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

AVIFAUNAL SPECIALIST SCOPING REPORT

The Vulnerable Lanner Falcon *Falco biarmicus* (immature)

Cape EAPrac

PRODUCED FOR CAPE EAPRAC

BY

3Foxes Biodiversity Solutions

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EXECUTIVE SUMMARY

ABO Wind Hotazel PV (Pty) Ltd is proposing the establishment of a commercial 100 MW photovoltaic (PV) solar energy facility (SEF), called Hotazel Solar, on the farm known as the Remaining Extent (Portion 0) of the farm York A 279, situated in the District of Hotazel in the Northern Cape, South Africa. The development is currently in the Scoping Phase and 3Foxes Biodiversity Solutions has been appointed to provide a specialist avifaunal scoping 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 was 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. 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 maintenance 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 areas of the property remain undeveloped and that suitable corridors are identified and maintained. This is to ensure that ecological connectivity between areas of higher conservation value is 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. Therefore, based on the results of this assessment, there are no reasons to indicate that the development should not proceed to the EIA phase. A proposed plan of study for the EIA phase is provided.

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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;	7-8
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	10
c) an indication of the scope of, and the purpose for which, the report was prepared;	11-12
(cA) an indication of the quality and age of base data used for the specialist report;	16-17
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	32-42
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e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	16-18
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g) an identification of any areas to be avoided, including buffers;	36 & 43
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i) a description of any assumptions made and any uncertainties or gaps in knowledge;	18-19
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k) any mitigation measures for inclusion in the EMPr;	35-42
l) any conditions for inclusion in the environmental authorisation;	
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	
n) a reasoned opinion- i. whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	42-43
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.	
2) 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.	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 Proces. Cape EAPrac 2015.
- Legoko Solar PV Facility. Fauna and Flora EIA Proces. Cape EAPrac 2015.
- RE Capital 10 Solar Power Plant, Postmasburg. Fauna and Flora EIA Proces. 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.

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:

- Excelsior Wind Facility. Avifaunal pre-construction monitoring. BTE Wind Pty (Ltd). 2018.
- Mamre Wind Facility. 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: ____24 July 2018_____

1 INTRODUCTION

ABO Wind Hotazel PV (Pty) Ltd is proposing the establishment of a commercial 100 MW photovoltaic (PV) solar energy facility (SEF), called Hotazel Solar, on the farm known as the Remaining Extent (Portion 0) of the farm York A 279, situated in the District of Hotazel in the Northern Cape, South Africa. Hotazel Solar will have a net generating capacity of 100 MW_{AC} with an estimated maximum footprint of ± 275 ha.

ABO Wind Hotazel PV (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 Scoping Phase and 3Foxes Biodiversity Solutions has been appointed to provide a specialist avifaunal scoping study of the development site as part of the EIA process.

The purpose of the Hotazel Solar Avifaunal Scoping 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 avifauna at the site.

This information is used to derive a draft avifaunal sensitivity map that presents the ecological constraints and opportunities for development at the site. The information and sensitivity map presented here provides an avifaunal baseline that should be used in the planning phase of the development to ensure that the potential negative avifaunal impacts associated with the development can be minimised. Furthermore, the study defines the terms of reference for the EIA phase of the project and outlines a plan of study for the EIA which will follow the Scoping Study. The full scope of study is detailed below.

1.1 SCOPE OF STUDY

The assessment is conducted according to the 2014 EIA Regulations (Government Notice Regulation 982) in terms of the National Environmental Management Act (Act 107 of 1998) as amended (NEMA), as well as best-practice guidelines and principles for avifaunal assessment within solar energy facilities as outlined by Birdlife South Africa.

