

ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED HOTAZEL 2 SOLAR PV  
FACILITY AND ASSOCIATED INFRASTRUCTURE, HOTAZEL, NORTHERN CAPE

**AVIFAUNAL EIA-PHASE STUDY**



The Vulnerable Lanner Falcon *Falco biarmicus* (immature)



**PRODUCED FOR CAPE EAPRAC**

**BY**



**[Simon.Todd@3foxes.co.za](mailto:Simon.Todd@3foxes.co.za)**

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## **EXECUTIVE SUMMARY**

Hotazel Solar Facility 2 (Pty) Ltd is proposing the establishment of a commercial photovoltaic (PV) solar energy facility, called Hotazel 2, on the Remaining Extent (Portion 0) of farm York A 279, situated in the District of Hotazel in the Northern Cape Province. Hotazel 2 is to consist of solar PV technology with fixed, single or double axis tracking mounting structures, with a net generation (contracted) capacity of 100 MW<sub>AC</sub> (MegaWatts), as well as associated infrastructure. Hotazel 2 will have an estimated maximum footprint of ± 230 ha. The development is currently in the EIA Phase and 3Foxes Biodiversity Solutions has been appointed to undertake a specialist avifaunal impact study of the development site as part of the EIA process.

A full field assessment as well as a desktop review of the available avifaunal information for the area was conducted in order to identify and characterise the avifaunal features of the site. An approximate total of 156 bird species have been recorded within the study area and surrounds, of which 59 species were observed on site during a three-day field survey in late April 2018. Very few of these are listed as near-endemic (two species) or biome-restricted (three species). There are no known Important Bird Areas (IBAs) within the vicinity of the study site, while there are also no known large terrestrial bird populations or wetlands of significant avifaunal importance.

Ten red-listed species are known to occur in the broader area or may occur in the area. Of these, six species are listed as threatened, while one other is considered Near-Threatened. Two red-listed species were recorded during the site visit, namely the Vulnerable Verreaux's Eagle *Aquila verreauxii* and Lanner Falcon *Falco biarmicus*. Three other red-listed species of concern that have not yet been recorded in the study area but that have a moderate probability of occurring, include the Endangered Tawny Eagle *Aquila rapax*, the Vulnerable Secretarybird *Sagittarius serpentarius*, and Near-Threatened European Roller *Coracias garrulus*. Species that may occur in the study area albeit in low numbers or infrequently include the Critically Endangered White-backed Vulture *Gyps africanus*, the Endangered Martial Eagle *Polemaetus bellicosus*, the Near-Threatened Kori Bustard *Ardeotis kori* and Secretarybird *Sagittarius serpentarius*. No sensitive breeding or roosting sites of any red-listed species were observed at the site during the field survey.

The expected impacts of the proposed solar development within the study area include 1) habitat loss and fragmentation associated with the open *Acacia haematoxylon* savanna, 2) disturbance caused during the construction and operational phases, and 3) direct mortality of avifauna colliding with solar panels and associated power line structures, as well as electrocutions with power line infrastructure. The species that will be the most negatively impacted by the proposed development include mostly small passerines, ground-dwelling non-passerines and large raptors and terrestrial birds that occasionally use the area for foraging. The impacts on the avifauna would normally be expected to be of medium

importance, but due to the low frequency of occurrence of priority species, the impacts are likely to be low and no high post-mitigation impacts are expected.

The primary mitigation measures required to reduce the potential impacts on priority species include 1) restrict habitat destruction and disturbance to within the footprint of the proposed development, 2) exclusion of dense *Acacia haematoxylon* savanna from any development, 3) fitment of bird diverters where necessary on all erected power lines associated with the development to reduce the possibility of collisions and electrocutions, and 4) ensure that perimeter fencing along the boundaries of the development are bird (especially ground-dwelling species) and wildlife friendly.

Cumulative impacts associated with the development area are a concern due to increasing development pressure from both mining and solar PV development in the broader Hotazel/Kathu area. Considering that vegetation and avifauna that occur on the property are typical of the Kalahari bioregion, the overall cumulative avifaunal impact of the development is considered likely to be low, provided that the remaining natural areas outside of the property remain undeveloped. This is to ensure that avifaunal and ecological connectivity between areas of higher conservation value can be maintained.

Considering that the study area supports a typical bioregional avifaunal assemblage, and that there are no known breeding or roosting sites of red-listed priority species, there are no impacts associated with the development that are considered to be of high significance and which cannot be mitigated to a low level.

### ***Impact Statement***

The development footprint of Hotazel 2 is considered suitable for development and there are no avifaunal impacts associated with the Hotazel 2 that cannot be mitigated to an acceptable level. As such, there are no fatal flaws or high post-mitigation impacts that should prevent the development from proceeding. Based on the layout provided for the assessment, Hotazel 2 can be supported from an avifaunal point of view.

In terms of the Hotazel 2 Grid Connection and associated infrastructure, the loop-in loop-out alternative is seen as preferable to the connection to the more distant Eskom Hotazel Substation. The preferred alternative would generate very low impacts on avifauna after mitigation. No high impacts that cannot be avoided were observed and from avifaunal perspective, there are no reasons to oppose the development of any of the grid connection and associated infrastructure.

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**COMPLIANCE WITH APPENDIX 6 OF THE 2014 EIA REGULATIONS, AS AMENDED**

Requirements of Appendix 6 – GN R326 2014 EIA Regulations, 7 April 2017	Addressed in the Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	6-8
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	9
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1
<u>(cA) an indication of the quality and age of base data used for the specialist report;</u>	Section 2.1
<u>(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;</u>	Section 3
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 2.2
e) a description of the methodology adopted in preparing the report or carrying out the specialised process <u>inclusive of equipment and modelling used;</u>	Section 2
f) <u>details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;</u>	Section 3.4
g) <u>an identification of any areas to be avoided, including buffers;</u>	Section 3.4
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 3.4
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2.4
j) a description of the findings and potential implications of such findings on the impact of the <u>proposed activity or activities;</u>	Section 3
k) <u>any mitigation measures for inclusion in the EMPr;</u>	Section 5
l) <u>any conditions for inclusion in the environmental authorisation;</u>	Section 5
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 5
n) a reasoned opinion- i. whether the proposed activity, <u>activities</u> or portions thereof should be authorised; (iA) <u>regarding the acceptability of the proposed activity or activities and</u> ii. if the opinion is that the proposed activity, <u>activities</u> or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 6
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	See Main Report
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	See Main Report
q) any other information requested by the competent authority.	N/A
2) <u>Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.</u>	N/A

**SHORT CV/SUMMARY OF EXPERTISE**



**Simon Todd**

Simon Todd is Director and principal scientist at 3Foxes Biodiversity Solutions and has over 20 years of experience in biodiversity measurement, management and assessment. He has provided specialist ecological input on more than 200 different developments distributed widely across the country. This includes input on the Wind and Solar SEA (REDZ) as well as the Eskom Grid Infrastructure (EGI) SEA and Karoo Shale Gas SEA. He is on the National Vegetation Map Committee as representative of the Nama and Succulent Karoo Biomes. Simon Todd is a recognised ecological expert and is a past chairman and current deputy chair of the Arid-Zone Ecology Forum. He is registered with the South African Council for Natural Scientific Professions (No. 400425/11).

*Skills & Primary Competencies*

- Research & description of ecological patterns & processes in Nama Karoo, Succulent Karoo, Thicket, Arid Grassland, Fynbos and Savannah Ecosystems.
- Ecological Impacts of land use on biodiversity
- Vegetation surveys & degradation assessment & mapping
- Long-term vegetation monitoring
- Faunal surveys & assessment.
- GIS & remote sensing

*Tertiary Education:*

- 1992-1994 – BSc (Botany & Zoology), University of Cape Town
- 1995 – BSc Hons, Cum Laude (Zoology) University of Natal
- 1996-1997- MSc, Cum Laude (Conservation Biology) University of Cape Town

*Employment History*

- 2009 – Present – Sole Proprietor of Simon Todd Consulting, providing specialist ecological services for development and research.
- 2007 Present – Senior Scientist (Associate) – Plant Conservation Unit, Department of Botany, University of Cape Town.

- 2004-2007 – Senior Scientist (Contract) – Plant Conservation Unit, Department of Botany, University of Cape Town
- 2000-2004 – Specialist Scientist (Contract) - South African National Biodiversity Institute
- 1997 – 1999 – Research Scientist (Contract) – South African National Biodiversity Institute

A selection of recent work is as follows:

#### **Strategic Environmental Assessments**

Co-Author. Chapter 7 - Biodiversity & Ecosystems - Shale Gas SEA. CSIR 2016.

Co-Author. Chapter 1 Scenarios and Activities – Shale Gas SEA. CSIR 2016.

Co-Author – Ecological Chapter – Wind and Solar SEA. CSIR 2014.

Co-Author – Ecological Chapter – Eskom Grid Infrastructure SEA. CSIR 2015.

Contributor – Ecological & Conservation components to SKA SEA. CSIR 2017.

#### **Recent Specialist Ecological Studies in the Vicinity of the Current Site**

- Kathu Solar PV Facility. Fauna and Flora EIA Process. Cape EAPrac 2015.
- Mogobe Solar PV Facility. Fauna and Flora EIA Process. Cape EAPrac 2015.
- Logoko Solar PV Facility. Fauna and Flora EIA Process. Cape EAPrac 2015.
- RE Capital 10 Solar Power Plant, Postmasburg. Fauna and Flora EIA Process. Cape EAPrac 2015.
- Walk-through study of Kumba Iron Ore expansion area at Dingleton, Northern Cape. MSA Group. 2017.
- Adams PV Project – EIA process and follow-up vegetation survey. Aurora Power Solutions. 2016.
- Mamatwane Compilation Yard. Fauna and Flora EIA process. ERM. 2013.
- Olifantshoek-Emil 132kV power line. Fauna and Flora BA process. Savannah Environmental 2017.

