

# AVIFAUNAL SPECIALIST REPORT

9 x PV Facilities: Grid Infrastructure near Stilfontein,  
North-West Province

---

## STARLING GRID



January 2023

AFRIMAGE Photography (Pty) Ltd t/a:

**Chris van Rooyen Consulting**

VAT#: 4580238113

email: [vanrooyen.chris@gmail.com](mailto:vanrooyen.chris@gmail.com)

Tel: +27 (0)82 4549570 cell

## EXECUTIVE SUMMARY

---

The applicant, South Africa Mainstream Renewable Power Developments (Pty) Ltd, proposes the construction and operation of the nine (9) photovoltaic (PV) facilities with up to 150 MW generation capacity each, and associated infrastructure. The facilities will be known as the Stilfontein PV Cluster and is located in the City of Matlosana and JB Marks Local Municipalities and Dr Kenneth Kaunda District Municipality in the North West province. The cumulative assessment area, comprising the nine PV sites and associated grid infrastructure, is located approximately 13 km east of the town of Stilfontein along the N12. The cumulative assessment area is situated within a Renewable Energy Development Zone (REDZ) known as the Klerksdorp REDZ (REDZ10) and within the Central Strategic Transmission Corridor (STC).

The Stilfontein PV Cluster comprises nine proposed PV facilities, each with an assessment area of ~200 ha: Spoonbill (Project 1), Sunbird (Project 2), Swallow (Project 3), Snipe (Project 4), Shrike (Project 5), Stilfontein (Project 6), Sparrow (Project 7), Starling (Project 8) and Swift (Project 9).

The associated grid infrastructure for the whole Stilfontein Cluster will consist of the following:

- Nine 11-33/132kV on-site substations, each serving one PV facility. The proposed step-up substation facility will have a development footprint of up to 4 ha, with a 100 m wide buffer around each on-site substation to accommodate powerline tie-ins at any point of the substation and other associated activities. The substation will consist of an IPP portion (100m x 200m) and an Eskom portion (100m x 200m) that will make up the total 4 hectares assigned for the substation as per the assessment area. This report will cover the Eskom portion, as the IPP portion is covered in the facility avifaunal report as part of a separate environmental authorisation application. Two alternative locations are identified for each substation from which a preferred will be selected.
- 11-33kV underground cabling and overhead power lines between the PV facilities and the on-site substations;
- One 132/400kV Main Transmission Substation (MTS). The proposed step-up MTS will be developed within a ~36 ha development area that is buffered by a 100 m wide powerline buffer interconnection area around the MTS substation to accommodate 132 kV powerline tie-ins at any point of the MTS.
- 132kV above ground powerlines from the 11-33/132kV on-site substations to the 132/400kV MTS;
- 400kV Loop In / Loop Out powerlines from the MTS to connect to the existing 400kV PLUTO / HERMES 1 and 2 powerlines. A total area of ~215 ha, located between the two existing Hermes/Pluto 400 kV lines east and west of MTS, was assessed to allow flexibility for the proposed 400 kV Loop in – Loop out transmission line to the existing Hermes/Pluto 1 and Hermes/Pluto 2 lines. The exact point of the Loop in – Loop out will be advised by Eskom due to the highly technical nature of the interconnection.
- Offices, including ablutions with septic / conservancy tank sewage treatment infrastructure;
- Material laydown areas (temporary for construction phase and permanent for operation phase).

**This report discusses all proposed grid infrastructure. Project-specific descriptions and impacts applicable to the current application are provided in Appendix D.**

### 1 POTENTIAL IMPACTS

The potential impacts on priority avifauna identified in the course of the study are:

#### *Construction Phase*

- Displacement of certain priority avifaunal species due to disturbance associated with the construction of the Eskom-side substations, associated 132kV overhead lines, the MTS and associated 400kV LILO overhead lines.

- Displacement of certain priority avifaunal species due to habitat transformation associated with the construction of the Eskom-side substations, associated 132kV overhead lines, the MTS and associated 400kV LILO overhead lines.

#### *Operational Phase*

- Mortality of certain avifaunal priority species due to collisions with the 132kV and 400kV LILO overhead lines.
- Mortality of certain avifaunal priority species due to electrocutions in the Eskom-side substations and in the MTS
- Mortality of certain avifaunal priority species due to electrocutions on the 132kV overhead lines.

#### *Decommissioning Phase*

- Displacement of certain priority avifaunal species due to disturbance associated with the dismantling of the Eskom-side substations, associated 132kV overhead lines, the MTS and associated 400kV LILO overhead lines.

## **2 ENVIRONMENTAL SENSITIVITIES**

The surveys at the assessment area revealed a White-backed Vulture roost on the Hermes/Pluto 400kV 2 overhead line. It is highly likely that the vultures use both the Hermes/Pluto high voltage lines in the assessment areas to periodically roost on, probably more so during the non-breeding season between December and March, when they tend to wander widely from breeding areas in the savanna biome further to the west and north-west in the North West Province.

## **3 IMPACT ASSESSMENT**

The table below provides a summarised assessment of the impact ratings for the Eskom-side substation and associated 132kV grid connections (impacts are identical for all substations).

Impact	Significance rating prior to mitigation	Significance rating post mitigation	Affected priority species
Displacement of certain priority avifaunal species due to disturbance associated with the construction of the Eskom-side substation and associated 132kV overhead line.	LOW	VERY LOW	Black-winged Kite Gabar Goshawk Greater Kestrel Helmeted Guineafowl Lanner Falcon Northern Black Korhaan Pied Crow Spotted Eagle-Owl White-backed Vulture
Displacement of certain priority avifaunal species due to habitat transformation associated with the construction of the Eskom-side substation and associated 132kV overhead line	MEDIUM	LOW	Amur Falcon Black-headed Heron Black-winged Kite Common Buzzard Gabar Goshawk Greater Kestrel Hadada Ibis Helmeted Guineafowl Lanner Falcon Lesser Kestrel Northern Black Korhaan Spotted Eagle-Owl Western Cattle Egret White-backed Vulture
Mortality of certain avifaunal priority species due to collisions with 132kV overhead lines	MEDIUM	VERY LOW	Black-headed Heron Egyptian Goose Hadada Ibis Northern Black Korhaan White-backed Vulture

Impact	Significance rating prior to mitigation	Significance rating post mitigation	Affected priority species
Mortality of certain avifaunal priority species due to electrocutions in the Eskom-side substation	LOW	VERY LOW	Amur Falcon Black-headed Heron Black-winged Kite Common Buzzard Egyptian Goose Greater Kestrel Hadada Ibis Helmeted Guineafowl Lanner Falcon Lesser Kestrel Pied Crow Spotted Eagle-Owl
Mortality of certain avifaunal priority species due to electrocutions on the 132kV overhead lines.	HIGH	LOW	White-backed Vulture
Displacement of certain priority avifaunal species due to disturbance associated with the dismantling of the Eskom-side substation and associated 132kV overhead line.	LOW	VERY LOW	Black-winged Kite Gabor Goshawk Greater Kestrel Helmeted Guineafowl Lanner Falcon Northern Black Korhaan Pied Crow Spotted Eagle-Owl White-backed Vulture

#### 4 MANAGEMENT ACTIONS

The following management actions for the Eskom-side substations and associated 132kV grid connections (actions are identical) are proposed:

##### Construction phase

- Construction activity should be restricted to the immediate footprint of the infrastructure as far as possible.
- Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority 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 as far as practically possible and the construction of new roads should be kept to a minimum.
- The mitigation measures proposed by the botanical/biodiversity specialist must be strictly enforced.

##### Operational phase

- Eskom-side substations: Due to the complicated design of the substation hardware, pro-active mitigation in the form of insulation of all live components is not a practical option. Instead, the situation must be monitored, and should electrocutions of priority species be recorded, reactive mitigation could be applied in the form of insulation of relevant live components. This is an acceptable approach because Red List priority species are unlikely to frequent the switching station and substation and be electrocuted.
- Eskom approved Bird Flight Diverters must be installed on the entire 132kV grid connection, on the earthwire, according to the applicable Eskom standard at the time
- The final Eskom approved pole design must be vulture-friendly and must be signed off by the avifaunal specialist.

##### De-commissioning phase

- Decommissioning activity should be restricted to the immediate footprint of the infrastructure.

- Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species.
- Measures to control noise and dust should be applied according to current best practice in the industry.

## 5 REASONED OPINION

The assessment area and immediate environment is classified as **Low and Medium** sensitivity for terrestrial animals according to the Terrestrial Animal Species Theme of the National Web-Based Environmental Screening Tool. The medium sensitivity classification is not linked to avifauna, but rather terrestrial sensitivity since no specific avifaunal features or buffer sensitivities were identified according to the database.

The virtual absence of species of conservation concern (SCC) was confirmed during the project site surveys<sup>1</sup>. However, White-backed Vulture (SA Status Endangered) was recorded in the assessment area roosting on the high voltage lines running through the site. This was the only SCC recorded during surveys, but based on the criteria in the Protocol, the study area should therefore be classified as **High** sensitivity due to the presence of an SCC. However, the potential impact on White-backed Vultures can be effectively mitigated, primarily through the use of bird-friendly designs for the 132kV overhead lines and the marking of the 132kV and/or 400kV overhead lines with Bird Flight Diverters.

## 6 IMPACT STATEMENT

It is recommended that the Eskom-side on-site substation and associated 132kV grid connection are authorised, on condition that the proposed mitigation measures as detailed in the Impact Tables and the EMPr (Appendix D) are strictly implemented.

---

<sup>1</sup> As defined in the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020), namely listed on the:

- IUCN Red List of Threatened Species or
- South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable

<b>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)</b>	
Contact details and relevant experience as well as the SACNASP Registration number of the specialist preparing the assessment including a curriculum vitae;	Appendix A
A signed statement of independence by the specialist;	Appendix B
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
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 2 and Appendix E
A description of the mean density of observations/number of sample sites per unit area and the site inspection observations;	Section 4
A description of the assumptions made and any uncertainties or gaps in knowledge or data;	Section 2
The location of areas not suitable for development and to be avoided during construction where relevant;	Section 5
Impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	Appendix D
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 12
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.	Section 5

## Contents

EXECUTIVE SUMMARY .....	2
1 POTENTIAL IMPACTS .....	2
1 Introduction.....	11
1.1 Scope, Purpose and Objectives of this Specialist Report .....	11
1.2 Terms of Reference .....	11
2 Approach and Methodology .....	14
2.1 Information Sources .....	16
2.2 Assumptions, Knowledge Gaps and Limitations .....	17
3 Legislative and Permit Requirements.....	18
3.1 Legislative Framework.....	18
4 Baseline Environmental Description.....	20
4.1 General Description.....	20
5 Identification of Environmental Sensitivities.....	27
5.1 Sensitivities identified by the National Web-Based Environmental Screening Tool.....	27
5.2 Specialist Sensitivity Analysis and Verification.....	29
5.3 Existing Hermes/Pluto 400kV 1 & 2 high voltage lines: Medium sensitivity.....	29
6 Issues, Risks and Impacts .....	29
6.1 Identification of Potential Impacts/Risks .....	29
7 Impact Assessment .....	30
7.1 Construction phase.....	30
7.2 Operational phase .....	31
Decommissioning phase.....	34
7.3 No-go option.....	34
8 Impact rating methodology.....	34
9 Impact rating.....	36
10 Environmental Management Programme Inputs .....	36
11 CUMULATIVE IMPACTS.....	36
12 Final Specialist Statement and Authorisation Recommendation.....	39
12.1 Statement and Reasoned Opinion .....	39
13 References .....	40
APPENDIX A – SPECIALIST EXPERTISE.....	41
APPENDIX B: DECLARATION.....	50
APPENDIX C1: SPECIES LIST FOR BROADER AREA.....	53
APPENDIX D: IMPACT RATINGS ESKOM-SIDE OF STARLING SUBSTATION AND 132kV GRID CONNECTION .....	61
1 Baseline aspects.....	61
1.1 Natural habitat .....	61
1.2 Anthropogenic modifications .....	61
2 Sensitivity map .....	61
3 Impact rating.....	62
3.1 Construction Phase.....	62

3.2 Operational Phase .....	62
3.3 Decommissioning Phase .....	63
4 Selection of preferred substation location .....	65
5 Impact statement .....	65
Appendix D1: Environmental Management Programme for Eskom-side Substations & 132kV overhead lines .....	66
APPENDIX E: SITE SENSITIVITY VERIFICATION REPORT .....	69
SITE SENSITIVITY VERIFICATION REPORT .....	69
1. Introduction .....	70
2. Methodology .....	70
3. Results of site assessment .....	71
3.1 Avifauna .....	72
3.2 Receiving environment .....	73
4. Environmental sensitivities .....	78
5. Conclusions .....	79
Appendix E1: Bird species list for the broader area .....	80

## List of Figures

Figure 1: Map of the proposed Stilfontein PV Cluster and associated grid connection infrastructure. ....	13
Figure 2: Area covered by the broader area (2 x SABAP2 pentad grid cells = green squares). ....	15
Figure 3: The location of the drive transects (blue) relative to the proposed Stilfontein PV Cluster grid infrastructure. ....	15
Figure 4: Open woodland habitat in the proposed assessment area. ....	21
Figure 5: A large <i>Vachellia</i> sp. tree with sparrow-weaver bird nests in the open woodland of the proposed assessment area. ....	22
Figure 6: Cement water trough in assessment area. ....	23
Figure 7: Cement water reservoir in the assessment area. ....	23
Figure 8: White-backed vultures roosting on the Hermes – Pluto 1 400kV transmission line the assessment area. ....	24
Figure 9: The National Web-Based Environmental Screening Tool map of the project site, indicating sensitivities for the Terrestrial Animal Species theme. The low and medium sensitivity is not related to avifauna, but rather terrestrial sensitivity since no specific avifaunal features or buffer sensitivities were identified according to the database. ....	28
Figure 10: The location of a White-backed Vulture powerline roost on the Hermes/Pluto 400kV 2 overhead line. ....	29
Figure 11: 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) .....	32
Figure 12: Stilfontein Solar Facilities Cluster - cumulative projects (Source: DFFE Q3 2022 REEA database) .....	38



## List of Tables

Table 1: International agreements and conventions which South Africa is party to, and which are relevant to the conservation of avifauna.....	18
Table 2: Powerline priority species occurring in the broader area with a medium to high likelihood of regular occurrence in the assessment area.....	26
Table 3: Powerline priority species recorded during surveys at the assessment area. Includes species with low likelihood of regular occurrence. ....	27
Table 4: Criteria used to determine the consequence of the impact.....	34
Table 5: Method used to determine the consequence score.....	35
Table 6: Probability classification.....	35
Table 7: Impact significance ratings.....	35
Table 8: Impact status and confidence classification.....	36
Table 9: Renewable energy projects within a 30km radius around the Stilfontein PV Cluster facilities (Source: DFFE Q3 2022 REEA database).....	37

## List of Abbreviations

BA	Basic Assessment
BGIS	Biodiversity Geographic Information System
BLSA	BirdLife South Africa
DFFE	Department of Forestry, Fisheries and the Environment
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
IBA	Important Bird Area
IKA	Index of Kilometric Abundance
IUCN	International Union for Conservation of Nature
LILO	Loop-in Loop-out
NEMA	National Environmental Management Act (Act 107 of 1998, as amended)
OHL	Overhead Line
PV	Photovoltaic
REDZs	Renewable Energy Development Zones
SABAP 1	South African Bird Atlas Project 1
SABAP 2	South African Bird Atlas Project 2
SACNASP	South African Council for Natural and Scientific Professions
SANBI	South African Biodiversity Institute
SAPAD	South Africa Protected Areas Database

## Glossary

Definitions	
PV site	The area comprising an individual proposed PV site.
Broader area	A consolidated data set for the pentads where the project site is located.
Assessment area	The combined area containing the nine Stilfontein PV Cluster solar projects, the Eskom-side substations with the associated 132kV grid connections, the Main Transmission Substation (MTS) and associated double Loop in – Loop out transmission lines to the Hermes/Pluto 1 and Hermes/Pluto 2, 400kV Overhead Lines.
Stilfontein PV Cluster	The nine proposed Stilfontein PV projects.
Priority species	Priority species are defined as species which could potentially be impacted by powerline collisions or electrocutions, based on their morphology. Larger birds, particularly raptors and vultures, are more vulnerable to electrocution as they are more likely to bridge the clearances between electrical components than smaller birds. Large terrestrial species and certain waterbirds with high wing loading are less manoeuvrable than smaller species and are therefore more likely to collide with overhead lines.

## 1 INTRODUCTION

The applicant, South Africa Mainstream Renewable Power Developments (Pty) Ltd, proposes the construction and operation of the nine (9) photovoltaic (PV) facilities with up to 150 MW generation capacity each, and associated infrastructure. The facilities will be known as the Stilfontein PV Cluster and is located in the City of Matlosana and JB Marks Local Municipalities and Dr Kenneth Kaunda District Municipality in the North West province. The assessment area, comprising the nine PV sites and associated grid infrastructure, is located approximately 6 km east of the town of Stilfontein along the N12. The assessment area is situated within a Renewable Energy Development Zone (REDZ) known as the Klerksdorp REDZ (REDZ10) and within the Central Strategic Transmission Corridor (STC).

The Stilfontein PV Cluster comprises nine proposed PV facilities, each with an assessment area of ~200 ha: Spoonbill (Project 1), Sunbird (Project 2), Swallow (Project 3), Snipe (Project 4), Shrike (Project 5), Stilfontein (Project 6), Sparrow (Project 7), Starling (Project 8) and Swift (Project 9).

The associated grid infrastructure for the whole Stilfontein Cluster will consist of the following (see Figure 1).

- Nine 11-33/132kV substations, each serving one PV facility. The proposed step-up substation facility will have a development footprint of up to 4 ha, with a 100 m wide buffer around each substation to accommodate powerline tie-ins at any point of the substation and other associated activities. The substation will consist of an IPP portion (100m x 200m) and an Eskom portion (100m x 200m) that will make up the total 4 hectares assigned for the substation as per the assessment area. This report will cover the Eskom portion, as the IPP portion is covered in the facility avifaunal report as part of a separate environmental authorisation application. Two alternative locations are identified for each substation from which a preferred will be selected.
- 11-33kV underground cabling and overhead power lines between the PV facilities and the substations;
- One 132/400kV Main Transmission Substation (MTS). The proposed step-up MTS will be developed within a ~36 ha development area that is buffered by a 150 m wide powerline buffer interconnection area around the MTS substation to accommodate 132 kV powerline tie-ins at any point of the MTS.
- 132kV above ground powerlines from the 11-33/132kV on-site substations to the 132/400kV MTS;
- 400kV Loop In / Loop Out powerlines from the MTS to connect to the existing 400kV PLUTO / HERMES 1 and 2 powerlines. A total area of ~215 ha, located between the two existing Hermes/Pluto 400 kV lines east and west of MTS, was assessed to allow flexibility for the proposed 400 kV Loop in – Loop out transmission line to the existing Hermes/Pluto 1 and Hermes/Pluto 2 lines. The exact point of the Loop in – Loop out will be advised by Eskom due to the highly technical nature of the interconnection.
- Offices, including ablutions with septic tank sewage treatment infrastructure;
- Material laydown areas (temporary for construction phase and permanent for operation phase).

**This report discusses all proposed grid infrastructure. Project-specific descriptions and impacts applicable to the current application are provided in Appendix D.**

### 1.1 Scope, Purpose and Objectives of this Specialist Report

The purpose of the report is to assess the potential impacts on priority avifaunal species of each Eskom-side of the 11-33/132kV on-site substation and associated 132kV grid connection, and the new 132/400kV MTS and associated 400kV LILO overhead lines, and to recommend measures for the mitigation of identified impacts.

### 1.2 Terms of Reference

The terms of reference for the Specialist Report are as follows:

- Describe the affected environment from an avifaunal perspective.
- Discuss gaps in baseline data and other limitations.
- Describe the methodology that was used for the field surveys.
- Compare the site sensitivity recorded in the field with the sensitivity classification in the DFFE National Screening Tool and adjust if necessary.
- Provide an overview of all applicable legislation.
- Provide an overview of assessment methodology.
- Identify and assess the potential impacts of the proposed development on avifauna.
- Provide sufficient mitigation measures to include in the Environmental Management Programme (EMPr).
- Conclude with an impact statement.

See Figure 1 for the area covered by the proposed Stilfontein PV Cluster and associated infrastructure.

