AVIFAUNAL IMPACT ASSESSMENT

Karreebosch 132kV Overhead Power Line and substation for the Karreebosch Wind Energy Facility located in the Northern Cape and Western Cape Provinces

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EXECUTIVE SUMMARY

Karreebosch Wind Farm RF (Pty) Ltd is proposing the construction and operation of a 33/132kV on-site substation and a 132kV overhead power line (OHPL) to connect the Karreebosch Wind Energy Facility (WEF) (EA Ref: 14/12/16/3/3/2/807/AM3, which is currently undergoing a Part 2 EA amendment, final layout and EMPr approval process) to the national grid. The proposed 132kV Karreebosch OHPL, 33/132kV Substation and associated infrastructure is located 35km north of Matjiesfontein, and extends across two provinces, namely the Northern and Western Cape Provinces. The proposed Karreebosch OHPL will extend from the proposed Karreebosch onsite 33/132kV substation where it will connect to the existing 400kV Komsberg substation via the existing Bon Espirange substation.

The OHPL will be a 132kV twin tern double circuit overhead powerline. The powerline towers will either be steel lattice or monopole structures. It is anticipated that towers will be located on average 200m to 250m apart; however, longer spans may be needed due to terrain and watercourse crossings.

The Karreebosch OHPL will be routed from the proposed onsite Karreebosch 33/132kV substation to the existing Bon Espirange substation, after which it will connect to the existing 400kV Komsberg substation. Two alternative 33/132kV onsite substation locations at the Karreebosch WEF site have been assessed as part of the Basic Assessment Report (BAR), each with a 200m x 150m (3 ha) footprint. The proposed Karreebosch OHPL may require an extension of the existing 400kV Komsberg substation, and therefore, the entire Komsberg substation property has been assessed. The proposed onsite substation and 132kV OHPL are the subjects of this impact assessment report.

PROJECT ALTERNATIVES

Only one (1) OHPL route is technically feasible for the section of the proposed powerline directly preceding the existing Bon Espirange Substation (Route 3) and for the section connecting the Bon Espirange substation to the Komsberg substation (Bon Espirange to Komsberg Route), which is approximately 9.2 km in length. No alternatives can therefore be provided for these two sections of the OHPL (Route 3 and Bon Espirange to Komsberg Route, as per Figure 1).

Six (6) OHPL route alternatives (Options 1A, 1B, 1C, 2A, 2B and 2C) are proposed between the Karreebosch WEF onsite 33/132kV substation (with substation alternatives: Option 1 and Option 2) and Route 3 preceding the existing Bon Espirange Substation. All of the six OHPL route alternatives follow the same routing from their point of convergence on Remainder of farm Ek Kraal No.199, approximately 3.1 km before the Bon Espirange Substation, to the Komsberg Substation situated on Portion 2 of Farm Standvastigheid No. 210.

The preferred option from an avifaunal perspective would be any one of the Option 1 permutations. They are the shortest and they all avoid the proposed 1.5km No Go buffer around the Verreaux's Eagle nest at Beacon Hill, except Option 1C, which marginally intrudes on the buffer by about 50m, which is not considered significant. Options 2A and 2B are not preferred, due to their length and they both intrude on the proposed 1.5km No Go buffer around the Verreaux's Eagle nest at Beacon Hill. Option 2C is acceptable but not preferred due to its length, compared to the Option 1 permutations.

AVIFAUNA

The SABAP2 data indicates that a total of 151 bird species could potentially occur within the broader area – Appendix 1 provides a comprehensive list of all the species. Of these, 46 species are classified as powerline sensitive species (see definition of powerline sensitive species in section 4) and ten of these are South African Red List species. Of the powerline sensitive species, 18 are likely to occur regularly at the study area and immediate surrounding area, and another 28 could occur sporadically.

POTENTIAL IMPACTS

The following impacts have been identified in the Avifauna Specialist Assessment.

Construction Phase

- Displacement due to disturbance associated with the construction of the on-site substation, Karreebosch 132kV OHPL and associated servitude roads.
- Displacement due to habitat transformation associated with the construction of the on-site substation, Karreebosch 132kV OHPL and associated servitude roads.

Operational Phase

- Collisions with the Karreebosch 132kV OHPL.
- Electrocutions within the on-site substation.

Decommissioning Phase

- Displacement due to disturbance associated with the decommissioning of the on-site substation and Karreebosch 132kV OHPL.

Cumulative Impacts

- Displacement due to disturbance associated with the construction and decommissioning of the on-site substation, OHPL and associated servitude roads.
- Displacement due to habitat transformation associated with the on-site substation.
- Collisions with the OHPL.
- Electrocutions within the on-site substation.

ENVIRONMENTAL SENSITIVITIES

The entire study area is regarded as highly sensitive due to the regular occurrence of Red List powerline sensitive species. Areas that are particularly risky from a potential bird collision perspective are the following:

- Natural flight paths: Topographical features e.g. ridges and areas where the line crosses a valley, or drainage lines.
- Waterbodies: Several powerline sensitive species are attracted to open water. If a line skirts a waterbody, or runs between two waterbodies, it can pose a collision risk to birds which are attracted to the water.

Areas that are particularly sensitive from a disturbance perspective are the following:

- Nests: Verreaux's Eagle nest at 32°51'59.27"S 20°30'12.02"E (Beacon Hill).

Bird Flight Diverters must be fitted to the entire powerline according to the applicable Eskom Engineering Instruction (Eskom Unique Identifier 240 – 93563150: The utilisation of Bird Flight Diverters on Eskom Overhead Lines). These devices must be installed as soon as the conductors are strung. A 1.5km No Go buffer should be implemented around the Verreaux's Eagle nest at Beacon Hill (see Figure 9).

MITIGATION MEASURES

The following mitigation measures are proposed for the Karreebosch grid connection:

<u>Construction phase</u>

- Construction activity should be restricted to the immediate footprint of the infrastructure as much as possible.

- Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of powerline sensitive species as much as practically possible.
- Measures to control noise and dust should be applied according to current best practice in the industry.
- Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.
- A 1.5km No Go buffer should be implemented around the Verreaux's Eagle nest at (Beacon Hill).
- Vegetation clearance should be limited to what is absolutely necessary.
- The mitigation measures proposed by the vegetation or biodiversity specialist must be strictly enforced.

<u>Operational phase</u>

- Bird Flight Diverters must be fitted to the entire powerline according to the applicable Eskom Engineering Instruction (Eskom Unique Identifier 240 – 93563150: The utilisation of Bird Flight Diverters on Eskom Overhead Lines). These devices must be installed as soon as the conductors are strung.
- The hardware within the proposed substation yard is too complex to warrant any mitigation for electrocution at this stage. It is recommended that if on-going impacts are recorded once operational, site-specific mitigation (insulation) be applied reactively. This is an acceptable approach because Red List powerline sensitive species are unlikely to frequent the substation.

<u>De-commissioning phase</u>

- An inspection to identify Red List species that may be breeding within the project footprint must be conducted by an avifaunal specialist to ensure that the impacts to breeding species (if any) are adequately managed.
- Decommissioning activity should be restricted to the immediate footprint of the infrastructure as far as possible.
- Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of powerline sensitive species.
- Measures to control noise and dust should be applied according to current best practice in the industry.
- Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.

STATEMENT AND REASONED OPINION

No-Go alternative

The no-go alternative will result in the current status quo being maintained at the proposed development site as far as the avifauna is concerned. The study area itself consists mostly of renosterveld, ephemeral drainage lines and ridge lines. The no-go option would maintain the natural habitat which would be beneficial to the avifauna currently occurring there.

Concluding statement

The expected impacts of the 132kV OHPL were rated to be of Moderate significance and negative status pre-mitigation. However, with appropriate mitigation, the post-mitigation significance of the identified impacts should be reduced to Low negative, except in the case of powerline collisions, where the significance will be reduced significantly, but will remain at a Moderate level (see Appendix 4). No fatal flaws were discovered in the course of the investigation. It is therefore recommended that the activity is authorised, on condition that the proposed mitigation measures as detailed in the EMPr (Appendix 3) are strictly implemented.

CONTENTS

DETAILS OF THE SPECIALIST AND EXPERTISE TO COMPILE A SPECIALIST REPORT

Chris van Rooyen (Avifaunal Specialist)

Chris has 26 years' experience in the management of wildlife interactions with electricity infrastructure. He was head of the Eskom-Endangered Wildlife Trust (EWT) Strategic Partnership from 1996 to 2007, which has received international acclaim as a model of co-operative management between industry and natural resource conservation. He is an acknowledged global expert in this field and has worked in South Africa, Namibia, Botswana, Lesotho, New Zealand, Texas, New Mexico and Florida. Chris also has extensive project management experience and has received several management awards from Eskom for his work in the Eskom-EWT Strategic Partnership. He is the author of 15 academic papers (some with co-authors), co-author of two book chapters and several research reports. He has been involved as ornithological consultant in numerous power line and wind generation projects. Chris is also co-author of the Best Practice for Avian Monitoring and Impact Mitigation at Wind Development Sites in Southern Africa, which is currently (2016) accepted as the industry standard. Chris also works outside the electricity industry and had done a wide range of bird impact assessment studies associated with various residential and industrial developments.

Albert Froneman (Avifaunal and GIS Specialist)

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

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.	Page 8
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 3, Section 6 and Appendix 3
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.	Appendix 3
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;	Page 8 & Appendix 6
A signed statement of independence by the specialist;	Page 8
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 2 and Section 3
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 3
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 4
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 study area;	N/A
The location of areas not suitable for development and to be avoided during construction where relevant;	Section 6
a discussion on the cumulative impacts;	Section 9
Impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	Section 10 and Appendix 4
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 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

1 INTRODUCTION

Karreebosch Wind Farm RF (Pty) Ltd is proposing the construction and operation of a 33/132kV on-site substation and a 132kV overhead power line (OHPL) to connect the Karreebosch Wind Energy Facility (WEF) to the national grid. The proposed 132kV Karreebosch OHPL, 33/132kV Substation and associated infrastructure is located 35km north of Matjiesfontein, and extends across two provinces, namely the Northern and Western Cape Provinces. The proposed Karreebosch OHPL will extend from the proposed Karreebosch onsite 33/132kV substation, which is situated in Ward 3 of the Karoo Hoogland Local Municipality in the Namakwa District Municipality in the Northern Cape into Ward 2 of the Laingsburg Local Municipality in the Central Karoo District Municipality in the Western Cape Province, where it will connect to the existing 400kV Komsberg substation via the existing Bon Espirange substation.

The OHPL and associated infrastructure will be accessed via roads forming part of the authorised Karreebosch WEF (EA Ref: 14/12/16/3/3/2/807/AM3 which is currently undergoing of a Part 2 EA amendment, final layout and EMPr approval process), where possible. The preferred OHPL routing will require an associated servitude road (following beneath the proposed OHPL) to be constructed which will be used to construct, operate and maintain the powerline. Existing roads will be used as much as possible, where feasible. However, additional access roads may be required to provide access to sections of the powerline route. New sections of access roads will deviate off existing roads (within the 400m wide assessment corridor), as needed to access tower positions. Access roads will be mostly two-track gravel roads up to 14m in width following beneath the OHPL in order to access tower structures for construction and maintenance purposes.

The proposed Karreebosch OHPL will evacuate power from the authorised Karreebosch WEF (EA Ref: 14/12/16/3/3/2/807/AM3, which is currently undergoing a Part 2 EA amendment, final layout and EMPr approval process), located in the Northern Cape Province, and will connect to the existing Komsberg substation. The OHPL will be a 132kV twin tern double circuit overhead powerline. The powerline towers will either be steel lattice or monopole structures. Pole positions will only be available once the powerline detail design has been completed by the Eskom Design Review Team (DRT). It is anticipated that towers will be located on average 200m to 250m apart; however, longer spans may be needed due to terrain and watercourse crossings.

Two alternative 33/132kV onsite substation locations at the Karreebosch WEF site have been assessed as part of the Basic Assessment (BA), each with a 200m x 150m (3 ha) footprint. A 200m assessment area surrounding the proposed substation alternatives have been included as part of this assessment for micro siting, with a slight funnel leading into the existing Bon Espirange and Komsberg substations to allow for greater flexibility for micro siting for incoming proposed line connections. The proposed Karreebosch OHPL may require an extension of the existing 400kV Komsberg substation, and therefore, the entire Komsberg substation property has been assessed.

See Figure 1 for the proposed alignments of the OHPL and substation alternatives.

1.1 Project alternatives

Only one (1) OHPL route is technically feasible for the section of the proposed powerline directly preceding the existing Bon Espirange Substation (Route 3) and for the section connecting the Bon Espirange substation to the Komsberg substation (Bon Espirange to Komsberg Route), which is approximately 9.2 km in length. No alternatives can therefore be provided for these two sections of the OHPL (Route 3 and Bon Espirange to Komsberg Route, as per Figure 1 below).

Six (6) OHPL route alternatives (Options 1A, 1B, 1C, 2A, 2B and 2C) are proposed between the Karreebosch WEF onsite 33/132kV substation (with substation alternatives: Option 1 and Option 2) and Route 3 preceding the existing Bon Espirange Substation. As noted above, all of the six OHPL route alternatives follow the same routing from their point of convergence on Remainder of farm Ek Kraal No.199, approximately 3.1 km before the Bon Espirange Substation, to the Komsberg Substation situated on Portion 2 of Farm Standvastigheid No. 210.

These alternatives, as depicted in Figure 1, are described below:

OHPL Route Option 1: Three (3) OHPL route alternatives are being considered for the link between Substation Option 1 and the Bon Espirange Substation and Komsberg Substation:

- Option 1A (approximately 14.51 km in length in its entirety from Substation Option 1 to the Komsberg Substation);
- Option 1B (approximately 17.28 km in length in its entirety from Substation Option 1 to the Komsberg Substation); and
- Option 1C (approximately 13.91 km in length in its entirety from Substation Option 1 to the Komsberg Substation).

OHPL Route Option 2: Three (3) powerline corridor route alternatives were considered for the link between Substation Option 2 and the Bon Espirange Substation and Komsberg Substation:

- Option 2A (approximately 20.47 km in length in its entirety from Substation Option 2 to the Komsberg Substation);
- Option 2B (approximately 16.63 km in length in its entirety from Substation Option 2 to the Komsberg Substation); and
- Option 2C (approximately 20.52 km in length in its entirety from Substation Option 2 to the Komsberg Substation).

Alternatives 1A-C feed out of Substation Option 1 which is proposed in the south-central portion of the Farm Klipbanks Fontein 198/1. Alternatives 2A-C feed out of Substation Option 2 which is proposed in the south-eastern corner of Wilgebosch Rivier 188/RE.

2 PROJECT SCOPE

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

- Describe the affected environment from an avifaunal perspective;
- Discuss gaps in baseline data and other limitations;
- List and describe the expected impacts associated with the proposed on-site substation and 132kV power line grid connection;
- Perform an assessment of the potential impacts; and
- Recommend mitigation measures to reduce the significance of the expected impacts.