#### **Eric Herrmann**

Eric Herrmann is an avifaunal specialist with over 15 years of experience in biodiversity research and conservation in the Northern Cape. He completed a B.Tech Degree (cum laude) in Nature Conservation (1997) at the Cape Technikon, followed by a Masters (cum laude) in Conservation Ecology at the University of Stellenbosch (2004). He has worked as a research assistant for the Endangered Wildlife Trust (1999-2001) in the Kgalagadi Transfrontier Park, and then for the Percy FitzPatrick Institute of African Ornithology (University of Cape Town) as project manager of a field research centre near Kimberley (2003 to 2006). In 2006 he joined the provincial Department of Environment and Nature Conservation (DENC) in Kimberley as a faunal scientist until 2012. Since 2016 he has been working independently as an avifaunal specialist largely on wind and solar energy projects in the Western and Northern Cape.

*Tertiary Education:*

- 1994 - 1997 – National Diploma: Nature Conservation (cum laude), Cape Technikon
- 1998 - 1999 – B.Tech Degree: Nature Conservation (cum laude), Cape Technikon
- 2000 - 2004 – MFor: Conservation Ecology (cum Laude), University of Stellenbosch

*Employment History*

- 2016 - Present – Independent contractor, avifaunal specialist for renewable energy projects.
- 2006 - 2012 – Senior Conservation Scientist, Department of Environment and Nature Conservation, Kimberley.
- 2003 - 2006 – Research Assistant and Field Projects Manager, Percy Fitzpatrick Institute of African Ornithology, Cape Town
- 2001 - 2002 – Field Researcher, Deciduous Fruit Producers Trust, Stellenbosch.
- 1999 - 2001 – Research Assistant, Endangered Wildlife Trust, Johannesburg.

Recent Specialist Avifaunal projects related to Solar and Wind energy or transmission infrastructure:

- Hyperion Solar PV Facility, Kathu. Avifaunal Specialist Scoping Report. Savannah Environmental. 2018.
- Dassieklip Wind Facility, Caledon. Avifaunal post-construction monitoring. BioTherm Energy. 2018.
- Excelsior Wind Facility, Swellendam. Avifaunal pre-construction monitoring. BioTherm Energy. 2018.
- Mamre Wind Facility, Mamre. Avifaunal pre-construction monitoring. Mulilo Renewable Project Developments. 2017.
- Soventix Solar PV Facility (De Aar). Avifaunal Specialist Scoping and EIA Reports. Ecoleges. 2017.
- Olifantshoek-Emil 132kV power line. Ecological Basic Assessment Report. Savannah Environmental. 2016.
- Klondike (Vryburg) Solar PV Facility. Ecological Specialist Report for EIA. Cape EAPrac 2016.



**SPECIALIST DECLARATION**

I, ..Simon Todd....., as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- I act as the independent specialist in this application;
- I 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;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- 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 have no vested interest in the proposed activity proceeding;
- 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;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study 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:  \_\_\_\_\_

Name of Specialist: \_\_\_\_ Simon Todd \_\_\_\_\_

Date: \_\_\_\_ 15 February 2021 \_\_\_\_\_

# 1 INTRODUCTION

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Hotazel Solar Facility 2 (Pty) Ltd is proposing the establishment of a commercial photovoltaic (PV) solar energy facility, called Hotazel 2, on the Remaining Extent (Portion 0) of farm York A 279, situated in the District of Hotazel in the Northern Cape Province. Hotazel 2 is to consist of solar PV technology with fixed, single or double axis tracking mounting structures, with a net generation (contracted) capacity of 100 MW<sub>AC</sub> (MegaWatts), as well as associated infrastructure. Hotazel 2 will have an estimated maximum footprint of ± 230 ha. Hotazel Solar Facility 2 (Pty) Ltd has appointed Cape EAPrac to undertake the required application for environmental authorisation process for the above development. The development is currently in the EIA Phase and 3Foxes Biodiversity Solutions has been appointed to undertake a specialist avifaunal impact study for the development site as part of the EIA process.

The purpose of the Hotazel Solar Facility 2 Avifaunal EIA Report is to 1) describe the avian ecological features of the proposed PV project site, 2) to provide a preliminary assessment of the avian ecological sensitivity of the site, and 3) identify and assess the significance of the likely impacts on the avifauna associated with the development of the site as a solar PV facility, and 4) to provide measures to avoid, minimize and mitigate project related impacts to the avifauna. A site visit (28 to 30 April 2018) as well as a desktop review of the available literature for the area was conducted in order to identify and characterise the local avifaunal community and avifaunal habitats present at the site. This information is used to derive an avifaunal sensitivity map that has been used to inform the development layouts at the site. An assessment of likely impacts on avifauna associated with the construction, operation, and decommissioning phases of the development is provided. A variety of avoidance and mitigation measures associated with each identified impact are recommended to reduce the likely impact of the development, which should be included in the EMP for the development. The full scope of study is detailed below.

## 1.1 SCOPE OF STUDY

The scope of the study includes the following activities

- a description of the avifauna that may be affected by the activity and the manner in which the avifauna may be affected by the proposed project
- a description and evaluation of environmental issues and potential impacts on the avifauna (including direct, indirect and cumulative impacts) that have been identified
- a statement regarding the potential significance of the identified issues based on the evaluation of the issues/impacts
- an indication of the methodology used in determining the significance of potential impacts on the avifauna
- an assessment of the significance of direct indirect and cumulative impacts in terms of

the following criteria:

- the nature of the impact, which shall include a description of what causes the effect, what will be affected, and how it will be affected
  - the extent of the impact, indicating whether the impact will be local (limited to the immediate area or site of development), regional, national or international
  - the duration of the impact, indicating whether the lifetime of the impact will be of a short-term duration (0-5 years), medium-term (5-15 years), long-term (> 15 years, where the impact will cease after the operational life of the activity), or permanent
  - the probability of the impact, describing the likelihood of the impact actually occurring, indicated as improbable (low likelihood) probable (distinct possibility), highly probable (most likely), or definite (Impact will occur regardless of any preventable measures)
  - the severity/beneficial scale indicating whether the impact will be very severe/beneficial (a permanent change which cannot be mitigated/permanent and significant benefit with no real alternative to achieving this benefit), severe/beneficial (long-term impact that could be mitigated/long-term benefit), moderately severe/beneficial (medium- to long-term impact that could be mitigated/ medium- to long-term benefit), slight, or have no effect
  - the significance which shall be determined through a synthesis of the characteristics described above and can be assessed as low medium or high
  - the status which will be described as either positive, negative or neutral
  - the degree to which the impact can be reversed
  - the degree to which the impact may cause irreplaceable loss of resources
  - the degree to which the impact can be mitigated
- a description and comparative assessment of all alternatives
  - recommendations regarding practical mitigation measures for potentially significant impacts, for inclusion in the Environmental Management Programme (EMPr)
  - an indication of the extent to which the issue could be addressed by the adoption of mitigation measures
  - a description of any assumptions uncertainties and gaps in knowledge
  - an environmental impact statement which contains:
    - a summary of the key findings of the environmental impact assessment;
    - an assessment of the positive and negative implications of the proposed activity;
    - a comparative assessment of the positive and negative implications of identified alternatives.

**General Considerations:**

- Disclose any gaps in information or assumptions made.
- Identify recommendations for mitigation measures to minimise impacts.
- Outline additional management guidelines.
- Provide monitoring requirements, mitigation measures and recommendations in a table format as input into the EMP for avifaunal related issues.

A description of the potential impacts of the development and recommended mitigation measures are to be provided, which will be separated into the following project phases:

- Preconstruction
- Construction
- Operational Phase
- Decommissioning

### **1.2 RELEVANT ASPECTS OF THE DEVELOPMENT**

The project is to be located on the Remaining Extent (Portion 0) of the farm York A 279, situated in the District of Hotazel in the Northern Cape Province. The total footprint would be about 230ha, with access obtained from the R31 (Figure 1). Hotazel 2 is to consist of solar PV technology with fixed, single or double axis tracking mounting structures, with a net generation (contracted) capacity of 100 MW<sub>AC</sub> (MegaWatts), as well as associated infrastructure, which will include:

- On-site substation / collector switching station;
- Auxiliary buildings (gate-house and security, control centre, office, warehouse, canteen & visitors centre, staff lockers etc.);
- Inverter-stations, transformers and internal electrical reticulation (underground cabling);
- Access and internal road network;
- Laydown area;
- There are three options proposed to connect Hotazel 2 to the Eskom Hotazel Substation:
  - Option 1 (Preferred): Overhead 132kV powerline from the Hotazel 2 on-site substation/ collector switching station to the Eskom Hotazel substation.
  - Option 2: Via a loop-in loop-out (LILO) into the Hotazel-Eldoret 132kV line.
  - Option 3: Overhead 132kV powerline from the Hotazel 2 on-site substation/ collector switching station to the Hotazel Solar collector switching station.
- Rainwater tanks; and
- Perimeter fencing and security infrastructure.



**Figure 1.** Layout of Hotazel 2, showing the location of the facility within the property (study area) as well as the grid connection corridor to the Eskom Hotazel Substation.

## 2 METHODOLOGY

### 2.1 DATA SOURCING AND REVIEW

Data sources from the literature consulted and used in the study include the following:

- The Southern African Bird Atlas Project 1 (SABAP 1; Harrison *et al.*, 1997), which obtained bird distribution data between 1987 and 1992, was consulted to determine the bird species likely to occur within the study area. The relevant quarter-degree grid cells (QDGC) that covers the study area are 2722BB (19 cards, 118 species) and 2723AA (7 cards, 101 species). More recent bird distribution data were also obtained from the second bird atlas project, which has been on-going since its inception in 2007 (SABAP 2; <http://sabap2.adu.org.za/>). SABAP2 employs a finer resolution using the pentad scale (5' latitude x 5' longitude), with the relevant pentad codes for the study area being 2710\_2255 (4 cards, 65 species) and 2710\_2300 (4 cards, 73 species).