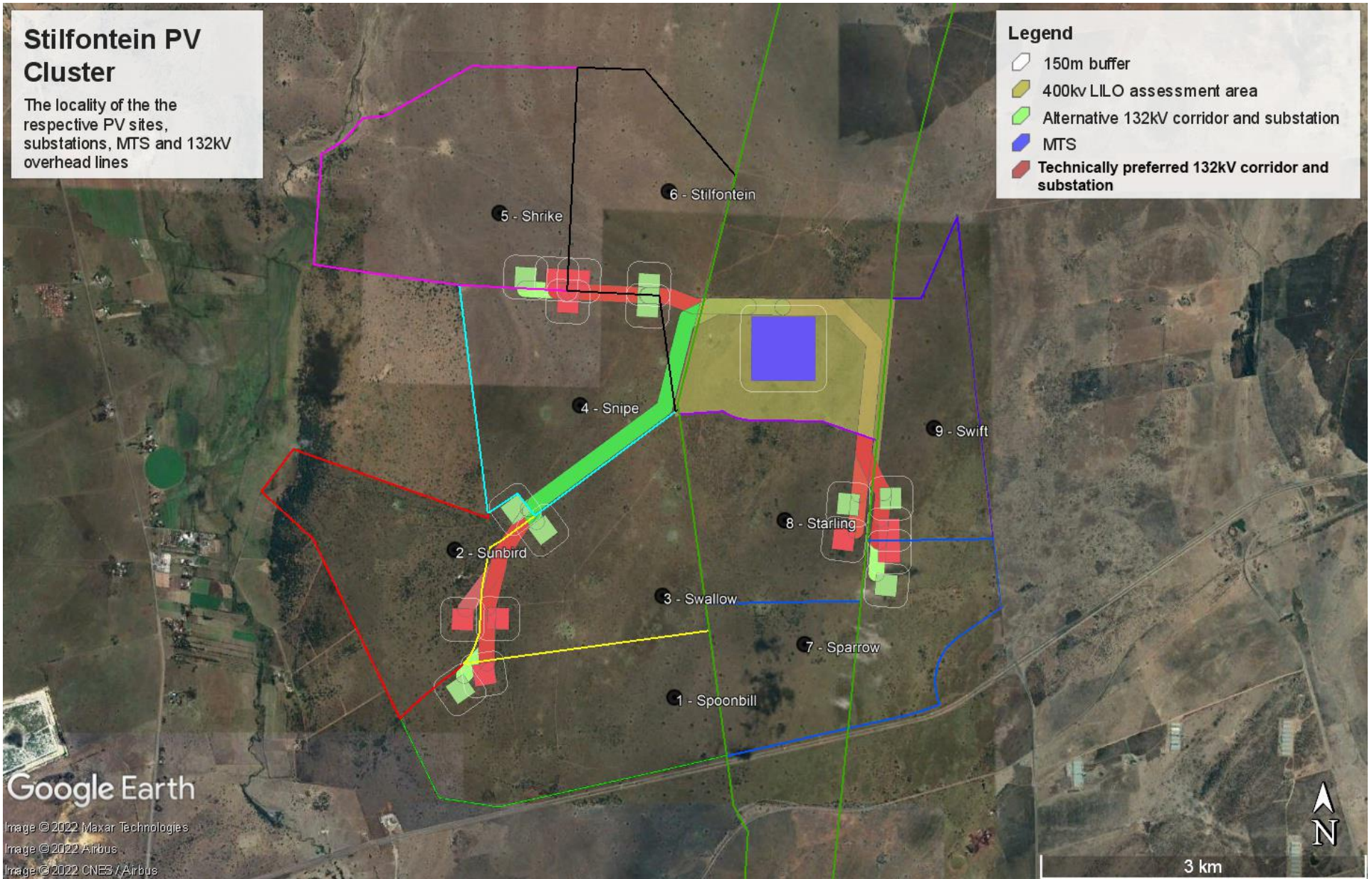


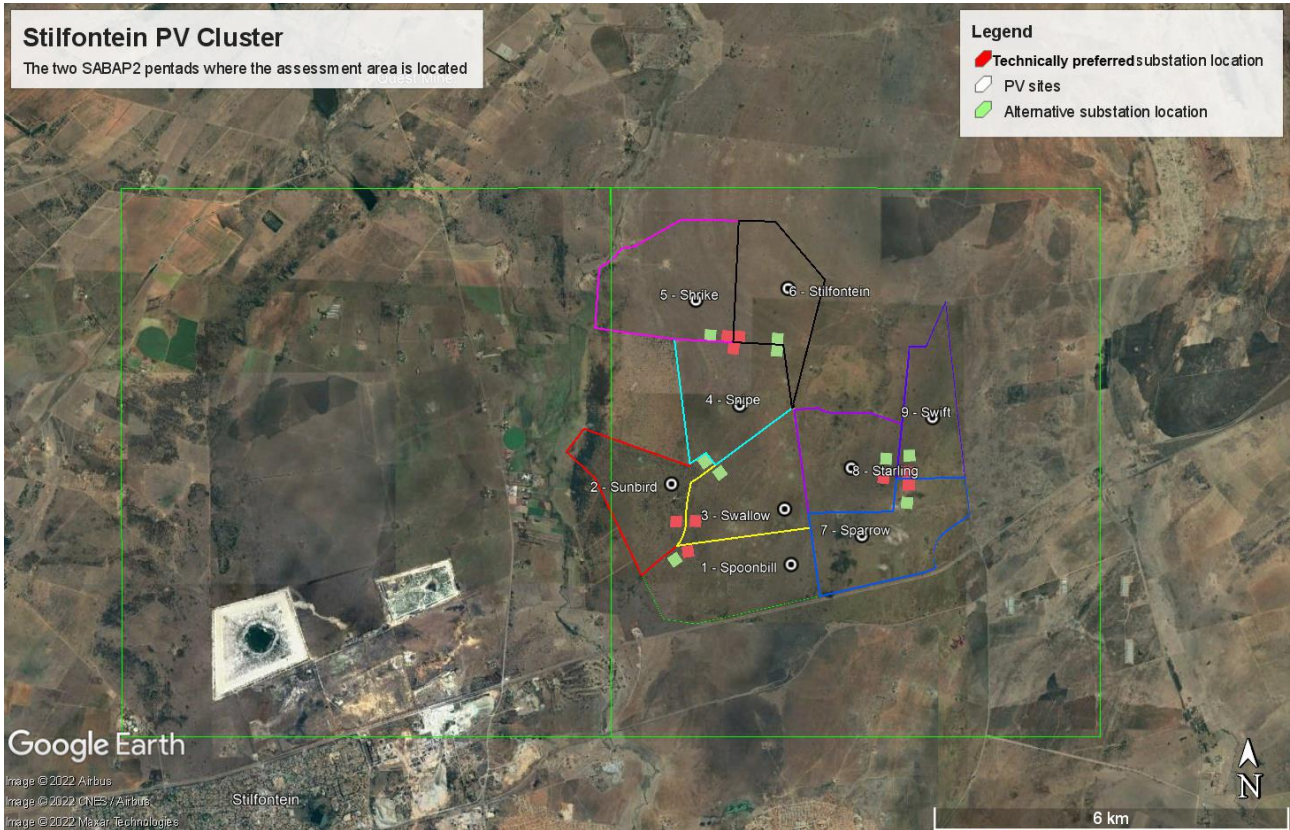
Figure 1: Map of the proposed Stilfontein PV Cluster and associated grid connection infrastructure.

## 2 APPROACH AND METHODOLOGY

The below approach was followed to conduct this study:

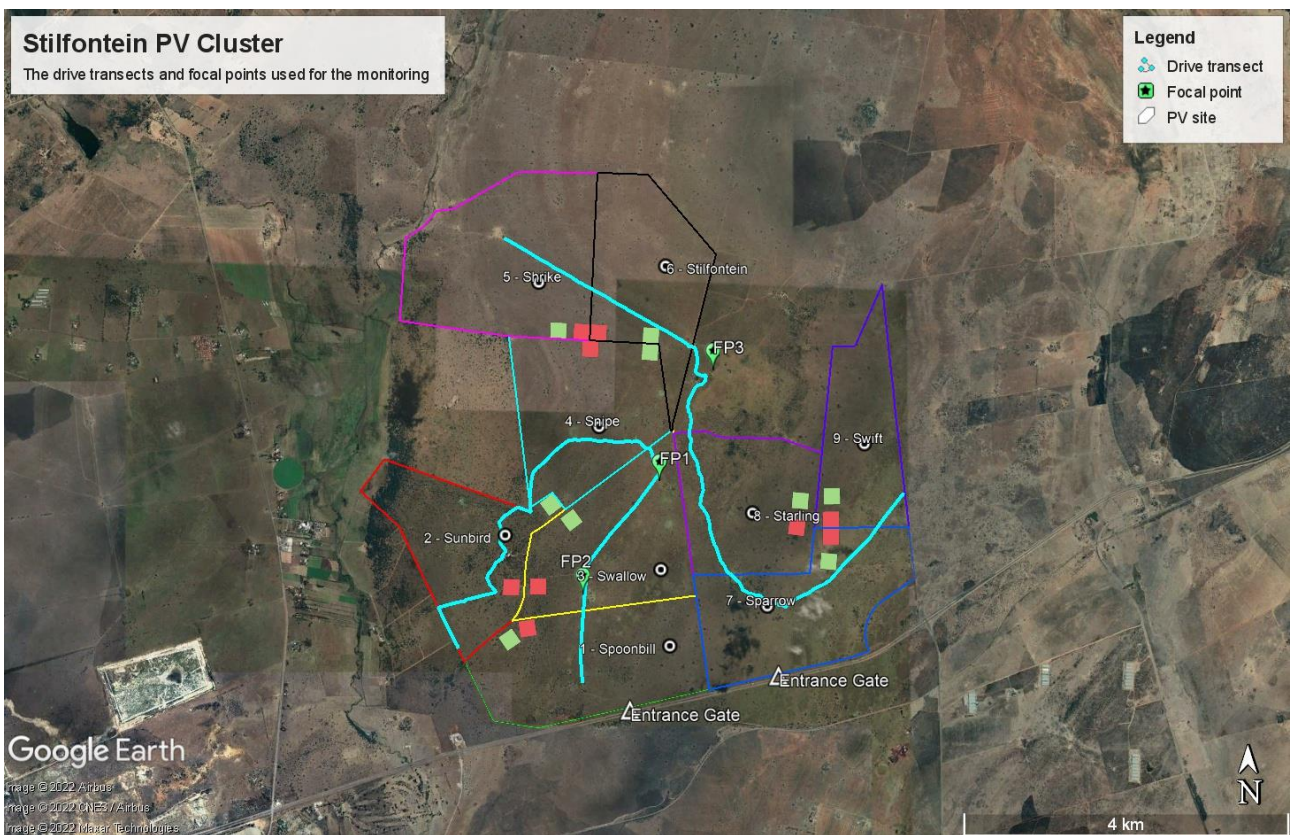
- Bird distribution data of the Southern African Bird Atlas Project 2 (SABAP 2) was obtained from the FitzPatrick Institute of African Ornithology, University of Cape Town, to ascertain which species occurs within the broader area i.e., within a block consisting of 2 pentad grid cells within which the proposed project is situated. A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'x 5'). Each pentad is approximately 8 x 7.6 km. To date, a total of 89 full protocol lists (i.e., surveys lasting a minimum of two hours each) have been completed for this area. In addition, 22 ad hoc protocol lists (i.e., surveys lasting less than two hours but still yielding valuable data) have been completed.
- The national threatened status of all priority species was determined with the use of the most recent edition of the Red Data Book of Birds of South Africa (Taylor *et al.* 2015), and the latest authoritative summary of southern African bird biology (Hockey *et al.* 2005).
- The global threatened status of all priority species was determined by consulting the (2022.2) IUCN Red List of Threatened Species (<http://www.iucnredlist.org/>).
- A classification of the vegetation types in the assessment area was obtained from the Atlas of Southern African Birds 1 (SABAP 1) (Harrison *et al.* 1997) and the National Vegetation Map (2012 beta2) from the South African National Biodiversity Institute website (Mucina & Rutherford 2006 & <http://bgisviewer.sanbi.org>).
- The Important Bird Areas of Southern Africa (Marnewick *et al.* 2015) was consulted for information on potentially relevant Important Bird Areas (IBAs).
- Satellite imagery (Google Earth ©2021) was used in order to view the broader assessment area on a landscape level and to help identify sensitive bird habitat.
- The South African National Biodiversity BGIS map viewer was used to determine the locality of the proposed site relative to National Protected Areas.
- The DFFE National Screening Tool was used to determine the assigned avian sensitivity of the proposed assessment area.
- An on-site Site Sensitivity Verification (SSV) survey was conducted on 03 February 2022. The assessment area was inspected with a 4x4 vehicle and on foot. All birds were recorded.
- Additional on-site surveys were conducted from 9-10 February 2022 at the assessment area, based on the best practice guidelines for avifaunal impact studies for solar developments, compiled by BirdLife South Africa (BLSA) in 2017 (Jenkins *et al.* 2017). Monitoring was conducted in the following manner:
  - Two drive transects of 8.1 km and 8.72 km respectively were identified in the assessment area and surveyed four times over a period of 2 days. One observer driving slowly recorded all birds on both sides of the transect. The observer stopped at regular intervals and moved a distance away from the vehicle to listen to bird calls and to scan the environment with binoculars.
  - The following variables were recorded:
    - Species;
    - Number of birds;
    - Date;
    - Start time and end time;
    - Estimated distance from transect (m);
    - Wind direction;
    - Wind strength (estimated Beaufort scale 1 - 7);
    - Weather (sunny; cloudy; partly cloudy; rain; mist);
    - Temperature (cold; mild; warm; hot);
    - Behaviour (flushed; flying-display; perched; perched-calling; perched-hunting; flying- foraging; flying-commute; foraging on the ground).
  - All incidental sightings of priority species were recorded.
  - Three focal points of bird activity, namely two water troughs and a small farm dam, were also monitored during the course of the two day monitoring period.

See Figure 2 below for the extent of the broader area.



**Figure 2: Area covered by the broader area (2 x SABAP2 pentad grid cells = green squares).**

See Figure 3 for the location of drive transects and focal points.



**Figure 3: The location of the drive transects (blue) relative to the proposed Stilfontein PV Cluster grid infrastructure.**

## 2.1 Information Sources

The following data sources were used to compile this report:

Data / Information	Source	Date	Type	Description
South African Protected Areas Database (SAPAD)	Department of Forestry, Fisheries and the Environment (DFFE)	2021, Q3	Spatial	Spatial delineation of protected areas in South Africa. Updated quarterly
Atlas of Southern African Birds 1 (SABAP1)	University of Cape Town	1987-1991	Spatial, reference	SABAP1, which took place from 1987-1991.
South African Bird Atlas Project 2 (SABAP2)	University of Cape Town	February 2022	Spatial, database	SABAP2 is the follow-up project to the SABAP1. The second bird atlas project started on 1 July 2007 and is still growing. The project aims to map the distribution and relative abundance of birds in southern Africa.
National Vegetation Map	South African National Biodiversity Institute (SANBI) (BGIS)	2018	Spatial	The National Vegetation Map Project (VEGMAP) is a large collaborative project established to classify, map and sample the vegetation of South Africa, Lesotho and Swaziland.
Red Data Book of Birds of South Africa, Lesotho and Swaziland	BirdLife South Africa	2015	Reference	The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland is an updated and peer-reviewed conservation status assessment of the 854 bird species occurring in South Africa undertaken in collaboration between BirdLife South Africa, the Animal Demography Unit of the University of Cape Town, and the SANBI.
IUCN Red List of Threatened Species (2022.2)	IUCN	2022.2	Online reference source	Established in 1964, the International Union for Conservation of Nature's Red List of Threatened Species is the world's most comprehensive information source on the global extinction risk status of animal, fungus and plant species.
Important Bird and Biodiversity Areas of South Africa	BirdLife South Africa	2015	Reference work	Important Bird and Biodiversity Areas (IBAs), as defined by BirdLife International, constitute a global network of over 13 500 sites, of which 112 sites are found in South Africa. IBAs are sites of global significance for bird conservation, identified nationally through multi-stakeholder processes using globally standardised, quantitative and scientifically agreed criteria.
Strategic Environmental Assessment for wind and solar photovoltaic energy in South Africa	Department of Environmental Affairs, 2015. Strategic Environmental Assessment for wind and solar photovoltaic energy in South Africa. CSIR Report Number:	2015	SEA	The SEA identifies areas where large scale wind and solar PV energy facilities can be developed in terms of Strategic Infrastructure Project (SIP) 8 and in a manner that limits significant negative impacts on the natural environment, while yielding the highest possible socio-economic benefits to the country. These areas are referred to as Renewable Energy Development Zones (REDZs).



Data / Information	Source	Date	Type	Description
	CSIR/CAS/EMS/ER/2015/0001/B. Stellenbosch.			
Phase 2 Strategic Environmental Assessment for wind and solar photovoltaic energy in South Africa	Department of Environment, Forestry and Fisheries, 2019. Phase 2 Strategic Environmental Assessment for wind and solar PV energy in South Africa. CSIR Report Number: CSIR/SPLA/SECO/ER/2019/0085 Stellenbosch, Western Cape.	2019	SEA	The SEA identifies additional areas where large scale wind and solar PV energy facilities can be developed in terms of Strategic Infrastructure Project (SIP) 8 and in a manner that limits significant negative impacts on the natural environment, while yielding the highest possible socio-economic benefits to the country. These areas are referred to as Renewable Energy Development Zones (REDZs). These are referred to as FA9 eMalahleni (solar PV), FA10 Klerksdorp and. (solar PV) and FA11 Beaufort West (wind). The numbers are a continuation from the already gazetted eight REDZs from the Phase 1 wind and solar PV SEA.
The National Web Based Screening Tool	Department of Forestry, Fisheries and the Environment	February 2022	Spatial	The National Web based Environmental Screening Tool is a geographically based web-enabled application which allows a proponent intending to submit an application for environmental authorisation in terms of the Environmental Impact Assessment (EIA) Regulations 2014, as amended to screen their proposed site for any environmental sensitivity.

## 2.2 Assumptions, Knowledge Gaps and Limitations

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

- It was assumed that the SABAP 2 is an accurate representation of the avifauna that are likely to occur in the broader area, based on the large number of completed lists for this area.
- The focus of the study was primarily on the potential impacts of the proposed grid infrastructure on priority species.
- Priority species are defined as species which could potentially be impacted by powerline collisions or electrocutions, based on their morphology:
  - Larger birds, particularly raptors and vultures, are more vulnerable to electrocution as they are more likely to bridge the gaps between electrical components than smaller birds.
  - Large terrestrial species and certain waterbirds with high wing loading are less manoeuvrable than smaller species and are therefore more likely to collide with overhead lines.
- The assessment of impacts is based on the baseline environment as it currently exists at the assessment area.
- Conclusions drawn in this study are based on experience of the specialist in relation to the species found on site and similar species in different parts of South Africa. Bird behaviour can never be entirely reduced to formulas that would be valid under all circumstances.
- The **broader area** is defined as the area encompassed by the two pentads where the project is located (see Figure 2 above). The **assessment area** is the combined area containing the nine Stilfontein PV Cluster solar projects, the on-site substations with the associated 132kV grid connections, and the Main Transmission Substation (MTS) and associated double Loop in – Loop out transmission lines to the Hermes/Pluto 1 and Hermes/Pluto 2, 400kV Overhead Lines. A **project site** is the area taken up by the infrastructure associated with an individual application i.e. the footprint containing the relevant portion of the substation (including the relevant buffer) and associated transmission lines and other infrastructure.

### 3 LEGISLATIVE AND PERMIT REQUIREMENTS

#### 3.1 Legislative Framework

There is no legislation pertaining specifically to the impact of solar facilities and associated electrical grid infrastructure on avifauna. There are best practice guidelines available which were compiled under the auspices of BLSA i.e. Jenkins, A.R., Ralston-Patton, Smit- Robinson, A.H. 2017. *Guidelines for assessing and monitoring the impact of solar power generating facilities on birds in southern Africa*. These guidelines were consulted in this assessment.

##### 3.1.1 Agreements and conventions

Relevant international agreements and conventions are described in this section.

**Table 1: International 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)	<p>The Agreement on the Conservation of 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.</p> <p>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.</p>	Regional
Convention on Biological Diversity (CBD), Nairobi, 1992	<p>The Convention on Biological Diversity (CBD) entered into force on 29 December 1993. It has three main objectives:</p> <ul style="list-style-type: none"> <li>• The conservation of biological diversity;</li> <li>• The sustainable use of the components of biological diversity; and</li> <li>• The fair and equitable sharing of the benefits arising out of the utilization of genetic resources.</li> </ul>	Global
Convention on the Conservation of Migratory Species of Wild Animals, (CMS), Bonn, 1979	<p>As an environmental treaty under the aegis of the UNEP, 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.</p>	Global
Convention on the International Trade in Endangered Species of Wild Flora and Fauna, (CITES), Washington DC, 1973	<p>CITES 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.</p>	Global
Ramsar Convention on Wetlands of International Importance, Ramsar, 1971	<p>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.</p>	Global
Memorandum of Understanding on the Conservation of Migratory	<p>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.</p>	Regional

Convention name	Description	Geographic scope
Birds of Prey in Africa and Eurasia		

### 3.1.2 National legislation

#### 3.1.2.1 Constitution of the Republic of South Africa, 1996

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

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

#### 3.1.2.2 The National Environmental Management Act NEMA (Act 107 of 1998, as amended)

The 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 (via the promulgation of the EIA Regulations 2014, as amended), which may significantly affect the environment, may be performed only after an EIA or BA has been undertaken and environmental authorisation has been obtained from the relevant competent 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 (Government Gazette No 43855, 30 October 2020) is applicable in the case of potential impacts on avifauna by powerlines and substations.

#### 3.1.2.3 The National Environmental Management: Biodiversity Act 10 of 2004 and the Threatened or Protected Species Regulations, February 2007

The most prominent statute containing provisions directly aimed at the conservation of birds is the National Environmental Management: Biodiversity Act (Act 10 of 2004, as amended) 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 (as noted in Table 5 above). The State is endowed with the trusteeship of biodiversity and has the responsibility to manage, conserve and sustain the biodiversity of South Africa.

### 3.1.3 *Provincial legislation*

#### 3.1.3.1 North-West Biodiversity Management Act, No 4 of 2016

The Act provides for the management and conservation of the North West Province's biophysical environment and protected areas within the framework of the National Environmental Management Act, 1998 (Act No 107 of 1998) including the protection of species and ecological- systems that warrant provincial protection.

## **4 BASELINE ENVIRONMENTAL DESCRIPTION**

### **4.1 General Description**

#### 4.1.1 *Important Bird Areas (IBAs)*

The Sandveld and Bloemhof Dam Nature Reserves IBA SA039 is the closest IBA and is located approximately 102 km south-west of the site. The proposed development is not expected to have any impact on the avifauna in this IBA due to the distance from the development.

#### 4.1.2 *Protected Areas*

The site does not form part of a formally protected area. The closest protected area is the Faan Meintjies Private Nature Reserve which is located approximately 10 km to the west at its closest point. The proposed development is not expected to have any impact on the avifauna in this nature reserve due to the distance from the development.

#### 4.1.3 *The Strategic Environmental Assessment for Wind and Solar Photovoltaic Energy in South Africa*

On 16 February 2018, Minister Edna Molewa published Government Notice No. 114 in Government Gazette No. 41445 which identified 8 renewable energy development zones (REDZ) important for the development of large-scale wind and solar photovoltaic facilities. The Government Notice included procedure to be followed when applying for environmental authorisation for large scale wind and solar photovoltaic energy facilities when occurring in these REDZs.

On 26 February 2021, Minister Barbara Dallas Creecy, published Government Notice No. 142, 144 and 145 in Government Gazette No. 44191 which identified 3 additional REDZs for implementation as well as the procedures to be followed when applying for environmental authorisation for electricity transmission or distribution infrastructure or large-scale wind and solar photovoltaic energy facilities in these REDZs.

The REDZs were identified through the undertaking of 2 Strategic Environmental Assessments (SEAs), the first being finalised in 2015 and the second being finalised in 2019. The site falls within the Klerksdorp REDZ10 Renewable Energy Zone (REDZ), which was identified during the second SEA.

#### 4.1.4 *Bird Habitat*

The assessment area is situated approximately 7 km north-east of the town of Stilfontein, in the North West Province. It is located in the Grassland Biome, in the Dry Highveld Grassland Bioregion, in a mixture of open to dense woodland with a strong grassland component. The habitat in the broader area is more variable and consists of fallow fields (recovering grassland), natural grassland, shrub- and woodland, some wetland and pans, and some agricultural and industrial activities. Mucina & Rutherford (2006) classifies the natural vegetation in the assessment area as a mixture of Vaal Reefs Dolomite Sinkhole Woodland and Carletonville Dolomite Grassland

The Stilfontein area has a semi-arid climate (according to the Köppen-Geiger climate classification), with warm to hot summers and cool, dry winters. The average annual precipitation is ~482 mm, with most of the rainfall

occurring during summer. It should be noted that photos from the field surveys were taken in the high (rainy) season (i.e., summer).

The following features with relevance to avifauna are present in the assessment area:

- Open Woodland
- Water Points
- High Voltage Overhead Powerlines

#### 4.1.4.1 *Open Woodland*

The dominant habitat type of the assessment area is that of open woodland with a prominent grassy component (see Figures 4 & 5). The woodland consists of mainly fine-leaved, semi-deciduous *Vachellia*-dominated shrubs up to medium-sized trees. The density of the woodland ranges from relatively dense in places to open tracts of grassland with scattered shrubs.



**Figure 4: Open woodland habitat in the proposed assessment area.**



**Figure 5: A large *Vachellia* sp. tree with sparrow-weaver bird nests in the open woodland of the proposed assessment area.**

The following powerline priority avifauna with a high or medium likelihood of occurrence could use open woodland habitat in the development area:

- Amur Falcon
- Black-headed Heron
- Black-winged Kite
- Common Buzzard
- Gabar Goshawk
- Greater Kestrel
- Hadada Ibis
- Helmeted Guineafowl
- Lanner Falcon
- Lesser Kestrel
- Northern Black Korhaan
- Pied Crow
- Spotted Eagle-Owl
- Western Cattle Egret
- White-backed Vulture

#### *4.1.4.2 Surface water*

Surface water is important to avifauna in this semi-arid area. The assessment area contains several artificial impoundments (cement water troughs and water reservoirs) scattered throughout the area which are the only permanent sources of water (aside from the Koekemoer Spruit which runs to the west of the assessment site) and provide habitat for some waterbirds and many other non-priority species (see Figures 6 & 7). Vultures most likely use the water troughs on occasion for drinking and bathing. Some raptors could be attracted to the water points for bathing, drinking and to hunt other birds coming to drink.



