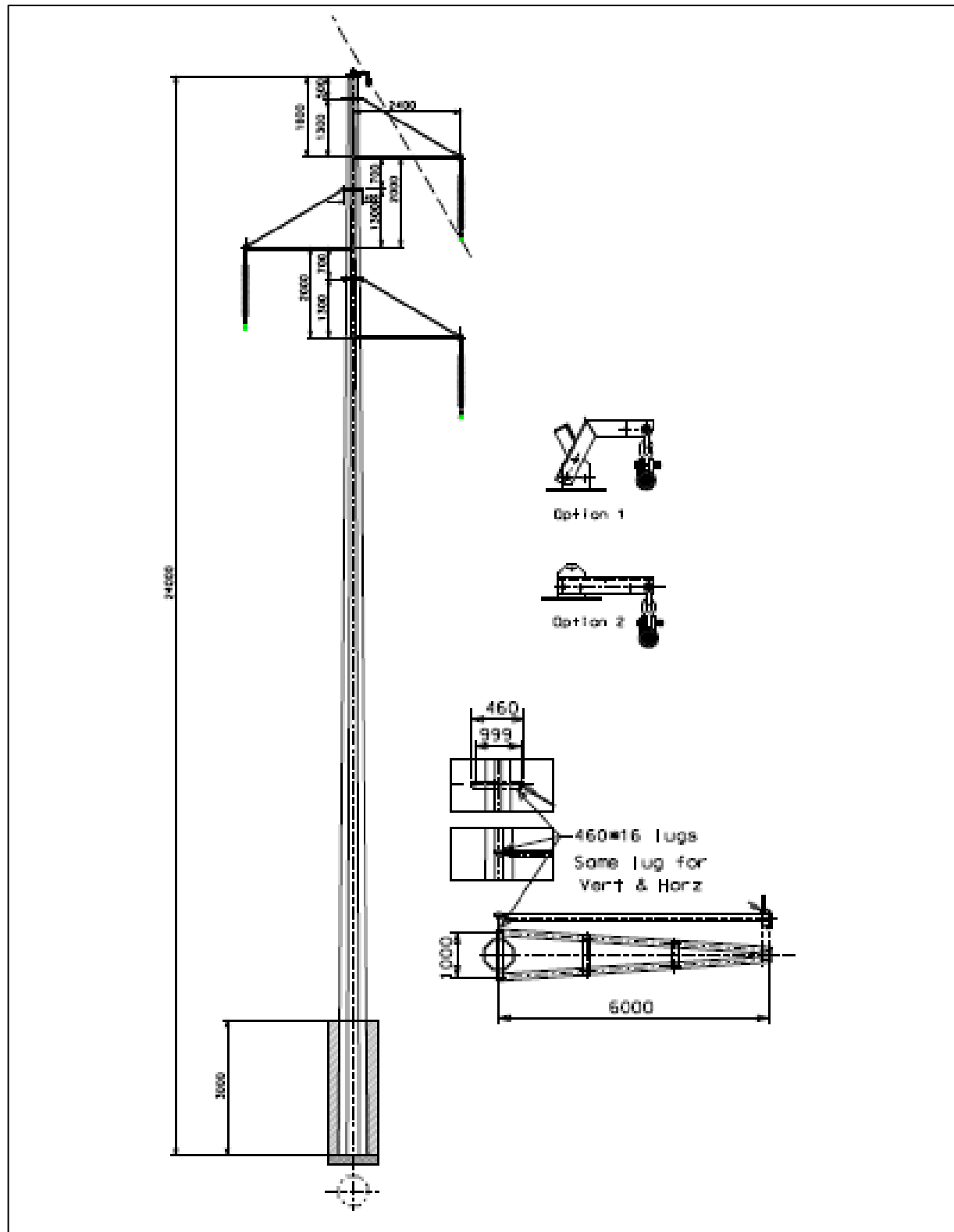
APPENDIX 3: METHOD OF ASSESSING THE SIGNIFICANCE OF POTENTIAL AVIFAUNAL IMPACTS

The status of the impact		
Status		Description
Positive:		a benefit to the holistic environment
Negative:		a cost to the holistic environment
Neutral:		no cost or benefit
The duration of the impact		
Score	Duration	Description
1	Short term	Immediate/ short term (less than 3 months)
2	Medium term	Construction or decommissioning period
3	Long term	For the life of the operation
5	Permanent	Permanent
The extent of the impact		
Score	Extent	Description
1	Footprint	Within the site boundary
2	Site	Affects immediate surrounding areas
3	Local	Local area / district (neighbouring properties, transport routes and adjacent towns) is affected
4	Regional	Extends to almost entire province or larger region
5	National	Affects the country.
The reversibility of the impact		
Score	Reversibility	Description
1	Completely reversible	Reverses with minimal rehabilitation & negligible residual affects
3	Reversible	Requires mitigation and rehabilitation to ensure reversibility
5	Irreversible	Cannot be rehabilitated completely/rehabilitation not viable
The magnitude (severe or beneficial) of the impact		
Score	Severe/beneficial effect	Description
1	Zero	Natural and/or social functions and/or processes remain unaltered.
2	Very Low	Natural and/or social functions and/or processes are negligibly altered.