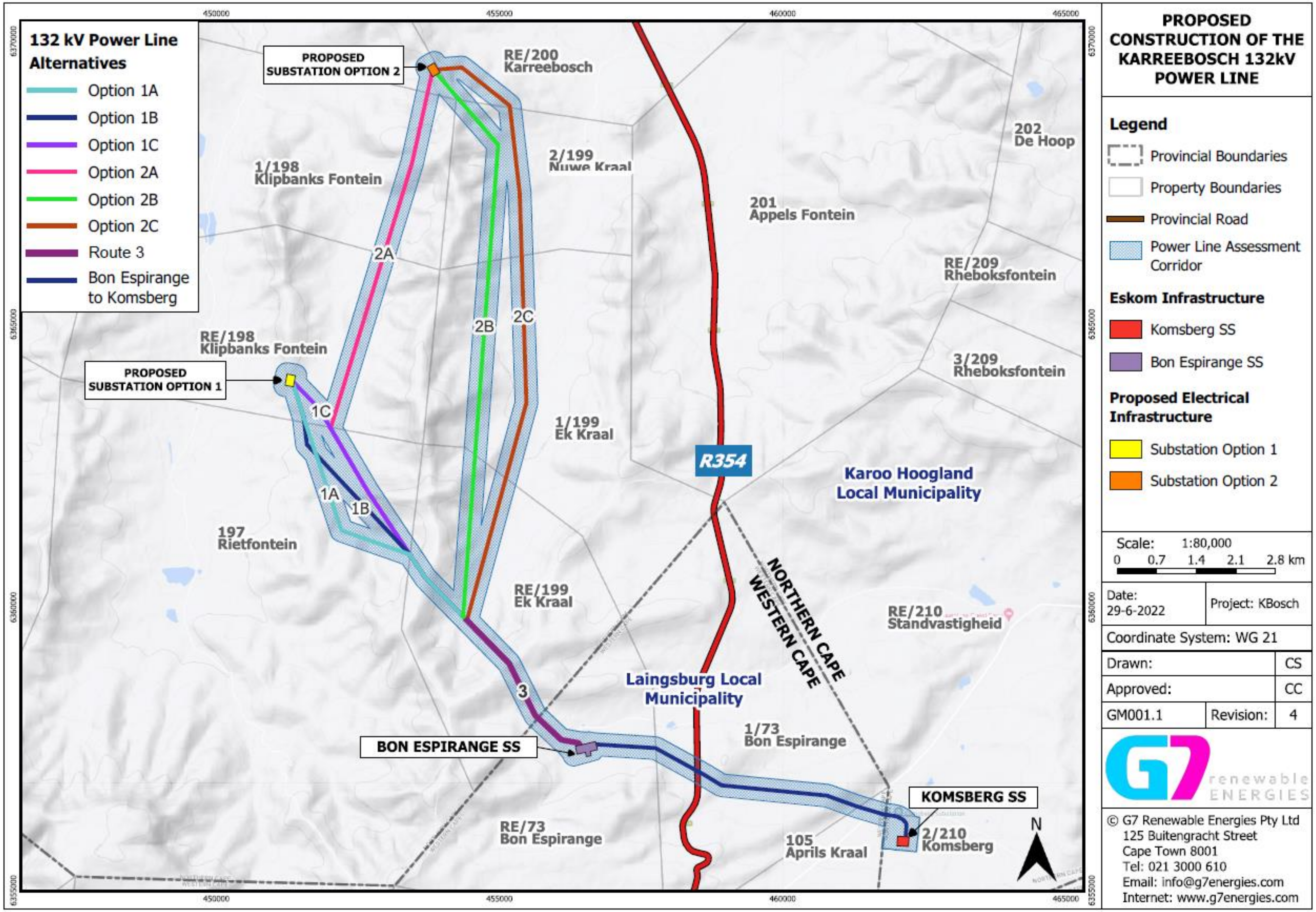


Figure 1: Locality map of the study area indicating the location of the Karreebosch on-site substation and 132kV overhead power line route alignment including all alternatives.

3 OUTLINE OF METHODOLOGY AND INFORMATION REVIEWED

The following information sources were consulted to conduct this study:

- The study area was defined as a 2km zone around the proposed on-site substation alternatives and 132kV OHPL alternatives.
- Bird distribution data from the Southern African Bird Atlas Project 2 (SABAP 2) was obtained (http://sabap2.adu.org.za/), in order to ascertain which species occur in the pentads where the proposed development is located. A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5' × 5'). Each pentad is approximately 8 × 7.6 km. To get a more representative impression of the birdlife, a consolidated data set was obtained for a total of 20 pentads some of which intersect and others that are near the study area (the broader area). The decision to include multiple pentads around the study area was influenced by the fact that the pentads within which the proposed development is located have few completed full protocol surveys. The additional pentads and their data augment the bird distribution data. The 20 pentad grid cells are the following: 3240_2025, 3240_2030, 3240_2035, 3240_2040, 3245_2025, 3245_2030; 3245_2035; 3245_2040; 3250_2025; 3250_2030; 3250_2035; 3250_2040; 3255_2025; 3255_2030; 3255_2035; 3255_2040; 3300_2025; 3300_2030; 3300_2035 and 3300_2040 (see Figure 22). A total of 131 full protocol lists (i.e. bird listing surveys lasting a minimum of two hours each) and 52 ad hoc protocol lists (surveys lasting less than two hours but still yielding valuable data) have been completed to date for the 20 pentads where the study area is located. The SABAP2 data is regarded as a reliable reflection of the avifauna which occurs in the area, but the data was also supplemented by data collected during site surveys and general knowledge of the area.
- A classification of the vegetation types in the study area was obtained from the Atlas of Southern African Birds 1 (SABAP1) and the latest version (2018) of the National Vegetation Map compiled by the South African National Biodiversity Institute (Mucina & Rutherford 2006).
- The national threatened status of all powerline sensitive species was determined with the use of the most recent edition of the Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor *et al.* 2015), and the latest authoritative summary of southern African bird biology (Hockey *et al.* 2005).
- The global threatened status of all powerline sensitive species was determined by consulting the latest (2021.3) IUCN Red List of Threatened Species (http://www.iucnredlist.org/).
- The Important Bird and Biodiversity Areas of South Africa (Marnewick *et al.* 2015; http://www.birdlife.org.za/conservation/important-bird-areas) was consulted for information on potentially relevant Important Bird Areas (IBAs).
- Satellite imagery (Google Earth © 2022) was used in order to view the broader area on a landscape level and to help identify bird habitat on the ground.
- The Department of Forestry, Fisheries and the Environment (DFFE) National Screening Tool was used to determine the assigned avian sensitivity of the study area (July 2022).
- A site visit to the study area was conducted on 17 August 2021 to record the avifaunal habitat first-hand, using a 4 x 4 vehicle, a Zeiss 10 x 32 pair of binoculars and a Nikon 20 x 60 spotting scope.
- Additional Information on bird diversity and abundance at the proposed Karreebosch development site was obtained by consulting studies previously conducted namely additional monitoring conducted by Birds & Bats Unlimited (Simmons & Martins 2014, 2020 and 2021) and an 18-month monitoring programme which was implemented in 2013 – 2014 (Williams 2014).

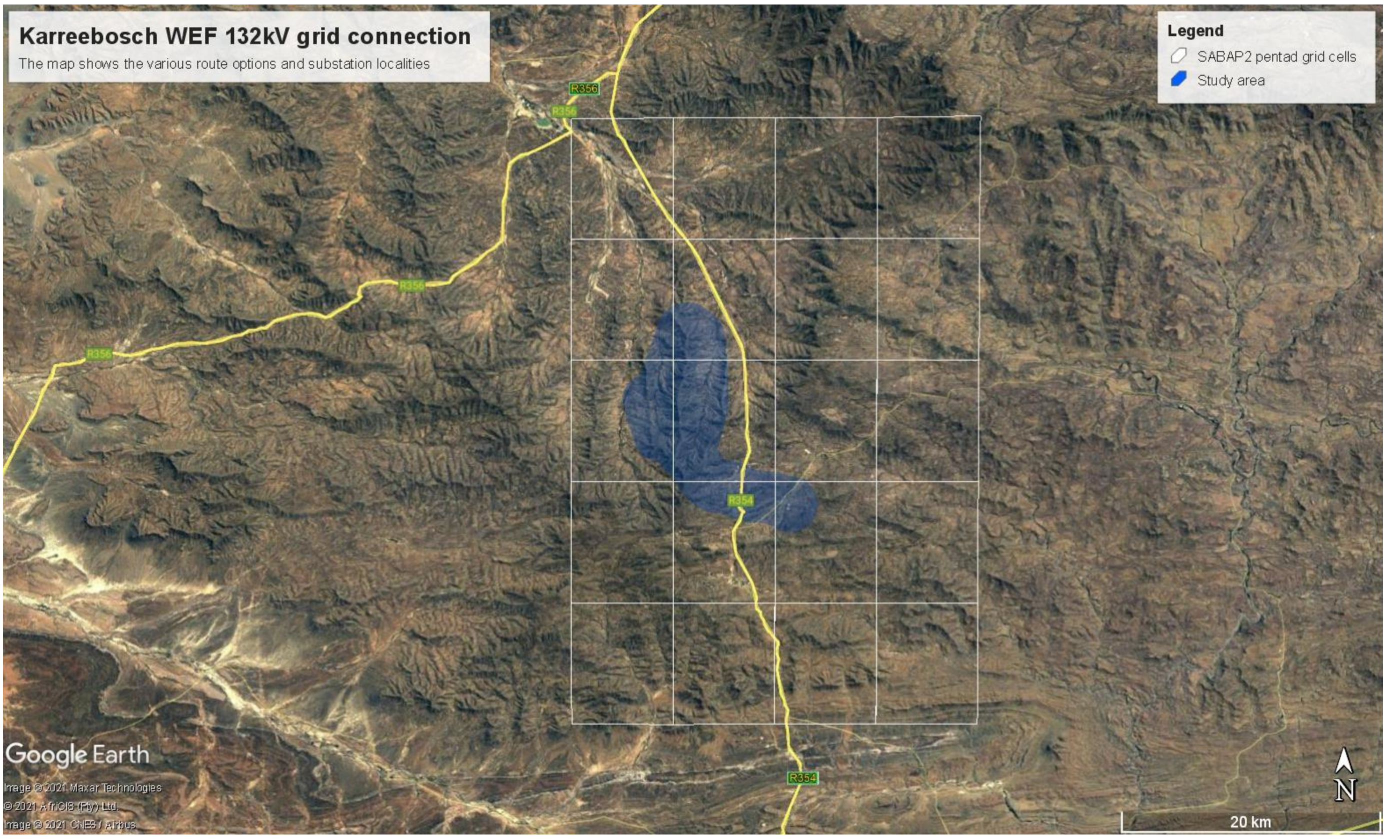


Figure 2: Location of the twenty South African Bird Atlas Project 2 (SABAP2) pentad grid cells that were considered for the proposed Karreebosch 33/132kV on-site substation and 132kV overhead power line project.

4 ASSUMPTIONS AND LIMITATIONS

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

- The focus of the study was primarily on the potential impacts of the proposed on-site substation and 132kV OHPL on powerline sensitive species. Powerline sensitive species were defined as species which could potentially be impacted by power line collisions or electrocutions, based on specific morphological and/or behavioural characteristics.
- Cumulative impacts include all wind energy projects with grid connections within a 30km radius that currently have open applications or have been approved by the Competent Authority as per the 2022 Q2 database from the DFFE.
- Despite thorough and extremely onerous and time-consuming internet searches, details of all the proposed grid connections of all the registered wind energy projects within a 30km radius could not be located. The accuracy of the ones that were located can also not be guaranteed as amendments are taking place on an ongoing basis.
- Conclusions in this study are based on experience of these and similar species in different parts of South Africa. Bird behaviour can never be entirely reduced to formulas that will be valid under all circumstances.
- Although the habitat is fairly marginal for Verreaux's Eagle from a breeding perspective, as the exposed ridge lines are very small, an active nest was recorded during the 2013 – 2014 Karreebosch WEF pre-construction monitoring (Williams 2014) at 32°51'59.27"S 20°30'12.02"E (Beacon Hill) (see Figure 7). Subsequent nest inspections were performed by Dr. Rob Simmons in October 2014, September 2020 and May 2021. No activity was reported at the nest in 2021, and no activity was recorded by this author during the current survey either. However, a pair was in attendance in September 2020. The possibility therefore always remains that the territory could still be active or become active again.

5 LEGISLATIVE CONTEXT

5.1 Agreements and conventions

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

Table 1: Agreements and conventions which South Africa is party to, and which are relevant to the conservation of avifauna.

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

5.2 National legislation

5.2.1 Constitution of the Republic of South Africa, 1996

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

(a) to an environment that is not harmful to their health or well-being; and

(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that –

- (i) prevent pollution and ecological degradation;
- (ii) promote conservation; and

[1] (BirdLife International (2021) Country profile: South Africa. Available from: http://www.birdlife.org/datazone/country/south_africa. Checked: 2021-09-29).

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

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

The National Environmental Management Act 107 of 1998 (NEMA) creates the legislative framework for environmental protection in South Africa and is aimed at giving effect to the environmental right in the Constitution. It sets out 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.

NEMA makes provision for the prescription of procedures for the assessment and minimum criteria for reporting on identified environmental themes (Sections 24(5)(a) and (h) and 44) when applying for environmental authorisation. The Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species was published on 30 October 2020. This protocol applies also for the assessment of impacts caused by power lines on avifauna.

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

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

5.3 Provincial Legislation

5.3.1 Western Cape Nature Conservation Laws Amendment Act, 2000

This statute provides for the amendment of various laws on nature conservation in order to transfer the administration of the provisions of those laws to the Western Cape Nature Conservation Board, which includes various regulations pertaining to wild animals, including avifauna.

5.3.2 Northern Cape Nature Conservation Act No 9 of 2009

The statute provides for the sustainable utilisation of wild animals, aquatic biota and plants; the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; describes offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; provides for the issuing of permits and other authorisations; and provides for matters connected therewith.

6 BASELINE ASSESSMENT

6.1 Important Bird Areas

There are no Important Bird Areas (IBA) within the confines of the study area. The closest IBA (Anysberg Nature Reserve) is located a 40km south of the proposed Karreebosch grid connection (Figure 4). It is therefore highly unlikely that the proposed on-site substation and 132kV OHPL will have a negative impact on the IBAs within the broader area.

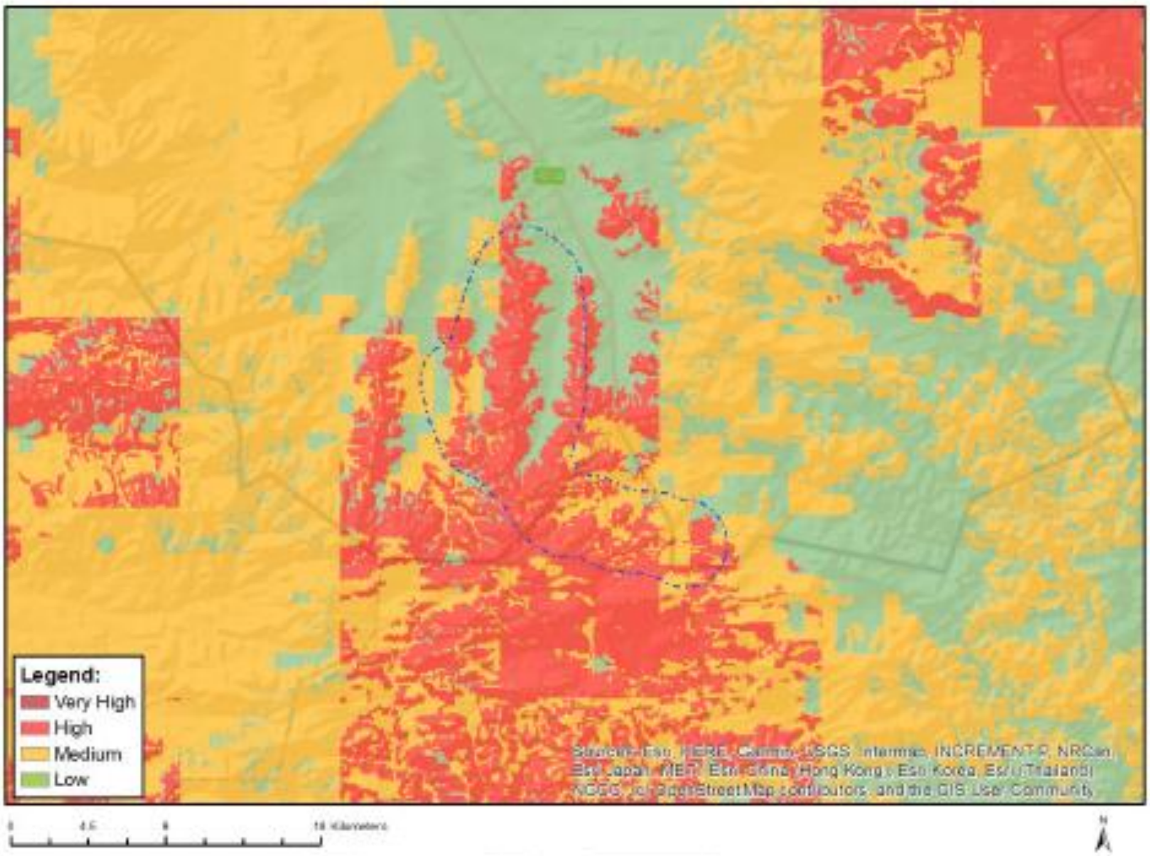
6.2 Critical Biodiversity Areas (CBAs)

The majority of the study area is classified as a Critical Biodiversity Area Category 1 and 2. The remainder is classified mostly as Ecological Support Area and Other Natural Areas.