**Figure 6: Cement water trough in assessment area.**



**Figure 7: Cement water reservoir in the assessment area.**

The following powerline priority avifauna with a high or medium likelihood of occurrence could use water points in the development area:

- Black-headed Heron
- Common Buzzard
- Egyptian Goose
- Gabar Goshawk
- Hadada Ibis
- Helmeted Guineafowl

- Lanner Falcon
- Pied Crow
- Western Cattle Egret
- White-backed Vulture

#### 4.1.4.3 High Voltage Overhead Powerlines

The Hermes – Pluto 1 & 2 400kV transmission lines cross the assessment area in a north-south direction (see Figure 8). White-backed Vultures were recorded roosting on the Hermes – Pluto 400kV 2 powerline during the first field visit. Other powerline priority avifaunal species will also make use of these powerlines for roosting and breeding.



**Figure 8: White-backed vultures roosting on the Hermes – Pluto 1 400kV transmission line the assessment area.**

The following powerline priority avifauna with a high or medium likelihood of occurrence could use overhead powerlines in the assessment area:

- Amur Falcon
- Black-headed Heron
- Black-winged Kite
- Common Buzzard
- Egyptian Goose
- Greater Kestrel
- Hadada Ibis
- Helmeted Guineafowl
- Lanner Falcon
- Lesser Kestrel
- Pied Crow
- Spotted Eagle-Owl
- White-backed Vulture



#### 4.1.5 Avifauna

##### 4.1.5.1 Southern African Bird Atlas Project 2

A total of 211 species could potentially occur within the broader where the project is located (see Appendix C1). Of these, 48 are classified as powerline priority species. Of the 48 priority species, 16 have a medium to high probability of occurring in the assessment area. Of these, 6 were recorded during site surveys.

The probability of a priority species occurring regularly in the assessment area is indicated in Table 2. **Due to the similarity in habitat and associated avifaunal composition, the likelihood of occurrence and potential impacts as listed in Table 2 is applicable to each of the proposed substations and grid connections.**

Table 2 below lists all priority species and the possible impact on the respective species by the Stilfontein PV facilities and associated infrastructure.

CR = Critically endangered

VU = Vulnerable

LC = Least concern

M = Medium

H = High

**Table 2: Powerline priority species occurring in the broader area with a medium to high likelihood of regular occurrence in the assessment area.**

Species name	Taxonomic name	SABAP 2 reporting rate		Status		Likelihood of occurrence	Recorded during monitoring	Habitat			Impacts				
		Full protocol	Ad hoc protocol	Global status	Regional status			Woodland	Waterpoints	High voltage lines	Displacement: Disturbance	Displacement: Habitat transformation	Substations – Electrocutation	132kV powerline electrocution	132kV and 400kV powerline – Collision
Amur Falcon	<i>Falco amurensis</i>	5.62	0.00	-	-	M		x		x		x	x		
Black-headed Heron	<i>Ardea melanocephala</i>	16.85	4.55	-	-	M		x	x	x		x	x		x
Black-winged Kite	<i>Elanus caeruleus</i>	58.43	36.36	-	-	H		x		x	x	x	x		
Common Buzzard	<i>Buteo buteo</i>	5.62	0.00	-	-	M		x	x	x		x	x		
Egyptian Goose	<i>Alopochen aegyptiaca</i>	24.72	0.00	-	-	H			x	x			x		x
Gabar Goshawk	<i>Micronisus gabar</i>	7.87	0.00	-	-	M		x	x		x	x			
Greater Kestrel	<i>Falco rupicoloides</i>	10.11	4.55	-	-	M		x		x	x	x	x		
Hadada Ibis	<i>Bostrychia hagedash</i>	70.79	4.55	-	-	H	x	x	x	x		x	x		x
Helmeted Guineafowl	<i>Numida meleagris</i>	75.28	4.55	-	-	H	x	x	x	x		x	x		
Lanner Falcon	<i>Falco biarmicus</i>	3.37	0.00	LC	VU	M		x	x	x	x	x	x		
Lesser Kestrel	<i>Falco naumanni</i>	6.74	0.00	-	-	M		x		x		x	x		
Northern Black Korhaan	<i>Afrotis afraoides</i>	83.15	22.73	-	-	H	x	x			x	x			x
Pied Crow	<i>Corvus albus</i>	93.26	50.00	-	-	H	x	x	x	x			x		
Spotted Eagle-Owl	<i>Bubo africanus</i>	1.12	0.00	-	-	M		x		x	x	x	x		
Western Cattle Egret	<i>Bubulcus ibis</i>	83.15	36.36	-	-	H	x	x	x			x			
White-backed Vulture	<i>Gyps africanus</i>	0.00	0.00	CR	CR	M	x	x	x	x	x	x		x	x

#### 4.1.5.2 Pre-construction surveys

The powerline priority species that were recorded during surveys in the assessment area are listed in Table 3.

**Table 3: Powerline priority species recorded during surveys at the assessment area. Includes species with low likelihood of regular occurrence.**

H = High

M = Medium

L = Low

CR = Critically endangered

Species name	Taxonomic name	SABAP 2 reporting rate		Status		
		Full protocol	Ad hoc protocol	Global status	Regional status	Likelihood of occurrence
Hadada Ibis	<i>Bostrychia hagedash</i>	70.79	4.55	-	-	H
Helmeted Guineafowl	<i>Numida meleagris</i>	75.28	4.55	-	-	H
Northern Black Korhaan	<i>Afrotis afraoides</i>	83.15	22.73	-	-	H
Pied Crow	<i>Corvus albus</i>	93.26	50.00	-	-	H
Western Cattle Egret	<i>Bubulcus ibis</i>	83.15	36.36	-	-	H
White-backed Vulture	<i>Gyps africanus</i>	00.00	00.00	CR	CR	M
White-faced Whistling Duck	<i>Dendrocygna viduata</i>	7.87	0.00	-	-	L
Yellow-billed Duck	<i>Anas undulata</i>	20.22	0.00	-	-	L

## 5 IDENTIFICATION OF ENVIRONMENTAL SENSITIVITIES

### 5.1 Sensitivities identified by the National Web-Based Environmental Screening Tool

The assessment area and immediate environment is classified as **Low and medium** sensitivity for terrestrial animals according to the Terrestrial Animal Species Theme (see Figure 11). The low and medium sensitivity classification is not linked to avifauna, but rather terrestrial sensitivity since no specific avifaunal features or buffer sensitivities were identified according to the database.

The project site contains marginal habitat for most species of conservation concern (SCC)<sup>2</sup>. The virtual absence of SCC was confirmed during the project site surveys. However, White-backed Vulture (SA and Global Status Critically Endangered) was recorded in the assessment area roosting on the high

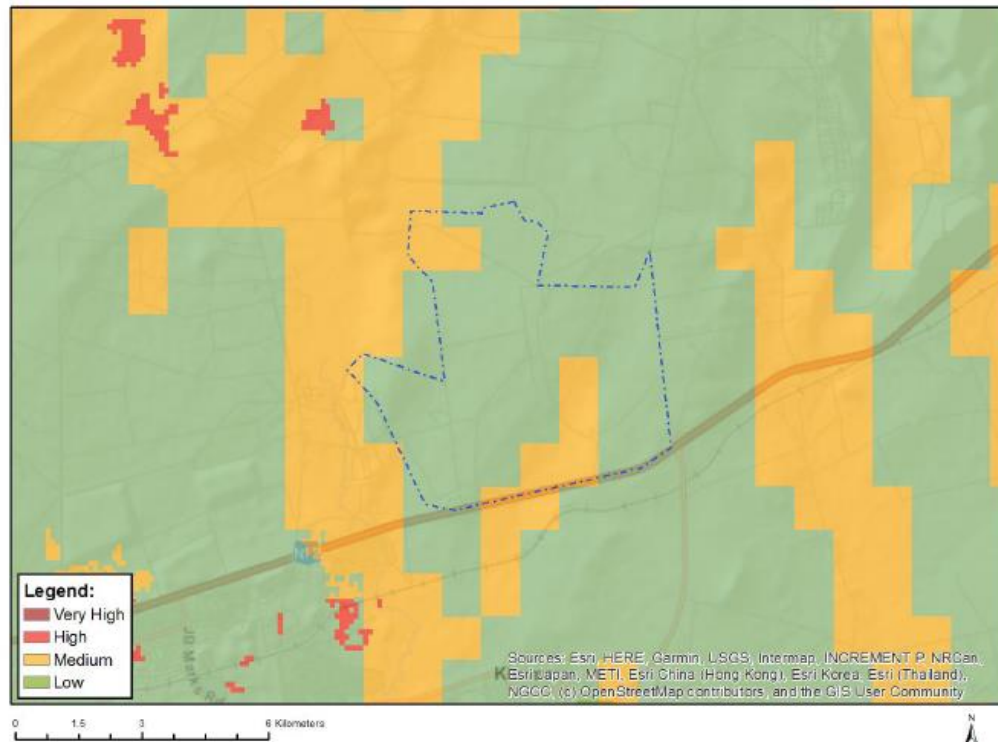
<sup>2</sup> As defined in the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020), namely listed on the:

- IUCN Red List of Threatened Species or
- South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable

Hermes/Pluto 400kV 2 high voltage line running through the site. This was the only SCC recorded during surveys but based on the criteria in the Protocol the study area should therefore be classified as **High** sensitivity due to the presence of an SCC.

See Appendix E for the Site Sensitivity Report.

### 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](mailto: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)
Low	Low sensitivity
Medium	Mammalia-Hydrictris maculicollis

Figure 9: The National Web-Based Environmental Screening Tool map of the project site, indicating sensitivities for the Terrestrial Animal Species theme. The low and medium sensitivity is not related to avifauna, but rather terrestrial sensitivity since no specific avifaunal features or buffer sensitivities were identified according to the database.

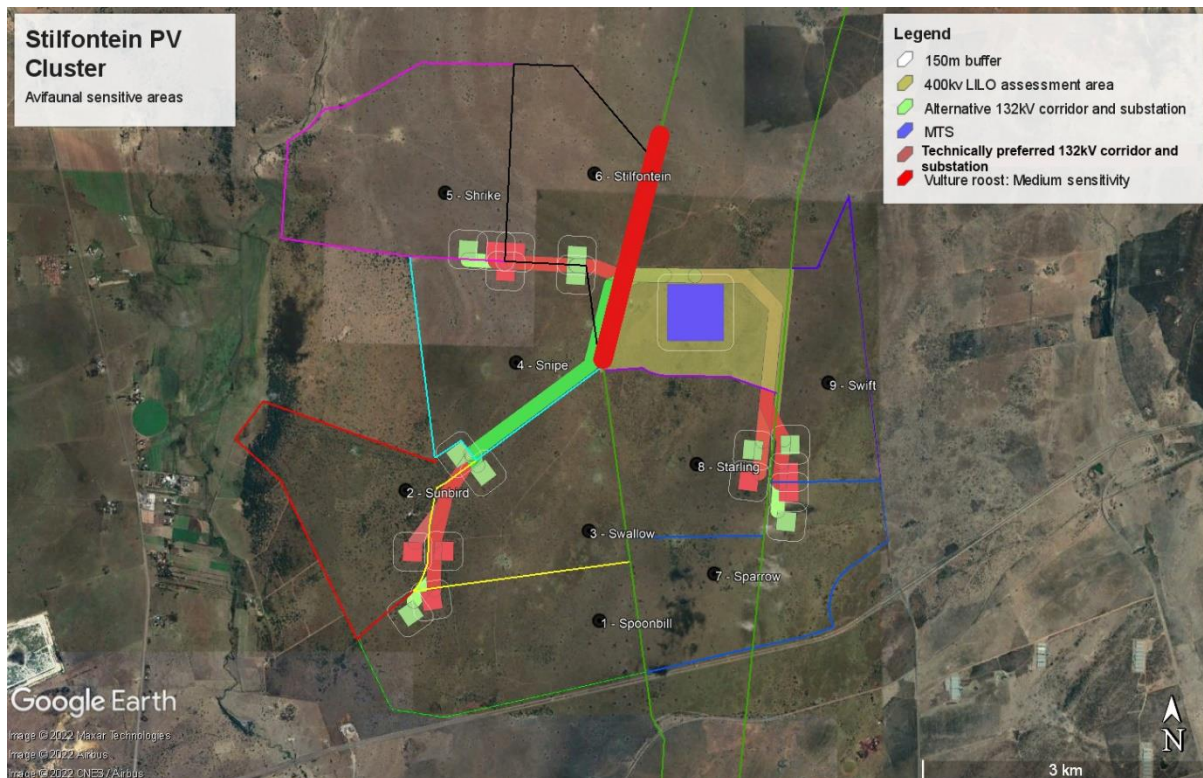
## 5.2 Specialist Sensitivity Analysis and Verification

The avifaunal sensitivities that were identified in the project area are discussed below. **The spatial distribution of sensitivities relative to the individual grid connections and LILO lines are covered in Appendix D.**

## 5.3 Existing Hermes/Pluto 400kV 1 & 2 high voltage lines: Medium sensitivity

The surveys at the assessment area revealed a White-backed Vulture roost on the 400kV Hermes/Pluto 2 overhead line (Figure 10). It is highly likely that the vultures use both Hermes/Pluto high voltage lines in the assessment areas to periodically roost on, probably more so during the non-breeding season between December and March, when they tend to wander widely from breeding areas in the savanna biome further to the west and north-west in the North West Province.

Figure 10 shows the location of the White-backed Vultures roosting identified in the assessment area during the site visit. The locality of the roost is likely to shift periodically along the powerlines in areas of natural habitat, depending on factors such as availability of carcasses to feed on.



**Figure 10: The location of a White-backed Vulture powerline roost on the Hermes/Pluto 400kV 2 overhead line.**

## 6 ISSUES, RISKS AND IMPACTS

### 6.1 Identification of Potential Impacts/Risks

The potential impacts on priority avifauna identified in the course of the study are:

### 6.1.1 Construction Phase

- Displacement of certain priority avifaunal species due to disturbance associated with the construction of the Eskom-side substations, associated 132kV overhead lines, the MTS and associated 400kV LILO overhead lines.
- Displacement of certain priority avifaunal species due to habitat transformation associated with the construction of the Eskom-side substations, associated 132kV overhead lines, the MTS and associated 400kV LILO overhead lines.

### 6.1.2 Operational Phase

- Mortality of certain avifaunal priority species due to collisions with the 132kV and 400kV LILO overhead lines.
- Mortality of certain avifaunal priority species due to electrocutions in the Eskom-side substations and in the MTS.
- Mortality of certain avifaunal priority species due to electrocutions on the 132kV overhead lines.

### 6.1.3 Decommissioning Phase

- Displacement of certain priority avifaunal species due to disturbance associated with the dismantling of the Eskom-side substations, associated 132kV overhead lines, the MTS and associated 400kV LILO overhead lines.

## 7 IMPACT ASSESSMENT

### 7.1 Construction phase

- 7.1.1 Displacement of certain priority avifaunal species due to disturbance associated with the construction of the Eskom-side substations, associated 132kV overhead lines, the MTS and associated 400kV LILO overhead lines.

Areas directly supporting project infrastructure will be cleared of vegetation, notably:

- Eskom-side substation foundations
- MTS substation foundations
- Overhead line support structure foundations
- Laydown area and other infrastructure (such as offices, internal roads etc.) associated with the MTS

Stripped topsoil will be stockpiled, backfilled, removed from site and/or spread on the site. Vegetation in and near the overhead line servitude and substation will be trimmed, and shrubs and trees will be removed to ensure sufficient clearance between vegetation and the overhead line. Support structure (pylon) foundations for overhead lines will be excavated and constructed. Structures will be assembled and erected on site, followed by the stringing of conductors. For the substation, trenching and ground grid conduit installation will be followed by installation of concrete foundations. Thereafter, substation equipment is assembled and installed. Gravel will be placed within the substation area, which will be fenced. Transportation of personnel, construction material and equipment to the site, and personnel away from the site will happen constantly during the construction phase. Existing service 'farm' roads will be used as far as possible. Where new access is required, an internal access road will be constructed. Vegetation will be cleared, the road will be graded and a suitable road surface material will be used.

The above-mentioned activities impact on birds through disturbance; this could lead to breeding failure if the disturbance happens during a critical part of the breeding cycle. Construction activities 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. Terrestrial species and other powerline priority avifaunal species breeding and roosting on the existing Hermes/Pluto 400kV overhead powerlines are most likely to be affected by displacement due to disturbance associated with construction activities. However, the displacement will be short-term and unlikely to continue beyond the construction phase. No White-backed Vulture breeding activity was recorded at the assessment site, and the vultures should be able to shift their roosting to another area in natural grassland habitat to the north for the duration of the construction phase.

The priority species with a medium to high likelihood of occurrence in the assessment area which could be affected by this impact, are the following:

- Black-winged Kite
- Gabar Goshawk
- Greater Kestrel
- Helmeted Guineafowl
- Lanner Falcon
- Northern Black Korhaan
- Pied Crow
- Spotted Eagle-Owl
- White-backed Vulture

#### 7.1.2 Displacement of certain priority avifaunal species due to habitat destruction associated with the construction of the Eskom-side substations, associated 132kV overhead lines, the MTS and associated 400kV LILO overhead lines.

The construction activities described under 7.1.1 could impact on birds breeding, foraging and roosting in or in close proximity of the proposed substations areas and the overhead powerlines through transformation of habitat, which could result in permanent displacement in the case of the substations. 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 substations is unavoidable. However, the total footprint of a substation is 4 ha (36 ha in the case of the MTS) which is small, and even the combined area of all the proposed substations to be thus transformed equals a maximum of 72 ha, which is still small compared to the available habitat in the broader area. Compared to the habitat transformation associated with the proposed PV solar arrays, it is still negligible.

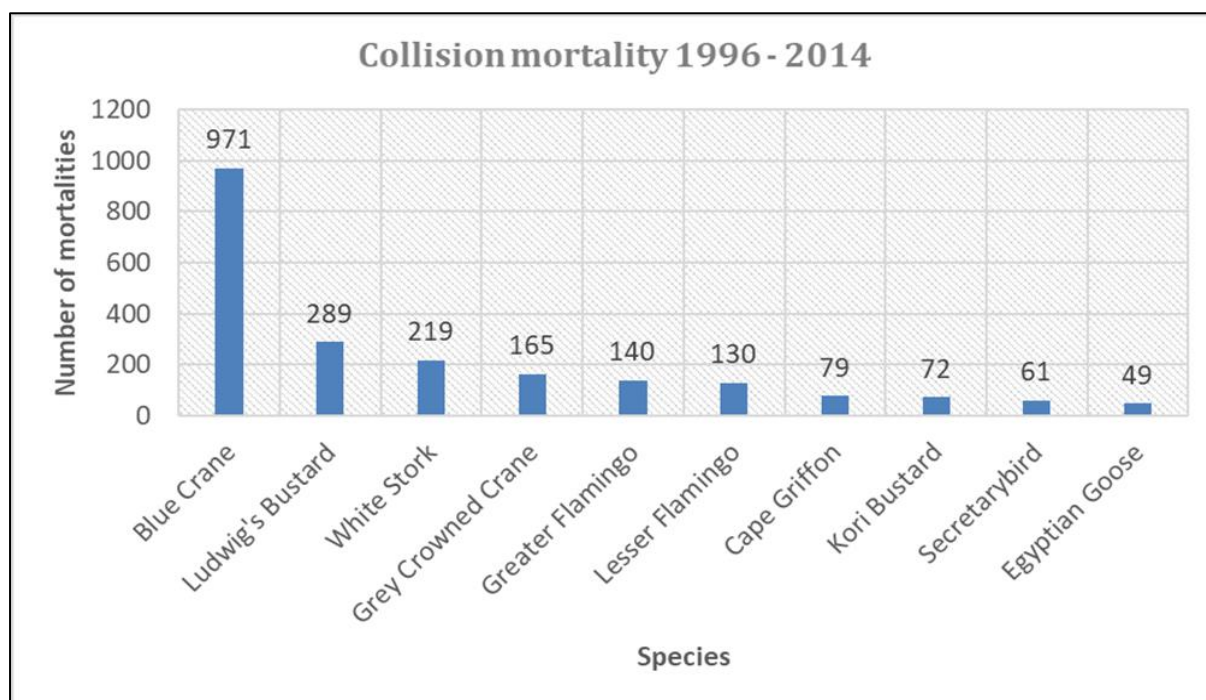
In the case of the overhead powerlines, the direct habitat transformation is limited to the pylon footprints and the narrow access road/track under the powerline. The habitat in the study area is relatively uniform from a bird perspective. The loss of habitat of a relatively small quantity of the natural habitat for priority species due to direct habitat transformation associated with the construction of the proposed overhead lines is thus fairly minimal.

## 7.2 Operational phase

### 7.2.1 Operational phase: Mortality of certain avifaunal priority species due to collisions with the 132kV and 400kV overhead lines

Collisions might be the biggest threat posed by powerlines 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 overhead lines (van Rooyen, 2004).

From incidental record keeping by the Endangered Wildlife Trust, it is possible to give a measure of what species are generally susceptible to powerline collisions in South Africa (see Figure 11 below).



**Figure 11: 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)**

There are many studies which prove that marking a line with PVC spiral type Bird Flight Diverters (BFDs) generally reduces 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). 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 *Anthropoides paradiseus*, 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 (*Neotis ludwigii*). 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).

With the exception of White-backed Vultures, none of the powerline priority species in the assessment area that could be impacted through collisions with the overhead powerlines are currently classified as threatened. In the case of White-backed Vultures, the collision threat is limited by the short length (~11



km in total) of the proposed overhead powerlines. The highest collision risk for the vultures would be if they the congregate around a carcass in the assessment area, which would be unlikely as the livestock will be largely displaced by solar PV arrays in the assessment area. The priority species with a medium to high likelihood of occurrence in the assessment area which could be affected by this impact, are the following:

- Black-headed Heron
- Egyptian Goose
- Hadada Ibis
- Northern Black Korhaan
- White-backed Vulture

#### 7.2.2 Operational phase: Mortality of certain avifaunal priority species due to electrocutions in the Eskom-side substations and in the MTS

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 (clearance) between live components and/or live and earthed components (van Rooyen 2004). The electrocution risk is largely determined by the design of the electrical hardware. Electrocutions within the proposed substations are possible, however, the likelihood of this impact on the more sensitive Red List priority species is remote, as these species are unlikely to regularly utilise the infrastructure within the substation yard for perching or roosting.

The priority species with a medium to high likelihood of occurrence in the assessment area which could be affected by this impact, are the following:

- Amur Falcon
- Black-headed Heron
- Black-winged Kite
- Common Buzzard
- Egyptian Goose
- Greater Kestrel
- Hadada Ibis
- Helmeted Guineafowl
- Lanner Falcon
- Lesser Kestrel
- Pied Crow
- Spotted Eagle-Owl

#### 7.2.3 Mortality of certain avifaunal priority species due to electrocutions on the 132kV overhead lines.

The existing 400kV Hermes/Pluto 1 and 2 overhead lines running through the assessment area do not pose a material risk of electrocution to birds, as the clearances between potentially lethal components are too big to bridge for even the largest birds. The same is expected to apply to the new 400 kV LILO lines.

However, there could be an electrocution risk to White-backed Vultures on the smaller proposed 132kV overhead lines, due to the smaller clearances between wires, unless a bird-friendly structure is used.

## Decommissioning phase

7.2.4 Displacement of certain priority avifaunal species due to disturbance associated with the dismantling of the Eskom-side substations, associated 132kV overhead lines, the MTS and associated 400kV LILO overhead lines.

The activities associated with the dismantling of the substations and associated overhead lines could impact on birds through disturbance; this could lead to breeding failure if the disturbance happens during a critical part of the breeding cycle. 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. Terrestrial species will have been largely displaced by the PV solar arrays, but other powerline priority avifaunal species breeding and roosting on the existing Hermes/Pluto 400kV overhead powerlines could potentially to be affected by displacement due to disturbance associated with dismantling activities. However, the displacement will be short-term and unlikely to continue beyond the decommissioning phase.