These were consulted to determine the bird species likely to occur within the study area and the broader impact zone of the development.

- The Important Bird Areas of South Africa (IBA; Marnewick *et al.*, 2015) were consulted to determine the location of the nearest IBAs to the study area.
- The data from the Coordinated Avifaunal Roadcounts (CAR; Young *et al.*, 2003) were consulted to determine the location of the nearest CAR routes to the study area.
- The data from the Coordinated Waterbird Counts (CWAC; Taylor *et al.*, 1999) were consulted to determine the location of the nearest CWAC sites to the study area.
- The conservation status, endemism and biology of all species considered likely to occur within the study area were determined from Hockey *et al.* (2005) and Taylor *et al.* (2015).
- The South African National Vegetation Map (Mucina & Rutherford, 2006/2018) was consulted in order to determine the vegetation types and their conservation status that occur within the study area.

## **2.2 SITE VISIT & FIELD METHODOLOGY**

A site visit of three days was made to the study area in early autumn following a wet summer (28 to 30 April 2018) to determine the *in situ* local avifauna and avian habitats present on site. Conditions at the time of the site visit were favourable, with high activity levels of resident species. Linear transects (n = 11), measuring 1km in length were walked through the study area, mostly in a zig-zag formation to ensure adequate coverage under the time constraints. All birds detected by sight or sound during these transect walks were recorded, as well as the number of birds per detection. Each transect took several hours to complete. These walked transects served to:

- Quantify aspects of the local avifauna (such as species diversity and abundance);
- Identify important avian features present on site (such as nesting and roosting sites);
- Confirm the presence, abundance, habitat preference and movements of priority species;
- Identify important flyways across the site; and
- Delineate any obvious, highly sensitive, no-go areas to be avoided by the development.

Prior to analysing the transect data, all records of birds that were only seen flying over the study site (e.g. Pale-winged Starling), or large flocking species attracted to focal points such as watering holes (e.g. sandgrouse, bishop and quelea), were excluded from the database.

A list was compiled of all the avifaunal species likely to occur within the study area and the broader impact zone of the development, based on a combination of existing distributional data (SABAP 1 and SABAP 2) and species seen during the site visit. A short-list of priority bird species (including nationally and/or globally threatened, rare, endemic or range-restricted bird species) which could be affected by the proposed development was also compiled. These species will subsequently be considered as adequate surrogates for the local

avifauna in general, and mitigation of impacts on these species will be considered likely to accommodate any less important bird populations that may also potentially be affected.

**2.3 SENSITIVITY MAPPING & ASSESSMENT**

An avifaunal sensitivity map (Figure 7) of the study area was produced by mapping the avifaunal habitats as observed in the study area and the observed or potential presence of avifaunal species of conservation concern associated with each habitat or part of the site as well as any observed nesting sites, feeding areas, wetlands or other features of significance. The avifaunal sensitivity of the different units identified in the mapping procedure was rated according to the following scale:

Sensitivity	Description
Low	Areas of natural or transformed habitat which are considered low sensitivity where there is likely to be a negligible impact on avifaunal biodiversity. Most types of development can proceed within these areas with little avifaunal impact.
Medium	Areas of natural or previously transformed land where the impacts on avifauna or avifaunal habitats are likely to be largely local in nature. These areas usually comprise the bulk of avifaunal habitats within an area. Development within these areas can proceed with relatively little avifaunal impact provided that appropriate mitigation measures are taken.
High	Usually areas of natural habitat where a high impact on avifauna is anticipated due to the high avifaunal diversity, sensitivity or presence of important avifaunal habitats or nesting sites. Development within these areas is undesirable and should only proceed with caution as it may not be possible to mitigate all impacts appropriately.
Very High/No-Go	Critical and unique avifaunal habitats that serve as habitat, nesting sites or forging area for rare/endangered species or otherwise of significant local or regional avifaunal value. These areas are essentially no-go areas from a developmental perspective and should be avoided as much as possible.

**2.4 SAMPLING LIMITATIONS AND ASSUMPTIONS**

The current study consisted of a single detailed field assessment as well as a desktop study, which serves to significantly reduce the limitations and assumptions required for the study. However, it must be noted that there are limiting factors and these could detract from the accuracy of the predicted results:

- There is a scarcity of published, scientifically assessed information regarding the avifaunal impacts at existing solar energy facilities (SEFs). Recent studies at SEFs (all

using different solar technologies) in southern California have revealed that a wide range of bird species are susceptible to morbidity and mortality at SEFs, regardless of the type of technology employed. It must however be noted, that facility related factors could influence impacts and mortality rates and as such, each SEF must be assessed individually, taking all variables into account.

- Assessment of the impacts associated with bird-SEF interactions is problematic due to: (i) limitations on the quality of information available describing the composition, abundance and movements of the local avifauna, and (ii) the lack of local, empirical data describing the known impacts of existing SEFs on birds (Jenkins, 2011). A more recent study (Visser, 2016), however, provides some preliminary data within the South African context.
- The SABAP 1 data for the relevant quarter degree squares covering the proposed development area are now >21 years old (Harrison *et al.*, 1997), while there are presently only eight SABAP 2 atlas cards recorded for the two relevant pentads combined. No more reliable and/or more recent formal data on bird species distribution in the study area are available.
- Limited time in the field and seasonal spread means that important components of the local avifauna (i.e. nest sites or localised areas of key habitats for rare or threatened species) could have been missed. However, the extent of the development area is not that large and as it contains few large trees, it is highly unlikely that there are any significant nesting sites of larger species present within the affected area that would not have been detected.
- During walking transects many birds were heard but not seen, which made it difficult to estimate the number of individuals present per detection. However, considering that the same observer was responsible for recording all detections, it is assumed that sampling error would be distributed evenly across all samples.

### **3 DESCRIPTION OF THE AFFECTED ENVIRONMENT- BASELINE**

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#### **3.1 AVIFAUNAL MICROHABITATS**

Broad-scale vegetation patterns influence the distribution and abundance of bird species holistically, while vegetation structure, rather than plant species composition, has a greater influence on local avifauna populations and species assemblages (Harrison *et al.*, 1997). The study area lies within one vegetation type, the Kathu Bushveld, and essentially supports only one avifaunal microhabitat, an open savannah comprising the nationally protected *Acacia haematoxylon*, interspersed by dense stands of *Acacia mellifera*. This habitat unit covers most of the study site, but is somewhat denser within the western half of the site (Figure 3). A few large *Terminalia sericea* trees occur and are generally scarce in the broader area. The grass layer is dominated by genera such as *Aristida*, *Cymbopogon*, *Cynodon*, *Enneapogon*,



*Eragrostis* and the species *Schmidtia pappophoroides*. This microhabitat is considered to have a *Medium* sensitivity from an avifaunal perspective.



**Figure 2.** *Acacia haematoxylon* and *Acacia mellifera* savanna within the western half of the study area. The *Terminalia sericea* tree in the foreground is a rare occurrence on the property. This area is outside of the Hotazel 2 footprint.



**Figure 4.** *Acacia haematoxylon savanna* within the eastern half of the study area, showing the typical vegetation and avifaunal habitat within the footprint of the Hotazel 2 Solar Facility.



**Figure 5.** The south-eastern corner of the development area, showing the higher density of trees in this area which are comprised mostly of *Senegalia mellifera* with occasional *Vachellia haematoxylon* and *V.erioloba*.

**3.2 AVIFAUNA**

An approximate total of 156 bird species are known to occur in the study area and surrounds (Annexure 1), of which 59 species were recorded on site during the field survey. Six of these species are listed as threatened, one species is considered Near-Threatened, while a further three species (Endangered, Vulnerable and Near-Threatened) may likely occur within the area. Only two species are considered as true near-endemics to South Africa (Taylor *et al.*, 2015), while another three are considered as biome-restricted species (Marnewick *et al.*, 2015). A literature review indicates that there are no Important Bird Areas (IBAs), Coordinated Avifaunal Roadcounts (CAR) routes, or Coordinated Waterbird Counts (CWAC) wetlands in the vicinity of the study area.

The bird assemblage recorded within the study area is typical of the Kalahari bioregion. Of the 59 species recorded on site, 48 species were detected during walking transects. An average of 18.6 species were recorded per transect, with an average of 77.5 individual birds (Table 1). Small passerine species made up the majority (37 species, 77%) of the species detected, compared to non-passerines (11 species, 23%). The two near-endemic species reported for the broader study area (Fiscal Flycatcher *Sigelus silens* and Karoo Thrush *Turdus smithi*) were not detected along the transects, although all three biome-restricted species were reported, namely, the Kalahari Scrub-robin *Cercotrichas paena*, Pale-winged Starling *Onychognathus nabouroup* and Burchell’s Sandgrouse *Pterocles burchelli*.

**Table 1.** Summary of transects (n = 11) walked across the Hotazel 2 study area during the field survey (late April 2018), with respect to the number of species, and total birds detected.

Transect	No. of species	Total birds
1	19	75
2	16	57
3	17	70
4	18	57
5	17	79
6	19	87
7	24	98
8	25	103
9	20	88
10	13	56
11	17	83
<b>Average</b>	<b>18.6</b>	<b>77.5</b>
<b>Std deviation</b>	<b>3.4</b>	<b>16.3</b>

The most abundant species was the Scaly-feathered Finch *Sporopipes squamifrons*, with a relative abundance of 25.0 birds/km (Table 2). Other common species which occurred at significantly lower abundances included Black-chested Prinia *Prinia flavicans* (7.7 birds/km), Kalahari Scrub-robin (6.7 birds/km), and Chestnut-vented Warbler *Sylvia subcaeruleum* (6.1 birds/km). These three species were markedly more common than the next most abundant species such as Cape Turtle-dove *Streptopelia capicola*, Namaqua Dove *Oena capensis* and Fawn-coloured Lark *Calendulauda africanoides*. The remaining species all had relative abundances of less than two birds/km.