6.3 DFFE National Screening Tool

The study area and immediate environment is classified as **MEDIUM** and **HIGH** sensitivity for terrestrial animals according to the Terrestrial Animal Species Theme. These classifications are linked to the potential occurrence of Ludwig's Bustard *Neotis ludwigii* (Globally and Regionally Endangered), and Verreaux's Eagle *Aquila verreauxii* (Regionally Vulnerable). The medium classification is linked to the potential occurrence of Secretarybird *Sagittarius serpentarius* (Globally Endangered and Regionally Vulnerable), Southern Black Korhaan *Afrotis afra* (Globally and Regionally Vulnerable). The study area contains confirmed habitat for these species of conservation concern (SCC) as defined in the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020). The occurrence of SCC in the study area was confirmed during the pre-construction monitoring programme implemented at the site of the proposed for the Karreebosch WEF (with observations of Verreaux's Eagle, Black Harrier *Circus maurus* and Martial Eagle *Polemaetus bellicosus* recorded within the study area and its immediate surrounds. A Martial Eagle was also recorded during the field investigation in August 2021. Based on the field surveys to date, a classification of **HIGH** sensitivity for avifauna for the study area is therefore suggested (Figure 3).

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



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

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Neotis ludwigii
High	Aves-Aquila verreauxii
Low	Subject to confirmation
Medium	Aves-Sagittarius serpentarius
Medium	Aves-Afrotis afra
Medium	Aves-Aquila verreauxii
Medium	Mammalia-Bunolagus monticularis

Figure 3: The DFFE screening tool rating for the study area. The high sensitivity rating is related to the potential presence of Ludwig's Bustard (Neotis ludwigii), Verreaux's Eagle (Aquila verreauxii) . The medium rating is related to the presence of Verreaux's Eagle, Secretarybird (Sagittarius serpentarius) and Southern Black Korhaan (Afrotis afra).

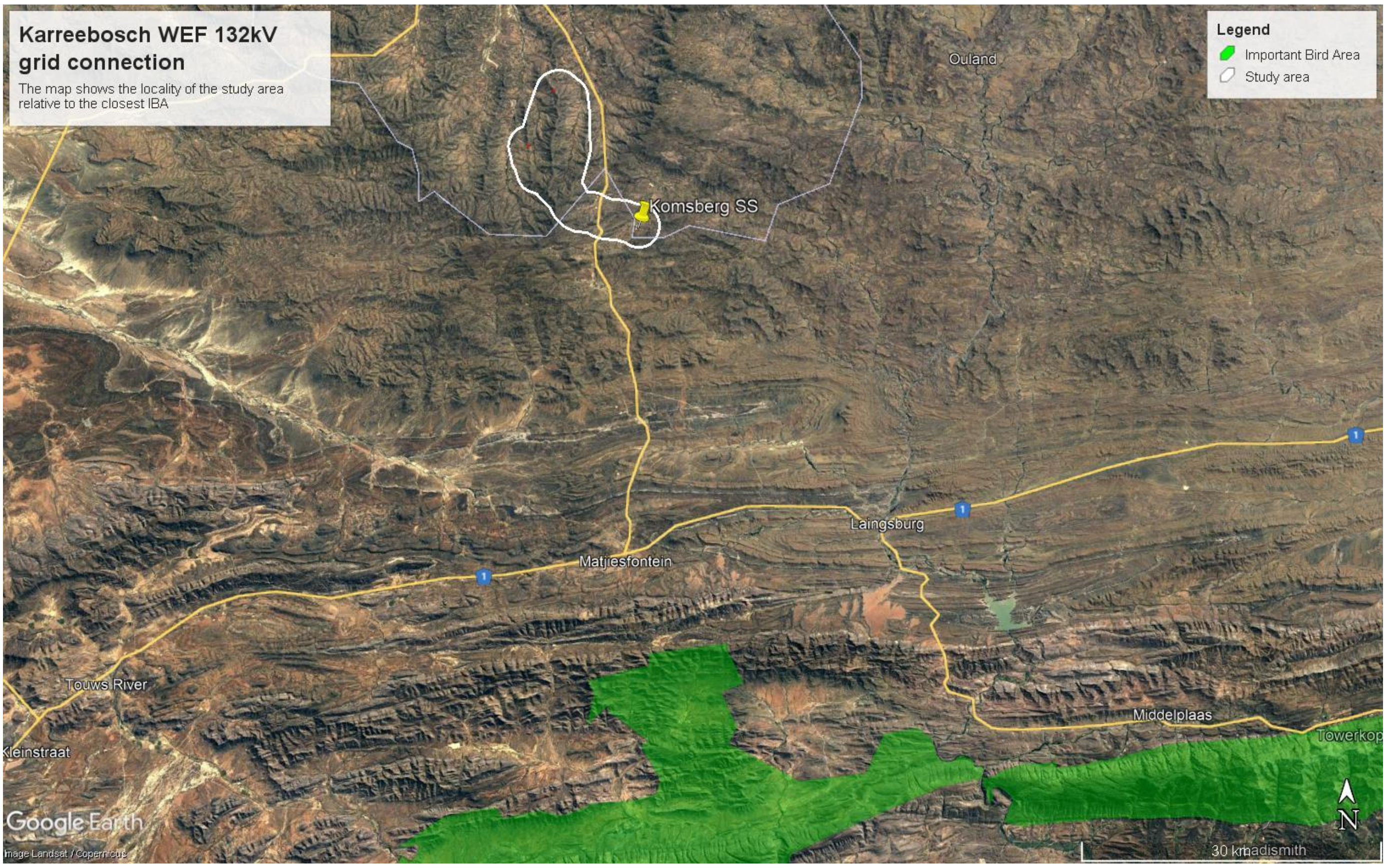


Figure 4: Regional map detailing the location of the proposed Karreebosch on-site substation and 132kV OHPL project in relation to Important Bird Areas (IBAs)

6.4 Biomes and vegetation types

The study area is situated 30 - 45km north of the town of Matjiesfontein in the Western Cape Province. The habitat in the study area is rugged, consisting of rolling hills and ridges with boulder-strewn slopes and exposed ridge lines, and is bisected by a few ephemeral drainage lines. The study area contains a number of man-made dams used for the irrigation of a few crops (mostly pastures), which is grown as supplementary fodder for small stock farming. Sheep farming is the main economic activity. Eskom's Droërivier-Kappa 2 400kV, Bacchus-Droërivier 1400kV and Gamma Kappa 1 765 kV transmission lines and Komsberg Substation are located in the extreme south of the study area.

The natural vegetation at the site is dominated by Central Mountain Shale Renosterveld which exists in a transitional zone between the Fynbos and Succulent Karoo Biomes (Mucina & Rutherford 2006). The vegetation type is found on slopes and broad ridges of low mountains and escarpments. It consists of tall shrubland dominated by renosterbos and large suites of mainly non-succulent karoo shrubs with a rich geophytic flora in the undergrowth or in more open, wetter or rocky habitats (Mucina & Rutherford 2006). In the south and south-east the Central Mountain Shale Renosterveld is replaced by Koedoesberge – Moordenaars Karoo which is found on slightly undulating to hilly landscapes consisting of low succulent scrub and dotted by scattered tall shrubs and patches of "white" grass (Mucina & Rutherford 2006).

The climate is arid to semi-arid with a mean average precipitation of 219mm, most of which takes place between March and September. Mean daily maximum and minimum temperatures in Laingsburg range between 29°C and 2°C for February and July (http://www.worldweatheronline.com/laingsburg-weather-averages/northern-cape/za.aspx).

Whilst the distribution and abundance of the bird species in the study area and immediate surrounding environment are typical of the broad vegetation type, it is also necessary to examine bird habitats in more detail as it may influence the distribution and behaviour of powerline sensitive species. These are discussed in more detail below. The powerline sensitive species most likely associated with the various bird habitats are listed in Table 2.

6.5 Bird habitats

6.5.1 Renosterveld/Karoo

The Fynbos biome is dominated by low shrubs and has two major vegetation divisions: fynbos proper, characterised by restioid, erioid and proteoid components; and renosterveld, dominated by *Asteraceae*, specifically Renosterbos *Elytropappus rhinocerotis*, with geophytes and some grasses. Renosterveld, unlike fynbos, extend into the karoo shales, where rainfall patterns allow a high grass cover and abundance of non-succulent shrubs. Shale renosterveld shows strong affinities with neighbouring succulent Karoo vegetation (Mucina & Rutherford 2006). This biome is characterised by a high level of diversity and endemism in its botanical composition, which is not paralleled in its terrestrial avifauna, which is depauperate relative to other southern African biomes (Harrison *et al*. 1997). Powerline sensitive species that may occur in renosterveld in the study area are Ludwig's Bustard, Common Buzzard *Buteo buteo*, Jackal Buzzard *Buteo rufofuscus*, Cape Crow *Corvus capensis*, Pied Crow *Corvus albus*, Black-chested Snake-Eagle *Circaetus pectoralis*, Booted Eagle *Hieraaetus pennatus*, Black Harrier *Circus maurus*, Martial Eagle *Polemaetus bellicosus*, Verreaux's Eagle, Helmeted Guineafowl *Numida meleagris*, Lesser Kestrel *Falco naumanni*, Rock Kestrel *Falco rupicolus*, Black-winged Kite *Elanus caeruleus*, Karoo Korhaan *Eupodotis vigorsii*, Southern Black Korhaan *Afrotis afra* and Secretarybird *Sagittarius serpentarius* may occur, especially in ecotonal areas between renosterveld and succulent Karoo.

6.5.2 Surface water

Man-made impoundments, although artificial in nature, can be very important for a variety of birds, particularly water birds. Apart from the water quality, the structure of the dam, and specifically the margins and the associated shoreline and vegetation, plays a big role in determining the species that will be attracted to the dam. The study area contains a few dams and the larger impoundments probably support good numbers of waterbirds in wet years. Powerline sensitive species recorded in the broader area by SABAP2 that could be attracted to these dams include Red-knobbed Coot *Fulica cristata*, Reed Cormorant *Microcarbo africanus*, White-breasted Cormorant *Phalacrocorax lucidus*, Maccoa Duck *Oxyura maccoa*, Yellow-billed Duck *Anas undulata*, African Black Duck *Anas sparsa*, Greater Flamingo *Phoenicopterus roseus*, Egyptian Goose *Alopochen aegyptiaca*, Spur-winged Goose *Plectropterus gambensis*, Black-necked Grebe *Podiceps nigricollis*, Greater Crested Grebe *Podiceps cristatus*, Little Grebe *Tachybaptus ruficollis*, Black-headed Heron *Ardea melanocephala*, Grey Heron *Ardea cinerea*, African Sacred Ibis *Threskiornis aethiopicus*, Hadeda Ibis *Bostrychia hagedash*, Common Moorhen *Gallinula chloropus*, Southern Pochard *Netta erythrophthalma*, South African Shelduck *Tadorna cana*, Cape Shoveler *Spatula smithii,* African Spoonbill *Platalea alba*, Black Stork *Ciconia nigra*, Cape Teal *Anas capensis*, Red-billed Teal *Anas erythrorhyncha* and Hamerkop *Scopus umbretta*.

6.5.3 Ridges, Cliffs and Rocky Outcrops

Steep terrain is another identified habitat within the project area. Ridges are potentially important roosting, breeding and foraging habitat for a variety of powerline sensitive species, e.g., Jackal Buzzard, Booted Eagle, Verreaux's Eagle, Rock Kestrel, White-necked Raven *Corvus albicollis* and Black Stork. Although the habitat is fairly marginal for Verreaux's Eagle from a breeding perspective, as the exposed ridge lines are very small, an active nest was recorded during the 2013 – 2014 pre-construction monitoring (Williams 2014) at 32°51'59.27"S 20°30'12.02"E (Beacon Hill) (see Figure 7). Subsequent nest inspections were performed by Dr. Rob Simmons in October 2014, September 2020 and May 2021. No activity was reported at the nest in 2021, and no activity was recorded by this author during the current survey either. However, a pair was in attendance in September 2020. The possibility therefore always remains that the territory could still be active or become active again.

6.5.4 Cultivated Lands

Arable or cultivated land represents a significant feeding area for many bird species in any landscape for the following reasons: through opening up the soil surface, land preparation makes many insects, seeds, bulbs and other food sources suddenly accessible to birds and other predators; the crop or pasture plants cultivated are often eaten by birds or attract insects which are in turn eaten by birds. Relevant to this study, pastures grown as supplementary fodder for small stock farming occur within the study area and are likely draw cards for several powerline sensitive species e.g. Ludwig's Bustard, Common Buzzard, Egyptian Goose, Spur-winged Goose, Helmeted Guineafowl, Black-headed Heron, Hadeda Ibis, Lesser Kestrel and Black-winged Kite.

6.5.5 Exotic Trees

Although stands of *Eucalyptus* are strictly-speaking invader species, they have become important refuges for certain species of raptors, particularly Amur Falcon, a Palearctic migrant, which will commonly roost in small stands of *Eucalyptus* in suburbs of small towns. Black Sparrowhawk *Accipiter melanoleucus* and Ovambo Sparrowhawk *Accipiter ovampensis* are another two species that use these trees for roosting and breeding purposes. Relevant to this project Common Buzzard, Jackal Buzzard, Cape Crow, Pied Crow, Black-chested Snake-eagle, Booted Eagle, Martial Eagle, Verreaux's Eagle, Spotted Eagle-Owl *Bubo africanus*, Egyptian Goose, Pale Chanting Goshawk *Melierax canorus*, Helmeted Guineafowl, Black-headed Heron, Grey Heron, African Sacred Ibis, Hadeda Ibis, Lesser Kestrel, Rock Kestrel, Black-winged Kite, White-necked Raven, Rufous-breasted Sparrowhawk *Accipiter rufiventris*, African Spoonbill and Secretarybird may utilise this habitat type occasionally. There are very few large trees in the study area, and they are associated with homesteads.

6.5.6 Power Lines

Eskom power line pylons/towers are regularly used as roosting, hunting and/or nesting habitat by certain species. The Droërivier-Kappa 2 400kV, Bacchus-Droërivier 1400kV and Gamma Kappa 1 765 kV transmission lines that run through the southern part of the study area utilised by Martial Eagle further to the west beyond the impact zone of the proposed power line. Relevant to this project Common Buzzard, Jackal Buzzard, Cape Crow, Pied Crow, Black-chested Snake-eagle, Booted Eagle, Martial Eagle, Verreaux's Eagle, Spotted Eagle-Owl, Pale Chanting Goshawk, Helmeted Guineafowl, Black-headed Heron, Hadeda Ibis, Lesser Kestrel, Rock Kestrel and Black-winged Kite may utilise power line infrastructure for perching, roosting, and (in some instances) breeding.

See Appendix 2 for photographic record of the habitat in the study area.

7 AVIFAUNA IN THE STUDY AREA

7.1 South African Bird Atlas Project 2

The SABAP2 data indicates that a total of 151 bird species could potentially occur within the broader area Appendix 1 provides a comprehensive list of all the species. Of these, 46 species are classified as powerline sensitive species (see definition of powerline sensitive species in section 4) and ten of these are South African Red List species. Of the powerline sensitive species, 18 are likely to occur regularly at the study area and immediate surrounding area, and another 28 could occur sporadically.

Table 2 below lists all the powerline sensitive species and the possible impact on the respective species by the proposed on-site substation and 132kV OHPL.

Table 2: Powerline sensitive species potentially occurring at the site and immediate surroundings.