The priority species with a medium to high likelihood of occurrence in the assessment area which could be affected by this impact, are the following:

- Black-winged Kite
- Greater Kestrel
- Lanner Falcon
- Pied Crow
- White-backed Vulture

## 7.3 No-go option

The no-go option will result in no additional impacts on priority avifauna and will result in the ecological status quo being maintained, which will be to the advantage of the avifauna in the short term, but perhaps less so in the longer term, given the expected impact of climate change on avifauna in the longer term. No fatal flaws relating to the proposed substations and overhead lines were discovered during the investigations.

## 8 IMPACT RATING METHODOLOGY

Impacts criteria according to SRK's prescribed impact assessment methodology are presented below. The **significance** of an impact is defined as a combination of the **consequence** of the impact occurring, including possible irreversibility of impacts and/or loss of irreplaceable resources, and the **probability** that the impact will occur.

The criteria used to determine impact consequence are presented in the table below.

**Table 4: Criteria used to determine the consequence of the impact**

Rating	Definition of Rating	Score
<b>A. Extent</b> – the area (distance) over which the impact will be experienced		
Local	Confined to project area (e.g. the development site and immediate surrounds)	1
Regional	The region (e.g. municipality or Quaternary catchment)	2
(Inter) national	Nationally or beyond	3
<b>B. Intensity</b> – the magnitude of the impact in relation to the sensitivity of the receiving environment, taking into account the degree to which the impact may cause irreplaceable loss of resources		
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1

Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way	2
High	Site-specific and wider natural and/or social functions or processes are severely altered and/or irreplaceable resources <sup>3</sup> are lost	3
<b>C. Duration</b> – the timeframe over which the impact will be reversed		
Short-term	Up to 2 years	1
Medium-term	2 to 15 years	2
Long-term	More than 15 years or irreversible	3

The combined score of these three criteria corresponds to a **Consequence Rating**, as follows:

**Table 5: Method used to determine the consequence score**

<b>Combined Score (A+B+C)</b>	3 – 4	5	6	7	8 – 9
<b>Consequence Rating</b>	Very low	Low	Medium	High	Very high

Once the consequence was derived, the probability of the impact occurring was considered, using the probability classifications presented in the table below.

**Table 6: Probability classification**

<b>Probability</b> – the likelihood of the impact occurring	
Improbable	< 40% chance of occurring
Possible	40% - 70% chance of occurring
Probable	> 70% - 90% chance of occurring
Definite	> 90% chance of occurring

The overall **significance** of impacts was determined by considering consequence and probability using the rating system prescribed in the table below.

**Table 7: Impact significance ratings**

		<b>Probability</b>			
		Improbable	Possible	Probable	Definite
<b>Consequence</b>	Very Low	<b>INSIGNIFICANT</b>	<b>INSIGNIFICANT</b>	<b>VERY LOW</b>	<b>VERY LOW</b>
	Low	<b>VERY LOW</b>	<b>VERY LOW</b>	<b>LOW</b>	<b>LOW</b>
	Medium	<b>LOW</b>	<b>LOW</b>	<b>MEDIUM</b>	<b>MEDIUM</b>
	High	<b>MEDIUM</b>	<b>MEDIUM</b>	<b>HIGH</b>	<b>HIGH</b>
	Very High	<b>HIGH</b>	<b>HIGH</b>	<b>VERY HIGH</b>	<b>VERY HIGH</b>

Finally the impacts were also considered in terms of their status (positive or negative impact) and the confidence in the ascribed impact significance rating. The prescribed system for considering impacts status and confidence (in assessment) is laid out in the table below.

<sup>3</sup> Defined as important cultural or biological resource which occur nowhere else, and for which there are no substitutes.

**Table 8: Impact status and confidence classification**

<b>Status of impact</b>	
Indication whether the impact is adverse (negative) or beneficial (positive).	+ ve (positive – a ‘benefit’)
	– ve (negative – a ‘cost’)
<b>Confidence of assessment</b>	
The degree of confidence in predictions based on available information, SRK’s judgment and/or specialist knowledge.	Low
	Medium
	High

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

- **INSIGNIFICANT:** the potential impact is negligible and **will not** have an influence on the decision regarding the proposed activity/development.
- **VERY LOW:** the potential impact is very small and **should not** have any meaningful influence on the decision regarding the proposed activity/development.
- **LOW:** the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity/development.
- **MEDIUM:** the potential impact **should** influence the decision regarding the proposed activity/development.
- **HIGH:** the potential impact **will** affect the decision regarding the proposed activity/development.
- **VERY HIGH:** The proposed activity should only be approved under special circumstances.

Practicable mitigation and optimisation measures are recommended and impacts are rated in the prescribed way both without and with the assumed effective implementation of mitigation and optimisation measures. Mitigation and optimisation measures are either:

- **Essential:** measures that must be implemented and are non-negotiable; and
- **Best Practice:** recommended to comply with best practice, with adoption dependent on the proponent’s risk profile and commitment to adhere to best practice, and which must be shown to have been considered and sound reasons provided by the applicant if not implemented.

## **9 IMPACT RATING**

See Appendix D for the project-specific impact ratings associated with this application.

## **10 ENVIRONMENTAL MANAGEMENT PROGRAMME INPUTS**

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

## **11 CUMULATIVE IMPACTS**

For the purposes of this report, cumulative impacts are defined as ‘direct and indirect impacts that act together with existing or future potential impacts of other activities or proposed activities in the area / region that affect the same resources and / or receptors.

For the most part, cumulative effects or aspects thereof are too uncertain to be quantifiable, due mainly to a lack of data availability and accuracy. This is particularly true of cumulative effects arising from potential or future projects, the design or details of which may not be finalised or available and the direct and indirect impacts of which have not yet been assessed.

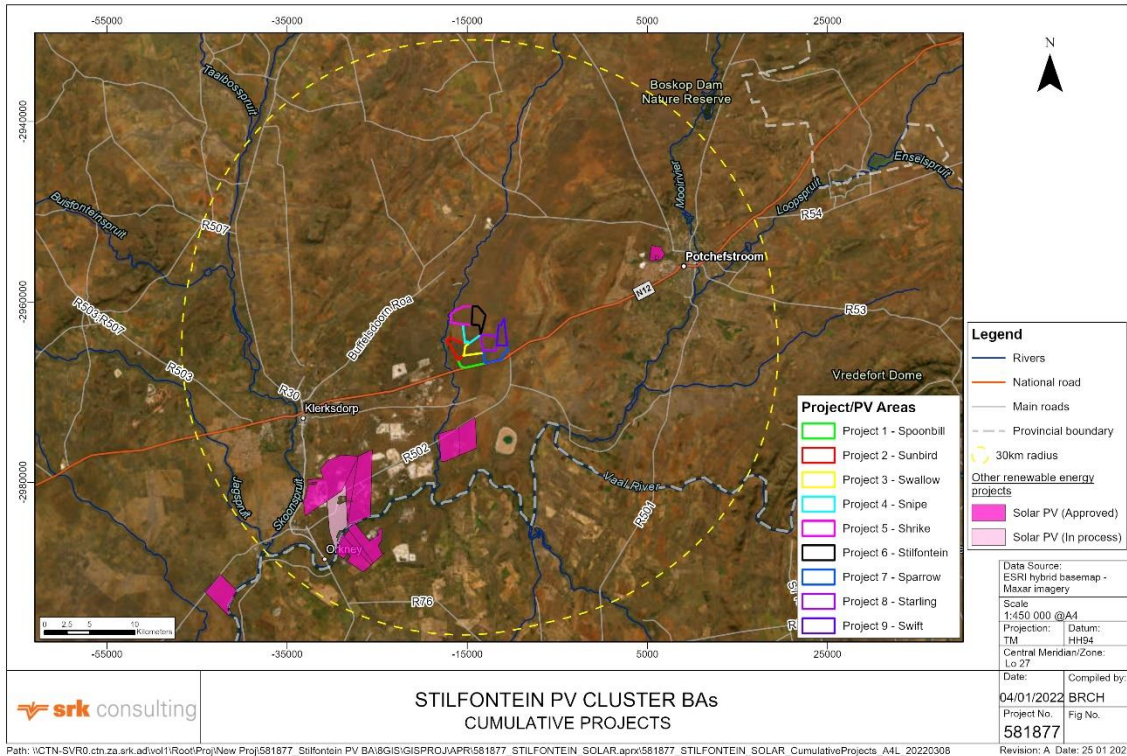
For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognised as important on the basis of scientific concerns and/or concerns of affected communities. From an avifaunal impact perspective, the cumulative impacts that are likely to be the most significant as far as grid connections for the planned renewable energy projects are concerned, are the following:

- Mortality of priority avifauna, specifically White-backed Vultures, due to electrocution on 132kV grid connection overhead lines
- Mortality of priority avifauna due to collisions with 132kV grid connection overhead lines

The renewable energy projects within a 30km radius around the Stilfontein PV Cluster facilities that were considered for purposes of cumulative impacts, are listed in Table 9 and shown in the map in Figure 12.

**Table 9: Renewable energy projects within a 30km radius around the Stilfontein PV Cluster facilities (Source: DFFE Q3 2022 REEA database)**

<b>Project</b>	<b>DFFE Reference</b>	<b>Capacity</b>	<b>EA Status</b>
Kabi Vaalkop PV Facility	12/12/20/2513/4/AM1	n/a	Approved
Kabi Vaalkop PV Facility	12/12/20/2513/4	75 MW	Approved
YMS Mineral Resources PV Plant	12/12/20/2629/AM1	20 MW	Approved
Buffels Solar PV 1	14/12/16/3/3/2/777	75 MW	Approved
Buffels Solar PV 2	14/12/16/3/3/2/778	100 MW	Approved
Orkney Solar PV	14/12/16/3/3/2/954/AM1	100 MW	Approved
Vaal River Solar 3 PV facility	12/12/20/2513/3/AM6	250 MW	Approved
Witkop Solar PV II	12/12/20/2507/2	61 MW	In process
Paleso Solar PV	14/12/16/3/3/1/2365	150 MW	Approved
Siyanda Solar PV	14/12/16/3/3/2/1/2369	150 MW	Approved



**Figure 12: Stilfontein Solar Facilities Cluster - cumulative projects (Source: DFFE Q3 2022 REEA database)**

- Mortality of priority avifauna, specifically White-backed Vultures, due to electrocution on 132kV grid connection overhead lines

The biggest threat to White-backed Vultures within the 30km radius around the proposed PV developments are bird-unfriendly 11/22kV reticulation lines and sub-transmission lines up to 132kV (Verdoorn 1996). The total length of existing reticulation and sub-transmission lines within the 30km radius is unknown but can safely be assumed to be in the hundreds of kilometres. Many of these lines could pose an electrocution risk to large raptors, and particularly vultures, given the fact that many lines may have been constructed before bird-friendly designs became the norm. However, if the proposed 132kV overhead lines at the proposed Stilfontein PV Cluster projects are designed to be bird-friendly, their cumulative impact will be **Negligible**.

- Mortality of priority avifauna due to collisions with 132kV grid connection overhead lines

The total length of existing reticulation and sub-transmission lines within the 30km radius around the Stilfontein PV Cluster is unknown but can safely be assumed to be in the hundreds of kilometres. Based on publicly available information, it is estimated that the combined length of the grid connections for the planned PV facilities within the 30km radius is unlikely to exceed 20km. The total length of the proposed grid connections corridors and LILO lines at the Stilfontein PV Cluster comes to ~11km. The combined contribution of the planned renewable energy projects' grid connections and the Stilfontein PV Cluster overhead lines to the cumulative collision risk posed to priority avifaunal species is **Low**. This is due to the short length of these planned overhead lines, and the already depleted state of the avifauna caused by the extensive habitat transformation linked to urban, agricultural and industrial development within the 30km radius.

## 12 FINAL SPECIALIST STATEMENT AND AUTHORISATION RECOMMENDATION

### 12.1 Statement and Reasoned Opinion

The assessment area and immediate environment are classified as Low and Medium sensitivity for terrestrial animals according to the Terrestrial Animal Species Theme of the National Web-Based Environmental Screening Tool. The medium sensitivity classification is not linked to avifauna, but rather terrestrial sensitivity since no specific avifaunal features or buffer sensitivities were identified according to the database.

The virtual absence of SCC was confirmed during the project site surveys<sup>4</sup>. However, White-backed Vulture (SA and Global Status Critically Endangered) was recorded in the assessment area roosting on the high voltage lines running through the site. This was the only SCC recorded during surveys, but based on the criteria in the Protocol, the study area should therefore be classified as **High** sensitivity due to the presence of an SCC. However, the potential impact on White-backed Vultures can be effectively mitigated, primarily through the use of bird-friendly designs for the proposed 132kV power lines, and the marking of the overhead lines with Bird Flight Diverters.

It is therefore recommended that the project is authorised, on condition that the proposed mitigation measures as detailed in the Impact Tables and the EMPr (Appendix D) are strictly implemented.

---

<sup>4</sup> As defined in the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020), namely listed on the:

- IUCN Red List of Threatened Species or
- South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable

### 13 REFERENCES

- ALONSO, J. A. AND ALONSO, J. C. 1999 Collision of birds with overhead transmission lines in Spain. Pp. 57–82 in Ferrer, M. and Janss, G. F. E., eds. Birds and power lines: Collision, electrocution and breeding. Madrid, Spain: Quercus.Google Scholar
- BARRIENTOS R, PONCE C, PALACIN C, MARTÍN CA, MARTÍN B, ET AL. 2012. Wire marking results in a small but significant reduction in avian mortality at power lines: A BACI Designed Study. PLoS ONE 7(3): e32569. Doi:10.1371/journal.pone.0032569.
- BARRIENTOS, R., ALONSO, J.C., PONCE, C., PALACÍN, C. 2011. Meta-Analysis of the effectiveness of marked wire in reducing avian collisions with power lines. Conservation Biology 25: 893-903.
- BERNARDINO, J., BEVANGER, K., BARRIENTOS, R., DWYER, J.F. MARQUES, A.T., MARTINS, R.C., SHAW, J.M., SILVA, J.P., MOREIRA, F. 2018. Bird collisions with power lines: State of the art and priority areas for research. <https://doi.org/10.1016/j.biocon.2018.02.029>. Biological Conservation 222 (2018) 1 – 13.
- BIRDLIFE INTERNATIONAL (202) Country profile: South Africa. Available from <http://www.birdlife.org/datazone/country/south-africa>.
- ENDANGERED WILDLIFE TRUST. 2014. Central incident register for powerline incidents. Unpublished data.
- HARRISON, J.A., ALLAN, D.G., UNDERHILL, L.G., HERREMANS, M., TREE, A.J., PARKER, V & BROWN, C.J. (eds). 1997. The atlas of southern African birds. Vol 1 & 2. BirdLife South Africa, Johannesburg.
- HOCKEY P.A.R., DEAN W.R.J., AND RYAN P.G. 2005. Robert's Birds of Southern Africa, seventh edition. Trustees of the John Voelcker Bird Book Fund, Cape Town.
- JENKINS, A.R., SMALLIE, J.J. & DIAMOND, M. 2010. Avian collisions with power lines: a global review of causes and mitigation with a South African perspective. Bird Conservation International 20: 263-278.
- KOOPS, F.B.J. & DE JONG, J. 1982. Vermindering van draadslachtoffers door markering van hoogspanningsleidingen in de omgeving van Heerenveen. Electrotechniek 60 (12): 641 – 646.
- MARNEWICK, M.D., RETIEF E.F., THERON N.T., WRIGHT D.R., ANDERSON T.A. 2015. Important Bird and Biodiversity Areas of South Africa. Johannesburg: Birdlife South Africa.
- MARTIN, G., SHAW, J., SMALLIE J. & DIAMOND, M. 2010. Bird's eye view – How birds see is key to avoiding power line collisions. Eskom Research Report. Report Nr: RES/RR/09/31613.
- MARTIN, G., SHAW, J., SMALLIE J. & DIAMOND, M. 2010. Bird's eye view – How birds see is key to avoiding powerline collisions. Eskom Research Report. Report Nr: RES/RR/09/31613.
- MUCINA. L. & RUTHERFORD, M.C. (Eds) 2006. The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.
- SHAW, J.M. 2013. Powerline collisions in the Karoo: Conserving Ludwig's Bustard. Unpublished PhD thesis. Percy FitzPatrick Institute of African Ornithology, Department of Biological Sciences, Faculty of Science University of Cape Town May 2013.
- SHAW, J.M., PRETORIUS, M.D., GIBBONS, B., MOHALE, O., VISAGIE, R., LEEUWNER, J.L.& RYAN, P.G. 2017. The effectiveness of line markers in reducing powerline collisions of large terrestrial birds at De Aar, Northern Cape. Eskom Research, Testing and Development. Research Report. RES/RR/17/1939422.
- SPORER, M.K., DWYER, J.F., GERBER, B.D, HARNESS, R.E, PANDEY, A.K. 2013. Marking Power Lines to Reduce Avian Collisions Near the Audubon National Wildlife Refuge, North Dakota. Wildlife Society Bulletin 37(4):796–804; 2013; DOI: 10.1002/wsb.329.
- TAYLOR, M.R., PEACOCK F, & WANLESS R.W (EDS.) 2015. The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. BirdLife South Africa, Johannesburg, South Africa.
- VAN ROOYEN, C.S. 2004. The Management of Wildlife Interactions with overhead lines. In: The fundamentals and practice of Overhead Line Maintenance (132kV and above), pp217-245. Eskom Technology, Services International, Johannesburg.
- VERDOORN, G.H. 1996. Mortality of Cape Griffons *Gyps coprotheres* and African Whitebacked Vultures *Pseudogyps africanus* on 88kV and 132kV powerlines in Western Transvaal, South Africa, and mitigation measures to prevent future problems. Proceedings of the 2<sup>nd</sup> International Conference on Raptors: Urbino (Italy), Oct. 2-5, 1996.



## APPENDIX A – SPECIALIST EXPERTISE

---

### Curriculum vitae: Chris van Rooyen

Profession/Specialisation	:	Avifaunal Specialist
Highest Qualification	:	BA LLB
Nationality	:	South African
Years of experience	:	25 years

### Key Experience

Chris van Rooyen has twenty-five years' experience in the assessment of avifaunal interactions with industrial infrastructure. He was employed by the Endangered Wildlife Trust as head of the Eskom-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 consulted in South Africa, Namibia, Botswana, Lesotho, New Zealand, Texas, New Mexico and Florida. He also has extensive project management experience and he has received several management awards from Eskom for his work in the Eskom-EWT Strategic Partnership. He is the author and/or co-author of 17 conference papers, co-author of two book chapters, several research reports and the current best practice guidelines for avifaunal monitoring at wind farm sites. He has completed around 130 power line assessments; and has to date been employed as specialist avifaunal consultant on more than 50 renewable energy generation projects. He has also conducted numerous risk assessments on existing power lines infrastructure. He also works outside the electricity industry and he has done a wide range of bird impact assessment studies associated with various residential and industrial developments. He serves on the Birds and Wind Energy Specialist Group which was formed in 2011 to serve as a liaison body between the ornithological community and the wind industry.

### Key Project Experience

#### **Bird Impact Assessment Studies and avifaunal monitoring for wind-powered generation facilities:**

1. Eskom Klipheuwel Experimental Wind Power Facility, Western Cape
2. Mainstream Wind Facility Jeffreys Bay, Eastern Cape (EIA and monitoring)
3. Biotherm, Swellendam, (Excelsior), Western Cape (EIA and monitoring)
4. Biotherm, Napier, (Matjieskloof), Western Cape (pre-feasibility)
5. Windcurrent SA, Jeffreys Bay, Eastern Cape (2 sites) (EIA and monitoring)
6. Caledon Wind, Caledon, Western Cape (EIA)
7. Innowind (4 sites), Western Cape (EIA)
8. Renewable Energy Systems (RES) Oyster Bay, Eastern Cape (EIA and monitoring)
9. Oelsner Group (Kerriefontein), Western Cape (EIA)
10. Oelsner Group (Langefontein), Western Cape (EIA)
11. InCa Energy, Vredendal Wind Energy Facility Western Cape (EIA)
12. Mainstream Loeriesfontein Wind Energy Facility (EIA and monitoring)
13. Mainstream Noupoot Wind Energy Facility (EIA and monitoring)
14. Biotherm Port Nolloth Wind Energy Facility (Monitoring)
15. Biotherm Laingsburg Wind Energy Facility (EIA and monitoring)
16. Langhoogte Wind Energy Facility (EIA)
17. Vleesbaai Wind Energy Facility (EIA and monitoring)
18. St. Helena Bay Wind Energy Facility (EIA and monitoring)
19. Electrawind, St Helena Bay Wind Energy Facility (EIA and monitoring)
20. Electrawind, Vredendal Wind Energy Facility (EIA)
21. SAGIT, Langhoogte and Wolseley Wind Energy facilities
22. Renosterberg Wind Energy Project – 12-month preconstruction avifaunal monitoring project
23. De Aar – North (Mulilo) Wind Energy Project – 12-month preconstruction avifaunal monitoring project
24. De Aar – South (Mulilo) Wind Energy Project – 12-month bird monitoring
25. Namies – Aggenys Wind Energy Project – 12-month bird monitoring
26. Pofadder – Wind Energy Project – 12-month bird monitoring
27. Dwarsrug Loeriesfontein – Wind Energy Project – 12-month bird monitoring
28. Waaihoek – Utrecht Wind Energy Project – 12-month bird monitoring
29. Amathole – Butterworth Utrecht Wind Energy Project – 12-month bird monitoring & EIA specialist
30. Phezukomoya and San Kraal Wind Energy Projects 12-month bird monitoring & EIA specialist study

(Innowind)

31. Beaufort West Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mainstream)
32. Leeuwdraai Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mainstream)
33. Sutherland Wind Energy Facility 12-month bird monitoring (Mainstream)
34. Maralla Wind Energy Facility 12-month bird monitoring & EIA specialist study (Biotherm)
35. Esizayo Wind Energy Facility 12-month bird monitoring & EIA specialist study (Biotherm)
36. Humansdorp Wind Energy Facility 12-month bird monitoring & EIA specialist study (Cennergi)
37. Aletta Wind Energy Facility 12-month bird monitoring & EIA specialist study (Biotherm)
38. Eureka Wind Energy Facility 12-month bird monitoring & EIA specialist study (Biotherm)
39. Makambako Wind Energy Facility (Tanzania) 12-month bird monitoring & EIA specialist study (Windlab)
40. R355 Wind Energy Facility 12-month bird monitoring (Mainstream)
41. Groenekloof Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mulilo)
42. Tsitsikamma Wind Energy Facility 24-months post-construction monitoring (Cennergi)
43. Noupoot Wind Energy Facility 24-months post-construction monitoring (Mainstream)
44. Kokerboom Wind Energy Facility 12-month bird monitoring & EIA specialist study (Business Venture Investments)
45. Kuruman Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mulilo)
46. Dassieklip Wind Energy Facility 3 years post-construction monitoring (Biotherm)
47. Loeriesfontein 2 Wind Energy Facility 2 years post-construction monitoring (Mainstream)
48. Khobab Wind Energy Facility 2 years post-construction monitoring (Mainstream)
49. Excelsior Wind Energy Facility 18 months construction phase monitoring (Biotherm)
50. Boesmansberg Wind Energy Facility 12-months pre-construction bird monitoring (juwi)
51. Mañhica Wind Energy Facility, Mozambique, 12-months pre-construction monitoring (Windlab)
52. Kwagga Wind Energy Facility, Beaufort West, 12-months pre-construction monitoring (ABO)
53. Pienaarspoort Wind Energy Facility, Touws River, Western Cape, 12-months pre-construction monitoring (ABO).
54. Koup 1 and 2 Wind Energy Facilities, Beaufort West, Western Cape, 12 months pre-construction monitoring (Genesis Eco-energy)
55. Duiker Wind Energy Facility, Vredendal, Western Cape 12 months pre-construction monitoring (ABO)
56. Perdekraal East Wind Energy Facility, Touws River, Western Cape, 18 months construction phase monitoring (Mainstream).
57. Swellendam Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (Veld Renewables)
58. Lombardskraal Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (Enertrag SA)
59. Mainstream Roan 1 & Heuweltjies Wind Energy Facilities, Western Cape, 12-month pre-construction monitoring (Mainstream)
60. Great Karoo Wind Energy Facility, Northern Cape, 12-month pre-construction monitoring (African Green Ventures).
61. Mpumalanga & Gauteng Wind and Hybrid Energy Facilities (6x), pre-construction monitoring (Enertrag SA)
62. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (Enertrag SA)
63. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (ACED)
64. Nanibees North & South Wind Energy Facilities, Northern Cape, Screening Report (juwi)
65. Sutherland Wind Energy Facilities, Northern Cape, Screening Report (WKN Windcurrent)
66. Pofadder Wind Energy Facility, Northern Cape, Screening Report (Atlantic Energy)
67. Haga Wind Energy Facility, Eastern Cape, Amendment Report (WKN Windcurrent)
68. Banken Wind Energy Facility, Northern Cape, Screening Report (Atlantic Energy)
69. Hartebeest Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (juwi).