**Table 2.** The most commonly detected bird species during transects (n = 11) walked across the Hotazel 2 study area, with the number of birds seen per kilometre as a measure of relative abundance.

Species	No. of observations	Total birds	Birds/km
Scaly-feathered Finch	125	275	25.0
Black-chested Prinia	55	85	7.7
Kalahari Scrub Robin	59	74	6.7
Chestnut-vented Warbler	52	67	6.1
Cape Turtle-dove	30	41	3.7
Namaqua Dove	26	35	3.2
Fawn-coloured Lark	23	23	2.1
Red-headed Finch	10	20	1.8
Crimson-breasted Shrike	17	19	1.7
Ant-eating Chat	13	18	1.6
White-browed Sparrow-weaver	12	15	1.4
Violet-eared Waxbill	7	14	1.3
Desert Cisticola	11	13	1.2
Ashy Tit	9	12	1.1
Yellow Canary	8	12	1.1
Brown-crowned Tchagra	8	10	0.9
Marico Flycatcher	8	9	0.8
Southern Fiscal	8	8	0.7
Northern Black Korhaan	6	6	0.6
Tinkling Cisticola	5	5	0.5

Some species showed rather clear preferences for parts of the study area. Northern Black Korhaan *Afrotis afroides* was found exclusively in the eastern half of the site, which is less dense with fewer woody plant species and a more expansive grass layer. The Red-crested

Korhaan *Lophotis ruficrista*, which prefers more closed woodland, showed the opposite trend, being detected only within the woodier western half of the site. Amongst the passerines, Desert Cisticola *Cisticola aridulus*, Fawn-coloured Lark *Calendulauda africanoides*, and White-browed Sparrow-weaver *Plocepasser mahali* also showed a distinct preference for the less woody eastern half of the site.

Red-listed species are considered fundamental to this study, because of their susceptibility to the various threats posed by solar facilities and associated infrastructures. Only six species that have been recorded in the area are threatened, while one other species is considered Near-Threatened (Table 3). The most important of these is the Critically Endangered White-backed Vulture *Gyps africanus*, which has been recorded in the area previously during SABAP2 and hence has a high probability of occurring again. Two Red-listed species were recorded during the field survey, a pair of Verreaux's Eagle *Aquila verreauxii* (Vulnerable) and a single Lanner Falcon *Falco biarmicus* (Vulnerable). Both species were considered to have a high likelihood of occurring in the area. Another species of concern that may have a high probability of occurring in the study area is the Martial Eagle *Polemaetus bellicosus* (Endangered). The local populations of these species are, however, mostly of moderate importance, as the study site and surrounds most likely serve as only part of the foraging range of occasional individuals passing through.

An additional three species which have not yet been recorded in the area, but have a moderate probability of occurring, are also considered. These include the Tawny Eagle *Aquila rapax* (Endangered), Secretarybird *Sagittarius serpentarius* (Vulnerable) and the European Roller *Coracias garrulus* (Near-Threatened). The Kori Bustard *Ardeotis kori* (Near-threatened) was recorded during SABAP1 and therefore has a moderate probability of occurring again, especially considering that the species favours open savanna as characterised by the study area.

Other red-listed species which may occur with negligible frequency and therefore are of less concern include the Vulnerable Black Stork *Ciconia nigra* and Burchell's Courser *Cursorius rufus*. The lack of suitable microhabitats such as water bodies and shrubland plains, respectively, will in all likelihood exclude these species from the site.

**Table 3.** Red-listed species recorded in the study area during SABAP1 (1987-1991), SABAP2 (2007 on-going) and the site visit (28 to 30 April 2018), ranked according to their red-list status. Seven species have been recorded during the bird atlasing periods, while three have not yet been recorded but may likely occur (Tawny Eagle, Secretarybird and European Roller). Only two species were observed during the site visit (marked in bold). None of these species are listed as regional endemics or near-endemics.

English name	Taxonomic name	Red-list status	Estimated importance of local population	Preferred habitat	Probability of occurrence	Threats
Vulture, White-backed	<i>Gyps africanus</i>	Critically Endangered	Low	Savanna	High	Habitat loss/Disturbance Collisions/Electrocution
Eagle, Martial	<i>Polemaetus bellicosus</i>	Endangered	Moderate	Savanna & shrublands	High	Habitat loss/Disturbance Collisions/Electrocution
Eagle, Tawny	<i>Aquila rapax</i>	Endangered	Low	Savanna & Karoo plains	Moderate	Habitat loss/Disturbance Collisions/Electrocution
Courser, Burchell's	<i>Cursorius rufus</i>	Vulnerable	Low	Shrubland plains	Low	Habitat loss/Disturbance
<b>Eagle, Verreaux's</b>	<b><i>Aquila verreauxii</i></b>	<b>Vulnerable</b>	<b>Moderate</b>	<b>Mountainous and rocky areas</b>	<b>Recorded</b>	<b>Habitat loss/Disturbance Collisions/Electrocution</b>
<b>Falcon, Lanner</b>	<b><i>Falco biarmicus</i></b>	<b>Vulnerable</b>	<b>Moderate</b>	<b>Widespread</b>	<b>Recorded</b>	<b>Habitat loss/Disturbance Collisions/Electrocution</b>
Secretarybird	<i>Sagittarius serpentarius</i>	Vulnerable	Low	Open savanna & grassland	Moderate	Habitat loss/Disturbance Collisions
Stork, Black	<i>Ciconia nigra</i>	Vulnerable	Low	Water bodies	Low	Collisions
Bustard, Kori	<i>Ardeotis kori</i>	Near-threatened	Moderate	Open savanna	Moderate	Habitat loss/Disturbance Collisions
Roller, European	<i>Coracias garrulus</i>	Near-Threatened	Low	Open savanna	Moderate	Habitat loss/Disturbance

During the walking transects regular scans were made to detect any large flying birds to establish the presence of flight paths across the study area. Aside from the pair of Verreaux's Eagle seen soaring over the area at a height of approximately 150 to 200m, only Gabar Goshawk *Melierax gabar* was seen flying within the study area on one occasion. The Lanner Falcon was seen perched on the large power line on the southern boundary of the site, possibly using the pylons as vantage points during hunting forays. This power line was also observed from the study area at various times during the day on three consecutive days to determine whether it is used by large raptors and vultures. No other red-listed species or any other large birds were seen using the pylon structures for roosting or hunting during the period of the site visit, although this does not exclude the possibility that birds may use these structures at other times of the year. No nest or communal nesting sites of red-listed species were found in the study area during the site visit, which could be due to the absence of suitably large trees in the area. These observations seem to suggest that red-listed or large communal species are not currently using the study area or parts thereof for roosting or nesting.

In essence, much of the avifauna within the study area appears similar to that found across the Kalahari bioregion of the Northern Cape. The apparent lack of red-listed species in the area could be attributed to their naturally low densities and large ranges (eagles and Secretarybird), the absence of suitable habitat (Black Stork and Burchell's Courser) and nesting/roosting trees (White-backed Vulture). However, certain species may use the study area on occasion as part of their large ranges, such as Martial Eagle and Kori Bustard, as well as the unreported Tawny Eagle and Secretarybird. However, since the study area appears not to directly support large and healthy populations of red-listed species, the sensitivity of the study area in general can be considered to be of medium significance with respect to avifauna.

### **3.3 CURRENT BASELINE & CUMULATIVE IMPACT**

There are several other proposed PV facilities in the wider Hotazel area (Figure 6). The only constructed project in the immediate vicinity is the 10MW Adams PV facility south of the site. In the wider area, there are several constructed PV plants towards Kathu including the Kalahari Solar, Kathu Solar and Sishen Solar Farms. The total extent of the constructed plants in the wider area as far south as Kathu is approximately 1000ha. The existing plants are considered to form part of the existing baseline for the area and represent existing impact. The 1000ha footprint of these is however small in comparison with the iron and manganese mines in the area, which with an existing footprint of at least 12 000ha are currently the major driver of habitat loss and transformation in the Kathu-Hotazel area. There are also several authorised developments in close vicinity to the Hotazel 2 site, raising the potential for cumulative impact in the area. However, the overall development pressure in the wider area is still low and the proximity of the current development to Hotazel 2, the road and railway line as well as existing mine footprint areas suggests that the site is not likely to be

of high significance as avifaunal habitat or breeding area for species of concern. The overall extent of cumulative impact due to the solar energy development in the area is seen to be relatively low and the contribution of the current development to cumulative impact is seen as low and of local significance only. The specific contribution of the current development is up to 230ha of habitat loss which is seen to have a largely local impact.



**Figure 6.** Map of other renewable energy projects near the site. It is important to note that these are the cadastral units and not the actual footprint of the developments, which is usually only a small proportion of the unit.