EN = Endangered VU = Vulnerable NT = Near Threatened H = High M = Medium L = Low																					
			SABAP2 reporting rate		Status					Habitat						Potential Impacts			
Group	Species	Taxonomic name	Full protocol	Ad hoc protocol	Global status	SA status	Recorded during surveys: Karreebosch	Powerline sensitive species	Likelihood of regular occurrence: Karreebosch	Renosterveld/Succulent Karoo	Alien trees	High voltage lines	Ridges/cliffs	Surface water	Agriculture	Electrocution: Substation	Collision	Displacement: Disturbance	Displacement: Habitat transformation
Bustard	Ludwig's Bustard	*Neotis ludwigii*	4,62	3,85	EN	EN		x	L	x					x		x	x	x
Buzzard	Common Buzzard	*Buteo buteo*	4,62	5,77			x	x	H	x	x	x			x	x			
Buzzard	Jackal Buzzard	*Buteo rufofuscus*	35,38	13,46			x	x	H	x	x	x	x			x			
Coot	Red-knobbed Coot	*Fulica cristata*	15,38	7,69			x	x	L					x			x		
Cormorant	Reed Cormorant	*Microcarbo africanus*	7,69	3,85			x	x	L					x			x		
Cormorant	White-breasted Cormorant	*Phalacrocorax lucidus*	3,08	1,92			x	x	L					x			x		
Crow	Cape Crow	*Corvus capensis*	0,00	1,92				x	H	x	x	x				x			
Crow	Pied Crow	*Corvus albus*	53,85	30,77			x	x	L	x	x	x				x			
Duck	African Black Duck	*Anas sparsa*	3,08	0,00			x	x	L					x			x		
Duck	Maccoa Duck	*Oxyura maccoa*	0,00	1,92	VU	NT	x	x	L					x			x		
Duck	Yellow-billed Duck	*Anas undulata*	8,46	3,85			x	x	L					x			x		
Eagle	Black-chested Snake Eagle	*Circaetus pectoralis*	0,77	0,00				x	H	x	x	x		x		x			
Eagle	Booted Eagle	*Hieraaetus pennatus*	9,23	1,92			x	x	H	x	x	x	x	x		x			
Eagle	Martial Eagle	*Polemaetus bellicosus*	11,54	3,85	VU	EN	x	x	H	x	x	x		x		x			
Eagle	Verreaux's Eagle	*Aquila verreauxii*	31,54	7,69	LC	VU	x	x	L	x	x	x	x	x		x	x		x
Eagle-Owl	Spotted Eagle-Owl	*Bubo africanus*	7,69	1,92				x	H	x	x	x				x			
Flamingo	Greater Flamingo	*Phoenicopterus roseus*	0,00	1,92	LC	NT	x	x	L					x			x		
Goose	Egyptian Goose	*Alopochen aegyptiaca*	55,38	19,23			x	x	M		x			x	x	x	x		
Goose	Spur-winged Goose	*Plectropterus gambensis*	14,62	1,92			x	x	M					x	x		x		
Goshawk	Pale Chanting Goshawk	*Melierax canorus*	40,00	21,15			x	x	H		x	x		x		x			
Grebe	Black-necked Grebe	*Podiceps nigricollis*	2,31	0,00			x	x	L					x			x		
Grebe	Great Crested Grebe	*Podiceps cristatus*	0,77	0,00			x	x	L					x			x		
Grebe	Little Grebe	*Tachybaptus ruficollis*	6,15	3,85			x	x	L					x			x		
Guineafowl	Helmeted Guineafowl	*Numida meleagris*	7,69	3,85				x	M	x	x	x		x	x	x	x	x	x

EN = Endangered VU = Vulnerable NT = Near Threatened H = High M = Medium L = Low																			
			SABAP2 reporting rate		Status					Habitat						Potential Impacts			
Group	Species	Taxonomic name	Full protocol	Ad hoc protocol	Global status	SA status	Recorded during surveys: Karreebosch	Powerline sensitive species	Likelihood of regular occurrence: Karreebosch	Renosterveld/Succulent Karoo	Alien trees	High voltage lines	Ridges/cliffs	Surface water	Agriculture	Electrocution: Substation	Collision	Displacement: Disturbance	Displacement: Habitat transformation
Harrier	Black Harrier	*Circus maurus*	11,54	7,69	EN	EN	x	x	M	x				x		x			
Heron	Black-headed Heron	*Ardea melanocephala*	11,54	1,92			x	x	L		x	x		x	x	x	x		
Heron	Grey Heron	*Ardea cinerea*	10,00	3,85			x	x	L		x			x			x		
Ibis	African Sacred Ibis	*Threskiornis aethiopicus*	13,85	1,92			x	x	L		x			x			x		
Ibis	Hadada Ibis	*Bostrychia hagedash*	33,85	7,69			x	x	M		x	x		x	x	x	x		
Kestrel	Lesser Kestrel	*Falco naumanni*	0,77	3,85				x	H	x	x	x			x	x			
Kestrel	Rock Kestrel	*Falco rupicolus*	49,23	26,92			x	x	L	x	x	x	x			x			
Kite	Black-winged Kite	*Elanus caeruleus*	3,08	0,00			x	x	L	x	x	x			x	x			
Korhaan	Karoo Korhaan	*Eupodotis vigorsii*	16,92	3,85	LC	NT		x	H	x							x	x	x
Korhaan	Southern Black Korhaan	*Afrotis afra*	5,38	0,00	VU	VU		x	M	x							x	x	x
Moorhen	Common Moorhen	*Gallinula chloropus*	0,77	1,92			x	x	L					x			x		
Pochard	Southern Pochard	*Netta erythrophthalma*	0,77	1,92				x	L					x			x		
Raven	White-necked Raven	*Corvus albicollis*	56,92	19,23			x	x	H		x		x			x			
Shelduck	South African Shelduck	*Tadorna cana*	49,23	26,92			x	x	M					x			x		
Shoveler	Cape Shoveler	*Spatula smithii*	3,85	0,00			x	x	L					x			x		
Sparrowhawk	Rufous-breasted Sparrowhawk	*Accipiter rufiventris*	2,31	0,00				x	L		x					x			
Spoonbill	African Spoonbill	*Platalea alba*	4,62	1,92			x	x	L		x			x			x		
Stork	Black Stork	*Ciconia nigra*	1,54	0,00	LC	VU	x	x	L				x	x			x		
Teal	Cape Teal	*Anas capensis*	6,92	3,85			x	x	L					x			x		
Teal	Red-billed Teal	*Anas erythrorhyncha*	1,54	0,00			x	x	L					x			x		
	Hamerkop	*Scopus umbretta*	3,08	0,00			x	x	L					x		x			
	Secretarybird	*Sagittarius serpentarius*	0,77	0,00	VU	VU	x	x	L	x	x						x		

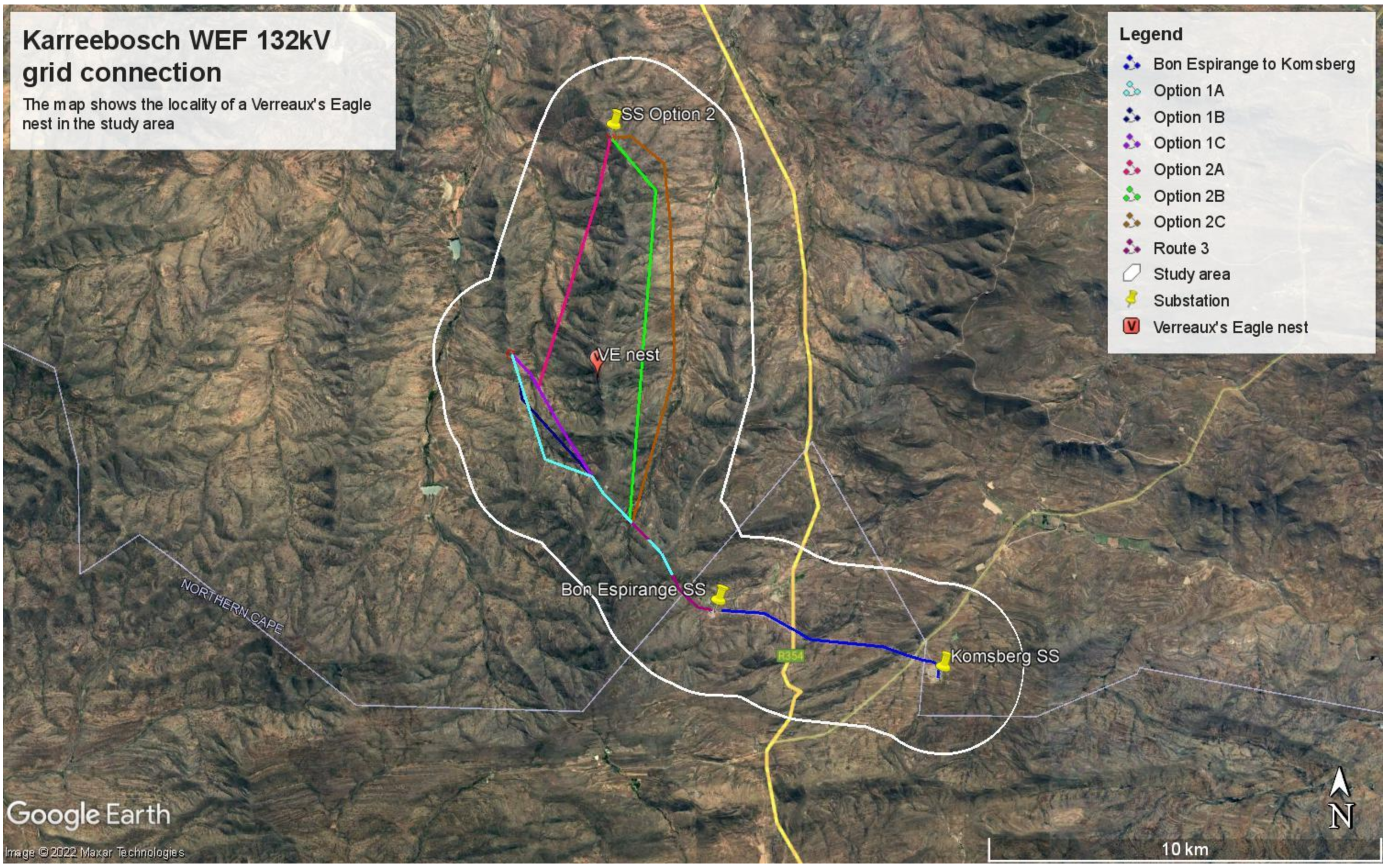


Figure 5: Verreaux's Eagle nest location in relation to the proposed Karreebosch on-site 33/132kV substation and 132kV OHPL line alignment.

8 IMPACT ASSESSMENT

8.1 General

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

8.2 Electrocutions

Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (Van Rooyen 2004). The electrocution risk is largely determined by the pole/tower design. In the case of the proposed Karreebosch OHPL, the electrocution risk is envisaged to be low because the proposed design of the 132kV line, namely the steel monopole and the clearance distances between the live and earthed components. The Karreebosch OHPL should not pose an electrocution threat to the powerline sensitive species which are likely to occur in the study area and immediate surrounding environment. Electrocutions within the proposed on-site substation yard are possible but should not affect the more sensitive Red List bird species, as these species are unlikely to use the infrastructure within the substation yard for perching or roosting. Species that are more vulnerable to this impact are corvids, owls and certain species of waterbirds. The powerline sensitive species which are potentially vulnerable to this impact are listed in Table 2, and below:

- Common Buzzard
- Jackal Buzzard
- Cape Crow
- Pied Crow

- Black-chested Snake-Eagle
- Booted Eagle
- Martial Eagle
- Verreaux's Eagle
- Spotted eagle-Owl
- Egyptian Goose
- Pale Chanting Goshawk
- Helmeted Guineafowl
- Black Harrier
- Black-headed Heron
- Hadeda Ibis
- Lesser Kestrel
- Rock Kestrel
- Black-winged Kite
- White-necked Raven
- Rufous-breasted Sparrowhawk
- Hamerkop

8.3 Collisions

Collisions are the biggest threat posed by transmission lines to birds in southern Africa (Van Rooyen 2004). Most heavily impacted upon are bustards, storks, cranes and various species of waterbirds, and to a lesser extent, vultures. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with transmission lines (Van Rooyen 2004, Anderson 2001). In a PhD study, Shaw (2013) provides a concise summary of the phenomenon of avian collisions with transmission lines:

"The collision risk posed by power lines is complex and problems are often localised. While any bird flying near a power line is at risk of collision, this risk varies greatly between different groups of birds, and depends on the interplay of a wide range of factors (APLIC 1994). Bevanger (1994) described these factors in four main groups – biological, topographical, meteorological and technical. Birds at highest risk are those that are both susceptible to collisions and frequently exposed to power lines, with waterbirds, gamebirds, rails, cranes and bustards usually the most numerous reported victims (Bevanger 1998, Rubolini et al. 2005, Jenkins et al. 2010).

The proliferation of man-made structures in the landscape is relatively recent, and birds are not evolved to avoid them. Body size and morphology are key predictive factors of collision risk, with large-bodied birds with high wing loadings (the ratio of body weight to wing area) most at risk (Bevanger 1998, Janss 2000). These birds must fly fast to remain airborne, and do not have sufficient manoeuvrability to avoid unexpected obstacles. Vision is another key biological factor, with many collision-prone birds principally using lateral vision to navigate in flight, when it is the lower-resolution, and often restricted, forward vision that is useful to detect obstacles (Martin & Shaw 2010, Martin 2011, Martin et al. 2012). Behaviour is important, with birds flying in flocks, at low levels and in crepuscular or nocturnal conditions at higher risk of collision (Bevanger 1994). Experience affects risk, with migratory and nomadic species that spend much of their time in unfamiliar locations also expected to collide more often (Anderson 1978, Anderson 2002). Juvenile birds have often been reported as being more collision-prone than adults (e.g. Brown et al. 1987, Henderson et al. 1996).

Topography and weather conditions affect how birds use the landscape. Power lines in sensitive bird areas (e.g. those that separate feeding and roosting areas, or cross flyways) can be very dangerous (APLIC 1994, Bevanger 1994). Lines crossing the prevailing wind conditions can pose a problem for large birds that use the wind to aid take-off and landing (Bevanger 1994). Inclement weather can disorient birds and reduce their flight altitude, and strong winds can result in birds colliding with power lines that they can see but do not have enough flight control to avoid (Brown et al. 1987, APLIC 2012).

The technical aspects of power line design and siting also play a big part in collision risk. Grouping similar power lines on a common servitude, or locating them along other features such as tree lines, are both approaches thought to reduce risk (Bevanger 1994). In general, low lines with short span lengths (i.e. the distance between two adjacent pylons) and flat conductor configurations are thought to be the least dangerous (Bevanger 1994, Jenkins et al. 2010). On many higher voltage lines, there is a thin earth (or ground) wire above the conductors, protecting the system from lightning strikes. Earth wires are widely accepted to cause the majority of collisions on power lines with this configuration because they are difficult to see, and birds flaring to avoid hitting the conductors often put themselves directly in the path of these wires (Brown et al. 1987, Faanes 1987, Alonso et al. 1994a, Bevanger 1994)."

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

Power line collisions are generally accepted as a key threat to bustards (Raab *et al*. 2009; Raab *et al*. 2010; Jenkins & Smallie 2009; Barrientos *et al*. 2012, Shaw 2013). In a recent study, carcass surveys were performed under high voltage transmission lines in the Karoo for two years, and low voltage distribution lines for one year (Shaw 2013). Ludwig's Bustard was the most common collision victim (69% of carcasses), with bustards generally comprising 87% of mortalities recovered. Total annual mortality was estimated at 41% of the Ludwig's Bustard population, with Kori Bustards also dying in large numbers (at least 14% of the South African population killed in the Karoo alone). Karoo Korhaan was also recorded, but to a much lesser extent than Ludwig's Bustard. The reasons for the relatively low collision risk of this species probably include their smaller size (and hence greater agility in flight) as well as their more sedentary lifestyles, as local birds are familiar with their territory and are less likely to collide with power lines (Shaw 2013).