#### **Bird Impact Assessment Studies for Solar Energy Plants:**

1. Concentrated Solar Power Plant, Upington, Northern Cape.
2. Globeleq De Aar and Droogfontein Solar PV Pre- and Post-construction avifaunal monitoring
3. JUWI Kronos PV project, Copperton, Northern Cape
4. Sand Draai CSP project, Groblershoop, Northern Cape
5. Biotherm Helena PV Project, Copperton, Northern Cape
6. Biotherm Letsiao CSP Project, Aggeneys, Northern Cape
7. Biotherm Enamandla PV Project, Aggeneys, Northern Cape
8. Biotherm Sendawo PV Project, Vryburg, North-West

9. Biotherm Tlisitseng PV Project, Lichtenburg, North-West
10. JUWI Hotazel Solar Park Project, Hotazel, Northern Cape
11. Namakwa Solar Project, Aggeneys, Northern Cape
12. Brypaal Solar Power Project, Kakamas, Northern Cape
13. ABO Vryburg 1,2,3 Solar PV Project, Vryburg, North-West
14. Scatec Solar Kenhardt PV 4, PV 5 and PV6 Projects, Kenhardt, Northern Cape
15. NamPower CSP Facility near Arandis, Namibia
16. Dayson Klip PV Facility near Upington, Northern Cape
17. Geelkop PV Facility near Upington, Northern Cape
18. Oya PV Facility, Ceres, Western Cape
19. Vrede and Rondawel PV Facilities, Free State
20. Veroniva Ceres PV Facilities, Western Cape
21. Leeudoringstad PV Facility, North-West

**Bird Impact Assessment Studies for the following overhead line projects:**

1. Chobe 33kV Distribution line
2. Athene – Umfolozi 400kV
3. Beta-Delphi 400kV
4. Cape Strengthening Scheme 765kV
5. Flurian-Louis-Trichardt 132kV
6. Ghanzi 132kV (Botswana)
7. Ikaros 400kV
8. Matimba-Witkop 400kV
9. Naboomspruit 132kV
10. Tabor-Flurian 132kV
11. Windhoek – Walvisbaai 220 kV (Namibia)
12. Witkop-Overysse 132kV
13. Breyten 88kV
14. Adis-Phoebus 400kV
15. Dhuva-Janus 400kV
16. Perseus-Mercury 400kV
17. Gravelotte 132kV
18. Ikaros 400 kV
19. Khanye 132kV (Botswana)
20. Moropule – Thamaga 220 kV (Botswana)
21. Parys 132kV
22. Simplon –Everest 132kV
23. Tutuka-Alpha 400kV
24. Simplon-Der Brochen 132kV
25. Big Tree 132kV
26. Mercury-Ferrum-Garona 400kV
27. Zeus-Perseus 765kV
28. Matimba B Integration Project
29. Caprivi 350kV DC (Namibia)
30. Gerus-Mururani Gate 350kV DC (Namibia)
31. Mmamabula 220kV (Botswana)
32. Steenberg-Der Brochen 132kV
33. Venetia-Paradise T 132kV
34. Burgersfort 132kV
35. Majuba-Umfolozi 765kV
36. Delta 765kV Substation
37. Braamhoek 22kV
38. Steelpoort Merensky 400kV
39. Mmamabula Delta 400kV
40. Delta Epsilon 765kV
41. Gerus-Zambezi 350kV DC Interconnector: Review of proposed avian mitigation measures for the Okavango and Kwando River crossings
42. Giyani 22kV Distribution line

43. Liqhobong-Kao 132/11kV distribution power line, Lesotho
44. 132kV Leslie – Wildebeest distribution line
45. A proposed new 50 kV Spoornet feeder line between Sishen and Saldanha
46. Cairns 132kv substation extension and associated power lines
47. Pimlico 132kv substation extension and associated power lines
48. Gyani 22kV
49. Matafin 132kV
50. Nkomazi\_Fig Tree 132kV
51. Pebble Rock 132kV
52. Reddersburg 132kV
53. Thaba Combine 132kV
54. Nkomati 132kV
55. Louis Trichardt – Musina 132kV
56. Endicot 44kV
57. Apollo Lepini 400kV
58. Tarlton-Spring Farms 132kV
59. Kuschke 132kV substation
60. Bendstore 66kV Substation and associated lines
61. Kuiseb 400kV (Namibia)
62. Gyani-Malamulele 132kV
63. Watershed 132kV
64. Bakone 132kV substation
65. Eerstegoud 132kV LILO lines
66. Kumba Iron Ore: SWEP – Relocation of Infrastructure
67. Kudu Gas Power Station: Associated power lines
68. Steenberg Booyendal 132kV
69. Toulon Pumps 33kV
70. Thabatshipi 132kV
71. Witkop-Silica 132kV
72. Bakubung 132kV
73. Nelsriver 132kV
74. Rethabiseng 132kV
75. Tilburg 132kV
76. GaKgapane 66kV
77. Knobel Gilead 132kV
78. Bochum Knobel 132kV
79. Madibeng 132kV
80. Witbank Railway Line and associated infrastructure
81. Spencer NDP phase 2 (5 lines)
82. Akanani 132kV
83. Hermes-Dominion Reefs 132kV
84. Cape Pensinsula Strengthening Project 400kV
85. Magalakwena 132kV
86. Benfiosa 132kV
87. Dithabaneng 132kV
88. Taunus Diepkloof 132kV
89. Taunus Doornkop 132kV
90. Tweedracht 132kV
91. Jane Furse 132kV
92. Majeje Sub 132kV
93. Tabor Louis Trichardt 132kV
94. Riversong 88kV
95. Mamatsekele 132kV
96. Kabokweni 132kV
97. MDPP 400kV Botswana
98. Marble Hall NDP 132kV
99. Bokmakiere 132kV Substation and LILO lines
100. Styldrift 132kV
101. Taunus – Diepkloof 132kV
102. Bighorn NDP 132kV

103. Waterkloof 88kV
104. Camden – Theta 765kV
105. Dhuva – Minerva 400kV Diversion
106. Lesedi –Grootpan 132kV
107. Waterberg NDP
108. Bulgerivier – Dorset 132kV
109. Bulgerivier – Toulon 132kV
110. Nokeng-Fluorspar 132kV
111. Mantsole 132kV
112. Tshilamba 132kV
113. Thabamooopo – Tshebela – Nhlovuko 132kV
114. Arthurseat 132kV
115. Borutho 132kV MTS
116. Volspruit - Potgietersrus 132kV
117. Neotel Optic Fibre Cable Installation Project: Western Cape
118. Matla-Glockner 400kV
119. Delmas North 44kV
120. Houwhoek 11kV Refurbishment
121. Clau-Clau 132kV
122. Ngwedi-Silwerkrans 134kV
123. Nieuwehoop 400kV walk-through
124. Booyesdal 132kV Switching Station
125. Tarlton 132kV
126. Medupi – Witkop 400kV walk-through
127. Germiston Industries Substation
128. Sekgame 132kV
129. Botswana – South Africa 400kV Transfrontier Interconnector
130. Syferkuil – Rampheri 132kV
131. Queens Substation and associated 132kV powerlines
132. Oranjemonnd 400kV Transmission line
133. Aries – Helios – Juno walk-down
134. Kuruman Phase 1 and 2 Wind Energy facilities 132kV Grid connection
135. Transnet Thaba 132kV

**Bird Impact Assessment Studies for the following residential and industrial developments:**

1. Lizard Point Golf Estate
2. Lever Creek Estates
3. Leloko Lifestyle Estates
4. Vaaloewers Residential Development
5. Clearwater Estates Grass Owl Impact Study
6. Somerset Ext. Grass Owl Study
7. Proposed Three Diamonds Trading Mining Project (Portion 9 and 15 of the Farm Blesbokfontein)
8. N17 Section: Springs to Leandra – “Borrow Pit 12 And Access Road On (Section 9, 6 And 28 Of the Farm Winterhoek 314 Ir)
9. South African Police Services Gauteng Radio Communication System: Portion 136 Of the Farm 528 Jq, Lindley.
10. Report for the proposed upgrade and extension of the Zeekoegat Wastewater Treatment Works, Gauteng.
11. Bird Impact Assessment for Portion 265 (a portion of Portion 163) of the farm Rietfontein 189-JR, Gauteng.
12. Bird Impact Assessment Study for Portions 54 and 55 of the Farm Zwartkop 525 JQ, Gauteng.
13. Bird Impact Assessment Study Portions 8 and 36 of the Farm Nooitgedacht 534 JQ, Gauteng.
14. Shumba’s Rest Bird Impact Assessment Study
15. Randfontein Golf Estate Bird Impact Assessment Study
16. Zilkaatsnek Wildlife Estate
17. Regenstein Communications Tower (Namibia)
18. Avifaunal Input into Richards Bay Comparative Risk Assessment Study
19. Maquasa West Open Cast Coal Mine

20. Glen Erasmia Residential Development, Kempton Park, Gauteng
21. Bird Impact Assessment Study, Weltevreden Mine, Mpumalanga
22. Bird Impact Assessment Study, Olifantsvlei Cemetery, Johannesburg
23. Camden Ash Disposal Facility, Mpumalanga
24. Lindley Estate, Lanseria, Gauteng
25. Proposed open cast iron ore mine on the farm Lylyveld 545, Northern Cape
26. Avifaunal monitoring for the Sishen Mine in the Northern Cape as part of the EMPr requirements
27. Steelpoort CNC Bird Impact Assessment Study

#### Professional affiliations

I work under the supervision of and in association with Albert Froneman (MSc Conservation Biology) (SACNASP Zoological Science Registration number 400177/09) as stipulated by the Natural Scientific Professions Act 27 of 2003.

### Curriculum vitae: Albert Froneman

Profession/Specialisation : Avifaunal Specialist  
Highest Qualification : MSc (Conservation Biology)  
Nationality : South African  
Years of experience : 20 years

### Key Qualifications

Albert Froneman (Pr.Sci.Nat) has more than 22 years' experience in the management of avifaunal interactions with industrial infrastructure. He holds a M.Sc. degree in Conservation Biology from the University of Cape Town. He managed the Airports Company South Africa (ACSA) – Endangered Wildlife Trust Strategic Partnership from 1999 to 2008 which has been internationally recognized for its achievements in addressing airport wildlife hazards in an environmentally sensitive manner at ACSA's airports across South Africa. Albert is recognized worldwide as an expert in the field of bird hazard management on airports and has worked in South Africa, Swaziland, Botswana, Namibia, Kenya, Israel, and the USA. He has served as the vice chairman of the International Bird Strike Committee and has presented various papers at international conferences and workshops. At present he is consulting to ACSA with wildlife hazard management on all their airports. He also an accomplished specialist ornithological consultant outside the aviation industry and has completed a wide range of bird impact assessment studies. He has co-authored many avifaunal specialist studies and pre-construction monitoring reports for proposed renewable energy developments across South Africa. He also has vast experience in using Geographic Information Systems to analyse and interpret avifaunal data spatially and derive meaningful conclusions. Since 2009 Albert has been a registered Professional Natural Scientist (reg. nr 400177/09) with The South African Council for Natural Scientific Professions, specialising in Zoological Science.

### Key Project Experience

#### **Renewable Energy Facilities –avifaunal monitoring projects in association with Chris van Rooyen Consulting**

1. Jeffrey's Bay Wind Farm – 12-months preconstruction avifaunal monitoring project
2. Oysterbay Wind Energy Project – 12-months preconstruction avifaunal monitoring project
3. Ubuntu Wind Energy Project near Jeffrey's Bay – 12-months preconstruction avifaunal monitoring project
4. Bana-ba-Pifu Wind Energy Project near Humansdorp – 12-months preconstruction avifaunal monitoring project
5. Excelsior Wind Energy Project near Caledon – 12-months preconstruction avifaunal monitoring project
6. Laingsburg Spitskopvlakte Wind Energy Project – 12-months preconstruction avifaunal monitoring project
7. Loeriesfontein Wind Energy Project Phase 1, 2 & 3 – 12-months preconstruction avifaunal monitoring project
8. Noupoot Wind Energy Project – 12-months preconstruction avifaunal monitoring project
9. Vleesbaai Wind Energy Project – 12-months preconstruction avifaunal monitoring project
10. Port Nolloth Wind Energy Project – 12-months preconstruction avifaunal monitoring project
11. Langhoogte Caledon Wind Energy Project – 12-months preconstruction avifaunal monitoring project
12. Lunsklip – Stilbaai Wind Energy Project – 12-months preconstruction avifaunal monitoring project
13. Indwe Wind Energy Project – 12-months preconstruction avifaunal monitoring project
14. Zeeland St Helena bay Wind Energy Project – 12-months preconstruction avifaunal monitoring project
15. Wolseley Wind Energy Project – 12-months preconstruction avifaunal monitoring project
16. Renosterberg Wind Energy Project – 12-months preconstruction avifaunal monitoring project
17. De Aar – North (Mulilo) Wind Energy Project – 12-months preconstruction avifaunal monitoring project (2014)
18. De Aar – South (Mulilo) Wind Energy Project – 12-months bird monitoring
19. Namies – Aggenys Wind Energy Project – 12-months bird monitoring
20. Pofadder – Wind Energy Project – 12-months bird monitoring
21. Dwarsrug Loeriesfontein – Wind Energy Project – 12-months bird monitoring
22. Waaihoek – Utrecht Wind Energy Project – 12-months bird monitoring
23. Amathole – Butterworth Utrecht Wind Energy Project – 12-months bird monitoring & EIA specialist study
24. De Aar and Droogfontein Solar PV Pre- and Post-construction avifaunal monitoring
25. Makambako Wind Energy Facility (Tanzania) 12-month bird monitoring & EIA specialist study (Windlab)
26. R355 Wind Energy Facility 12-month bird monitoring (Mainstream)
27. Groenekloof Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mulilo)
28. Tsitsikamma Wind Energy Facility 24-months post-construction monitoring (Cennergi)
29. Noupoot Wind Energy Facility 24-months post-construction monitoring (Mainstream)
30. Kokerboom Wind Energy Facility 12-month bird monitoring & EIA specialist study (Business Venture Investments)
31. Kuruman Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mulilo)

32. Mañhica Wind Energy Facility 12-month bird monitoring & EIA specialist study (Windlab)
33. Kwagga Wind Energy Facility, Beaufort West, 12-months pre-construction monitoring (ABO)
34. Pienaarspoort Wind Energy Facility, Touws River, Western Cape, 12-months pre-construction monitoring (ABO). Koup 1 and 2 Wind Energy Facilities, Beaufort West, Western Cape, 12 months pre-construction monitoring (Genesis Eco-energy)
35. Duiker Wind Energy Facility, Vredendal, Western Cape 12 months pre-construction monitoring (ABO)
36. Perdekraal East Wind Energy Facility, Touws River, Western Cape, 18 months construction phase monitoring (Mainstream).
37. Swellendam Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (Veld Renewables)
38. Lombardskraal Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (Enertrag SA)
39. Mainstream Roan 1 & Heuweltjies Wind Energy Facilities, Western Cape, 12-month pre-construction monitoring (Mainstream)
40. Great Karoo Wind Energy Facility, Northern Cape, 12-month pre-construction monitoring (African Green Ventures).
41. Mpumalanga & Gauteng Wind and Hybrid Energy Facilities (6x), pre-construction monitoring (Enertrag SA)
42. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (Enertrag SA)
43. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (ACED)
44. Nanibees North & South Wind Energy Facilities, Northern Cape, Screening Report (juwi)
45. Sutherland Wind Energy Facilities, Northern Cape, Screening Report (WKN Windcurrent)
46. Pofadder Wind Energy Facility, Northern Cape, Screening Report (Atlantic Energy)
47. Haga Haga Wind Energy Facility, Eastern Cape, Amendment Report (WKN Windcurrent)
48. Banken Wind Energy Facility, Northern Cape, Screening Report (Atlantic Energy)
49. Hartebeest Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (juwi).

**Bird Impact Assessment studies and / or GIS analysis:**

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



24. Swaziland Civil Aviation Authority – Sikhuphe International Airport – Bird hazard management assessment
25. Avifaunal monitoring – extension of Specialist Study – SRVM Volspruit Mining project – Mokopane Limpopo Province
26. Avifaunal Specialist Study – Rooikat Hydro Electric Dam – Hope Town, Northern Cape
27. The Stewards Pan Reclamation Project – Bird Impact Assessment study
28. Airports Company South Africa – Avifaunal Specialist Consultant – Airport Bird and Wildlife Hazard Mitigation

#### **Geographic Information System analysis & maps**

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

#### **Professional affiliations**

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

**APPENDIX B: DECLARATION**



**environmental affairs**

Department:  
Environmental Affairs  
REPUBLIC OF SOUTH AFRICA

**DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH**

File Reference Number:	(For official use only)
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

**PROJECT TITLE**

Proposed development the Stilfontein Cluster, North West Province, with separate EA applications for:

- Nine Photovoltaic (PV) facilities and associated infrastructure: Spoonbill, Sunbird, Swallow, Snipe, Shrike, Stilfontein, Sparrow, Starling and Swift;
- Three collector substations and associated infrastructure: Voelnessie A, Voelnessie B, Voelnessie C; and
- One Main Transmission Substation and associated infrastructure.

**Kindly note the following:**

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at <https://www.environment.gov.za/documents/forms>.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

**Departmental Details**

**Postal address:**  
Department of Environmental Affairs  
Attention: Chief Director: Integrated Environmental Authorisations  
Private Bag X447  
Pretoria  
0001

**Physical address:**  
Department of Environmental Affairs  
Attention: Chief Director: Integrated Environmental Authorisations  
Environment House  
473 Steve Biko Road  
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:  
Email: [EIAdmin@environment.gov.za](mailto:EIAdmin@environment.gov.za)

Details of Specialist, Declaration and Undertaking Under Oath

**1. SPECIALIST INFORMATION**

Specialist Company Name:	Afrimage Photography (Pty) Ltd t/a Chris van Rooyen Consulting		
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	
Specialist name:	Chris van Rooyen		
Specialist Qualifications:	BA LLB		
Professional affiliation/registration:	I work under the supervision of and in association with Albert Froneman (MSc Conservation Biology) (SACNASP Zoological Science Registration number 400177/09) as stipulated by the Natural Scientific Professions Act 27 of 2003.		
Physical address:	6 Pladda Drive, Plettenberg Bay, 2122		
Postal address:	P.O. Box 2676, Fourways		
Postal code:	2055		
Telephone:	0824549570		
E-mail:	Vanrooyen.chris@gmail.com		

**2. DECLARATION BY THE SPECIALIST**

I, Christiaan Stephanus van Rooyen, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

  
 \_\_\_\_\_  
 Signature of the Specialist

Chris van Rooyen Consulting  
 \_\_\_\_\_

Name of Company:

05 May 2022  
 \_\_\_\_\_

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION


I, Christiaan Stephanus van Rooyen, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

  
\_\_\_\_\_  
Signature of the Specialist

Afrimage Photography (Pty) Ltd  
\_\_\_\_\_  
Name of Company

10 May 2022  
\_\_\_\_\_  
Date

Date

  
7132220-5 SGT  
NGUBOMB  
\_\_\_\_\_  
Signature of the Commissioner of Oaths

2022-05-10  
\_\_\_\_\_  
Date



**APPENDIX C1: SPECIES LIST FOR BROADER AREA**

Group	Species name	Taxonomic name	Full protocol	Ad hoc protocol	Global status	Regional status
	Bokmakierie	<i>Telophorus zeylonus</i>	37.08	4.55	-	-
	Brubru	<i>Nilaus afer</i>	10.11	0.00	-	-
	Mallard	<i>Anas platyrhynchos</i>	1.12	0.00	-	-
	Neddicky	<i>Cisticola fulvicapilla</i>	66.29	4.55	-	-
	Quailfinch	<i>Ortygospiza atricollis</i>	29.21	4.55	-	-
Duck	African Black Duck	<i>Anas sparsa</i>	1.12	0.00	-	-
Apalis	Bar-throated Apalis	<i>Apalis thoracica</i>	3.37	0.00	-	-
Darter	African Darter	<i>Anhinga rufa</i>	4.49	0.00	-	-
Barbet	Acacia Pied Barbet	<i>Tricholaema leucomelas</i>	84.27	27.27	-	-
Barbet	Black-collared Barbet	<i>Lybius torquatus</i>	22.47	0.00	-	-
Barbet	Crested Barbet	<i>Trachyphonus vaillantii</i>	61.80	4.55	-	-
Batis	Chin-spot Batis	<i>Batis molitor</i>	8.99	0.00	-	-
Batis	Priort Batis	<i>Batis priort</i>	8.99	0.00	-	-
Bee-eater	European Bee-eater	<i>Merops apiaster</i>	30.34	0.00	-	-
Bee-eater	Little Bee-eater	<i>Merops pusillus</i>	29.21	9.09	-	-
Bee-eater	White-fronted Bee-eater	<i>Merops bullockoides</i>	12.36	0.00	-	-
Bishop	Southern Red Bishop	<i>Euplectes orix</i>	85.39	27.27	-	-
Bishop	Yellow-crowned Bishop	<i>Euplectes afer</i>	19.10	4.55	-	-
Bulbul	African Red-eyed Bulbul	<i>Pycnonotus nigricans</i>	95.51	27.27	-	-
Bunting	Cape Bunting	<i>Emberiza capensis</i>	1.12	0.00	-	-
Bunting	Cinnamon-breasted Bunting	<i>Emberiza tahapisi</i>	30.34	4.55	-	-
Bunting	Golden-breasted Bunting	<i>Emberiza flaviventris</i>	1.12	0.00	-	-
Eagle	African Fish Eagle	<i>Haliaeetus vocifer</i>	1.12	0.00	-	-
Canary	Black-throated Canary	<i>Crithagra atrogularis</i>	79.78	36.36	-	-
Canary	Yellow Canary	<i>Crithagra flaviventris</i>	70.79	13.64	-	-
Canary	Yellow-fronted Canary	<i>Crithagra mozambica</i>	3.37	0.00	-	-
Chat	Ant-eating Chat	<i>Myrmecocichla formicivora</i>	12.36	0.00	-	-
Chat	Familiar Chat	<i>Oenanthe familiaris</i>	17.98	0.00	-	-
Cisticola	Desert Cisticola	<i>Cisticola aridulus</i>	48.31	0.00	-	-
Cisticola	Levaillant's Cisticola	<i>Cisticola tinniens</i>	26.97	9.09	-	-
Cisticola	Rattling Cisticola	<i>Cisticola chiniana</i>	31.46	0.00	-	-
Cisticola	Wing-snapping Cisticola	<i>Cisticola ayresii</i>	2.25	0.00	-	-
Cisticola	Zitting Cisticola	<i>Cisticola juncidis</i>	32.58	13.64	-	-
Rail	African Rail	<i>Rallus caerulescens</i>	1.12	0.00	-	-
Ibis	African Sacred Ibis	<i>Threskiornis aethiopicus</i>	42.70	9.09	-	-
Snipe	African Snipe	<i>Gallinago nigripennis</i>	6.74	0.00	-	-
Spoonbill	African Spoonbill	<i>Platalea alba</i>	6.74	0.00	-	-
Coucal	Burchell's Coucal	<i>Centropus burchellii</i>	5.62	0.00	-	-
Swamphen	African Swamphen	<i>Porphyrio madagascariensis</i>	2.25	0.00	-	-