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 using 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 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 Environmental Management Plan (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

1.2 RELEVANT ASPECTS OF THE DEVELOPMENT

The proposed development site is located on the Remaining Extent (Portion 0) of the farm York A 279, situated in the District of Hotazel in the Northern Cape Province (Figure 1). Hotazel Solar is to consist of solar photovoltaic (PV) technology with fixed, single or double axis tracking mounting structures, with a net generation (contracted) capacity of 100 MW_{AC}, as well as associated infrastructure, which will include:

- On-site switching-station / substation;
- 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;
- Overhead 132kV electrical transmission line / grid connection connecting to the authorised Hotazel substation;
- Rainwater tanks; and
- Perimeter fencing and security infrastructure.

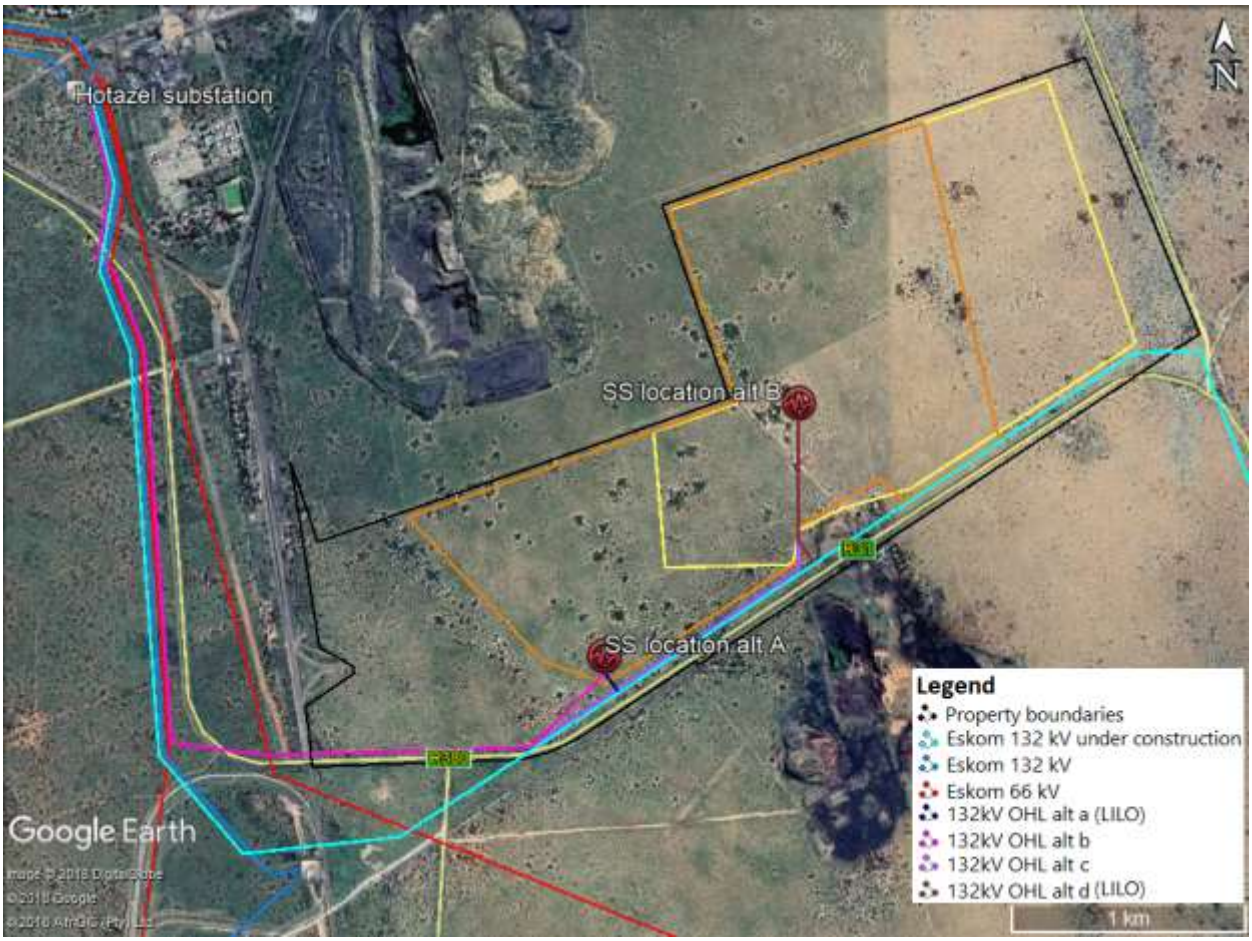

Figure 1. Satellite image of the Hotazel study site, illustrating the Alternative 1 in yellow and Alternative 2 in orange, as well as the power line alternatives.