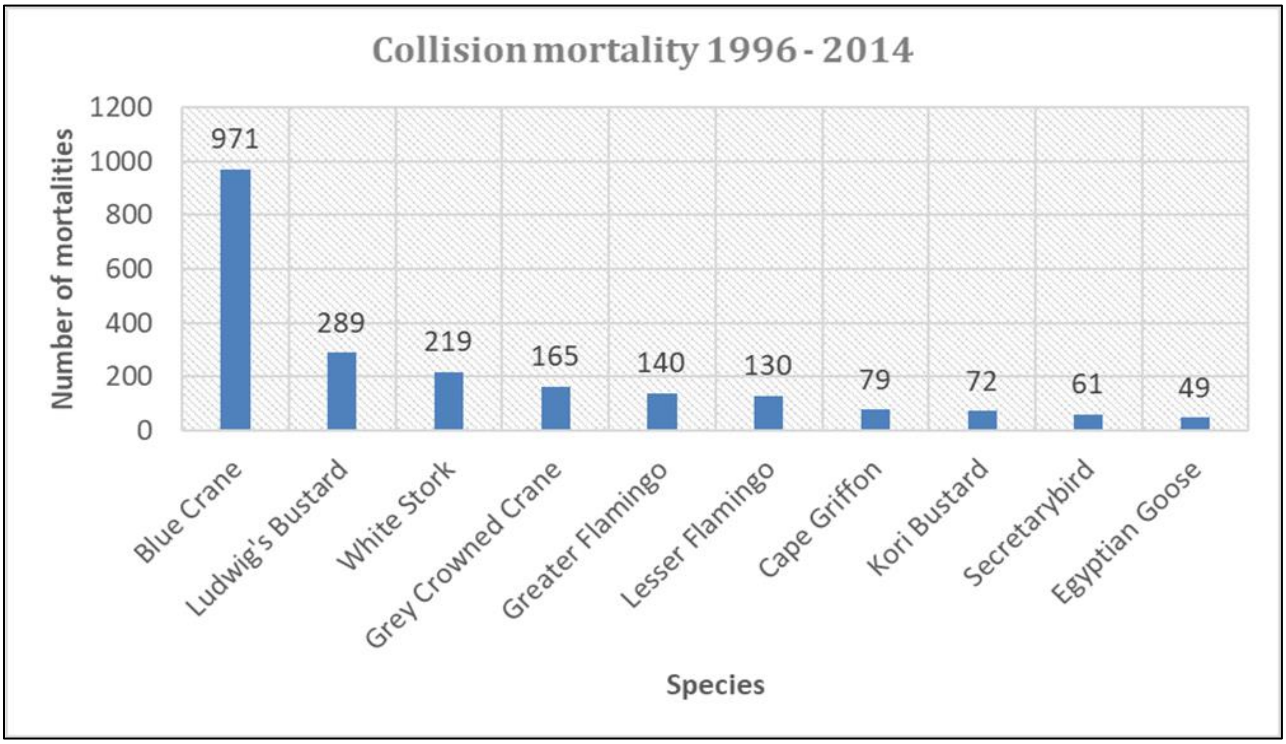


Figure 6: The top 10 collision prone bird species in South Africa, in terms of reported incidents contained in the Eskom/Endangered Wildlife Trust Strategic Partnership central incident register 1996 - 2014 (EWT unpublished data)

Several factors are thought to influence avian collisions, including the manoeuvrability of the bird, topography, weather conditions and power line configuration. An important additional factor that previously has received little attention is the visual capacity of birds; i.e. whether they are able to see obstacles such as power lines, and whether they are looking ahead to see obstacles with enough time to avoid a collision. In addition to helping explain the susceptibility of some species to collision, this factor is key to planning effective mitigation measures. Recent research provides the first evidence that birds can render themselves blind in the direction of travel during flight through voluntary head movements (Martin & Shaw 2010). Visual fields were determined in three bird species representative of families known to be subject to high levels of mortality associated with power lines i.e. Kori Bustards *Ardeotis kori*, Blue Cranes and White Storks. In all species the frontal visual fields showed narrow and vertically long binocular fields typical of birds that take food items directly in the bill under visual guidance. However, these species differed markedly in the vertical extent of their binocular fields and in the extent of the blind areas which project above and below the binocular fields in the forward-facing hemisphere. The importance of these blind areas is that when in flight, head movements in the vertical plane (pitching the head to look downwards) will render the bird blind in the direction of travel. Such movements may frequently occur when birds are scanning below them (for foraging or roost sites, or for conspecifics). In bustards and cranes pitch movements of only 25° and 35°, respectively, are sufficient to render the birds blind in the direction of travel; in storks, head movements of 55° are necessary. That flying birds can render themselves blind in the direction of travel has not been previously recognised and has important implications for the effective mitigation of collisions with human artefacts including wind turbines and power lines. These findings have applicability to species outside of these families especially raptors (A*ccipitridae*) which are known to have small binocular fields and large blind areas similar to those of bustards and cranes, and are also known to be vulnerable to power line collisions.

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

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

The powerline sensitive species which are potentially vulnerable to this impact are listed in Table 2, and below:

- Ludwig’s Bustard
- Red-knobbed Coot
- Reed Cormorant
- White-breasted Cormorant
- African Black Duck
- Maccoa Duck
- Yellow-billed Duck
- Verreaux’s Eagle
- Greater Flamingo
- Egyptian Goose

- Spur-winged Goose
- Black-necked Grebe
- Great Crested Grebe
- Little Grebe
- Helmeted Guineafowl
- Black-headed Heron
- Grey Heron
- African Sacred Ibis
- Hadeda Ibis
- Karoo Korhaan
- Southern Black Korhaan
- Common Moorhen
- Southern Pochard
- South African Shelduck
- Cape Shoveler
- African Spoonbill
- Black Stork
- Cape Teal
- Red-billed Teal
- Secretarybird

8.4 Displacement due to habitat destruction and disturbance

During the construction of power lines, service roads (4X4 tracks) and substations, habitat destruction/transformation inevitably takes place. The construction activities will constitute the following:

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

These activities could impact on birds breeding, foraging and roosting in or in close proximity of the proposed substation through **transformation of habitat**, which could result in temporary or permanent displacement. Unfortunately, very little mitigation can be applied to reduce the significance of this impact as the total permanent transformation of the natural habitat within the construction footprint of the on-site substation yard is unavoidable. The habitat in the study area is relatively uniform from a bird impact perspective, with fairly large expanses of karoo/renosterveld. The loss of habitat for powerline sensitive species due to direct habitat transformation associated with the construction of the proposed on-site 33/132kV substation and 132kV OHPL is likely to be minimal.

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

The study area contains one Verreaux's Eagle territory, with the nest situated at 32°51'59.27"S 20°30'12.02"E (Beacon Hill). While indications are that the territory is not currently active, it cannot be conclusively assumed, and the territory might become active again anytime in the future. It would therefore be prudent to implement a 1.5km no disturbance buffer around the nest during the construction phase to ensure the birds will not be disturbed by the construction activities, should the territory be active, or in the process of becoming active, when the construction commences.

The powerline sensitive species which are potentially vulnerable to this impact are listed in Table 2, and below:

- Ludwig's Bustard
- Helmeted Guineafowl
- Karoo Korhaan
- Southern Black Korhaan
- Verreaux's Eagle

9 IMPACT RATING AND MANAGEMENT ACTIONS

9.1 Potential impacts

The following potential impacts have been identified:

Construction Phase

- Displacement due to disturbance associated with the construction of the Karreebosch substation, OHPL and associated servitude access roads.
- Displacement due to habitat transformation associated with the construction of the Karreebosch substation, OHPL and associated servitude access roads.

Operational Phase

- Collisions with the Karreebosch OHPL.
- Electrocutions within the Karreebosch substation.

Decommissioning Phase

- Displacement due to disturbance associated with the decommissioning of the Karreebosch substation and OHPL.

Cumulative Impacts

- Displacement due to disturbance associated with the construction and decommissioning of the Karreebosch substation and OHPL.
- Displacement due to habitat transformation associated with the Karreebosch substation, OHPL and associated servitude access roads.
- Collisions with the OHPL.
- Electrocutions within the Karreebosch substation.

9.2 Determination of Significance of Impacts

The EIA Methodology assists in evaluating the overall effect of a proposed activity on the environment. The determination of the effect of an environmental impact on an environmental parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the environmental assessment practitioner through the process of the environmental impact assessment or basic assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

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

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Issues / aspects are reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct[2], indirect[3], secondary[4] as well as cumulative[5] impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e. residual impact). The significance of environmental aspects is determined and ranked by considering the criteria[6] presented in **Table 3**.

Table 3: Impact Assessment Criteria and Scoring System

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action

[2] Impacts that arise directly from activities that form an integral part of the Project.

[3] Impacts that arise indirectly from activities not explicitly forming part of the Project.

[4] Secondary or induced impacts caused by a change in the Project environment.

[5] Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.

[6] The definitions given are for guidance only, and not all the definitions will apply to all the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				

IMPACT SIGNIFICANCE RATING			
Total Score	0 – 30	31 to 60	61 – 100
Environmental Significance Rating (Negative (-))	**Low (-)**	**Moderate (-)**	**High (-)**
Environmental Significance Rating (Positive (+))	**Low (+)**	**Moderate (+)**	**High (+)**

9.3 Impact Assessments

9.3.1 Impact assessment tables

The impacts are summarised in table form in Appendix 4.

9.3.2 Cumulative impacts

Although the BA process is essential to assessing and managing the environmental and social impacts of individual projects, it often may be insufficient for identifying and managing incremental impacts on areas or resources used or directly affected by a given development from other existing, planned, or reasonably defined developments at the time the risks and impacts are identified.

International Finance Corporation (IFC) Performance Standard (PS) 1 recognizes that, in some instances, cumulative effects need to be considered in the identification and management of environmental and social impacts and risks. For private sector management of cumulative impacts, IFC considers good practice to be two pronged:

- effective application of and adherence to the mitigation hierarchy in environmental and social management of the specific contributions by the project to the expected cumulative impacts; and
- best efforts to engage in, enhance, and/or contribute to a multi-stakeholder, collaborative approach to implementing management actions that are beyond the capacity of an individual project proponent.

Cumulative impacts are those that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones. For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognized as important on the basis of scientific concerns and/or concerns of affected communities (IFC).

A cumulative impact assessment is the process of (a) analysing the potential impacts and risks of proposed developments in the context of the potential effects of other human activities and natural environmental and social external drivers on the chosen Valued Environmental and Social Components (VECs) over time, and (b) proposing concrete measures to avoid, reduce, or mitigate such cumulative impacts and risk to the extent possible (IFC). Cumulative impacts with existing and planned facilities may occur during construction and operation of the proposed project. While one project may not have a significant negative impact on sensitive resources or receptors, the collective impact of the projects may increase the severity of the potential impacts.

9.3.3 Surrounding Area

The project area and surrounding areas have been earmarked for renewable energy development. The South African government gazetted eight (8) areas earmarked for renewable energy development in South Africa. These areas are known as Renewable Energy Development Zones (REDZ) and this project falls within the Komsberg REDZ. The purpose of the REDZ is to cluster development of renewable energy facilities in order to streamline the grid expansion for South Africa i.e. connect zones to one another as opposed to a wide scatter of projects. It is therefore not surprising that there are a number of environmental authorisations (EA) either issued or in process in the area surrounding the proposed project site. It is important to note that the existence of an approved EA does not directly equate to actual ‘development’.

The surrounding projects, except for the Preferred Bidders, are still subject to the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) bidding process or subject to securing an off taker of electricity through an alternative process. Some of the surrounding proposed WEFs secured EAs several years ago but have not obtained Preferred Bidder status (or a private off taker) and as such have not been developed.

These existing surrounding projects of varying approval status have been detailed in the figure below. Given the site’s location within the Komsberg REDZ, it is considered to be located within the renewable energy hub that is developing in this focus area. According to the official database of DFFE and publicly available EIA/BA reports, there are currently 24 registered applications involving at least seven planned renewable wind energy projects within a 30km radius around the proposed development (see Figure 7)

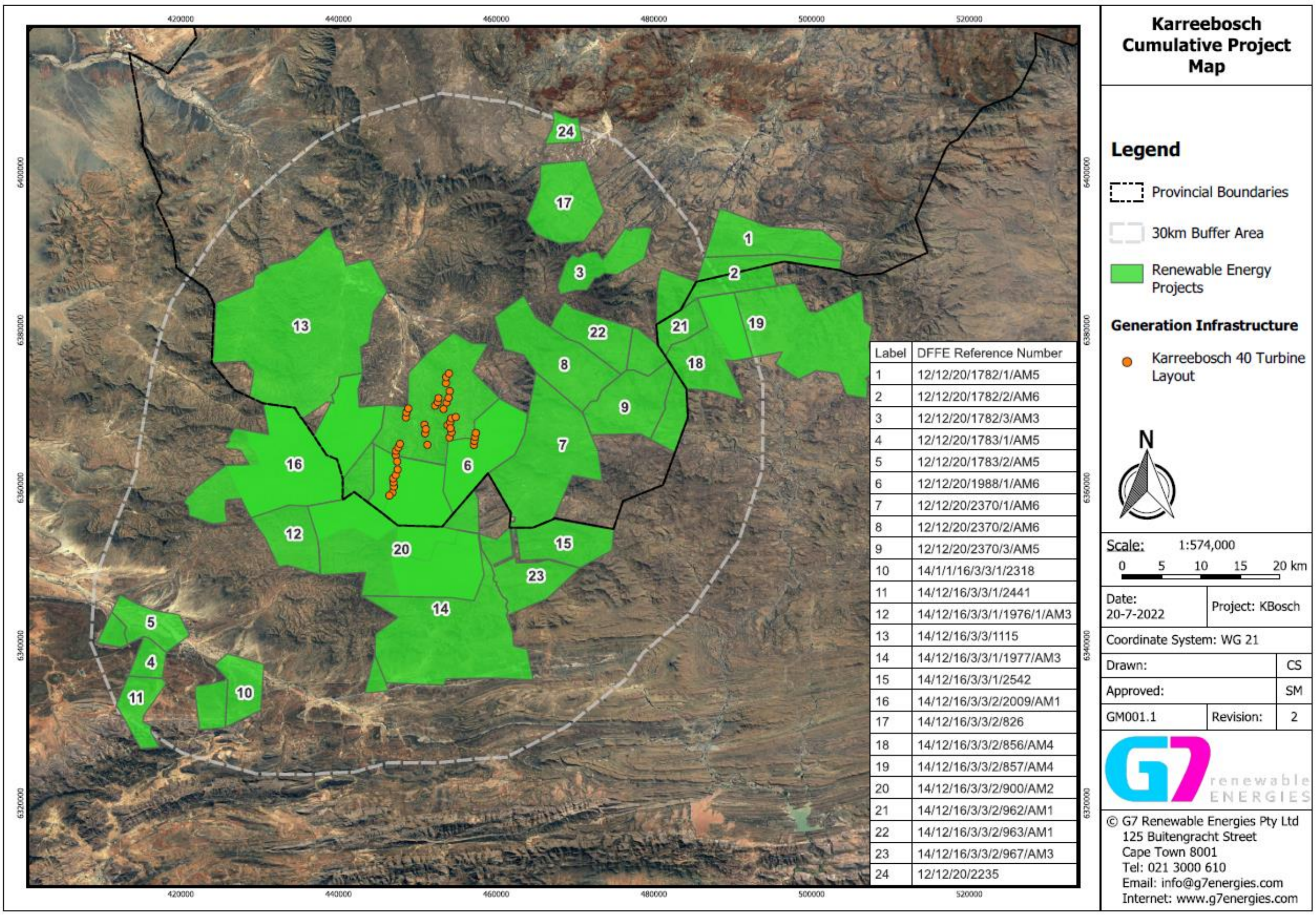


Figure 7: Renewable energy applications within 30km of the proposed Karreebosch grid connection project.

The proposed Karreebosch OHPL will have a maximum length of approximately 20.5km. There are approximately 140km of existing high voltage lines within the 30km radius around the Karreebosch project (counting parallel lines as one). In addition, at least around 250+km of new grid connections is planned to connect to the Komsberg Main Transmission Substation (MTS), based on information that is available in the public domain. The Karreebosch grid connection project will thus increase the total number of existing and planned high voltage lines by approximately 5.2% or less. The contribution of the proposed Karreebosch grid connection to the cumulative impact of all the high voltage lines is thus Low. However, the combined cumulative impact of the existing and proposed high voltage power lines on avifauna within a 30km radius is considered to be High as far as potential collision mortality is concerned, but if mitigated can be reduced to Moderate.

The cumulative impact of displacement due to disturbance and habitat transformation in the Karreebosch 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 substation yard is also likely to be Low as it is expected to be a very rare event. The cumulative impact of all the proposed substations linked to the planned renewable energy projects is considered to be Moderate as far as displacement is concerned, but if mitigated can be reduced to Low. In the case of potential electrocution in substations, the cumulative impact of all the renewable energy substations is likely to be Low both pre- and post-mitigation.

The tables in Appendix 4 summarises the cumulative impacts associated with the proposed development.