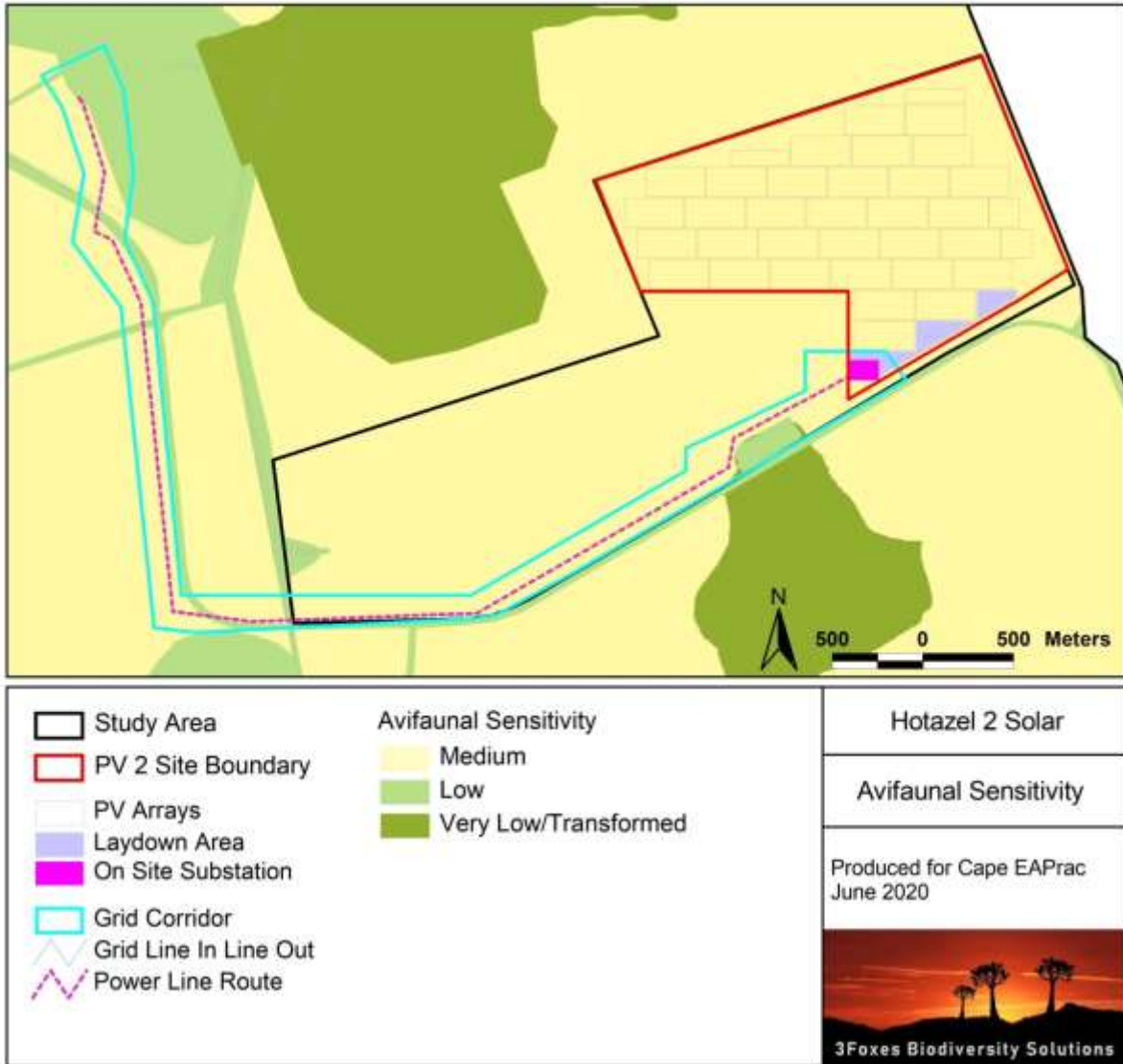
### **3.4 AVIAN SENSITIVITY ASSESSMENT**

Important avian microhabitats in the study area play an integral role within the landscape, providing nesting, foraging and reproductive benefits to the local avifauna. In order to ensure that the development does not have a long-term negative impact on the local avifauna, it is important to delineate these avian microhabitats within the study area. To this end an avian sensitivity map (Figure 7) was generated by integrating avian microhabitats present on the site and avifaunal information collected during the site visit.

The site itself is considered to be of Medium sensitivity as it represents habitat hosting typical avifauna of the Kalahari bioregion. There are however extensive areas of low and very low sensitivity areas in the surrounding area represented by mining footprint areas, the town of Hotazel and the various access and railway roads which characterise the area. These



additional disturbance and transformation footprints serve to reduce the overall sensitivity and significance of the area for avifauna. The development of a solar energy facility on a restricted portion of the study area would generate low impacts on the resident avifauna, provided that suitable mitigation measures are employed during construction and operation of the proposed facility. While the development would result in some habitat loss for avifauna of local significance, it will not necessarily impact negatively on red-listed avifaunal species, which appear to occur sparsely within the local area, probably as a result of all the disturbance that the area experiences.



**Figure 7.** Avifaunal sensitivity map for the wider Hotazel 2 area and grid connection route, showing the location of the Hotazel 2 footprint in the east of the study area.

## 4 IDENTIFICATION & NATURE OF IMPACTS

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In this section, the potential impacts and associated risk factors that may be generated by the development are identified. In order to ensure that the impacts identified are broadly applicable and inclusive, all the likely or potential impacts that may be associated with the development are listed. The relevance and applicability of each potential impact to the current situation are then examined in more detail in the next section.

According to a position statement by Birdlife South Africa, the main concerns with PV facilities are the following:

- Displacement or the exclusion of nationally and/or globally threatened, rare, endemic, or range-restricted bird species from important habitats.
- Loss of habitat and disturbance of resident bird species caused by construction, operation and maintenance activities.
- Collision with the solar panels, which may be mistaken for water bodies.
- Collision and electrocution caused when perching on or flying into associated power line infrastructure.
- Habitat destruction and disturbance/exclusion of avifauna through construction (short-term) and maintenance (long-term) of new power line infrastructure.
- Habitat destruction and disturbance of birds caused by the construction and maintenance of new roads and other infrastructure.

The proposed Hotazel 2 development will cover an area of up to approximately 230 ha, located within Kathu Bushveld dominated by *Acacia haematoxylon* and *Acacia mellifera*. This habitat represents the typical vegetation of the broader area, with few features of concern present across most of the site. Of six red-listed species that are known to occur in the broader area, only two were seen during the site visit, while only two near-endemic species and three biome-restricted species are known to occur. While the development may have an insignificant impact on these species, it will nevertheless impact on common local bird assemblages primarily through direct habitat loss and displacement. Species are expected to be impacted to varying degrees based on their life-history strategies, abundance and general susceptibility to the threats posed by PV facilities. While habitat loss can be quantified by extent of the development footprint, there are other impacts such as direct mortalities caused by collisions with solar panels, which are still poorly understood.

Data on estimates of birds killed at solar facilities as a direct result of collisions with associated infrastructure are limited, especially in South Africa. A recent study at the 96MW Jasper PV facility near Postmasburg in the Northern Cape (Visser, 2016) provides the first estimates of the potential impact on birds within the region, with direct mortalities amounting to 4.5 birds/MW/year. This short term study also concluded, however, that there was no significant association with collision-related mortality at that study site, suggesting that collisions with

panels is not the major source of mortality associated with PV facilities in the Northern Cape. While Visser suggests that 10cm gaps between panels can be used to break up the solid pattern of panels and reduce collisions, this would increase the footprint of the PV facility by 6-10ha and therefore the reduced collision-related mortality must be weighed up against the additional habitat loss. As significant collision-related mortality at PV facilities in South Africa has yet to be reported, this is not seen as an essential mitigation measure at this point and mitigation should focus on reducing the other PV facility related sources of mortality on avifauna. Most injuries that were recorded by Visser (2016) were related to species such as francolin colliding with the underside of PV panels, and korhaans becoming entrapped along the perimeter fencing, between the mesh and electrical strands. A PV solar facility in the United States is reported to result in the deaths of 0.5 birds/MW/year as a direct result of the collisions with infrastructure (Walston *et al.*, 2016).

#### **4.1 IDENTIFICATION OF POTENTIAL IMPACTS AND DAMAGING ACTIVITIES**

In this section each of the potential impacts on avifauna associated with the development is explored in more detail with reference to the features and characteristics of the site and the likelihood that each impact would occur given the characteristics of the site and the extent and nature of the development. While renewable energy sources, such as solar energy, are important to the future development of power generation and hold great potential to alleviate the dependence on fossil fuels, they are not without environmental risks and negative impacts. Poorly sited or designed SEFs can have negative impacts on not only vulnerable species and habitats, but also on entire ecosystem functioning. These impacts are extremely variable, differing from site to site, and are dependent on numerous contributing factors which include the design and specifications of the development, the importance and sensitivity of avian microhabitats present on site and the diversity and abundance of the local avifauna.

Potential avifaunal impacts resulting from the development of the Hotazel 2 would stem from a variety of different activities and risk factors associated with the preconstruction, construction and operational phases of the project including the following:

##### **Habitat loss and disturbance of small passerines**

For the smaller passerine species the most important impacts will involve displacement from the area encompassed by the development footprint as a result of habitat destruction. The loss of habitat will be permanent while disturbance may be continuous during the operational phase of the solar facility. Other impacts such as disturbances caused by reflective panels and grid connecting power lines are not likely to have any appreciable impact on these small species. The impacts in general can be expected to be minimal as these smaller species are far less susceptible to the associated impacts than larger species.

##### **Habitat loss, disturbance and collision risk of medium terrestrial birds and raptors**

Small to medium sized non-passerines that may be impacted to some extent due to habitat loss and displacement include resident raptors such as Gabar Goshawk *Micronisus gabar*, Pale Chanting Goshawk *Melierax canorus*, Greater Kestrel *Falco rupicoloides*, and the ground-dwelling Burchell's Sandgrouse *Pterocles burchelli*, Northern Black Korhaan *Afrotis afraoides*, and Red-crested Korhaan *Lophotis ruficrista*. These species may also be susceptible to collisions with associated infrastructure such as the PV panels and power lines, but this is not expected to have a major impact on most of these species. Northern Black Korhaan, Red-crested Korhaan, and potentially unrecorded francolin species may, however, be at more risk based on the recent research (Visser, 2016).