Group	Species name	Taxonomic name	Full protocol	Ad hoc protocol	Global status	Regional status
Crombec	Long-billed Crombec	<i>Sylvietta rufescens</i>	6.74	0.00	-	-
Falcon	Amur Falcon	<i>Falco amurensis</i>	5.62	0.00	-	-
Cuckoo	Diederik Cuckoo	<i>Chrysococcyx caprius</i>	34.83	0.00	-	-
Cuckoo	Great Spotted Cuckoo	<i>Clamator glandarius</i>	1.12	0.00	-	-
Cuckoo	Jacobin Cuckoo	<i>Clamator jacobinus</i>	2.25	0.00	-	-
Heron	Black-headed Heron	<i>Ardea melanocephala</i>	16.85	4.55	-	-
Dove	Cape Turtle Dove	<i>Streptopelia capicola</i>	58.43	4.55	-	-
Dove	Laughing Dove	<i>Spilopelia senegalensis</i>	94.38	40.91	-	-
Dove	Namaqua Dove	<i>Oena capensis</i>	48.31	18.18	-	-
Dove	Red-eyed Dove	<i>Streptopelia semitorquata</i>	77.53	0.00	-	-
Dove	Rock Dove	<i>Columba livia</i>	44.94	4.55	-	-
Crake	Black Crake	<i>Zapornia flavirostra</i>	2.25	0.00	-	-
Heron	Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	1.12	0.00	-	-
Lapwing	Blacksmith Lapwing	<i>Vanellus armatus</i>	83.15	18.18	-	-
Kite	Black-winged Kite	<i>Elanus caeruleus</i>	58.43	36.36	-	-
White-eye	Cape White-eye	<i>Zosterops virens</i>	7.87	0.00	-	-
Stilt	Black-winged Stilt	<i>Himantopus himantopus</i>	6.74	0.00	-	-
Shoveler	Cape Shoveler	<i>Spatula smithii</i>	3.37	0.00	-	-
Cisticola	Cloud Cisticola	<i>Cisticola textrix</i>	22.47	0.00	-	-
Buzzard	Common Buzzard	<i>Buteo buteo</i>	5.62	0.00	-	-
Eremomela	Yellow-bellied Eremomela	<i>Eremomela icteropygialis</i>	1.12	0.00	-	-
Goose	Egyptian Goose	<i>Alopochen aegyptiaca</i>	24.72	0.00	-	-
Moorhen	Common Moorhen	<i>Gallinula chloropus</i>	4.49	0.00	-	-
Finch	Cut-throat Finch	<i>Amadina fasciata</i>	3.37	0.00	-	-
Finch	Red-headed Finch	<i>Amadina erythrocephala</i>	32.58	27.27	-	-
Firefinch	African Firefinch	<i>Lagonosticta rubricata</i>	1.12	0.00	-	-
Firefinch	Jameson's Firefinch	<i>Lagonosticta rhodopareia</i>	5.62	0.00	-	-
Firefinch	Red-billed Firefinch	<i>Lagonosticta senegala</i>	25.84	4.55	-	-
Fiscal	Southern Fiscal	<i>Lanius collaris</i>	89.89	27.27	-	-
Flycatcher	African Paradise Flycatcher	<i>Terpsiphone viridis</i>	10.11	0.00	-	-
Flycatcher	Spotted Flycatcher	<i>Muscicapa striata</i>	19.10	0.00	-	-
Sandpiper	Curlew Sandpiper	<i>Calidris ferruginea</i>	1.12	0.00	NT	LC
Flycatcher	Fiscal Flycatcher	<i>Melaenornis silens</i>	69.66	4.55	-	-
Francolin	Orange River Francolin	<i>Scleroptila gutturalis</i>	8.99	0.00	-	-
Go-away-bird	Grey Go-away-bird	<i>Crinifer concolor</i>	7.87	0.00	-	-
Honey-buzzard	European Honey-buzzard	<i>Pernis apivorus</i>	1.12	0.00	-	-
Goose	Domestic Goose	<i>54nswer 54nswer domesticus</i>	42.70	22.73	-	-
Flycatcher	Fairy Flycatcher	<i>Stenostira scita</i>	2.25	0.00	-	-
Goshawk	Gabar Goshawk	<i>Micronisus gabar</i>	7.87	0.00	-	-
Kestrel	Greater Kestrel	<i>Falco rupicoloides</i>	10.11	4.55	-	-

Group	Species name	Taxonomic name	Full protocol	Ad hoc protocol	Global status	Regional status
Ibis	Glossy Ibis	<i>Plegadis falcinellus</i>	8.99	0.00	-	-
Grebe	Great Crested Grebe	<i>Podiceps cristatus</i>	1.12	0.00	-	-
Ibis	Hadada Ibis	<i>Bostrychia hagedash</i>	70.79	4.55	-	-
Egret	Great Egret	<i>Ardea alba</i>	3.37	0.00	-	-
Guineafowl	Helmeted Guineafowl	<i>Numida meleagris</i>	75.28	4.55	-	-
Heron	Grey Heron	<i>Ardea cinerea</i>	8.99	0.00	-	-
Gull	Grey-headed Gull	<i>Chroicocephalus cirrocephalus</i>	1.12	0.00	-	-
	Hamerkop	<i>Scopus umbretta</i>	1.12	0.00	-	-
Egret	Intermediate Egret	<i>Ardea intermedia</i>	3.37	0.00	-	-
Honeyguide	Lesser Honeyguide	<i>Indicator minor</i>	1.12	0.00	-	-
Hoopoe	African Hoopoe	<i>Upupa africana</i>	47.19	0.00	-	-
Thrush	Karoo Thrush	<i>Turdus smithi</i>	26.97	4.55	-	-
Plover	Kittlitz's Plover	<i>Charadrius pecuarius</i>	2.25	0.00	-	-
Falcon	Lanner Falcon	<i>Falco biarmicus</i>	3.37	0.00	-	VU
Indigobird	Dusky Indigobird	<i>Vidua funerea</i>	2.25	0.00	-	-
Indigobird	Purple Indigobird	<i>Vidua purpurascens</i>	2.25	0.00	-	-
Indigobird	Village Indigobird	<i>Vidua chalybeata</i>	11.24	0.00	-	-
Kestrel	Lesser Kestrel	<i>Falco naumanni</i>	6.74	0.00	-	-
Korhaan	Northern Black Korhaan	<i>Afrotis afraoides</i>	83.15	22.73	-	-
Kingfisher	Brown-hooded Kingfisher	<i>Halcyon albiventris</i>	3.37	0.00	-	-
Egret	Little Egret	<i>Egretta garzetta</i>	6.74	0.00	-	-
Grebe	Little Grebe	<i>Tachybaptus ruficollis</i>	11.24	0.00	-	-
Stint	Little Stint	<i>Calidris minuta</i>	1.12	0.00	-	-
Crow	Pied Crow	<i>Corvus albus</i>	93.26	50.00	-	-
Kingfisher	Malachite Kingfisher	<i>Corythornis cristatus</i>	2.25	4.55	-	-
Lapwing	African Wattled Lapwing	<i>Vanellus senegallus</i>	1.12	0.00	-	-
Lapwing	Crowned Lapwing	<i>Vanellus coronatus</i>	95.51	31.82	-	-
Lark	Eastern Clapper Lark	<i>Mirafra fasciolata</i>	47.19	0.00	-	-
Lark	Red-capped Lark	<i>Calandrella cinerea</i>	5.62	4.55	-	-
Lark	Rufous-naped Lark	<i>Mirafra africana</i>	62.92	22.73	-	-
Lark	Sabota Lark	<i>Calendulauda sabota</i>	15.73	4.55	-	-
Lark	Spike-heeled Lark	<i>Chersomanes albofasciata</i>	5.62	0.00	-	-
Longclaw	Cape Longclaw	<i>Macronyx capensis</i>	35.96	0.00	-	-
Martin	Banded Martin	<i>Riparia cincta</i>	8.99	0.00	-	-
Martin	Brown-throated Martin	<i>Riparia paludicola</i>	6.74	0.00	-	-
Owl	Marsh Owl	<i>Asio capensis</i>	2.25	0.00	-	-
Mousebird	Red-faced Mousebird	<i>Urocolius indicus</i>	67.42	13.64	-	-
Mousebird	Speckled Mousebird	<i>Colius striatus</i>	23.60	0.00	-	-
Mousebird	White-backed Mousebird	<i>Colius colius</i>	43.82	4.55	-	-
Myna	Common Myna	<i>Acridotheres tristis</i>	86.52	22.73	-	-
Ostrich	Common Ostrich	<i>Struthio camelus</i>	8.99	0.00	-	-

Group	Species name	Taxonomic name	Full protocol	Ad hoc protocol	Global status	Regional status
Sandpiper	Marsh Sandpiper	<i>Tringa stagnatilis</i>	2.25	0.00	-	-
Pigeon	Speckled Pigeon	<i>Columba guinea</i>	68.54	0.00	-	-
Pipit	African Pipit	<i>Anthus cinnamomeus</i>	56.18	4.55	-	-
Pipit	Buffy Pipit	<i>Anthus vaalensis</i>	1.12	0.00	-	-
Pipit	Plain-backed Pipit	<i>Anthus leucophrys</i>	3.37	0.00	-	-
Goshawk	Pale Chanting Goshawk	<i>Melierax canorus</i>	1.12	0.00	-	-
Avocet	Pied Avocet	<i>Recurvirostra avosetta</i>	2.25	0.00	-	-
Kingfisher	Pied Kingfisher	<i>Ceryle rudis</i>	5.62	0.00	-	-
Prinia	Black-chested Prinia	<i>Prinia flavicans</i>	94.38	27.27	-	-
Prinia	Tawny-flanked Prinia	<i>Prinia subflava</i>	6.74	0.00	-	-
Pytilia	Green-winged Pytilia	<i>Pytilia melba</i>	20.22	9.09	-	-
Quelea	Red-billed Quelea	<i>Quelea quelea</i>	68.54	22.73	-	-
Starling	Pied Starling	<i>Lamprotornis bicolor</i>	34.83	4.55	-	-
Robin-Chat	Cape Robin-Chat	<i>Cossypha caffra</i>	40.45	4.55	-	-
Teal	Red-billed Teal	<i>Anas erythrorhyncha</i>	13.48	0.00	-	-
Coot	Red-knobbed Coot	<i>Fulica cristata</i>	11.24	0.00	-	-
Cormorant	Reed Cormorant	<i>Microcarbo africanus</i>	17.98	4.55	-	-
Scimitarbill	Common Scimitarbill	<i>Rhinopomastus cyanomelas</i>	10.11	0.00	-	-
Scrub Robin	Kalahari Scrub Robin	<i>Cercotrichas paena</i>	68.54	4.55	-	-
Scrub Robin	White-browed Scrub Robin	<i>Cercotrichas leucophrys</i>	2.25	0.00	-	-
Swallow	South African Cliff Swallow	<i>Petrochelidon spilodera</i>	25.84	22.73	-	-
Shelduck	South African Shelduck	<i>Tadorna cana</i>	2.25	0.00	-	-
Shrike	Crimson-breasted Shrike	<i>Laniarius atrococcineus</i>	12.36	0.00	-	-
Shrike	Lesser Grey Shrike	<i>Lanius minor</i>	5.62	4.55	-	-
Shrike	Red-backed Shrike	<i>Lanius collurio</i>	28.09	18.18	-	-
Pochard	Southern Pochard	<i>Netta erythrophthalma</i>	1.12	0.00	-	-
Sparrow	Cape Sparrow	<i>Passer melanurus</i>	85.39	4.55	-	-
Sparrow	House Sparrow	<i>Passer domesticus</i>	68.54	9.09	-	-
Sparrow	Southern Grey-headed Sparrow	<i>Passer diffusus</i>	70.79	4.55	-	-
Sparrow	Yellow-throated Bush Sparrow	<i>Gymnoris supercilialis</i>	3.37	0.00	-	-
Sparrow-Lark	Chestnut-backed Sparrow-Lark	<i>Eremopterix leucotis</i>	4.49	4.55	-	-
Sparrow-Weaver	White-browed Sparrow-Weaver	<i>Plocepasser mahali</i>	95.51	31.82	-	-
Eagle-Owl	Spotted Eagle-Owl	<i>Bubo africanus</i>	1.12	0.00	-	-
Spurfowl	Swainson's Spurfowl	<i>Pternistis swainsonii</i>	80.90	9.09	-	-
Goose	Spur-winged Goose	<i>Plectropterus gambensis</i>	6.74	0.00	-	-
Starling	Cape Starling	<i>Lamprotornis nitens</i>	80.90	22.73	-	-
Starling	Wattled Starling	<i>Creatophora cinerea</i>	39.33	18.18	-	-
Heron	Squacco Heron	<i>Ardeola ralloides</i>	2.25	0.00	-	-
Plover	Three-banded Plover	<i>Charadrius tricollaris</i>	7.87	0.00	-	-



Group	Species name	Taxonomic name	Full protocol	Ad hoc protocol	Global status	Regional status
Stonechat	African Stonechat	<i>Saxicola torquatus</i>	74.16	13.64	-	-
Egret	Western Cattle Egret	<i>Bubulcus ibis</i>	83.15	36.36	-	-
Sunbird	Amethyst Sunbird	<i>Chalcomitra amethystina</i>	6.74	0.00	-	-
Sunbird	White-bellied Sunbird	<i>Cinnyris talatala</i>	23.60	0.00	-	-
Tern	Whiskered Tern	<i>Chlidonias hybrida</i>	1.12	0.00	-	-
Swallow	Barn Swallow	<i>Hirundo rustica</i>	35.96	0.00	-	-
Swallow	Greater Striped Swallow	<i>Cecropis cucullata</i>	52.81	9.09	-	-
Swallow	Lesser Striped Swallow	<i>Cecropis abyssinica</i>	1.12	0.00	-	-
Swallow	Red-breasted Swallow	<i>Cecropis semirufa</i>	4.49	0.00	-	-
Swallow	White-throated Swallow	<i>Hirundo albicularis</i>	21.35	4.55	-	-
Vulture	White-backed Vulture	<i>Gyps africanus</i>	0.00	0.00	CR	CR
Swift	African Palm Swift	<i>Cypsiurus parvus</i>	48.31	13.64	-	-
Swift	Little Swift	<i>Apus affinis</i>	28.09	9.09	-	-
Swift	White-rumped Swift	<i>Apus caffer</i>	25.84	0.00	-	-
Tchagra	Brown-crowned Tchagra	<i>Tchagra australis</i>	25.84	4.55	-	-
Cormorant	White-breasted Cormorant	<i>Phalacrocorax lucidus</i>	2.25	4.55	-	-
Duck	White-faced Whistling Duck	<i>Dendrocygna viduata</i>	7.87	0.00	-	-
Tern	White-winged Tern	<i>Chlidonias leucopterus</i>	1.12	0.00	-	-
Thick-knee	Spotted Thick-knee	<i>Burhinus capensis</i>	7.87	0.00	-	-
Sandpiper	Wood Sandpiper	<i>Tringa glareola</i>	6.74	0.00	-	-
Thrush	Groundscraper Thrush	<i>Turdus litsitsirupa</i>	2.25	0.00	-	-
Tit	Ashy Tit	<i>Melaniparus cinerascens</i>	6.74	4.55	-	-
Tit	Cape Penduline Tit	<i>Anthoscopus minutus</i>	1.12	0.00	-	-
Duck	Yellow-billed Duck	<i>Anas undulata</i>	20.22	0.00	-	-
Wagtail	Cape Wagtail	<i>Motacilla capensis</i>	43.82	4.55	-	-
Warbler	African Reed Warbler	<i>Acrocephalus baeticatus</i>	0.00	4.55	-	-
Warbler	Chestnut-vented Warbler	<i>Curruca subcoerulea</i>	79.78	9.09	-	-
Warbler	Great Reed Warbler	<i>Acrocephalus arundinaceus</i>	1.12	0.00	-	-
Warbler	Icterine Warbler	<i>Hippolais icterina</i>	1.12	0.00	-	-
Warbler	Lesser Swamp Warbler	<i>Acrocephalus gracilirostris</i>	3.37	0.00	-	-
Warbler	Willow Warbler	<i>Phylloscopus trochilus</i>	4.49	0.00	-	-
Waxbill	Black-faced Waxbill	<i>Brunhilda erythronotos</i>	8.99	0.00	-	-
Waxbill	Blue Waxbill	<i>Uraeginthus angolensis</i>	78.65	22.73	-	-
Waxbill	Common Waxbill	<i>Estrilda astrild</i>	3.37	4.55	-	-
Waxbill	Violet-eared Waxbill	<i>Granatina granatina</i>	6.74	4.55	-	-
Weaver	Scaly-feathered Weaver	<i>Sporopipes squamifrons</i>	49.44	22.73	-	-
Weaver	Southern Masked Weaver	<i>Ploceus velatus</i>	97.75	31.82	-	-
Weaver	Thick-billed Weaver	<i>Amblyospiza albifrons</i>	1.12	0.00	-	-
Wheatear	Capped Wheatear	<i>Oenanthe pileata</i>	21.35	4.55	-	-
Wheatear	Mountain Wheatear	<i>Myrmecocichla monticola</i>	7.87	4.55	-	-
Stork	Yellow-billed Stork	<i>Mycteria ibis</i>	1.12	0.00	-	EN

Group	Species name	Taxonomic name	Full protocol	Ad hoc protocol	Global status	Regional status
White-eye	Orange River White-eye	<i>Zosterops pallidus</i>	55.06	4.55	-	-
Whitethroat	Common Whitethroat	<i>Curruca communis</i>	2.25	0.00	-	-
Whydah	Long-tailed Paradise Whydah	<i>Vidua paradisaea</i>	26.97	22.73	-	-
Whydah	Pin-tailed Whydah	<i>Vidua macroura</i>	52.81	0.00	-	-
Whydah	Shaft-tailed Whydah	<i>Vidua regia</i>	16.85	4.55	-	-
Widowbird	Long-tailed Widowbird	<i>Euplectes progne</i>	40.45	4.55	-	-
Widowbird	Red-collared Widowbird	<i>Euplectes ardens</i>	5.62	0.00	-	-
Widowbird	White-winged Widowbird	<i>Euplectes albonotatus</i>	11.24	0.00	-	-
Wood Hoopoe	Green Wood Hoopoe	<i>Phoeniculus purpureus</i>	7.87	0.00	-	-
Woodpecker	Cardinal Woodpecker	<i>Dendropicos fuscescens</i>	3.37	0.00	-	-
Wryneck	Red-throated Wryneck	<i>Jynx ruficollis</i>	1.12	0.00	-	-

## APPENDIX C2: SPECIES LIST FOR THE SITE SURVEYS

Solar Priority Species		Transects	Incidental
Blacksmith Lapwing	<i>Vanellus armatus</i>	*	
Cloud Cisticola	<i>Cisticola textrix</i>	*	
Fiscal Flycatcher	<i>Melaenornis silens</i>	*	
Pied Starling	<i>Lamprotornis bicolor</i>	*	*
Red-billed Teal	<i>Anas erythrorhyncha</i>		*
Western Cattle Egret	<i>Bubulcus ibis</i>	*	
White-faced Whistling Duck	<i>Dendrocygna viduata</i>		*
Yellow-billed Duck	<i>Anas undulata</i>		*
White-backed Vulture	<i>Gyps africanus</i>		*
<b>9</b>		<b>5</b>	<b>5</b>
Non-Priority Species		Transects	Incidental
Acacia Pied Barbet	<i>Tricholaema leucomelas</i>	*	*
African Pipit	<i>Anthus cinnamomeus</i>	*	*
African quail-finch	<i>Ortygospiza atricollis</i>		*
African Red-eyed Bulbul	<i>Pycnonotus nigricans</i>	*	*
Ant-eating Chat	<i>Myrmecocichla formicivora</i>	*	
Banded Martin	<i>Riparia cincta</i>	*	
Barn Swallow	<i>Hirundo rustica</i>	*	
Black-chested Prinia	<i>Prinia flavicans</i>	*	
Black-faced Waxbill	<i>Estrilda erythronotos</i>	*	*
Blue Waxbill	<i>Uraeginthus angolensis</i>	*	
Bokmakierie	<i>Telophorus zeylonus</i>	*	*
Brown-crowned Tchagra	<i>Tchagra australis</i>	*	
Brubru	<i>Nilaus afer</i>	*	*
Cape glossy starling	<i>Lamprotornis nitens</i>	*	
Cape Longclaw	<i>Macronyx capensis</i>	*	*
Cape Sparrow	<i>Passer melanurus</i>	*	*
Cape turtle dove	<i>Streptopelia capicola</i>	*	*
Chestnut-backed Sparrow-Lark	<i>Eremopterix leucotis</i>	*	
Chestnut-vented Tit-babbler	<i>Sylvia subcoerulea</i>	*	*
Chin-spot Batis	<i>Batis molitor</i>	*	
Common Ostrich	<i>Struthio camelus</i>	*	
Common Waxbill	<i>Estrilda astrild</i>		*
Coqui Francolin	<i>Peliperdix coqui</i>	*	
Crested Barbet	<i>Trachyphonus vaillantii</i>	*	
Crimson-breasted Shrike	<i>Laniarius atrococcineus</i>	*	
Crowned Lapwing	<i>Vanellus coronatus</i>	*	
Desert Cisticola	<i>Cisticola aridulus</i>	*	*
Diederik Cuckoo	<i>Chrysococcyx caprius</i>	*	*
Eastern Clapper Lark	<i>Mirafra fasciolata</i>	*	
Hadedda ibis	<i>Bostrychia hagedash</i>	*	*

<b>Non-Priority Species</b>		<b>Transects</b>	<b>Incidental</b>
Helmeted Guineafowl	<i>Numida meleagris</i>	*	*
House Sparrow	<i>Passer domesticus</i>	*	
Kalahari Scrub Robin	<i>Cercotrichas paena</i>	*	*
Laughing Dove	<i>Spilopelia senegalensis</i>	*	
Lesser Grey Shrike	<i>Lanius minor</i>	*	
Little Bee-eater	<i>Merops pusillus</i>	*	
Long-billed Crombec	<i>Sylvietta rufescens</i>	*	*
Namaqua Dove	<i>Oena capensis</i>	*	
Neddicky	<i>Cisticola fulvicapilla</i>	*	*
Northern Black Korhaan	<i>Afrotis afraoides</i>	*	
Orange River Francolin	<i>Scleroptila gutturalis</i>	*	
Orange River White-eye	<i>Zosterops pallidus</i>	*	
Pied Crow	<i>Corvus albus</i>	*	*
Pin-tailed Whydah	<i>Vidua macroura</i>	*	*
Plain-backed Pipit	<i>Anthus leucophrys</i>	*	
Rattling Cisticola	<i>Cisticola chiniana</i>	*	
Red-backed Shrike	<i>Lanius collurio</i>	*	*
Red-eyed Dove	<i>Streptopelia semitorquata</i>	*	
Red-faced Mousebird	<i>Urocolius indicus</i>	*	
Red-throated Wryneck	<i>Jynx ruficollis</i>	*	
Rufous-naped Lark	<i>Mirafra africana</i>	*	*
Sabota Lark	<i>Calendulauda sabota</i>	*	*
Scaly-feathered finch	<i>Sporopipes squamifrons</i>	*	
Southern Fiscal	<i>Lanius collaris</i>	*	
Southern Grey-headed Sparrow	<i>Passer diffusus</i>	*	*
Southern Masked Weaver	<i>Ploceus velatus</i>	*	*
Southern Red Bishop	<i>Euplectes orix</i>	*	
Speckled Mousebird	<i>Colius striatus</i>		*
Speckled Pigeon	<i>Columba guinea</i>	*	
Spike-heeled Lark	<i>Chersomanes albofasciata</i>	*	
Spotted Flycatcher	<i>Muscicapa striata</i>	*	
Spotted Thick-knee	<i>Burhinus capensis</i>	*	
Swainson's Spurfowl	<i>Pternistis swainsonii</i>	*	
Violet-eared Waxbill	<i>Uraeginthus granatinus</i>	*	
White-backed Mousebird	<i>Colius colius</i>	*	*
White-browed Scrub Robin	<i>Cercotrichas leucophrys</i>	*	
White-browed Sparrow-Weaver	<i>Plocepasser mahali</i>	*	*
Willow Warbler	<i>Phylloscopus trochilus</i>	*	*
Yellow Canary	<i>Crithagra flaviventris</i>	*	
Yellow-crowned Bishop	<i>Euplectes afer</i>		*
Zitting Cisticola	<i>Cisticola juncidis</i>	*	*
<b>71</b>	Subtotal	<b>67</b>	<b>32</b>
	Grand total	<b>72</b>	<b>37</b>

## APPENDIX D: IMPACT RATINGS ESKOM-SIDE OF STARLING SUBSTATION AND 132kV GRID CONNECTION

### 1 Baseline aspects

The following distinct features relevant to avifauna are present:

#### 1.1 Natural habitat

- Open Woodland

#### 1.2 Anthropogenic modifications

- The Hermes/Pluto 400kV 2 High Voltage Overhead Powerline

### 2 Sensitivity map

Medium sensitivity: White-backed Vultures were recorded roosting on the Hermes – Pluto 400kV 2 overhead power line during the first field visit.