9.4 Mitigation measures

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

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

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

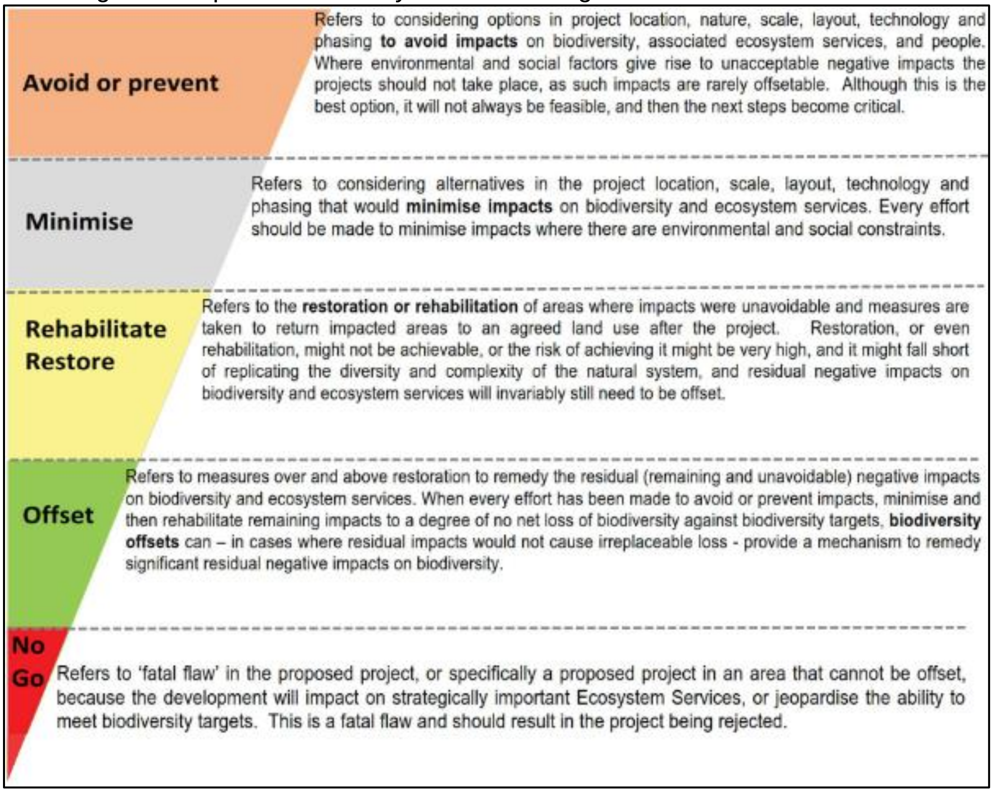


Figure 8: **Mitigation Sequence/Hierarchy**

The following mitigation measures are proposed for the Karreebosch grid connection:

Construction phase

- Construction activity should be restricted to the immediate footprint of the infrastructure as much as possible.
- Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of powerline sensitive species as much a practically possible.
- Measures to control noise and dust should be applied according to current best practice in the industry.
- Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.
- A 1.5km No Go buffer should be implemented around the Verreaux's Eagle nest at 32°51'59.27"S 20°30'12.02"E (Beacon Hill).

- Vegetation clearance should be limited to what is absolutely necessary.
- The mitigation measures proposed by the vegetation specialist must be strictly enforced.

Operational phase

- Bird Flight Diverters must be fitted to the entire powerline according to the applicable Eskom Engineering Instruction (Eskom Unique Identifier 240 – 93563150: The utilisation of Bird Flight Diverters on Eskom Overhead Lines). These devices must be installed as soon as the conductors are strung.
- The hardware within the proposed substation yard is too complex to warrant any mitigation for electrocution at this stage. It is recommended that if any on-going impacts are recorded once operational, site specific mitigation (insulation) be applied reactively. This is an acceptable approach because Red List powerline sensitive species are unlikely to frequent the substation.

De-commissioning phase

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

9.5 Identifying a preferred alternative

Only one (1) OHPL route is technically feasible for the section of the proposed powerline directly preceding the existing Bon Espirange Substation (Route 3) and for the section connecting the Bon Espirange substation to the Komsberg substation (Bon Espirange to Komsberg Route), which is approximately 9.2 km in length. No alternatives can therefore be provided for these two sections of the OHPL (Route 3 and Bon Espirange to Komsberg Route, as per Figure 1).

Six (6) OHPL route alternatives (Options 1A, 1B, 1C, 2A, 2B and 2C) are proposed between the Karreebosch WEF onsite 33/132kV substation (with substation alternatives: Option 1 and Option 2) and Route 3 preceding the existing Bon Espirange Substation. As noted above, all of the six OHPL route alternatives follow the same routing from their point of convergence on Remainder of farm Ek Kraal No.199, approximately 3.1 km before the Bon Espirange Substation, to the Komsberg Substation situated on Portion 2 of Farm Standvastigheid No. 210.

The preferred option from an avifaunal perspective would be any one of the Option 1 permutations. They are the shortest and they all avoid the proposed 1.5km No Go buffer around the Verreaux's Eagle nest at Beacon Hill, except Option 1C, which marginally intrudes on the buffer by about 50m, which is not considered significant. Options 2A and 2B are not preferred, due to their length and they both intrude on the proposed 1.5km No Go buffer around the Verreaux's Eagle nest at Beacon Hill. Option 2C is acceptable but not preferred due to its length, compared to the Option 1 permutations.

9.6 No-Go Alternative

The no-go alternative will result in the current status quo being maintained at the proposed development site as far as the avifauna is concerned. The study area itself consists mostly of renosterveld, ephemeral drainage lines and ridge lines. The no-go option would maintain the natural habitat which would be beneficial to the avifauna currently occurring there.

9.7 Environmental sensitivities

The entire study area is regarded as highly sensitive due to the regular occurrence of Red List powerline sensitive species. Areas that are particularly risky from a potential bird collision perspective are the following:

- Natural flight paths: Topographical features e.g. ridges and areas where the line crosses a valley, or drainage lines.
- Waterbodies: Several powerline sensitive species are attracted to open water. If a line skirts a waterbody, or runs between two waterbodies, it can pose a collision risk to birds which are attracted to the water.

Areas that are particularly sensitive from a disturbance perspective are the following:

- Nests: Verreaux's Eagle nest at Beacon Hill.

Due to the sensitivity of the habitat, it is recommended that Bird Flight Diverters are fitted to the entire powerline according to the applicable Eskom Engineering Instruction (Eskom Unique Identifier 240 – 93563150: The utilisation of Bird Flight Diverters on Eskom Overhead Lines). These devices must be installed as soon as the conductors are strung. A 1.5km No Go buffer should be implemented around the Verreaux's Eagle nest at 32°51'59.27"S 20°30'12.02"E (Beacon Hill) (see Figure 9).

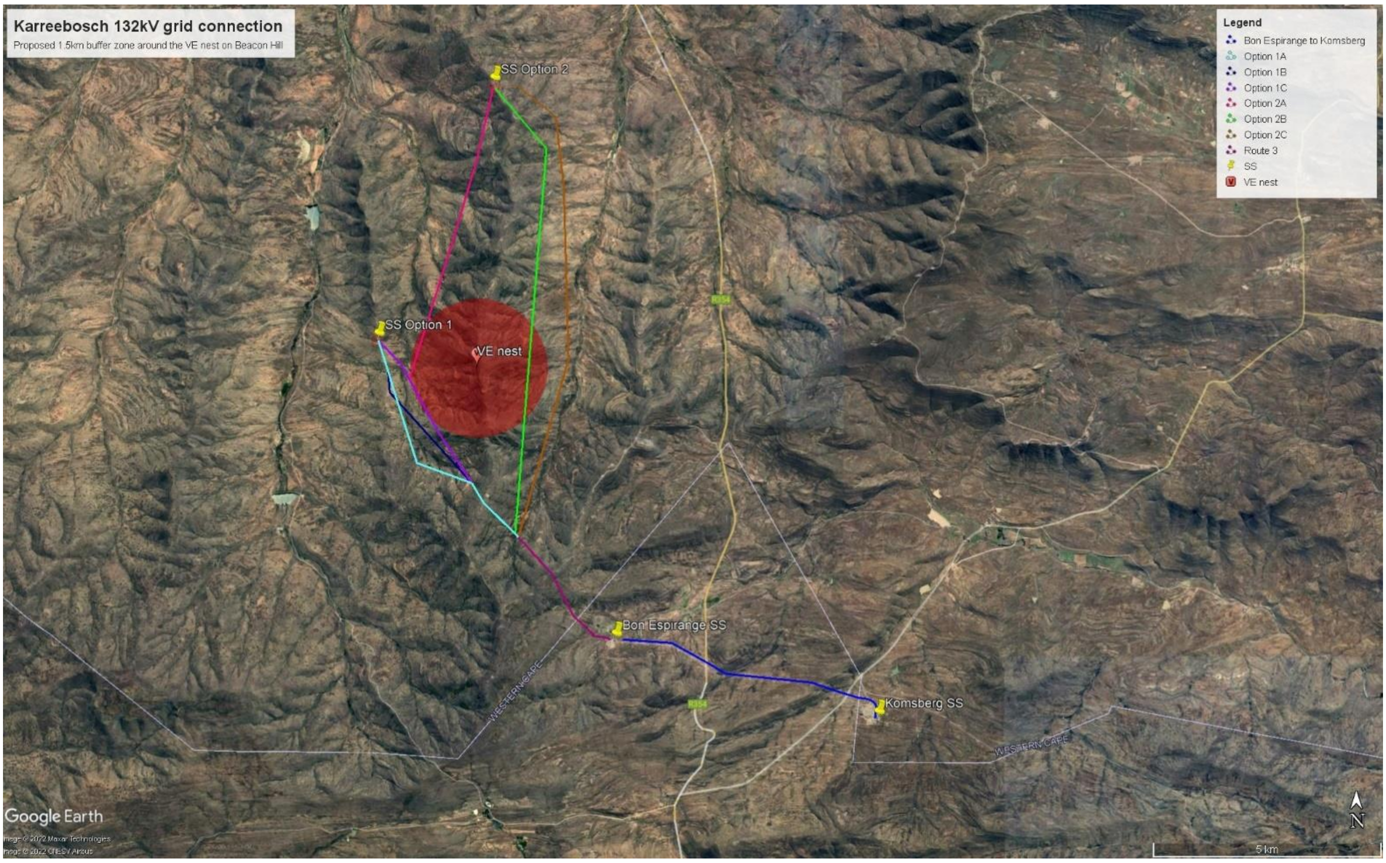


Figure 9: A 1.5km No Go buffer must be implemented around the Verreaux's Eagle nest at 32°51'59.27"S 20°30'12.02"E (Beacon Hill).

10. ENVIRONMENTAL MANAGEMENT PROGRAMME INPUTS

Refer to Appendix 3 for a description of the key mitigation and monitoring recommendations for each applicable mitigation measure identified for all phases of the project.

11. FINAL SPECIALIST STATEMENT AND AUTHORISATION RECOMMENDATION

11.1 Statement and Reasoned Opinion

The expected impacts of the 33/132kV on-site substation and 132kV OHPL and associated infrastructure were rated to be of Moderate significance and negative status pre-mitigation. However, with appropriate mitigation, the post-mitigation significance of the identified impacts should be reduced to Low negative (see Appendix 4). No fatal flaws were discovered in the course of the investigation. It is therefore recommended that the activity is authorised, on condition that the proposed mitigation measures as detailed in the EMPr (Appendix 3) are strictly implemented.

11.2 EA Condition Recommendations

The proposed mitigation measures are detailed in the EMPr (Appendix 3).

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APPENDICES

Appendix 1: Species List
Appendix 2: Habitat in the study area
Appendix 3: Environmental Management Plan
Appendix 4: Impact Tables

APPENDIX 1: SABAP 2 SPECIES LIST FOR THE BROADER AREA

Group	Species	Taxonomic name	Full protocol reporting rate	Ad hoc protocol reporting rate	Global status (IUCN)	SA status (Taylor et.al. 20215)	Powerline powerline sensitive species
Avocet	Pied Avocet	*Recurvirostra avosetta*	2,31	0,00			
Barbet	Acacia Pied Barbet	*Tricholaema leucomelas*	13,85	3,85			
Batis	Pririt Batis	*Batis pririt*	7,69	0,00			
Bee-eater	European Bee-eater	*Merops apiaster*	7,69	1,92			
Bishop	Southern Red Bishop	*Euplectes orix*	7,69	1,92			
Bulbul	Cape Bulbul	*Pycnonotus capensis*	20,00	0,00			
Bunting	Cape Bunting	*Emberiza capensis*	80,77	34,62			
Bunting	Lark-like Bunting	*Emberiza impetuani*	28,46	3,85			
Bustard	Ludwig's Bustard	*Neotis ludwigii*	4,62	3,85	EN	EN	x
Buzzard	Common Buzzard	*Buteo buteo*	4,62	5,77			x
Buzzard	Jackal Buzzard	*Buteo rufofuscus*	35,38	13,46			x
Canary	Black-headed Canary	*Serinus alario*	46,92	17,31			
Canary	Cape Canary	*Serinus canicollis*	6,92	0,00			
Canary	White-throated Canary	*Crithagra albogularis*	42,31	7,69			
Canary	Yellow Canary	*Crithagra flaviventris*	76,15	23,08			
Chat	Ant-eating Chat	*Myrmecocichla formicivora*	18,46	3,85			
Chat	Familiar Chat	*Oenanthe familiaris*	37,69	13,46			
Chat	Karoo Chat	*Emarginata schlegelii*	64,62	21,15			
Chat	Sickle-winged Chat	*Emarginata sinuata*	63,85	9,62			
Chat	Tractrac Chat	*Emarginata tractrac*	0,77	1,92			
Cisticola	Grey-backed Cisticola	*Cisticola subruficapilla*	76,15	26,92			
Cisticola	Levaillant's Cisticola	*Cisticola tinniens*	4,62	1,92			
Coot	Red-knobbed Coot	*Fulica cristata*	15,38	7,69			x
Cormorant	Reed Cormorant	*Microcarbo africanus*	7,69	3,85			x
Cormorant	White-breasted Cormorant	*Phalacrocorax lucidus*	3,08	1,92			x
Crombec	Long-billed Crombec	*Sylvietta rufescens*	10,77	0,00			
Crow	Cape Crow	*Corvus capensis*	0,00	1,92			x
Crow	Pied Crow	*Corvus albus*	53,85	30,77			x
Dove	Cape Turtle Dove	*Streptopelia capicola*	46,92	13,46			
Dove	Laughing Dove	*Spilopelia senegalensis*	18,46	9,62			
Dove	Namaqua Dove	*Oena capensis*	10,77	3,85			
Dove	Red-eyed Dove	*Streptopelia semitorquata*	10,77	0,00			
Duck	African Black Duck	*Anas sparsa*	3,08	0,00			x
Duck	Maccoa Duck	*Oxyura maccoa*	0,00	1,92	VU	NT	x
Duck	Yellow-billed Duck	*Anas undulata*	8,46	3,85			x
Eagle	Black-chested Snake Eagle	*Circaetus pectoralis*	0,77	0,00			x
Eagle	Booted Eagle	*Hieraaetus pennatus*	9,23	1,92			x
Eagle	Martial Eagle	*Polemaetus bellicosus*	11,54	3,85	VU	EN	x
Eagle	Verreaux's Eagle	*Aquila verreauxii*	31,54	7,69	LC	VU	x
Eagle-Owl	Spotted Eagle-Owl	*Bubo africanus*	7,69	1,92			x
Egret	Western Cattle Egret	*Bubulcus ibis*	1,54	1,92			x
Eremomela	Karoo Eremomela	*Eremomela gregalis*	14,62	0,00			
Eremomela	Yellow-bellied Eremomela	*Eremomela icteropygialis*	16,15	0,00			
Fiscal	Southern Fiscal	*Lanius collaris*	51,54	28,85			
Flamingo	Greater Flamingo	*Phoenicopterus roseus*	0,00	1,92	LC	NT	x
Flycatcher	Fairy Flycatcher	*Stenostira scita*	20,77	3,85			
Flycatcher	Fiscal Flycatcher	*Melaenornis silens*	3,08	3,85			
Francolin	Grey-winged Francolin	*Scleroptila afra*	26,15	7,69			
Goose	Egyptian Goose	*Alopochen aegyptiaca*	55,38	19,23			x
Goose	Spur-winged Goose	*Plectropterus gambensis*	14,62	1,92			x
Goshawk	Pale Chanting Goshawk	*Melierax canorus*	40,00	21,15			x