### **Habitat loss, disturbance and collision risk of large terrestrial birds and raptors**

The group of primary concern is the medium to large non-passerines, which include the large terrestrial birds and diurnal raptors. Many of these are also red-listed, such as White-backed Vulture, Martial eagle, Verreaux's Eagle, Kori Bustard, Secretarybird and Tawny Eagle. Besides the loss of habitat that these species will experience, disturbances during construction and operation of the facility are also expected to have a negative impact. In addition, most of these species are also highly susceptible to collisions with power lines owing to reduced ability to see the power lines and reduced manoeuvrability in flight to avoid collisions (Martin & Shaw, 2010; Jenkins *et al.*, 2010). A high number of large terrestrial birds, including the red-listed species, are killed in substantial numbers by existing and newly erected power lines in the country (Jenkins *et al.*, 2010; Jenkin *et al.*, 2011; Shaw, 2013). An additional threat faced by the large raptors is electrocution when perched or attempting to perch on power line structures (Lehman *et al.*, 2007).

## **5 ASSESSMENT OF IMPACTS**

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The various identified impacts are assessed below for the different phases of the development. It is important to note that the assessment is based on the layouts as provided and any changes to the layout or project description could invalidate the assessment.

**5.1 HOTAZEL SOLAR 2 PV DEVELOPMENT**

The following is an assessment of the Hotazel 2 Facility, for the planning, construction and operational phase of the development.

**5.1.1 Planning & Construction Phase**

Nature of impact	Direct Avifaunal Impacts During Construction – habitat loss and disturbance							
	Spatial Extent	Duration	Intensity	Probability	Reversibility	Significance and Status		Confidence level
						Without Mitigation	With Mitigation	
Hotazel 2	Local	Short- Term	Medium	High	High	Medium Negative	Medium-Low Negative	High
<b>Mitigation/Management Actions</b>								
<ul style="list-style-type: none"> <li>• The destruction of habitat during construction should be strictly contained within the development footprint.</li> <li>• The use of lay-down areas within the footprint of the development should be used where feasible, to avoid habitat loss and disturbance to adjoining areas.</li> <li>• All building waste produced during the construction phase should be removed from the development site and be disposed of at a designated waste management facility. Similarly, all liquid wastes should be contained in appropriately sealed vessels/ponds within the footprint of the development, and be disposed of at a designated waste management facility after use. Any liquid and chemical spills should be dealt with accordingly to avoid contamination of the environment.</li> <li>• Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to, and awareness about not harming or hunting ground-dwelling species (e.g. bustards, korhaans, thick-knees and coursers), and owls, which are often persecuted out of superstition.</li> <li>• This induction should also include awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc.</li> <li>• All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such nocturnal and crepuscular species (e.g. nightjars, thick-knees and owls) which sometimes forage or rest along roads.</li> <li>• Sensitive microhabitats should be avoided, such as nesting sites during the breeding season of large terrestrial birds (generally summer; Hockey <i>et al.</i>, 2005).</li> <li>• Any avifauna threatened by the construction activities should be removed to safety by the ECO or appropriately qualified environmental officer.</li> <li>• If holes or trenches need to be dug, these should not be left open for extended periods of time as ground-dwelling avifauna or their flightless young may fall in and become trapped in them. Holes should only be dug when they are required and should be used and filled shortly thereafter.</li> <li>• No construction activity should occur near to active raptor nests should these be discovered prior to or during the construction phase. If there are active nests near construction areas, these should be reported to ECO and should be monitored until the birds have finished nesting and the fledglings left the nest.</li> </ul>								

5.1.2 Operational Phase Impacts

Nature of Impact	Avifaunal Impacts due to operational activities – disturbance and collisions with PV panels							
Alternative	Spatial Extent	Duration	Intensity	Probability	Reversibility	Significance and Status		Confidence level
						Without Mitigation	With Mitigation	
Hotazel 2	Local	Long-term	Medium-Low	Moderate	High	Medium-Low Negative	Low-Negative	High
<p><b>Mitigation/Management Actions</b></p> <ul style="list-style-type: none"> <li>• If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects. The use of lighting at night should be kept to a minimum, so as not to unnecessarily attract invertebrates to the solar facility and possibly their avian predators, and to minimise disturbance to birds flying over the facility at night.</li> <li>• All incidents of collision with panels should be recorded as meticulously as possible, including data related to the species involved, the exact location of collisions within the facility, and suspected cause of death.</li> <li>• If birds are nesting on the infrastructure of the facility and cannot be tolerated due to operational risks of fire, electrical shorts, soiling of panels or other concerns, birds should be prevented from accessing nesting sites by using mesh or other manner of excluding them. Birds should not be shot, poisoned or harmed as this is not an effective control method and has negative ecological consequences. Birds that already have eggs or nestlings should be allowed to fledge their young before nests are removed. If there are any persistent problems with avifauna, then an avifaunal specialist should be consulted for advice on further mitigation.</li> <li>• All food waste and litter at the site should be placed in bins with lids and removed from the site on a regular basis.</li> <li>• All vehicles accessing the site should adhere to a low speed limit (30km/h max) to avoid collisions with susceptible species such nocturnal and crepuscular species (e.g. nightjars, thick-knees and owls) which sometimes forage or rest on roads at night.</li> </ul>								

**5.2 HOTAZEL 2 GRID CONNECTION**

The following is an assessment of the Grid Connection for the Hotazel 2 Facility, for the planning and construction and operational phases of the development.

**5.2.1 Planning & Construction Phase**

Impact Nature	Direct Avifaunal Impacts During Construction							
Alternative	Spatial Extent	Duration	Intensity	Probability	Reversibility	Significance and Status		Confidence level
						Without Mitigation	With Mitigation	
<b>Grid Connection Alt 1</b>	Local	Short- Term	Medium-Low	High	High	Medium-Low Negative	Low Negative	High
<b>Grid Connection Alt 2</b>	Local	Short- Term	Low	Low	High	Low Negative	Very Low Negative	High
<b>Grid Connection Alt 3</b>	Local	Short- Term	Low	Medium	High	Low Negative	Low Negative	High

**Mitigation/Management Actions**

- All personnel should undergo environmental induction with regards to avifauna and in particular awareness about not harming, collecting or hunting ground-dwelling species (e.g. bustards, korhaans, thick-knees and coursers), and owls, which are often persecuted out of superstition.
- Any avifauna threatened by the construction activities should be removed to safety by the ECO or appropriately qualified environmental officer.
- All vehicles (construction or other) accessing the site should adhere to a low speed limit (30km/h max) to avoid collisions with susceptible species such as nocturnal and crepuscular species (e.g. nightjars, thick-knees and owls) which sometimes forage or rest on roads, especially at night.
- If holes or trenches need to be dug, these should not be left open for extended periods of time as ground-dwelling avifauna or their flightless young may fall in and become trapped in them. Holes should only be dug when they are required and should be used and filled shortly thereafter.
- The design and layout of any proposed power lines must be endorsed by members of the Eskom-EWT Strategic Partnership, taking into account the mitigation guidelines recommended by Birdlife South Africa (Smit, 2012; Jenkins *et al.*, 2017).
- The route that the power line will follow should be the shortest distance possible across an area where collisions are expected to be minimal, or follow existing power lines, and be marked with bird diverters to make the lines as visible as possible to collision-susceptible species. Recommended bird diverters such as brightly coloured 'aviation' balls, thickened wire spirals, or flapping devices that increase the visibility of the lines should be fitted were considered necessary.
- Regular monitoring of power lines should be undertaken to detect bird carcasses, to enable the identification of any areas of high impact to be marked with bird diverters.

- Only power line structures that are considered safe for birds should be erected to avoid the electrocutions of birds (particularly large raptors) perching or attempting to perch. Where necessary, deterrent devices such as bird guards should be mounted on relevant parts of the pylons to further reduce the possibility of electrocutions.

**5.2.2 Operational Phase**

Impact Nature	Operational phase power line electrocution and collision risk of large terrestrial birds and raptors							
Alternative	Spatial Extent	Duration	Intensity	Probability	Reversibility	Significance and Status		Confidence level
						Without Mitigation	With Mitigation	
<b>Grid Connection Alt 1</b>	Local	Long- Term	Medium-Low	High	High	Medium-Low Negative	Low Negative	High
<b>Grid Connection Alt 2</b>	Local	Long- Term	Low	Low	High	Low Negative	Very Low Negative	High
<b>Grid Connection Alt 3</b>	Local	Long- Term	Low	Low	High	Low Negative	Very Low Negative	High
<b>Mitigation/Management Actions</b>								
<ul style="list-style-type: none"> <li>• Regular monitoring of the power line should be undertaken to detect bird carcasses, to enable the identification of any areas of high impact where additional mitigation such as fitting bird diverters may be required. This should occur at least monthly for the first year after construction.</li> <li>• Any raptors or other birds nesting on the power line structures should not be disturbed while the birds are breeding. If species such as sociable weavers are present, which are making the line unsafe, then these nests should be regularly removed before breeding can commence. Measures should also be put in place to prevent birds persistently nesting in problem areas by using artificial nesting platforms and perches positioned away from live components.</li> </ul>								



**5.3 CUMULATIVE IMPACTS**

The following are the cumulative impacts that are assessed as being a likely consequence of the development of the Hotazel 2 Facility. These are assessed in context of the extent of the current site, other developments in the area as well as general habitat loss and transformation resulting from mining and other activities in the area.