3	Low	Natural and/or social functions and/or processes are slightly altered and are reversible with time.
4	Moderate	Natural and/or social functions and/or processes are notably altered and are reversible with rehabilitation.
5	High	Natural and/or social functions and/or processes are permanently altered.
The probability of the impact		
Score	Rating	Description
1	Unlikely	The chance of this impact occurring is zero (0%).
2	Possible	May occur. The chances of this impact occurring is defined as 25%.
3	Probable	Likely to occur. The chances of this impact occurring is defined as 50%.
4	Highly Probable	The chances of this impact occurring is defined as 75%.
5	Definite	Will certainly occur. The chance of this impact occurring is defined as 100%.
The Consequence		= Magnitude + Extent + Duration + Reversibility.
The Significance		= Consequence x Probability.

Score	Significance
1 to 20	Low
21 to 40	Moderate to Low
41 to 60	Moderate
61 to 80	Moderate to high
81 to 100	High

APPENDIX 4: RECOMMENDED 132KV STRUCTURE TYPE (DT 7641/7649)



APPENDIX 5: CURRICULUM VITAE

MEGAN DIAMOND

PERSONAL DETAILS

Date of Birth | 7 December 1978
Driver's License | Code A and B
Home Language | English
Other Languages | Afrikaans

EDUCATION

BSc Environmental Management | *University of South Africa (UNISA)* 2002 – 2009

ACCREDITATION

South African Council for Natural Scientific Professions | *Environmental Science*
Registration Number: 300022/14

EXPERIENCE

Owner & Avifaunal Specialist | *Feathers Environmental Services*
July 2013 – Present

- * Perform specialist avifaunal assessment studies to minimise the impact of industrial infrastructure on birds and their habitats;
- * Provide strategic guidance to industry through the development of best practice procedures and guidelines;
- * Review and comment on methodologies, specialist studies and EIA reports for Renewable Energy projects;
- * Provide input into renewable energy and power line developments elsewhere in Africa and across the globe;
- * Manage the collection and collation of relevant and complete desktop and/or field datasets;
- * Manage pre- and post-construction avifaunal monitoring data collected at wind and solar energy facilities;
- * Site assessments, either as part of the project team or independently;
- * Preparation of reports according to project deadlines, including the use of Geographic Information Systems (GIS) to portray data;
- * Attendance of specialist integration meetings; and
- * Liaison with stakeholders where necessary.

Programme management

- * Annually review the programme's conservation and research strategic objectives and update in accordance with the EWT's and programme's vision and mission including work plans for staff etc.;
- * Ensure timeous, professional delivery on all aspects of Wildlife & Energy Programme activities;
- * Formulate, prioritise and approve relevant research and conservation projects;
- * Ensure acceptable quality of all research projects and their outputs;
- * Participate in international network liaison as and when required;
- * Produce regular popular articles & media releases on the Wildlife & Energy Programme projects and outputs & contribute to the EWT publications;
- * Establish & maintain a network with relevant national & international stakeholders;
- * Deliver presentations at relevant meetings, functions, workshops & conferences on behalf of the programme;
- * Assist with compilation of newsletters, updating of webpage, compilation of press articles, any advocacy issues;
- * Identify & establish partnerships to achieve Wildlife & Energy Programme conservation goals.

Eskom –EWT Strategic Partnership

- * Ensure that this partnership is managed effectively and sustainably against its goals. Manage staff in this division;
- * Develop and maintain relationships with Eskom;
- * Negotiate the terms of reference for the annual service level agreements between EWT and Eskom, to ensure the sustainability of the relationship;
- * Compile annual report to Eskom Corporate Environment and Sustainability;
- * Produce monthly reports to Eskom's regional grids on the status of incident follow-up;
- * Attend applicable forums to interact with Eskom stakeholders;
- * Participate in international network liaison as and when required;
- * Maintain a network with all relevant local and regional level stakeholders (meetings, forums, workshops, etc.);
- * Identify research needs relating to the management of wildlife interaction with power lines;
- * Conduct research projects on wildlife and power line interaction and present the results at national and international conferences and workshops;
- * Development and implementation of training for Eskom field services staff (at various levels) in the management of wildlife interactions; and
- * Conduct special investigations on power lines relating to wildlife induced faulting.