Group	Species	Taxonomic name	Full protocol reporting rate	Ad hoc protocol reporting rate	Global status (IUCN)	SA status (Taylor et.al. 20215)	Powerline powerline sensitive species
Grebe	Black-necked Grebe	*Podiceps nigricollis*	2,31	0,00			x
Grebe	Great Crested Grebe	*Podiceps cristatus*	0,77	0,00			x
Grebe	Little Grebe	*Tachybaptus ruficollis*	6,15	3,85			x
Greenshank	Common Greenshank	*Tringa nebularia*	0,77	0,00			
Guineafowl	Helmeted Guineafowl	*Numida meleagris*	7,69	3,85			x
Harrier	Black Harrier	*Circus maurus*	11,54	7,69	EN	EN	x
Heron	Black-headed Heron	*Ardea melanocephala*	11,54	1,92			x
Heron	Grey Heron	*Ardea cinerea*	10,00	3,85			x
Honeyguide	Lesser Honeyguide	*Indicator minor*	0,77	0,00			
Hoopoe	African Hoopoe	*Upupa africana*	0,77	0,00			
Ibis	African Sacred Ibis	*Threskiornis aethiopicus*	13,85	1,92			x
Ibis	Hadada Ibis	*Bostrychia hagedash*	33,85	7,69			x
Kestrel	Lesser Kestrel	*Falco naumanni*	0,77	3,85			x
Kestrel	Rock Kestrel	*Falco rupicolus*	49,23	26,92			x
Kite	Black-winged Kite	*Elanus caeruleus*	3,08	0,00			x
Korhaan	Karoo Korhaan	*Eupodotis vigorsii*	16,92	3,85	LC	NT	x
Korhaan	Southern Black Korhaan	*Afrotis afra*	5,38	0,00	VU	VU	x
Lapwing	Blacksmith Lapwing	*Vanellus armatus*	28,46	11,54			
Lapwing	Crowned Lapwing	*Vanellus coronatus*	14,62	5,77			
Lark	Cape Clapper Lark	*Mirafra apiata*	29,23	7,69			
Lark	Karoo Lark	*Calendulauda albescens*	36,92	9,62			
Lark	Karoo Long-billed Lark	*Certhilauda subcoronata*	59,23	17,31			
Lark	Large-billed Lark	*Galerida magnirostris*	59,23	28,85			
Lark	Red-capped Lark	*Calandrella cinerea*	29,23	0,00			
Lark	Spike-heeled Lark	*Chersomanes albofasciata*	16,15	1,92			
Martin	Brown-throated Martin	*Riparia paludicola*	6,15	1,92			
Martin	Rock Martin	*Ptyonoprogne fuligula*	56,15	5,77			
Moorhen	Common Moorhen	*Gallinula chloropus*	0,77	1,92			x
Mousebird	Red-faced Mousebird	*Urocolius indicus*	10,77	1,92			
Mousebird	Speckled Mousebird	*Colius striatus*	1,54	0,00			
Mousebird	White-backed Mousebird	*Colius colius*	35,38	1,92			
Nightjar	Rufous-cheeked Nightjar	*Caprimulgus rufigena*	0,77	1,92			
Pigeon	Speckled Pigeon	*Columba guinea*	38,46	9,62			
Pipit	African Pipit	*Anthus cinnamomeus*	20,00	5,77			
Pipit	African Rock Pipit	*Anthus crenatus*	0,00	1,92	NT	NT	
Pipit	Nicholson's Pipit	*Anthus nicholsoni*	3,08	0,00			
Plover	Kittlitz's Plover	*Charadrius pecuarius*	7,69	0,00			
Plover	Three-banded Plover	*Charadrius tricollaris*	36,15	11,54			
Pochard	Southern Pochard	*Netta erythrophthalma*	0,77	1,92			x
Prinia	Karoo Prinia	*Prinia maculosa*	72,31	17,31			
Quail	Common Quail	*Coturnix coturnix*	2,31	0,00			
Raven	White-necked Raven	*Corvus albicollis*	56,92	19,23			x
Robin-Chat	Cape Robin-Chat	*Cossypha caffra*	31,54	3,85			
Sandgrouse	Namaqua Sandgrouse	*Pterocles namaqua*	30,77	3,85			
Scrub Robin	Karoo Scrub Robin	*Cercotrichas coryphoeus*	71,54	25,00			
Shelduck	South African Shelduck	*Tadorna cana*	49,23	26,92			x
Shoveler	Cape Shoveler	*Spatula smithii*	3,85	0,00			x
Sparrow	Cape Sparrow	*Passer melanurus*	61,54	15,38			
Sparrow	House Sparrow	*Passer domesticus*	23,08	3,85			
Sparrow	Southern Grey-headed Sparrow	*Passer diffusus*	3,08	0,00			
Sparrowhawk	Rufous-breasted Sparrowhawk	*Accipiter rufiventris*	2,31	0,00			x
Sparrow-Lark	Grey-backed Sparrow-Lark	*Eremopterix verticalis*	1,54	0,00			

Group	Species	Taxonomic name	Full protocol reporting rate	Ad hoc protocol reporting rate	Global status (IUCN)	SA status (Taylor et.al. 20215)	Powerline powerline sensitive species
Spoonbill	African Spoonbill	*Platalea alba*	4,62	1,92			x
Spurfowl	Cape Spurfowl	*Pternistis capensis*	41,54	17,31			
Starling	Common Starling	*Sturnus vulgaris*	13,85	3,85			
Starling	Pale-winged Starling	*Onychognathus nabouroup*	13,85	1,92			
Starling	Pied Starling	*Lamprotornis bicolor*	53,08	25,00			
Starling	Red-winged Starling	*Onychognathus morio*	1,54	0,00			
Starling	Wattled Starling	*Creatophora cinerea*	4,62	0,00			
Stilt	Black-winged Stilt	*Himantopus himantopus*	4,62	1,92			
Stint	Little Stint	*Calidris minuta*	0,77	0,00			
Stonechat	African Stonechat	*Saxicola torquatus*	0,77	0,00			
Stork	Black Stork	*Ciconia nigra*	1,54	0,00	LC	VU	x
Sunbird	Dusky Sunbird	*Cinnyris fuscus*	4,62	0,00			
Sunbird	Malachite Sunbird	*Nectarinia famosa*	39,23	13,46			
Sunbird	Southern Double-collared Sunbird	*Cinnyris chalybeus*	26,15	1,92			
Swallow	Barn Swallow	*Hirundo rustica*	15,38	5,77			
Swallow	Greater Striped Swallow	*Cecropis cucullata*	29,23	7,69			
Swallow	Pearl-breasted Swallow	*Hirundo dimidiata*	1,54	0,00			
Swallow	South African Cliff Swallow	*Petrochelidon spilodera*	0,00	3,85			
Swallow	White-throated Swallow	*Hirundo albigularis*	3,08	0,00			
Swift	African Black Swift	*Apus barbatus*	0,77	0,00			
Swift	Alpine Swift	*Tachymarptis melba*	6,15	0,00			
Swift	Common Swift	*Apus apus*	0,77	0,00			
Swift	Little Swift	*Apus affinis*	15,38	3,85			
Swift	White-rumped Swift	*Apus caffer*	13,85	3,85			
Teal	Cape Teal	*Anas capensis*	6,92	3,85			x
Teal	Red-billed Teal	*Anas erythrorhyncha*	1,54	0,00			x
Thick-knee	Spotted Thick-knee	*Burhinus capensis*	2,31	1,92			
Thrush	Karoo Thrush	*Turdus smithi*	6,15	3,85			
Thrush	Olive Thrush	*Turdus olivaceus*	1,54	0,00			
Tit	Cape Penduline Tit	*Anthoscopus minutus*	20,77	0,00			
Tit	Grey Tit	*Melaniparus afer*	23,08	3,85			
Wagtail	Cape Wagtail	*Motacilla capensis*	55,38	9,62			
Warbler	Chestnut-vented Warbler	*Curruca subcoerulea*	8,46	3,85			
Warbler	Layard's Warbler	*Curruca layardi*	28,46	3,85			
Warbler	Lesser Swamp Warbler	*Acrocephalus gracilirostris*	1,54	0,00			
Warbler	Namaqua Warbler	*Phragmacia substriata*	16,15	5,77			
Warbler	Rufous-eared Warbler	*Malcorus pectoralis*	26,15	5,77			
Waxbill	Common Waxbill	*Estrilda astrild*	17,69	1,92			
Weaver	Cape Weaver	*Ploceus capensis*	40,77	15,38			
Weaver	Southern Masked Weaver	*Ploceus velatus*	30,77	3,85			
Wheatear	Capped Wheatear	*Oenanthe pileata*	3,85	0,00			
Wheatear	Mountain Wheatear	*Myrmecocichla monticola*	51,54	13,46			
White-eye	Cape White-eye	*Zosterops virens*	3,08	0,00			
Woodpecker	Ground Woodpecker	*Geocolaptes olivaceus*	6,92	0,00			
	Bokmakierie	*Telophorus zeylonus*	83,85	21,15			
	Hamerkop	*Scopus umbretta*	3,08	0,00			
	Neddicky	*Cisticola fulvicapilla*	1,54	0,00			
	Secretarybird	*Sagittarius serpentarius*	0,77	0,00	VU	VU	

APPENDIX 2: HABITAT AT THE STUDY AREA

Figure 1: Shale renosterveld shows strong affinities with neighbouring succulent Karoo vegetation.

Figure 2: Ground dams are an important source of surface water in the study area and immediate surroundings.

Figure 3: Ridges and cliffs are present in the study area. The arrow shows the approximate location of the VE nest.

Figure 4: Verreaux's Eagle nest at Beacon Hill (Photograph: Dr Rob Simmons – Birds & Bats Unlimited)

Management Plan for the Planning and Design Phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
Avifauna: Displacement due to disturbance					
The noise and movement associated with the construction activities at the development footprint will be a source of disturbance which would lead to the displacement of avifauna from the area	Prevent displacement of avifauna by the implementation of buffer zones	1. Implement a 1.5km No Go zone around the Verreaux's Eagle nest at 32°51'59.27"S 20°30'12.02"E (Beacon Hill).	1. Implement a 1.5km No Go zone around the Verreaux's Eagle nest at 32°51'59.27"S 20°30'12.02"E (Beacon Hill).	1. Once-off	Project developer

Management Plan for the Construction Phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
Avifauna: Displacement due to disturbance					
The noise and movement associated with the construction activities at the development footprint will be a source of disturbance which would lead to the displacement of avifauna from the area	Prevent displacement of avifauna by ensuring that contractors are aware of the requirements of the Construction Environmental Management Programme (CEMPr.)	A site-specific CEMPr must be implemented, which gives appropriate and detailed description of how construction activities must be conducted. All contractors are to adhere to the CEMPr and should apply good environmental practice during construction. The CEMPr must specifically include the following: 1. Construction vehicles must stick to designated access roads as much as possible; 2. Maximum use of existing roads, where possible; 3. Measures to control noise and dust according to latest best practice; 4. Strict application of all recommendations in the vegetation/terrestrial biodiversity specialist report pertaining to the limitation of the footprint.	1. Implementation of the CEMPr. Oversee activities to ensure that the CEMPr is implemented and enforced via site audits and inspections. Report and record any non-compliance. 2. Ensure that construction personnel are made aware of the impacts relating to off-road driving i.e. not sticking to designated access routes. 3. Construction access roads must be demarcated clearly. Undertake site inspections to verify. 4. Monitor the implementation of noise control mechanisms via site inspections and record and report non-compliance. 5. Ensure that the construction area is demarcated clearly and that construction personnel are made aware of these demarcations. Monitor via site inspections and report non-compliance.	1. Once-off 2. On a daily basis 3. Monthly 4. Monthly 5. Monthly	1. Contractor and ECO 2. Contractor and ECO 3. Contractor and ECO 4. Contractor and ECO 5. Contractor and ECO
Avifauna: Displacement due to habitat transformation in the substations					
Total or partial displacement of avifauna due to habitat transformation associated with the vegetation clearance in the onsite substations.	Prevent unnecessary displacement of avifauna by ensuring that the rehabilitation of transformed areas is implemented where possible by an appropriately qualified specialist, according to the recommendations of the vegetation/terrestrial biodiversity specialist study.	1. Adhere to the recommendations of the vegetation/terrestrial biodiversity specialist 2. Monitor rehabilitation via site audits and site inspections to ensure compliance. Record and report any non-compliance.	1. Appointment of vegetation/terrestrial biodiversity specialist to oversee the rehabilitation process. 2. Site inspections to monitor progress of rehabilitation. 3. Adaptive management to ensure rehabilitation goals are met.	1. Once-off 2. Once a year 3. As and when required	1. Facility operator

Management Plan for the Operational Phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
Avifauna: Mortality of avifauna due to electrocution in the onsite substations					
Mortality of avifauna due to electrocutions in the substations	Reduction of avian electrocution mortality	1. Monitor the electrocution mortality in the substations. 2. Apply mitigation if electrocution happens regularly.	1. Regular inspections of the substation yard	1. Monthly	1. Facility operator
Avifauna: Mortality due to collision with the overhead power line					
Mortality of avifauna due to collisions with the overhead power line.	Reduction of avian collision mortality	Mark power line with Eskom approved Bird Flight Diverters (BFDs).	1. Bird Flight Diverters must be fitted to the entire powerline according to the applicable Eskom Engineering Instruction (Eskom Unique Identifier 240 – 93563150: The utilisation of Bird Flight Diverters on Eskom Overhead Lines). These devices must be installed as soon as the conductors are strung.	1. Once-off	1. Contractor 2. Contractor and ECO

Management Plan for the Decommissioning Phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
Avifauna: Displacement due to disturbance					
The noise and movement associated with the decommissioning activities will be a source of disturbance which would lead to the displacement of avifauna from the area	Prevent unnecessary displacement of avifauna by ensuring that contractors are aware of the requirements of the Decommissioning EMPr.	A site-specific Decommissioning EMPr (DEMPr) must be implemented, which gives appropriate and detailed description of how construction activities must be conducted. All contractors are to adhere to the DEMPr and should apply good environmental practice during decommissioning. The DEMPr must specifically include the following: 1. Construction vehicles must stick to designated access roads as much as possible; 2. Maximum use of existing roads during the decommissioning phase and the construction of new roads should be kept to a minimum as far as practical; 3. Measures to control noise and dust according to latest best practice; 4. Strict application of all recommendations in the vegetation/terrestrial biodiversity specialist report pertaining to the limitation of the footprint.	1. Implementation of the DEMPr. Oversee activities to ensure that the DEMPr is implemented and enforced via site audits and inspections. Report and record any non-compliance. 2. Ensure that decommissioning personnel are made aware of the impacts relating to off-road driving i.e. not sticking to the designated access roads. 3. Access roads must be demarcated clearly. Undertake site inspections to verify. 4. Monitor the implementation of noise control mechanisms via site inspections and record and report non-compliance. 5. Ensure that the decommissioning area is demarcated clearly and that personnel are made aware of these demarcations. Monitor via site inspections and report non-compliance.	1. On a daily basis 2. Once-off 3. Monthly 4. Monthly 5. Monthly	1. Contractor and ECO 2. Contractor and ECO 3. Contractor and ECO 4. Contractor and ECO 5. Contractor and ECO

CONSTRUCTION PHASE

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
DISPLACEMENT OF POWERLINE SENSITIVE SPECIES DUE TO DISTURBANCE ASSOCIATED WITH CONSTRUCTION OF THE ON-SITE SUBSTATION AND 132KV OVERHEAD POWER LINE									
Without Mitigation	4	2	3	2	4	**44**	**Moderate**	(-)	High
With Mitigation	3	2	3	2	3	**30**	**Low**	(-)	High
Mitigation and Management Measures	• Construction activity should be restricted to the immediate footprint of the infrastructure as much as possible. • Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of powerline sensitive species. • Measures to control noise and dust should be applied according to current best practice in the industry. • A 1.5km No Go buffer should be implemented around the Verreaux's Eagle nest at 32°51'59.27"S 20°30'12.02"E (Beacon Hill).								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
DISPLACEMENT OF POWERLINE SENSITIVE SPECIES DUE TO HABITAT TRANSFORMATION ASSOCIATED WITH CONSTRUCTION OF THE ON-SITE SUBSTATION AND 132KV OVERHEAD POWER LINE									
Without Mitigation	4	2	3	2	4	**44**	**Moderate**	(-)	Medium
With Mitigation	3	2	3	2	3	**30**	**Low**	(-)	Medium
Mitigation and Management Measures	• Construction activity should be restricted to the immediate footprint of the infrastructure as much as possible. • Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum. • Vegetation clearance should be limited to what is absolutely necessary. • The mitigation measures proposed by the vegetation and terrestrial biology specialists must be strictly enforced.								