**Cumulative Impact 1. Impact on avifaunal habitats, migration routes and nesting areas due to cumulative loss and fragmentation of habitat**

Nature of Impact	Broad-scale avifaunal impacts due to cumulative loss and fragmentation of habitat							
Alternative	Spatial Extent	Duration	Intensity	Probability	Reversibility	Significance and Status		Confidence level
						Without Mitigation	With Mitigation	
Hotazel 2	Regional	Long-Term	Medium	Moderate	Low	Medium-Low Negative	Medium Low Negative	Moderate-High
<p><b>Mitigation/Management Actions</b></p> <ul style="list-style-type: none"> <li>• Minimise the development footprint as far as possible.</li> <li>• The facility should be fenced off in a manner which allows small fauna to pass through the facility, but that does not result in ground-dwelling avifauna (e.g. bustards, korhaan, francolin, thick-knees) being trapped and electrocuted along the boundary fences (Visser, 2016). In practical terms this means that the facility should be fenced-off to include only the developed areas and should include as little undeveloped ground or natural veld as possible. In addition, there should not be electrified ground-strands present within 30cm of the ground and the electrified strands should be located on the inside of the fence and not the outside. Furthermore, the fence should be a single layer fence and not a double fence with a large gap between. Images of suitable fencing types from existing PV facilities are available on request.</li> </ul>								

## 6 CONCLUSION & RECOMMENDATIONS

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The study area lies within the Kalahari bioregion and supports the typical avifaunal assemblage expected for the area. Although six threatened and one near-threatened species are known to occur within the broader study area, most of these are not common in the area and probably occur in low numbers. Furthermore, the vegetation of the study area supports few species or features of concern present across most of the site, such as nesting or roosting sites of red-listed species. Impacts on avifauna with the development on this site are likely to be medium-low and no high post-mitigation impacts are likely.

The expected impacts of the proposed solar development area will include the following, 1) habitat loss and fragmentation associated with transformation and loss of the *Acacia haematoxylon* savanna within the development footprint, 2) disturbance and displacement caused during the construction and operational phases, and 3) direct mortality of avifauna colliding with solar panels and associated power line structures, as well as electrocutions with power line infrastructure, and 4) a cumulative habitat loss at a broader scale from development impacts in the broader area. Habitat loss and disturbance during the construction phase of the development will impact mostly small passerine species and medium-sized non-passerines, with consequences restricted to the local area only. Impacts related to collisions with PV panels and associated infrastructure (such as fencing) will impact mostly medium-sized non-passerines (e.g. korhaans, francolin and thick-knees). Red-listed species will be impacted by the loss of foraging habitat and disturbances, and potentially by collisions and electrocutions with power line infrastructure. However, given the extensive national ranges of these species, the impact of the development on habitat loss for these species would be minimal and a long-term impact unlikely given the proximity of the site to existing mining disturbances.

Several mitigation measures should be implemented during the construction and maintenance phase of the proposed development to reduce the impacts on the avifauna. During the construction phase, mitigation measures may assist in reducing displacement and disturbance by restricting habitat loss and disturbance strictly to within the footprint of the development. Impacts associated with the power line, such as collisions and electrocutions, should be mitigated where necessary through regular monitoring to determine high risk areas where bird diversions (e.g. bird flappers) should be located along the power line route. However, if the loop-in loop-out option is used to connect the facility to the Eskom line passing south of the site, impacts on avifauna related to the grid connection would be reduced to a very low level. With the implementation of the mitigation measures, the impact of the development can be reduced to an acceptable level and as such there are no fatal flaws associated with the development.

Cumulative impacts in the area are a concern due firstly to the mining activity that characterises the area and secondly due to the proliferation of solar energy development in the wider Hotazel/Kathu area. The current development would contribute approximately 230ha of habitat loss within an area considered to be of relatively low avifaunal significance and which does not lie within a likely avifaunal movement corridor or along an important environmental gradient that would be regularly or seasonally used by avifauna. As such, the overall cumulative impact of the development on avifauna is considered likely to be low.

The on-site grid connection options including the loop-in loop-out connection to the 132kV line that traverses the site are preferable to the 6km connection to the Hotazel substation as the former would generate minimal avifaunal impact. There are however no impacts associated with the development that are considered to be of high significance and which cannot be mitigated to an acceptable level.

### ***Impact Statement***

The development footprint of Hotazel 2 is considered suitable for development. There are no avifaunal impacts associated with Hotazel 2 that cannot be mitigated to an acceptable level. As such there are no fatal flaws or high post-mitigation impacts that should prevent the development from proceeding. Based on the layout provided for the assessment, Hotazel 2 can be supported from an avifaunal point of view.

In terms of the Hotazel 2 Grid Connection and associated infrastructure, the loop-in loop-out alternative is seen as ecologically preferable to the connection to the more distant Eskom Hotazel Substation. While the LILO (Option 2) is preferred, all three options are acceptable from an avifaunal perspective. Therefore, should the LILO be deemed not technically feasible, it is acceptable for either Option 1 or 3 to be authorised. No high impacts that cannot be avoided were observed and from avifaunal perspective, there are no reasons to oppose the development of any of the grid connection and associated infrastructure.

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## 8 ANNEX 1. LIST OF AVIFAUNA

A consolidated avifaunal list for the Hotazel 2 study area and surrounds, including records from SABAP1, SABAP2 and the site visit, and includes red-list status (Taylor *et al.*, 2015), regional endemism (Taylor *et al.*, 2015), and SABAP2 reporting rates. Species with a zero reporting rate were only recorded during SABAP1 and not SABAP2. Species highlighted in bold text were recorded during the site visit (28 to 30 April 2018).

Common name	Taxonomic name	Red-list status	Regional endemism	Reporting rate (%)
<b>Babbler, Southern Pied</b>	<b><i>Turdoides bicolor</i></b>			<b>12.5</b>
<b>Barbet, Acacia Pied</b>	<b><i>Tricholaema leucomelas</i></b>			<b>50.0</b>
<b>Batis, Pririt</b>	<b><i>Batis pririt</i></b>			<b>25.0</b>
Bee-eater, European	<i>Merops apiaster</i>			12.5
<b>Bee-eater, Swallow-tailed</b>	<b><i>Merops hirundineus</i></b>			<b>50.0</b>
<b>Bishop, Southern Red</b>	<b><i>Euplectes orix</i></b>			<b>25.0</b>
<b>Bokmakierie</b>	<b><i>Telophorus zeylonus</i></b>			<b>37.5</b>
<b>Brubru</b>	<b><i>Nilaus afer</i></b>			<b>25.0</b>
<b>Bulbul, African Red-eyed</b>	<b><i>Pycnonotus nigricans</i></b>			<b>75.0</b>
<b>Bunting, Cinnamon-breasted</b>	<b><i>Emberiza tahapisi</i></b>			<b>12.5</b>
Bunting, Golden-breasted	<i>Emberiza flaviventris</i>			25.0
<b>Bunting, Lark-like</b>	<b><i>Emberiza impetuani</i></b>			<b>25.0</b>
Bustard, Kori	<i>Ardeotis kori</i>	Near-threatened		0
<b>Canary, Black-throated</b>	<b><i>Crithagra atrogularis</i></b>			<b>25.0</b>
<b>Canary, Yellow</b>	<b><i>Crithagra flaviventris</i></b>			<b>62.5</b>
<b>Chat, Ant-eating</b>	<b><i>Myrmecocichla formicivora</i></b>			<b>62.5</b>
Chat, Familiar	<i>Cercomela familiaris</i>			37.5
<b>Cisticola, Desert</b>	<b><i>Cisticola aridulus</i></b>			<b>25.0</b>
<b>Cisticola, Tinkling</b>	<b><i>Cisticola rufilatus</i></b>			<b>12.5</b>
Cisticola, Levillant's	<i>Cisticola tinniens</i>			0
Cisticola, Zitting	<i>Cisticola juncidis</i>			0
Coot, Red-knobbed	<i>Fulica cristata</i>			0
Cormorant, Reed	<i>Phalacrocorax africanus</i>			0
Courser, Burchell's	<i>Cursorius rufus</i>	Vulnerable		0
<b>Crombec, Long-billed</b>	<b><i>Sylvietta rufescens</i></b>			<b>25.0</b>
<b>Crow, Pied</b>	<b><i>Corvus albus</i></b>			<b>55.0</b>
Cuckoo, Black	<i>Cuculus clamosus</i>			12.5
Cuckoo, Diderick	<i>Chrysococcyx caprius</i>			12.5
Cuckoo, Jacobin	<i>Clamator jacobinus</i>			12.5
<b>Dove, Laughing</b>	<b><i>Streptopelia senegalensis</i></b>			<b>55.0</b>
<b>Dove, Namaqua</b>	<b><i>Oena capensis</i></b>			<b>62.5</b>
Dove, Red-eyed	<i>Streptopelia semitorquata</i>			25.0