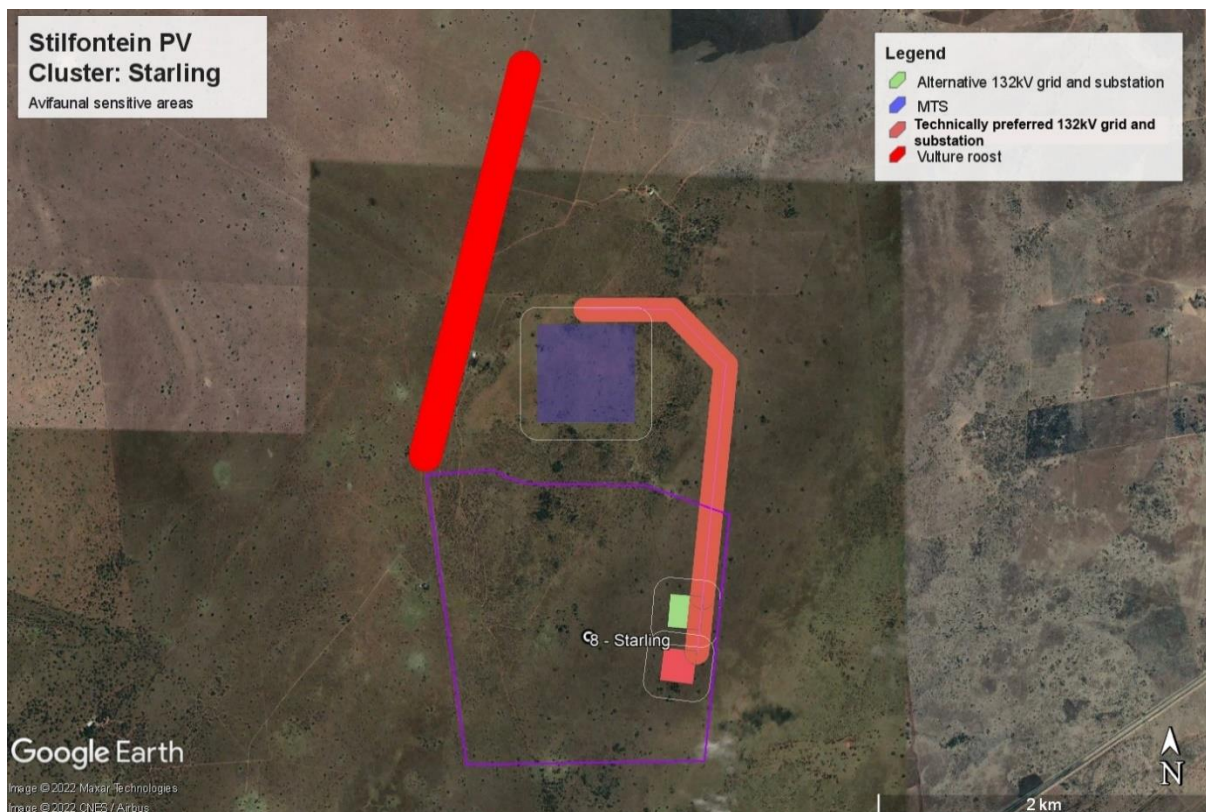


Figure D1: Starling Grid sensitivities map

### 3 Impact rating

The potential impacts identified in the course of the study are:

#### 3.1 Construction Phase

- Displacement of certain priority avifaunal species due to disturbance associated with the construction of the Eskom-side substation and associated 132kV overhead line.

	<i>Extent</i>	<i>Intensity</i>	<i>Duration</i>	<i>Consequence</i>	<i>Probability</i>	<i>Significance</i>	<i>Status</i>	<i>Confidence</i>
Without mitigation	Local 1	High 3	Short-term 1	<b>Low</b> <b>5</b>	Definite	<b>LOW</b>	- ve	High
<b>Essential mitigation measures:</b>								
<ul style="list-style-type: none"> <li>• Construction activity should be restricted to the immediate footprint of the infrastructure as far as possible.</li> <li>• Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species.</li> <li>• Measures to control noise and dust should be applied according to current best practice in the industry.</li> <li>• Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.</li> </ul>								
With mitigation	Local 1	Medium 2	Short-term 1	<b>Very low</b> <b>4</b>	Definite	<b>VERY LOW</b>	- ve	High

- Displacement of certain priority avifaunal species due to habitat transformation associated with the construction of the Eskom-side substation and associated 132kV overhead line

	<i>Extent</i>	<i>Intensity</i>	<i>Duration</i>	<i>Consequence</i>	<i>Probability</i>	<i>Significance</i>	<i>Status</i>	<i>Confidence</i>
Without mitigation	Local 1	Medium 2	Long-term 3	<b>Medium</b> <b>6</b>	Probable	<b>MEDIUM</b>	- ve	Medium
<b>Essential mitigation measures:</b>								
<ul style="list-style-type: none"> <li>• Construction activity should be restricted to the immediate footprint of the infrastructure</li> <li>• Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species.</li> <li>• Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.</li> <li>• The mitigation measures proposed by the botanical specialist must be strictly enforced.</li> </ul>								
With mitigation	Local 1	Low 1	Long-term 3	<b>Low</b> <b>5</b>	Probable	<b>LOW</b>	- ve	Medium

#### 3.2 Operational Phase

- Mortality of certain avifaunal priority species due to collisions with 132kV overhead lines

	<b>Extent</b>	<b>Intensity</b>	<b>Duration</b>	<b>Consequence</b>	<b>Probability</b>	<b>Significance</b>	<b>Status</b>	<b>Confidence</b>
Without mitigation	Local 1	Medium 2	Long-term 3	<b>Medium</b> 6	Probable	<b>MEDIUM</b>	- ve	Medium
<b>Essential mitigation measures:</b>								
<ul style="list-style-type: none"> <li>Eskom approved Bird Flight Diverters must be installed on the entire 132kV grid connection, on the earthwire, according to the applicable Eskom standard at the time. These devices must be installed as soon as the conductors are strung.</li> </ul>								
With mitigation	Local 1	Low 1	Long-term 3	<b>Low</b> 5	Possible	<b>VERY LOW</b>	- ve	Medium

- Mortality of certain avifaunal priority species due to electrocutions in the Eskom-side substation

	<b>Extent</b>	<b>Intensity</b>	<b>Duration</b>	<b>Consequence</b>	<b>Probability</b>	<b>Significance</b>	<b>Status</b>	<b>Confidence</b>
Without mitigation	Local 1	Medium 2	Long-term 3	<b>Medium</b> 6	Possible	<b>LOW</b>	- ve	High
<b>Essential mitigation measures:</b>								
<ul style="list-style-type: none"> <li>Due to the complicated design of the substation hardware, pro-active mitigation in the form of insulation of all live components is not a practical option. Instead, the situation must be monitored, and should electrocutions of priority species be recorded, reactive mitigation could be applied in the form of insulation of relevant live components. This is an acceptable approach because Red List priority species are unlikely to frequent the switching station and substation and be electrocuted.</li> </ul>								
With mitigation	Local 1	Low 1	Long-term 3	<b>Low</b> 5	Improbable	<b>VERY LOW</b>	- ve	High

- Mortality of certain avifaunal priority species due to electrocutions on the 132kV overhead lines.

	<b>Extent</b>	<b>Intensity</b>	<b>Duration</b>	<b>Consequence</b>	<b>Probability</b>	<b>Significance</b>	<b>Status</b>	<b>Confidence</b>
Without mitigation	Regional 2	Medium 2	Long-term 3	<b>High</b> 7	Probable	<b>HIGH</b>	- ve	High
<b>Essential mitigation measures:</b>								
<ul style="list-style-type: none"> <li>The Eskom approved pole design must be vulture-friendly and must be signed off by the avifaunal specialist.</li> </ul>								
With mitigation	Regional 2	Low 1	Long-term 3	<b>Medium</b> 6	Improbable	<b>LOW</b>	- ve	High

### 3.3 Decommissioning Phase

- Displacement of certain priority avifaunal species due to disturbance associated with the dismantling of the Eskom-side substations and associated 132kV overhead lines.

	<b>Extent</b>	<b>Intensity</b>	<b>Duration</b>	<b>Consequence</b>	<b>Probability</b>	<b>Significance</b>	<b>Status</b>	<b>Confidence</b>
Without mitigation	Local 1	High 3	Short-term 1	<b>Low</b> 5	Definite	<b>LOW</b>	- ve	High
<b>Essential mitigation measures:</b>								
<ul style="list-style-type: none"> <li>• Dismantling activity should be restricted to the immediate footprint of the infrastructure as far as possible.</li> <li>• Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species.</li> <li>• Measures to control noise and dust should be applied according to current best practice in the industry.</li> <li>• Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.</li> </ul>								
With mitigation	Local 1	Medium 2	Short-term 1	<b>Very low</b> 4	Definite	<b>VERY LOW</b>	- ve	High

A comparison between pre-and post-mitigation significance ratings is shown in below.

Impact	Significance rating prior to mitigation	Significance rating post mitigation	Affected priority species
Displacement of certain priority avifaunal species due to disturbance associated with the construction of the Eskom-side substation and associated 132kV overhead line.	LOW	VERY LOW	Black-winged Kite Gabar Goshawk Greater Kestrel Helmeted Guineafowl Lanner Falcon Northern Black Korhaan Pied Crow Spotted Eagle-Owl White-backed Vulture
Displacement of certain priority avifaunal species due to habitat transformation associated with the construction of the Eskom-side substation and associated 132kV overhead line	MEDIUM	LOW	Amur Falcon Black-headed Heron Black-winged Kite Common Buzzard Gabar Goshawk Greater Kestrel Hadada Ibis Helmeted Guineafowl Lanner Falcon Lesser Kestrel Northern Black Korhaan Spotted Eagle-Owl Western Cattle Egret White-backed Vulture
Mortality of certain avifaunal priority species due to collisions with 132kV overhead lines	MEDIUM	VERY LOW	Black-headed Heron Egyptian Goose Hadada Ibis Northern Black Korhaan White-backed Vulture
Mortality of certain avifaunal priority species due to electrocutions in the Eskom-side substation	LOW	VERY LOW	Amur Falcon Black-headed Heron Black-winged Kite Common Buzzard Egyptian Goose Greater Kestrel Hadada Ibis Helmeted Guineafowl Lanner Falcon Lesser Kestrel Pied Crow Spotted Eagle-Owl



Impact	Significance rating prior to mitigation	Significance rating post mitigation	Affected priority species
Mortality of certain avifaunal priority species due to electrocutions on the 132kV overhead lines.	HIGH	LOW	White-backed Vulture
Displacement of certain priority avifaunal species due to disturbance associated with the dismantling of the Eskom-side substation and associated 132kV overhead line.	LOW	VERY LOW	Black-winged Kite Gabar Goshawk Greater Kestrel Helmeted Guineafowl Lanner Falcon Northern Black Korhaan Pied Crow Spotted Eagle-Owl White-backed Vulture

#### 4 Selection of preferred substation location

Both substation alternatives are located in open woodland habitat and therefore the expected impact of habitat transformation will be identical for both alternatives. There is no preferred alternative from an avifaunal impact perspective, and both alternatives are deemed to be acceptable.

#### 5 Impact statement

No fatal flaws were discovered during the investigations. It is therefore recommended that the activity is authorised, on condition that the proposed mitigation measures as detailed in the Impact Tables and the EMPr in Appendix D1 are strictly implemented. Both 33/132 kV substation location alternatives and tie-in of powerlines anywhere along the substation are deemed acceptable.

## Appendix D1: Environmental Management Programme for Eskom-side Substations & 132kV overhead lines

### Management Programme for the Planning and Design Phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
<b>Avifauna: Mortality due to electrocution on the 132kV overhead line</b>					
Mortality of avifauna, specifically Cape Vulture, due to electrocutions on the overhead powerline poles/towers.	Reduction of avian electrocution mortality	1. The Eskom approved pole design must be vulture-friendly and must be signed off by the avifaunal specialist.		Once-off	Contractor and ECO

### Management Programme for the Construction Phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
<b>Avifauna: Displacement due to disturbance</b>					
The noise and movement associated with the construction activities at the development footprint will be a source of disturbance which would lead to the displacement of avifauna from the area	Prevent unnecessary displacement of avifauna by ensuring that contractors are aware of the requirements of the Construction Environmental Management Programme (CEMPr.)	<p>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:</p> <ol style="list-style-type: none"> <li>1. No off-road driving;</li> <li>2. Maximum use of existing roads, where possible;</li> <li>3. Measures to control noise and dust according to latest best practice;</li> <li>4. Restricted access to the rest of the property;</li> </ol>	<ol style="list-style-type: none"> <li>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. Ensure that construction personnel are made aware of the impacts relating to off-road driving.</li> <li>2. Construction access roads must be demarcated clearly. Undertake site inspections to verify.</li> <li>3. Monitor the implementation of noise control mechanisms via site inspections and record and report non-compliance.</li> <li>4. Ensure that the construction area is demarcated clearly and that construction personnel are made aware of these demarcations.</li> </ol>	<ol style="list-style-type: none"> <li>1. On a daily basis</li> <li>2. Weekly</li> <li>3. Weekly</li> <li>4. Weekly</li> </ol>	<ol style="list-style-type: none"> <li>1. Contractor and ECO</li> <li>2. Contractor and ECO</li> <li>3. Contractor and ECO</li> <li>4. Contractor and ECO</li> </ol>

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
			Monitor via site inspections and report non-compliance.		
<b>Avifauna: Displacement due to habitat transformation</b>					
Total or partial displacement of avifauna due to habitat transformation associated with the vegetation clearance and the presence of the substations and associated 132kV overhead line.	Prevent unnecessary displacement of avifauna by ensuring that the rehabilitation of transformed areas is implemented by an appropriately qualified rehabilitation specialist, according to the recommendations of the botanical specialist study.	Monitor rehabilitation via site audits and site inspections to ensure compliance. Record and report any non-compliance.	<ol style="list-style-type: none"> <li>1. Appointment of rehabilitation specialist to develop habitat rehabilitation plan (HRP).</li> <li>2. Site inspections to monitor progress of rehabilitation.</li> <li>3. Adaptive management to ensure HRP goals are met.</li> </ol>	<ol style="list-style-type: none"> <li>1. Once-off</li> <li>2. Once a year (or as recommended by the botanical specialist)</li> <li>3. As and when required</li> </ol>	<ol style="list-style-type: none"> <li>1. Project Developer</li> <li>2. Facility Environmental Manager or ECO, whichever is applicable</li> <li>3. Project Developer and Facility Operational Manager</li> </ol>
<b>Avifauna: Mortality of avifauna due to collision with the overhead powerline</b>					
Mortality of priority avifauna due to collision with the 132kV overhead line.	Reduction of avian collision mortality	Eskom approved Bird Flight Diversers (BFDs) must be installed on the entire 132kV grid connection, on the earthwire, according to the applicable Eskom standard at the time.	<ol style="list-style-type: none"> <li>1. BFDs must be installed as soon as the conductors are strung.</li> <li>2. BFDs to be maintained on sections of powerline during the operational life span of the 132kV powerline</li> </ol>	<ol style="list-style-type: none"> <li>1. Once-off</li> <li>2. As and when needed</li> </ol>	<ol style="list-style-type: none"> <li>1. Project Developer</li> <li>2. Project Developer and Facility Environmental Manager</li> </ol>

### Management Programme for the Operational Phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
<b>Avifauna: Electrocution in the Eskom-side substations</b>					
Electrocution of priority species in the Eskom-side substations	Reduction of priority avian electrocution mortality	Monitor the electrocution mortality within the substation. Apply mitigation if electrocution happens regularly.	Regular inspections of the onsite substation yard	Weekly	Facility operator

## Management Programme for the Decommissioning Phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
<b>Avifauna: Displacement due to disturbance</b>					
The noise and movement associated with the dismantling 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.	<p>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:</p> <ol style="list-style-type: none"> <li>1 No off-road driving;</li> <li>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;</li> <li>3 Measures to control noise and dust according to latest best practice;</li> <li>4 Restricted access to the rest of the property;</li> </ol>	<ol style="list-style-type: none"> <li>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. Ensure that decommissioning personnel are made aware of the impacts relating to off-road driving.</li> <li>2. Access roads must be demarcated clearly. Undertake site inspections to verify.</li> <li>3. Monitor the implementation of noise control mechanisms via site inspections and record and report non-compliance.</li> <li>4. 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.</li> </ol>	<ol style="list-style-type: none"> <li>1. On a daily basis</li> <li>2. Weekly</li> <li>3. Weekly</li> <li>4. Weekly</li> </ol>	<ol style="list-style-type: none"> <li>1. Contractor and ECO</li> <li>2. Contractor and ECO</li> <li>3. Contractor and ECO</li> <li>4. Contractor and ECO</li> </ol>

## SITE SENSITIVITY VERIFICATION REPORT

# STILFONTEIN SOLAR PV CLUSTER GRID INFRASTRUCTURE

North West Province



February 2022

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

## 1. Introduction

Prior to commencing with the specialist assessment in accordance with Appendix 6 of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) Environmental Impact Assessment (EIA) Regulations of 2014, a site sensitivity verification was undertaken in order to confirm the current land use and environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tool (Screening Tool). 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 (Government Gazette No 43855, 30 October 2020) is applicable in the case of solar powerline infrastructure.

The details of the site sensitivity verification are noted below:

<b>Date of Site Visit</b>	03 February 2022
<b>Supervising Specialist Name</b>	Albert Froneman
<b>Professional Registration Number</b>	MSc Conservation Biology (SACNASP Zoological Science Registration number 400177/09)
<b>Specialist Affiliation / Company</b>	Chris van Rooyen Consulting

## 2. Methodology

The following methods were used to compile the SSV report:

- Bird distribution data of the Southern African Bird Atlas Project 2 (SABAP 2) was obtained from the FitzPatrick Institute of African Ornithology, University of Cape Town (FitzPatrick 2022), to ascertain which species occurs within the broader area i.e., within a block consisting of 2 pentad grid cells within which the proposed project is situated. A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8 × 7.6 km. To date, a total of 89 full protocol lists (i.e., surveys lasting a minimum of two hours each) have been completed for this area. In addition, 22 ad hoc protocol lists (i.e., surveys lasting less than two hours but still yielding valuable data) have been completed.
- The national threatened status of all priority species was determined with the use of the most recent edition of the Red Data Book of Birds of South Africa (Taylor *et al.* 2015), and the latest authoritative summary of southern African bird biology (Hockey *et al.* 2005).
- The global threatened status of all priority species was determined by consulting the (2021.3) IUCN Red List of Threatened Species (<http://www.iucnredlist.org/>).
- A classification of the vegetation types in the development area was obtained from the Southern African Bird Atlas Project 1 (SABAP 1) (Harrison *et al.* 1997) and the National Vegetation Map (2012 beta2) from the South African National Biodiversity Institute website (Mucina & Rutherford 2006 & <http://bgisviewer.sanbi.org>).
- The Important Bird Areas of Southern Africa (Marnewick *et al.* 2015) was consulted for information on potentially relevant Important Bird Areas (IBAs).

- Satellite imagery (Google Earth ©2021) was used in order to view the broader development area on a landscape level and to help identify sensitive bird habitat.
- The South African National Biodiversity BGIS map viewer was used to determine the locality of the proposed site relative to National Protected Areas.
- The DFFE National Web Based Screening Tool was used to determine the assigned avian sensitivity of the proposed development area.
- An on-site survey conducted on 03 February 2022 and 09-10 February 2022. The development area was inspected with a 4x4 vehicle and on foot. All birds were recorded.
- Powerline priority species are defined as species which could potentially be impacted by powerline collisions or electrocutions, based on their morphology. Larger birds, particularly raptors and vultures, are more vulnerable to electrocution as they are more likely to bridge the clearances between electrical components than smaller birds. Large terrestrial species and certain waterbirds with high wing loading are less manoeuvrable than smaller species and are therefore more likely to collide with overhead lines.

### 3. Results of site assessment

The development area and immediate environment is classified as having a **Low to Medium** sensitivity for terrestrial animals according to the Terrestrial Animal Species Theme (**Figure 1**). The Medium classification, according to the DFFE Screening Tool, is due to the possible occurrence of a mammal species, the Spotted-necked Otter *Hydricotis maculicollis*, and is not linked to avifauna. However, the development area contains suitable habitat for avian species of conservation concern (SCC) as defined in the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020), namely species listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable). White-backed Vultures *Gyps africanus* (listed as Critically Endangered) were observed in the development area. Based on the field surveys to date, a classification of **High** sensitivity for avifauna is recommended for the proposed development 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](mailto: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)
Low	Low sensitivity
Medium	Mammalia- <i>Hydrictis maculicollis</i>

Figure E1: The National Web-Based Environmental Screening Tool map of the project site, indicating sensitivities for the Terrestrial Animal Species theme. The Medium sensitivity classification is linked to a mammal, Spotted-necked Otter *Hydrictis maculicollis*, and is not linked to avifauna

### 3.1 Avifauna

Priority avifauna were divided into two categories: solar PV developments priority species and overhead powerline priority species. A total of 211 species could potentially occur within the broader area where the project is located (see Appendix A). Of these, 48 are classified as powerline priority species.