Environmental Impact Assessment Division

- * Ensure that this division operates effectively and efficiently at all times and manage staff in this division; and

- * Conduct specialist avifaunal studies for new power lines developments including: tendering/quoting for the projects, conducting field work, preparing reports, presenting results & negotiating the acceptance of recommendations, final “walk through” as part of Environmental Management Plans; general project management, all liaison with clients, Eskom, authorities, Interested and Affected Parties etc.

Management and administration

- * Ensure all programme staff have relevant terms of reference;
- * Ensure that all programme staff are performance appraised against their terms of reference;
- * Compile and manage programme budgets, monthly reports, work plans and strategy;
- * Monitor expenditure and take corrective action if necessary; and
- * Ensure timely delivery on all projects to all stakeholders.

CONFERENCE ATTENDANCE

- * *Society for Conservation Biology 21st Annual Meeting (1-5 July 2007)*
- * *The 6th TAWIRI Scientific Conference (3 – 6 December 2007) Presented a paper titled “Co-operative management of wildlife and power line conflicts: an African solution”*
- * *Pan-African Ornithological Congress (7-12 September 2008)*
- * *International Conference on Overhead Lines, Design, Construction, Inspection & Maintenance, Fort Collins Colorado USA. (29 March – 1 April 2010) Presented a paper titled “Bird’s eye view: how birds see is key to avoiding power line collision”*
- * *Windaba 2011 – Implementing South African Wind Energy (27-29 September 2011)*
- * *Pan African Vulture Summit (16-20 April 2012) Presented a paper titled “Electrification in Africa – Are our vultures being strung along”*
- * *4th Wind Power Africa Conference & Renewable Energy Exhibition (28-30 May 2012) Presented a paper titled “Wind Energy in Africa – what does this really mean for our continent’s birds”*
- * *13th Pan-African Ornithological Congress (14-21 October 2012) Presented a paper titled “Stringing South Africa’s Terrestrial Birds Along - Monitoring of Bird Interactions with Power Line and Experimental Testing of Bird Collision Mitigation at the Karoo Long Term Monitoring Site”*
- * *AEWA Single Species Action-Planning Workshop for the Conservation of the Grey Crowned Crane (10-13 September 2013) Presented and participated in the workshop as a subject expert (energy and bird interactions)*

AUTHORED & CO-AUTHORED PAPERS

Jenkins, A.R., Smallie, J. & Diamond, M. 2009. Balls, flashers, flappers and coils: South African perspectives on a global search for ways to prevent avian collisions with overhead lines. In: Harebottle, D.M., Craig, A.J.F.K., Anderson, M.D., Rakatomonana, H. & Muchai, M. (eds). Proceedings of the 12th Pan-African Ornithological Congress, 2008. Cape Town, Animal Demography Unit.

Smallie, J., Diamond, M. & Jenkins, A. 2009. Lighting up the African continent – what does it mean for our birds? pp. 38–43. In: Harebottle, D.M., Craig, A.J.F.K., Anderson, M.D., Rakotomanana, H. & Muchai. (eds). *Proceedings of the 12th Pan-African Ornithological Congress, 2008*. Cape Town, Animal Demography Unit.

Jenkins, A. R., Smallie, J.J and Diamond, M. 2010 Avian collisions with power lines: a global review of causes and mitigation with a South African perspective. Bird Conservation International, page1 of16.

Retief, E.F., Diamond, M., Anderson, M.D., Smit, H.A., Jenkins, A.R., Brooks, M. 2011. Avian Wind Farm Sensitivity Map for South Africa.

Jenkins, A.R., Van Rooyen, C.S., Smallie, J.J., Harrison, J.A., Diamond, M. And Smit, H.A. 2012. BirdLife South Africa / Endangered Wildlife Trust best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa.

Jenkins, A.R., De Goede, K.H., Sebele, L. and Diamond, M. 2013. Brokering a settlement between eagles and industry: sustainable management of large raptors nesting on power infrastructure. Bird Conservation International (2013) 23:232 – 246.

Diamond, M., Harris, J., Mirande, C. and Austin, J. 2014. People of a feather flock together: A global initiative to address crane and power line interactions. 13th North American Crane Workshop Summary. Lafayette, Louisiana.

Page-Nicholson, S., Tate, G., Hoogstad, C., Murison, M., Diamond, M., Blofield, A., Pretorius, M., Michael, M.D. 2018. Mitigating the Impact of Large Mammals on Wooden Electrical Distribution Poles in the Kruger National Park, South Africa. African Journal of Wildlife Research.

Diamond, M. and Hoogstad, C. (in press) Collisions and habitat loss associated with utility lines and wind turbines. IUCN SSC Crane Specialist Group – Crane Conservation Strategy.