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Drongo, Fork-tailed	<i>Dicrurus adsimilis</i>		25.0
Duck, White-faced	<i>Dendrocygna viduata</i>		0
Duck, Yellow-billed	<i>Anas undulata</i>		0
Eagle, Martial	<i>Polemaetus bellicosus</i>	Endangered	0
<b>Verreaux's Eagle</b>	<b><i>Aquila verreauxii</i></b>	<b>Vulnerable</b>	<b>12.5</b>
Egret, Cattle	<i>Bubulcus ibis</i>		0
Egret, Little	<i>Egretta garzetta</i>		0
<b>Eremomela, Yellow-bellied</b>	<b><i>Eremomela icteropygialis</i></b>		<b>62.5</b>
<b>Falcon, Lanner</b>	<b><i>Falco biarmicus</i></b>	<b>Vulnerable</b>	<b>25.0</b>
Falcon, Pygmy	<i>Polihierax semitorquatus</i>		25.0
<b>Finch, Red-headed</b>	<b><i>Amadina erythrocephala</i></b>		<b>25.0</b>
<b>Finch, Scaly-feathered</b>	<b><i>Sporopipes squamifrons</i></b>		<b>62.5</b>
<b>Fiscal, Common (Southern)</b>	<b><i>Lanius collaris</i></b>		<b>55.0</b>
<b>Flycatcher, Chat</b>	<b><i>Bradornis infuscatus</i></b>		<b>37.5</b>
Flycatcher, Fiscal	<i>Sigelus silens</i>	Near-endemic	0
<b>Flycatcher, Marico</b>	<b><i>Bradornis mariquensis</i></b>		<b>75.0</b>
Flycatcher, Spotted	<i>Muscicapa striata</i>		0
<b>Goshawk, Gabar</b>	<b><i>Melierax gabar</i></b>		<b>37.5</b>
<b>Goshawk, Pale Chanting</b>	<b><i>Melierax canorus</i></b>		<b>25.0</b>
Grebe, Little	<i>Tachybaptus ruficollis</i>		0
Greenshank, Common	<i>Tringa nebularia</i>		0
<b>Guineafowl, Helmeted</b>	<b><i>Numida meleagris</i></b>		<b>25.0</b>
Hamerkop	<i>Scopus umbretta</i>		0
Heron, Black-headed	<i>Ardea melanocephala</i>		0
Heron, Grey	<i>Ardea cinerea</i>		0
<b>Hoopoe, African</b>	<b><i>Upupa africana</i></b>		<b>25.0</b>
<b>Hornbill, African Grey</b>	<b><i>Tockus nasutus</i></b>		<b>25.0</b>
Hornbill, Southern Yellow-billed	<i>Tockus leucomelas</i>		25.0
Ibis, African Sacred	<i>Threskiornis aethiopicus</i>		0
Ibis, Glossy	<i>Plegadis falcinellus</i>		0
Ibis, Hadedda	<i>Bostrychia hagedash</i>		12.5
Kestrel, Greater	<i>Falco rupicoloides</i>		12.5
Kestrel, Lesser	<i>Falco naumanni</i>		0
<b>Kestrel, Rock</b>	<b><i>Falco rupicolus</i></b>		<b>12.5</b>
Kingfisher, Malachite	<i>Alcedo cristata</i>		0
Kingfisher, Striped	<i>Halcyon chelicuti</i>		0
Kite, Black-winged	<i>Elanus caeruleus</i>		12.5
<b>Korhaan, Northern Black</b>	<b><i>Afrotis afraoides</i></b>		<b>55.0</b>
<b>Korhaan, Red-crested</b>	<b><i>Lophotis ruficrista</i></b>		<b>55.0</b>
Lapwing, Blacksmith	<i>Vanellus armatus</i>		12.5
<b>Lapwing, Crowned</b>	<b><i>Vanellus coronatus</i></b>		<b>62.5</b>

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Lark, Dusky	<i>Pinarocorys nigricans</i>	0
Lark, Eastern Clapper	<i>Mirafra fasciolata</i>	0
<b>Lark, Fawn-coloured</b>	<b><i>Calendulauda africanoides</i></b>	<b>75.0</b>
Lark, Red-capped	<i>Calandrella cinerea</i>	12.5
Lark, Sabota	<i>Calendulauda sabota</i>	0
Lark, Spike-heeled	<i>Chersomanes albofasciata</i>	0
Martin, Banded	<i>Riparia cincta</i>	0
<b>Martin, Brown-throated</b>	<b><i>Riparia paludicola</i></b>	<b>25.0</b>
<b>Martin, Rock</b>	<b><i>Hirundo fuligula</i></b>	<b>50.0</b>
<b>Masked-weaver, Southern</b>	<b><i>Ploceus velatus</i></b>	<b>75.0</b>
Moorhen, Common	<i>Gallinula chloropus</i>	0
<b>Mousebird, Red-faced</b>	<b><i>Urocolius indicus</i></b>	<b>55.0</b>
<b>Mousebird, White-backed</b>	<b><i>Colius colius</i></b>	<b>55.0</b>
Myna, Common	<i>Acridotheres tristis</i>	25.0
Neddicky	<i>Cisticola fulvicapilla</i>	25.0
Night-Heron, Black-crowned	<i>Nycticorax nycticorax</i>	0
Ostrich, Common	<i>Struthio camelus</i>	12.5
Owlet, Pearl-spotted	<i>Glaucidium perlatum</i>	0
Palm-swift, African	<i>Cypsiurus parvus</i>	12.5
<b>Penduline-tit, Cape</b>	<b><i>Anthoscopus minutus</i></b>	<b>12.5</b>
<b>Pigeon, Speckled</b>	<b><i>Columba guinea</i></b>	<b>37.5</b>
Pipit, African	<i>Anthus cinnamomeus</i>	25.0
<b>Pipit, Buffy</b>	<b><i>Anthus vaalensis</i></b>	<b>12.5</b>
Plover, Three-banded	<i>Charadrius tricollaris</i>	0
<b>Prinia, Black-chested</b>	<b><i>Prinia flavicans</i></b>	<b>75.0</b>
<b>Pytilia, Green-winged</b>	<b><i>Pytilia melba</i></b>	<b>12.5</b>
<b>Quelea, Red-billed</b>	<b><i>Quelea quelea</i></b>	<b>55.0</b>
Reed-warbler, African	<i>Acrocephalus baeticatus</i>	0
Roller, Lilac-breasted	<i>Coracias caudatus</i>	12.5
<b>Roller, Purple</b>	<b><i>Coracias naevius</i></b>	<b>12.5</b>
Ruff	<i>Philomachus pugnax</i>	0
<b>Sandgrouse, Burchell's</b>	<b><i>Pterocles burchelli</i></b>	<b>25.0</b>
Sandgrouse, Double-banded	<i>Pterocles bicinctus</i>	0
Sandgrouse, Namaqua	<i>Pterocles namaqua</i>	37.5
Sandpiper, Common	<i>Actitis hypoleucos</i>	0
Sandpiper, Wood	<i>Tringa glareola</i>	0
<b>Scimitarbill, Common</b>	<b><i>Rhinopomastus cyanomelas</i></b>	<b>37.5</b>
<b>Scrub-robin, Kalahari</b>	<b><i>Cercotrichas paena</i></b>	<b>75.0</b>
<b>Shrike, Crimson-breasted</b>	<b><i>Laniarius atrococcineus</i></b>	<b>37.5</b>
Shrike, Lesser Grey	<i>Lanius minor</i>	25.0
Shrike, Red-backed	<i>Lanius collurio</i>	37.5



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<b>Snake-eagle, Black-chested</b>	<b><i>Circaetus pectoralis</i></b>		<b>12.5</b>
Snipe, African	<i>Gallinago nigripennis</i>		0
<b>Sparrow, Cape</b>	<b><i>Passer melanurus</i></b>		<b>25.0</b>
Sparrow, House	<i>Passer domesticus</i>		37.5
Sparrow, Southern Grey-headed	<i>Passer diffusus</i>		12.5
<b>Sparrowlark, Grey-backed</b>	<b><i>Eremopterix verticalis</i></b>		<b>25.0</b>
<b>Sparrow-weaver, White-browed</b>	<b><i>Plocepasser mahali</i></b>		<b>75.0</b>
Spoonbill, African	<i>Platalea alba</i>		0
Spurfowl, Red-billed	<i>Pternistis adspersus</i>		12.5
<b>Starling, Cape Glossy</b>	<b><i>Lamprotornis nitens</i></b>		<b>87.5</b>
<b>Starling, Pale-winged</b>	<b><i>Onychognathus naboroupp</i></b>		<b>25.0</b>
Starling, Wattled	<i>Creatophora cinerea</i>		12.5
Stork, Black	<i>Ciconia nigra</i>	Vulnerable	0
Sunbird, Dusky	<i>Cinnyris fuscus</i>		0
<b>Sunbird, Marico</b>	<b><i>Cinnyris mariquensis</i></b>		<b>25.0</b>
Swallow, Barn	<i>Hirundo rustica</i>		0
<b>Swallow, Greater Striped</b>	<b><i>Cecropis cucullata</i></b>		<b>55.0</b>
Swallow, Red-breasted	<i>Cecropis semirufa</i>		0
Swallow, South African Cliff-	<i>Petrochelidon spilodera</i>		0
Swallow, White-throated	<i>Hirundo albigularis</i>		0
Swamp-warbler, Lesser	<i>Acrocephalus gracilirostris</i>		0
<b>Swift, Little</b>	<b><i>Apus affinis</i></b>		<b>37.5</b>
Swift, White-rumped	<i>Apus caffer</i>		12.5
<b>Tchagra, Brown-crowned</b>	<b><i>Tchagra australis</i></b>		<b>37.5</b>
Teal, Red-billed	<i>Anas erythrorhyncha</i>		0
Thick-knee, Spotted	<i>Burhinus capensis</i>		0
Thrush, Groundscraper	<i>Psophocichla litsipsirupa</i>		37.5
Thrush, Karoo	<i>Turdus smithi</i>	Near-endemic	12.5
<b>Tit, Ashy</b>	<b><i>Parus cinerascens</i></b>		<b>37.5</b>
<b>Turtle-dove (Ring-necked), Cape</b>	<b><i>Streptopelia capicola</i></b>		<b>62.5</b>
Vulture, White-backed	<i>Gyps africanus</i>	Critically Endangered	12.5
Wagtail, Cape	<i>Motacilla capensis</i>		0
<b>Warbler, Chestnut-vented</b>	<b><i>Parisoma subcaeruleum</i></b>		<b>75.0</b>
Warbler, Rufous-eared	<i>Malcorus pectoralis</i>		0
Waxbill, Black-faced	<i>Estrilda erythronotos</i>		0
Waxbill, Common	<i>Estrilda astrild</i>		0
<b>Waxbill, Violet-eared</b>	<b><i>Granatina granatina</i></b>		<b>62.5</b>
Weaver, Sociable	<i>Philetairus socius</i>		37.5
Wheatear, Capped	<i>Oenanthe pileata</i>		12.5
<b>White-eye, Orange River</b>	<b><i>Zosterops pallidus</i></b>		<b>12.5</b>
<b>Whydah, Shaft-tailed</b>	<b><i>Vidua regia</i></b>		<b>25.0</b>

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Woodpecker, Cardinal	<i>Dendropicos fuscescens</i>	12.5
Woodpecker, Golden-tailed	<i>Campethera abingoni</i>	25.0

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