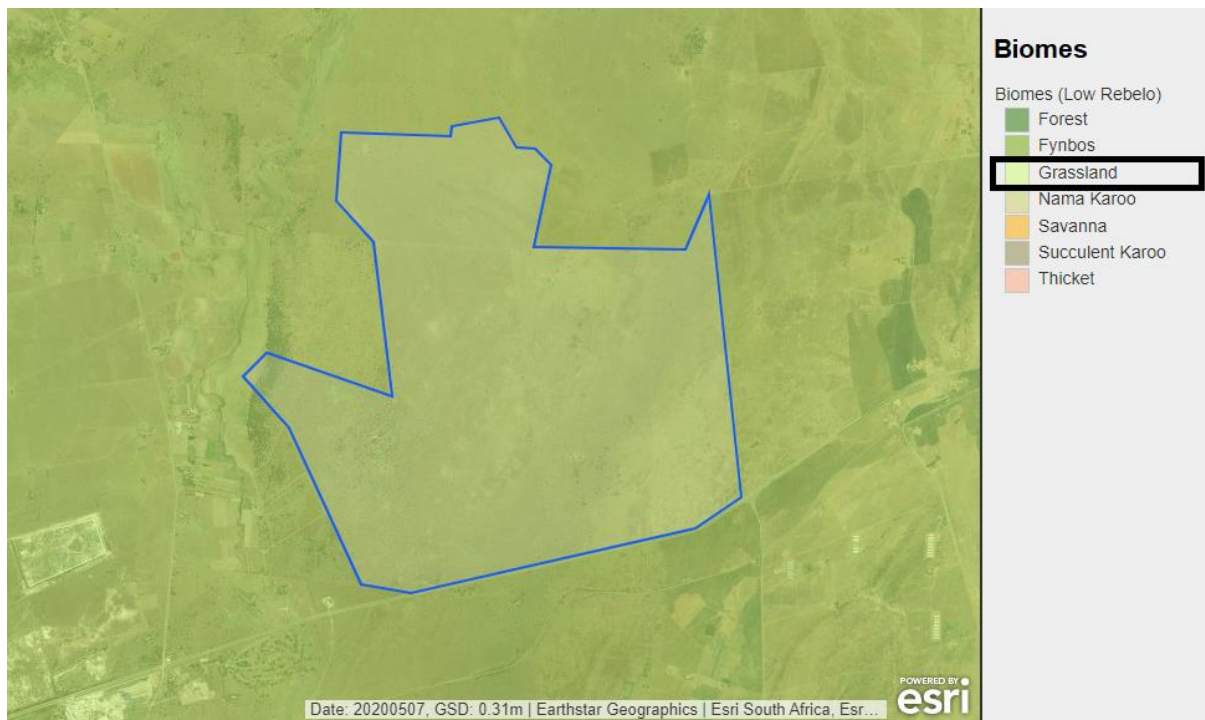


Of the 48 powerline priority species, 16 have a medium to high probability of occurring in the development site. Of the 16 powerline priority species with a medium to high probability of occurrence, six (6) were recorded during the site survey.

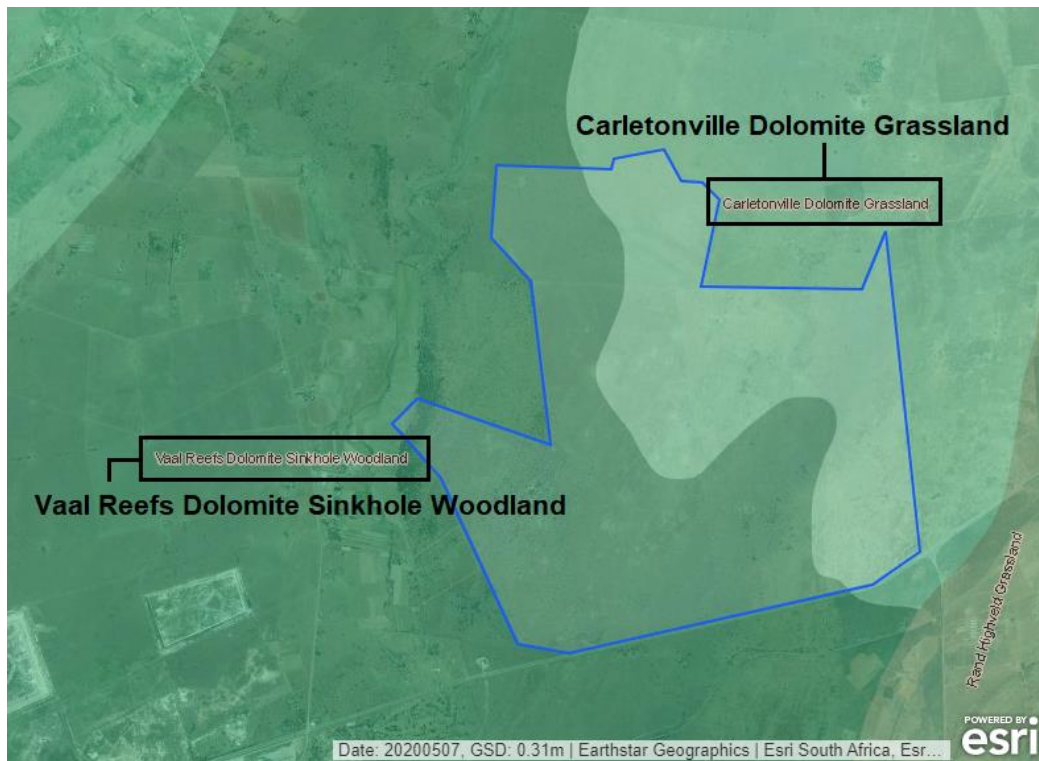
The Critically Endangered White-backed Vulture *Gyps africanus* (a solar and powerline priority species) was observed in the proposed development area.

### 3.2 Receiving environment

The proposed development area is situated approximately 7 km north-east of the town of Stilfontein, in the North West Province. It is located in the Grassland Biome (**Figure 2**), in the Dry Highveld Grassland Bioregion and is situated in an area that is made up of a mix of open to dense woodland with a strong grassland component. The habitat is quite variable and consists of fallow fields (recovering grassland), natural grassland, shrub- and woodland, some wetland and pans, and some agricultural and industrial activities. Mucina & Rutherford (2006) classifies the area as mix between Vaal Reefs Dolomite Sinkhole Woodland and Carletonville Dolomite Grassland (**Figure 3**).



**Figure E2: The Proposed Development Site situated in the Grassland Biome of South Africa – Biomes Map by South African National Biodiversity Institute (SANBI).**



**Figure E3: Vegetation Types of the Proposed Development Area - Mucina & Rutherford (2006).**

The Stilfontein area has a semi-arid climate (according to the Köppen-Geiger climate classification), with warm to hot summers and cool, dry winters. The average annual precipitation is 482 mm, with most of the rainfall occurring during summer. It should be noted that photos from the field survey were taken in the rainy season (i.e., summer).

The following distinct habitat features are present in the development area:

- Open Woodland
- Water Points
- High Voltage Overhead Powerlines

### 3.2.1 Open Woodland

The main habitat type of the development area is that of open woodland with a strong grassy component (**Figures 4 & 5**). Woodlands can be important nesting and roosting areas for avian species. The woodland in the development area consists of mainly fine-leaved, semi-deciduous *Vachellia*-dominated habitat.



**Figure E4: Open woodland habitat in the proposed development area.**



**Figure E5: A large *Vachellia* sp. tree with sparrow-weaver bird nests in the open woodland of the proposed development area.**

The following powerline priority species with a high or medium likelihood of occurrence could use Open Woodland habitat in the development area:

- Amur Falcon
- Black-headed Heron
- Black-winged Kite
- Common Buzzard
- Gabar Goshawk
- Greater Kestrel
- Hadada Ibis
- Helmeted Guineafowl
- Lanner Falcon
- Lesser Kestrel
- Northern Black Korhaan
- Pied Crow
- Spotted Eagle-Owl
- Western Cattle Egret
- White-backed Vulture

### 3.2.2 *Water Points*

Surface water is important to avifauna in this semi-arid area. The development area contains several artificial impoundments (cement water troughs and water reservoirs) which provide habitat for waterbirds and many other non-priority species (**Figures 6 & 7**). Raptors will also use these areas to hunt other bird species.



**Figure E6: Cement water trough in proposed development area.**



**Figure E7: Cement water reservoir in the proposed development area.**

The following powerline priority species with a high or medium likelihood of occurrence could use Water Points in the development area:

- Black-headed Heron
- Common Buzzard
- Egyptian Goose
- Gabar Goshawk
- Hadada Ibis
- Helmeted Guineafowl
- Lanner Falcon
- Pied Crow
- Western Cattle Egret
- White-backed Vulture

### *3.2.3 High Voltage Overhead Powerlines*

There is a high voltage overhead powerline that crosses the development area (**Figure 8**). Birds, such as raptors and crows, often use powerlines as perches or even nesting sites.



**Figure E8: High voltage overhead powerline in the proposed development area.**

The following powerline priority species with a high or medium likelihood of occurrence could use Overhead Powerlines in the development area:

- Amur Falcon
- Black-headed Heron
- Black-winged Kite
- Common Buzzard
- Egyptian Goose
- Greater Kestrel
- Hadada Ibis
- Helmeted Guineafowl
- Lanner Falcon
- Lesser Kestrel
- Pied Crow
- Spotted Eagle-Owl
- White-backed Vulture

#### **4. Environmental sensitivities**

The following environmental sensitivities have been identified to date:

- Existing Hermes/Pluto 400kV 1 & 2 high voltage lines: Medium sensitivity

The surveys at the assessment area revealed a White-backed Vulture roost on the Hermes/Pluto 400kV 2 overhead line. It is highly likely that the vultures use both the Hermes/Pluto high voltage lines in the assessment areas to periodically roost on, probably more so during the non-breeding season between December and March, when they tend to wander widely from breeding areas in the savanna biome further to the west and north-west in the North West Province.

## **5. Conclusions**

Based on the field survey to date, a classification of **High** sensitivity for avifauna is recommended for the proposed development area.

**Appendix E1: Bird species list for the broader area**

Common Name	Scientific Name	Recorded during Site Visit
Bokmakierie	<i>Telophorus zeylonus</i>	X
Brubru	<i>Nilaus afer</i>	
Mallard	<i>Anas platyrhynchos</i>	
Neddicky	<i>Cisticola fulvicapilla</i>	
Quailfinch	<i>Ortygospiza atricollis</i>	
African Black Duck	<i>Anas sparsa</i>	
Bar-throated Apalis	<i>Apalis thoracica</i>	
African Darter	<i>Anhinga rufa</i>	
Acacia Pied Barbet	<i>Tricholaema leucomelas</i>	
Black-collared Barbet	<i>Lybius torquatus</i>	
Crested Barbet	<i>Trachyphonus vaillantii</i>	
Chin-spot Batis	<i>Batis molitor</i>	
Pririt Batis	<i>Batis pririt</i>	X
European Bee-eater	<i>Merops apiaster</i>	
Little Bee-eater	<i>Merops pusillus</i>	
White-fronted Bee-eater	<i>Merops bullockoides</i>	
Southern Red Bishop	<i>Euplectes orix</i>	
Yellow-crowned Bishop	<i>Euplectes afer</i>	
African Red-eyed Bulbul	<i>Pycnonotus nigricans</i>	
Cape Bunting	<i>Emberiza capensis</i>	X
Cinnamon-breasted Bunting	<i>Emberiza tahapisi</i>	
Golden-breasted Bunting	<i>Emberiza flaviventris</i>	
African Fish Eagle	<i>Haliaeetus vocifer</i>	
Black-throated Canary	<i>Crithagra atrogularis</i>	
Yellow Canary	<i>Crithagra flaviventris</i>	X
Yellow-fronted Canary	<i>Crithagra mozambica</i>	
Ant-eating Chat	<i>Myrmecocichla formicivora</i>	X
Familiar Chat	<i>Oenanthe familiaris</i>	X
Desert Cisticola	<i>Cisticola aridulus</i>	
Levaillant's Cisticola	<i>Cisticola tinniens</i>	
Rattling Cisticola	<i>Cisticola chiniana</i>	
Wing-snapping Cisticola	<i>Cisticola ayresii</i>	
Zitting Cisticola	<i>Cisticola juncidis</i>	
African Rail	<i>Rallus caerulescens</i>	
African Sacred Ibis	<i>Threskiornis aethiopicus</i>	
African Snipe	<i>Gallinago nigripennis</i>	
African Spoonbill	<i>Platalea alba</i>	
Burchell's Coucal	<i>Centropus burchellii</i>	
African Swamphen	<i>Porphyrio madagascariensis</i>	
Long-billed Crombec	<i>Sylvietta rufescens</i>	X
Amur Falcon	<i>Falco amurensis</i>	



Diederik Cuckoo	<i>Chrysococcyx caprius</i>	
Great Spotted Cuckoo	<i>Clamator glandarius</i>	
Jacobin Cuckoo	<i>Clamator jacobinus</i>	
Black-headed Heron	<i>Ardea melanocephala</i>	
Cape Turtle Dove	<i>Streptopelia capicola</i>	X
Laughing Dove	<i>Spilopelia senegalensis</i>	
Namaqua Dove	<i>Oena capensis</i>	
Red-eyed Dove	<i>Streptopelia semitorquata</i>	
Rock Dove	<i>Columba livia</i>	
Black Crane	<i>Zapornia flavirostra</i>	
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	
Blacksmith Lapwing	<i>Vanellus armatus</i>	X
Black-winged Kite	<i>Elanus caeruleus</i>	
Cape White-eye	<i>Zosterops virens</i>	
Black-winged Stilt	<i>Himantopus himantopus</i>	
Cape Shoveler	<i>Spatula smithii</i>	
Cloud Cisticola	<i>Cisticola textrix</i>	X
Common Buzzard	<i>Buteo buteo</i>	
Yellow-bellied Eremomela	<i>Eremomela icteropygialis</i>	X
Egyptian Goose	<i>Alopochen aegyptiaca</i>	
Common Moorhen	<i>Gallinula chloropus</i>	
Cut-throat Finch	<i>Amadina fasciata</i>	
Red-headed Finch	<i>Amadina erythrocephala</i>	
African Firefinch	<i>Lagonosticta rubricata</i>	
Jameson's Firefinch	<i>Lagonosticta rhodopareia</i>	
Red-billed Firefinch	<i>Lagonosticta senegala</i>	
Southern Fiscal	<i>Lanius collaris</i>	X
African Paradise Flycatcher	<i>Terpsiphone viridis</i>	
Spotted Flycatcher	<i>Muscicapa striata</i>	
Curlew Sandpiper	<i>Calidris ferruginea</i>	
Fiscal Flycatcher	<i>Melaenornis silens</i>	X
Orange River Francolin	<i>Scleroptila gutturalis</i>	
Grey Go-away-bird	<i>Crinifer concolor</i>	
European Honey-buzzard	<i>Pernis apivorus</i>	
Domestic Goose	<i>Anser anser domesticus</i>	
Fairy Flycatcher	<i>Stenostira scita</i>	
Gabar Goshawk	<i>Micronisus gabar</i>	
Greater Kestrel	<i>Falco rupicoloides</i>	
Glossy Ibis	<i>Plegadis falcinellus</i>	
Great Crested Grebe	<i>Podiceps cristatus</i>	
Hadada Ibis	<i>Bostrychia hagedash</i>	X
Great Egret	<i>Ardea alba</i>	
Helmeted Guineafowl	<i>Numida meleagris</i>	X
Grey Heron	<i>Ardea cinerea</i>	

Grey-headed Gull	<i>Chroicocephalus cirrocephalus</i>	
Hamerkop	<i>Scopus umbretta</i>	
Intermediate Egret	<i>Ardea intermedia</i>	
Lesser Honeyguide	<i>Indicator minor</i>	
African Hoopoe	<i>Upupa africana</i>	
Karoo Thrush	<i>Turdus smithi</i>	
Kittlitz's Plover	<i>Charadrius pecuarius</i>	
Lanner Falcon	<i>Falco biarmicus</i>	
Dusky Indigobird	<i>Vidua funerea</i>	
Purple Indigobird	<i>Vidua purpurascens</i>	
Village Indigobird	<i>Vidua chalybeata</i>	
Lesser Kestrel	<i>Falco naumanni</i>	
Northern Black Korhaan	<i>Afrotis afraoides</i>	X
Brown-hooded Kingfisher	<i>Halcyon albiventris</i>	
Little Egret	<i>Egretta garzetta</i>	
Little Grebe	<i>Tachybaptus ruficollis</i>	
Little Stint	<i>Calidris minuta</i>	
Pied Crow	<i>Corvus albus</i>	X
Malachite Kingfisher	<i>Corythornis cristatus</i>	
African Wattled Lapwing	<i>Vanellus senegallus</i>	
Crowned Lapwing	<i>Vanellus coronatus</i>	
Eastern Clapper Lark	<i>Mirafra fasciolata</i>	
Red-capped Lark	<i>Calandrella cinerea</i>	
Rufous-naped Lark	<i>Mirafra africana</i>	
Sabota Lark	<i>Calendulauda sabota</i>	
Spike-heeled Lark	<i>Chersomanes albofasciata</i>	X
Cape Longclaw	<i>Macronyx capensis</i>	
Banded Martin	<i>Riparia cincta</i>	
Brown-throated Martin	<i>Riparia paludicola</i>	
Marsh Owl	<i>Asio capensis</i>	
Red-faced Mousebird	<i>Urocolius indicus</i>	
Speckled Mousebird	<i>Colius striatus</i>	
White-backed Mousebird	<i>Colius colius</i>	
Common Myna	<i>Acridotheres tristis</i>	
Common Ostrich	<i>Struthio camelus</i>	
Marsh Sandpiper	<i>Tringa stagnatilis</i>	
Speckled Pigeon	<i>Columba guinea</i>	X
African Pipit	<i>Anthus cinnamomeus</i>	
Buffy Pipit	<i>Anthus vaalensis</i>	
Plain-backed Pipit	<i>Anthus leucophrys</i>	
Pale Chanting Goshawk	<i>Melierax canorus</i>	
Pied Avocet	<i>Recurvirostra avosetta</i>	
Pied Kingfisher	<i>Ceryle rudis</i>	
Black-chested Prinia	<i>Prinia flavicans</i>	

Tawny-flanked Prinia	<i>Prinia subflava</i>	
Green-winged Pytilia	<i>Pytilia melba</i>	
Red-billed Quelea	<i>Quelea quelea</i>	
Pied Starling	<i>Lamprotornis bicolor</i>	X
Cape Robin-Chat	<i>Cossypha caffra</i>	
Red-billed Teal	<i>Anas erythrorhyncha</i>	
Red-knobbed Coot	<i>Fulica cristata</i>	
Reed Cormorant	<i>Microcarbo africanus</i>	
Common Scimitarbill	<i>Rhinopomastus cyanomelas</i>	
Kalahari Scrub Robin	<i>Cercotrichas paena</i>	
White-browed Scrub Robin	<i>Cercotrichas leucophrys</i>	
South African Cliff Swallow	<i>Petrochelidon spilodera</i>	
South African Shelduck	<i>Tadorna cana</i>	
Crimson-breasted Shrike	<i>Laniarius atrococcineus</i>	
Lesser Grey Shrike	<i>Lanius minor</i>	
Red-backed Shrike	<i>Lanius collurio</i>	
Southern Pochard	<i>Netta erythrophthalma</i>	
Cape Sparrow	<i>Passer melanurus</i>	X
House Sparrow	<i>Passer domesticus</i>	
Southern Grey-headed Sparrow	<i>Passer diffusus</i>	
Yellow-throated Bush Sparrow	<i>Gymnoris superciliaris</i>	
Chestnut-backed Sparrow-Lark	<i>Eremopterix leucotis</i>	
White-browed Sparrow-Weaver	<i>Plocepasser mahali</i>	
Spotted Eagle-Owl	<i>Bubo africanus</i>	
Swainson's Spurfowl	<i>Pternistis swainsonii</i>	
Spur-winged Goose	<i>Plectropterus gambensis</i>	
Cape Starling	<i>Lamprotornis nitens</i>	
Wattled Starling	<i>Creatophora cinerea</i>	
Squacco Heron	<i>Ardeola ralloides</i>	
Three-banded Plover	<i>Charadrius tricollaris</i>	
African Stonechat	<i>Saxicola torquatus</i>	
Western Cattle Egret	<i>Bubulcus ibis</i>	X
Amethyst Sunbird	<i>Chalcomitra amethystina</i>	
White-bellied Sunbird	<i>Cinnyris talatala</i>	
Whiskered Tern	<i>Chlidonias hybrida</i>	
Barn Swallow	<i>Hirundo rustica</i>	X
Greater Striped Swallow	<i>Cecropis cucullata</i>	
Lesser Striped Swallow	<i>Cecropis abyssinica</i>	
Red-breasted Swallow	<i>Cecropis semirufa</i>	
White-throated Swallow	<i>Hirundo albigularis</i>	
White-backed Vulture	<i>Gyps africanus</i>	X
African Palm Swift	<i>Cypsiurus parvus</i>	
Little Swift	<i>Apus affinis</i>	
White-rumped Swift	<i>Apus caffer</i>	

Brown-crowned Tchagra	<i>Tchagra australis</i>	
White-breasted Cormorant	<i>Phalacrocorax lucidus</i>	
White-faced Whistling Duck	<i>Dendrocygna viduata</i>	X
White-winged Tern	<i>Chlidonias leucopterus</i>	
Spotted Thick-knee	<i>Burhinus capensis</i>	
Wood Sandpiper	<i>Tringa glareola</i>	
Groundscraper Thrush	<i>Turdus litsitsirupa</i>	
Ashy Tit	<i>Melaniparus cinerascens</i>	
Cape Penduline Tit	<i>Anthoscopus minutus</i>	
Yellow-billed Duck	<i>Anas undulata</i>	X
Cape Wagtail	<i>Motacilla capensis</i>	
African Reed Warbler	<i>Acrocephalus baeticatus</i>	
Chestnut-vented Warbler	<i>Curruca subcoerulea</i>	
Great Reed Warbler	<i>Acrocephalus arundinaceus</i>	
Icterine Warbler	<i>Hippolais icterina</i>	
Lesser Swamp Warbler	<i>Acrocephalus gracilirostris</i>	
Willow Warbler	<i>Phylloscopus trochilus</i>	
Black-faced Waxbill	<i>Brunhilda erythronotos</i>	
Blue Waxbill	<i>Uraeginthus angolensis</i>	
Common Waxbill	<i>Estrilda astrild</i>	
Violet-eared Waxbill	<i>Granatina granatina</i>	
Scaly-feathered Weaver	<i>Sporopipes squamifrons</i>	
Southern Masked Weaver	<i>Ploceus velatus</i>	X
Thick-billed Weaver	<i>Amblyospiza albifrons</i>	
Capped Wheatear	<i>Oenanthe pileata</i>	
Mountain Wheatear	<i>Myrmecocichla monticola</i>	X
Yellow-billed Stork	<i>Mycteria ibis</i>	
Orange River White-eye	<i>Zosterops pallidus</i>	
Common Whitethroat	<i>Curruca communis</i>	
Long-tailed Paradise Whydah	<i>Vidua paradisaea</i>	
Pin-tailed Whydah	<i>Vidua macroura</i>	
Shaft-tailed Whydah	<i>Vidua regia</i>	
Long-tailed Widowbird	<i>Euplectes progne</i>	
Red-collared Widowbird	<i>Euplectes ardens</i>	
White-winged Widowbird	<i>Euplectes albonotatus</i>	
Green Wood Hoopoe	<i>Phoeniculus purpureus</i>	
Cardinal Woodpecker	<i>Dendropicus fuscescens</i>	
Red-throated Wryneck	<i>Jynx ruficollis</i>	