OPERATIONAL PHASE

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
MORTALITY OF POWERLINE SENSITIVE SPECIES DUE TO COLLISIONS WITH THE KARREEBOSCH 132KV OVERHEAD POWER LINE									
Without Mitigation	5	3	3	4	4	**60**	**Moderate**	(-)	High
With Mitigation	3	3	3	4	3	**39**	**Moderate**	(-)	Medium
Mitigation and Management Measures	• Bird Flight Diverters must be fitted to the entire powerline according to the applicable Eskom Engineering Instruction (Eskom Unique Identifier 240 – 93563150: The utilisation of Bird Flight Diverters on Eskom Overhead Lines). These devices must be installed as soon as the conductors are strung.								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
MORTALITY OF POWERLINE SENSITIVE SPECIES DUE TO ELECTROCUTION IN THE ON-SITE SUBSTATION INFRASTRUCTURE									
Without Mitigation	5	3	3	4	2	**30**	**Low**	(-)	High
With Mitigation	1	2	3	4	2	**20**	**Low**	(-)	High
Mitigation and Management Measures	• The hardware within the proposed substation yard is too complex to warrant any mitigation for electrocution at this stage. It is recommended that if on-going impacts are recorded once operational, site-specific mitigation (insulation) be applied reactively. This is an acceptable approach because Red List powerline sensitive species are unlikely to frequent the substation.								

DECOMISSIONING PHASE

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
DISPLACEMENT OF POWERLINE SENSITIVE SPECIES DUE TO DISTURBANCE ASSOCIATED WITH DISMANTLING OF THE ON-SITE SUBSTATION AND 132KV OVERHEAD POWER LINE									
Without Mitigation	4	2	3	2	4	**44**	**Moderate**	(-)	High
With Mitigation	3	2	3	2	3	**30**	**Low**	(-)	High
Mitigation and Management Measures	• Dismantling activity should be restricted to the immediate footprint of the infrastructure as much as possible.								

Potential Impact DISPLACEMENT OF POWERLINE SENSITIVE SPECIES DUE TO DISTURBANCE ASSOCIATED WITH DISMANTLING OF THE ON-SITE SUBSTATION AND 132KV OVERHEAD POWER LINE	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
	• Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of powerline sensitive species. • Measures to control noise and dust should be applied according to current best practice in the industry. • Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.								

CUMULATIVE IMPACTS

Potential Impact DISPLACEMENT OF POWERLINE SENSITIVE SPECIES DUE TO DISTURBANCE AND HABITAT TRANSFORMATION	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	2	3	2	4	**44**	**Moderate**	(-)	High
With Mitigation	3	2	3	2	2	**20**	**Low**	(-)	High
Mitigation and Management Measures	• Dismantling activity should be restricted to the immediate footprint of the infrastructure as much as possible. • Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of powerline sensitive species. • Measures to control noise and dust should be applied according to current best practice in the industry.								

Potential Impact MORTALITY OF POWERLINE SENSITIVE SPECIES DUE TO COLLISIONS WITH OVERHEAD POWER LINE	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	3	4	4	4	**64**	**High**	(-)	High
With Mitigation	5	3	3	4	3	**45**	**Moderate**	(-)	Medium
Mitigation and Management Measures	• Bird Flight Diverters must be fitted to the entire powerline according to the applicable Eskom Engineering Instruction (Eskom Unique Identifier 240 – 93563150: The utilisation of Bird Flight Diverters on Eskom Overhead Lines). These devices must be installed as soon as the conductors are strung.								

Potential Impact MORTALITY OF POWERLINE SENSITIVE SPECIES DUE TO ELECTROCUTION IN THE ON-SITE SUBSTATION INFRASTRUCTURE	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	3	3	4	2	**30**	**Low**	(-)	High
With Mitigation	1	2	3	4	2	**20**	**Low**	(-)	High
Mitigation and Management Measures	• The hardware within the proposed substation yard is too complex to warrant any mitigation for electrocution at this stage. It is recommended that if on-going impacts are recorded once operational, site-specific mitigation (insulation) be applied reactively. This is an acceptable approach because Red List powerline sensitive species are unlikely to frequent the substation.								

1. INTRODUCTION

Karreebosch Wind Farm RF (Pty) Ltd is proposing the construction and operation of an on-site 33/132 kV substation and a 132kV overhead power line to connect the Karreebosch Wind Energy Facility (WEF) to the national grid via the existing Eskom Komsberg MTS (Main Transmission Substation). The powerline will be between 13.9km (1C) and 20.5km (2C) long, depending on which option is constructed. The project is situated north of the town of Matjiesfontein in the Karoo Hoogland Local Municipality and the Laingsburg Local Municipality in the Northern Cape Province and Western Cape Province.

In terms of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) Environmental Impact Assessment (EIA) Regulations [4 December 2014, Government Notice (GN) R982, R983, R984 and R985, as amended], various aspects of the proposed developments may have an impact on the environment and are considered to be listed activities. These activities require authorisation from the National Competent Authority (CA), namely the Department of Forestry, Fisheries and the Environment (DFFE), prior to the commencement thereof. In accordance with GN 320 and GN 1150 (20 March 2020)[7] of the NEMA EIA Regulations of 2014 (as amended), prior to commencing with a specialist assessment, a site sensitivity verification must be undertaken to confirm the current land use and environmental sensitivity of the proposed project areas as identified by the National Web-Based Environmental Screening Tool (i.e., Screening Tool). Chris van Rooyen, in association with Albert Froneman, as avifaunal specialists, have been commissioned to verify the sensitivity of the project site under these specialist protocols.

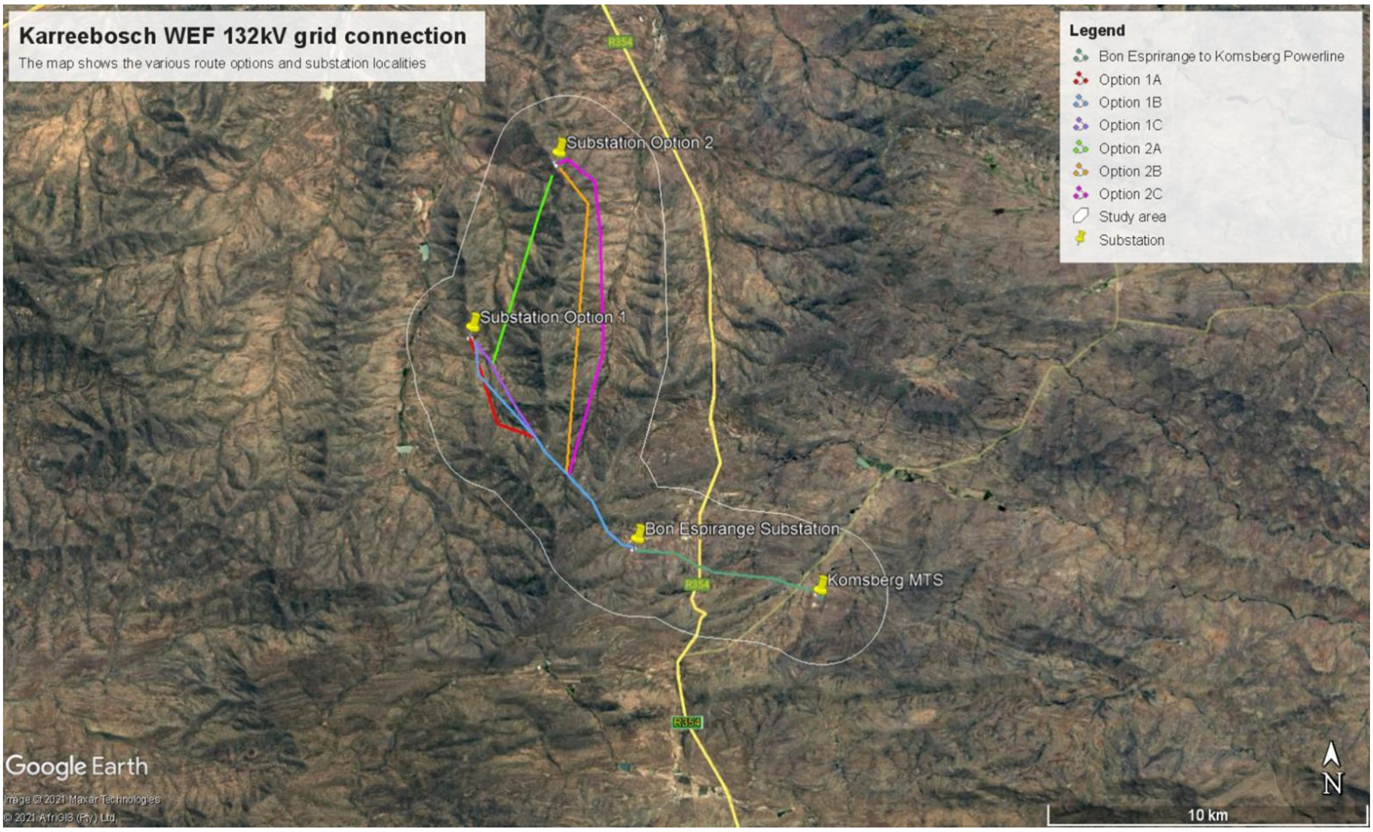


Figure 1: Locality map indicating the location of the proposed development within the study area near Matjiesfontein in the Western and Northern Cape Province.

[7] GN 320 (20 March 2020): Procedures for The Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(A) and (H) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation

2. SITE SENSITIVITY VERIFICATION METHODOLOGY

The following information sources were consulted to compile this report:

- Bird distribution data from the Southern African Bird Atlas Project 2 (SABAP 2) was obtained (http://sabap2.adu.org.za/), in order to ascertain which species occur in the pentads where the proposed development is located. A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5' × 5'). Each pentad is approximately 8 × 7.6 km. To get a more representative impression of the birdlife, a consolidated data set was obtained for a total of 20 pentads some of which intersect and others that are near the study area (the broader area). The decision to include multiple pentads around the study area was influenced by the fact that the pentads within which the proposed development is located have few completed full protocol surveys. The additional pentads and their data augment the bird distribution data. The 20 pentad grid cells are the following: 3240_2025, 3240_2030, 3240_2035, 3240_2040, 3245_2025, 3245_2030; 3245_2035; 3245_2040; 3250_2025; 3250_2030; 3250_2035; 3250_2040; 3255_2025; 3255_2030; 3255_2035; 3255_2040; 3300_2025; 3300_2030; 3300_2035 and 3300_2040 (see Figure 22). A total of 131 full protocol lists (i.e. bird listing surveys lasting a minimum of two hours each) and 52 ad hoc protocol lists (surveys lasting less than two hours but still yielding valuable data) have been completed to date for the 20 pentads where the study area is located. The SABAP2 data is regarded as a reliable reflection of the avifauna which occurs in the area, but the data was also supplemented by data collected during site surveys and general knowledge of the area.
- A classification of the vegetation types in the study area was obtained from the Atlas of Southern African Birds 1 (SABAP1) and the latest version (2018) of the National Vegetation Map compiled by the South African National Biodiversity Institute (Mucina & Rutherford 2006).
- The national threatened status of all powerline sensitive species was determined with the use of the most recent edition of the Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor *et al.* 2015), and the latest authoritative summary of southern African bird biology (Hockey *et al.* 2005).
- The global threatened status of all powerline sensitive species was determined by consulting the latest (2021.3) IUCN Red List of Threatened Species (http://www.iucnredlist.org/).
- The Important Bird and Biodiversity Areas of South Africa (Marnewick *et al.* 2015; http://www.birdlife.org.za/conservation/important-bird-areas) was consulted for information on potentially relevant Important Bird Areas (IBAs).
- Satellite imagery (Google Earth © 2022) was used in order to view the broader area on a landscape level and to help identify bird habitat on the ground.
- The Department of Forestry, Fisheries and the Environment (DFFE) National Screening Tool was used to determine the assigned avian sensitivity of the study area (July 2022).
- A site visit to the study area was conducted on 17 August 2021 to record the avifaunal habitat first-hand, using a 4 x 4 vehicle, a Zeiss 10 x 32 pair of binoculars and a Nikon 20 x 60 spotting scope.
- Additional Information on bird diversity and abundance at the proposed Karreebosch development site was obtained by consulting studies previously conducted namely additional monitoring conducted by Birds & Bats Unlimited (Simmons & Martins 2014, 2020 and 2021) and an 18-month monitoring programme which was implemented in 2013 – 2014 (Williams 2014) at the proposed Karreebosch WEF.

3. OUTCOME OF SITE SENSITIVITY VERIFICATION

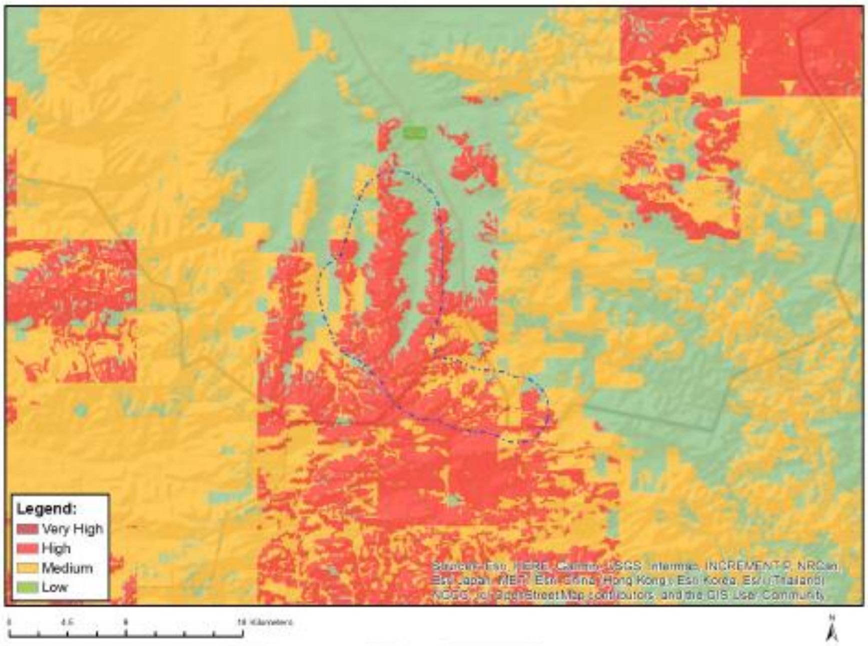
The study area and immediate environment is classified as **MEDIUM** and **HIGH** sensitivity for terrestrial animals according to the Terrestrial Animal Species Theme. These classifications are linked to the potential occurrence of Ludwig's Bustard *Neotis ludwigii* (Globally and Regionally Endangered), and Verreaux's Eagle *Aquila verreauxii* (Regionally Vulnerable). The medium classification is linked to the potential occurrence of Secretarybird *Sagittarius serpentarius* (Globally Endangered and Regionally Vulnerable), Southern Black Korhaan *Afrotis afra* (Globally and Regionally Vulnerable). The study area contains confirmed habitat for these species of conservation concern (SCC) as defined in the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020).

The occurrence of SCC in the study area was confirmed during the pre-construction monitoring programme implemented at the site of the proposed for the Karreebosch Wind Energy Facility, with observations of Verreaux's Eagle, Black Harrier *Circus maurus* and Martial Eagle *Polemaetus bellicosus* recorded within the study area and its immediate surrounds. **A Martial Eagle was also recorded during the field investigation in August 2021.** Based on the field surveys to date, a classification of **HIGH** sensitivity for avifauna for the study area is therefore suggested (Figure 2).

4. CONCLUSION

The occurrence of the SCC was confirmed during the site visit in August 2021, as well as during previous avifaunal monitoring conducted at the project site in 2014, 2020 and 2021. Based on these observations, the classification of **HIGH** sensitivity for avifauna is suggested for the study area.

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



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

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	x		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Neotis ludwigii
High	Aves-Aquila verreauxii
Low	Subject to confirmation
Medium	Aves-Sagittarius serpentarius
Medium	Aves-Afrotis afra
Medium	Aves-Aquila verreauxii
Medium	Mammalia-Bunolagus monticularis

Figure 2: The DFFE screening tool rating for the study area. The high sensitivity rating is related to the potential presence of Ludwig's Bustard (*Neotis ludwigii*), Verreaux's Eagle (*Aquila verreauxii*). The medium rating is related to the presence of Verreaux's Eagle, Secretarybird (*Sagittarius serpentarius*) and Southern Black Korhaan (*Afrotis afra*).