2 METHODOLOGY

2.1 DATA SOURCING AND REVIEW

Data sources from the literature consulted and used where necessary 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) was 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) 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. 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. 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 of the site was produced by integrating the available ecological and biodiversity information available in the literature and various spatial databases with mapping based on the satellite imagery of the site as well as personal knowledge of the site. This includes delineating different habitat units identified on the satellite imagery and assigning likely sensitivity values to the units based on their ecological properties, conservation value and the potential presence of avifaunal species of conservation concern. The ecological sensitivity of the different units identified in the mapping procedure was rated according to the following scale:

- **Low** – Areas of natural or transformed habitat with a low sensitivity where there is likely to be a negligible impact on ecological processes and avifaunal biodiversity. Most types of development can proceed within these areas with little ecological impact.
- **Medium**- Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impact such as erosion low. These areas usually comprise the bulk of habitats within an area. Development within these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken.
- **High** – Areas of natural or transformed land where a high impact is anticipated due to the high biodiversity value, sensitivity or important ecological role of the area. These areas may contain or be important habitat for avifaunal species or provide important ecological services such as water flow regulation or forage provision. 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** – Critical and unique habitats that serve as habitat for rare/endangered species or perform critical ecological roles. 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 relatively 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 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 (Venter, 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. In an attempt to reduce this limitation, and ensure a conservative approach, the species list derived from the literature was obtained from an area somewhat larger than the study site, and thus likely includes a much wider array of species than what actually occurs at the site.
- 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

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 A*cacia 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 site. The *Terminalia sericea* tree in the foreground is a rare occurrence on the property.

Figure 4. *Acacia haematoxylon savanna* within the eastern half of the study site, showing the lower density of trees compared to the majority of the western portion of the study area.

4 DESCRIPTION OF THE AFFECTED ENVIRONMENT

4.1 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 site 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 passerines 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 site 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
Average	**18.6**	**77.5**
Std deviation	**3.4**	**16.3**

The most abundant species was 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 study site, 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 afraoides* 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	*Gyps africanus*	Critically Endangered	Low	Savanna	High	Habitat loss/Disturbance Collisions/Electrocution
Eagle, Martial	*Polemaetus bellicosus*	Endangered	Moderate	Savanna & shrublands	High	Habitat loss/Disturbance Collisions/Electrocution
Eagle, Tawny	*Aquila rapax*	Endangered	Low	Savanna & Karoo plains	Moderate	Habitat loss/Disturbance Collisions/Electrocution
Courser, Burchell's	*Cursorius rufus*	Vulnerable	Low	Shrubland plains	Low	Habitat loss/Disturbance
Eagle, Verreaux's	***Aquila verreauxii***	**Vulnerable**	**Moderate**	**Mountainous and rocky areas**	**Recorded**	**Habitat loss/Disturbance Collisions/Electrocution**
Falcon, Lanner	***Falco biarmicus***	**Vulnerable**	**Moderate**	**Widespread**	**Recorded**	**Habitat loss/Disturbance Collisions/Electrocution**
Secretarybird	*Sagittarius serpentarius*	Vulnerable	Low	Open savanna & grassland	Moderate	Habitat loss/Disturbance Collisions
Stork, Black	*Ciconia nigra*	Vulnerable	Low	Water bodies	Low	Collisions
Bustard, Kori	*Ardeotis kori*	Near-threatened	Moderate	Open savanna	Moderate	Habitat loss/Disturbance Collisions
Roller, European	*Coracias garrulus*	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 site. 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 where 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.

4.2 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 the area experiences.

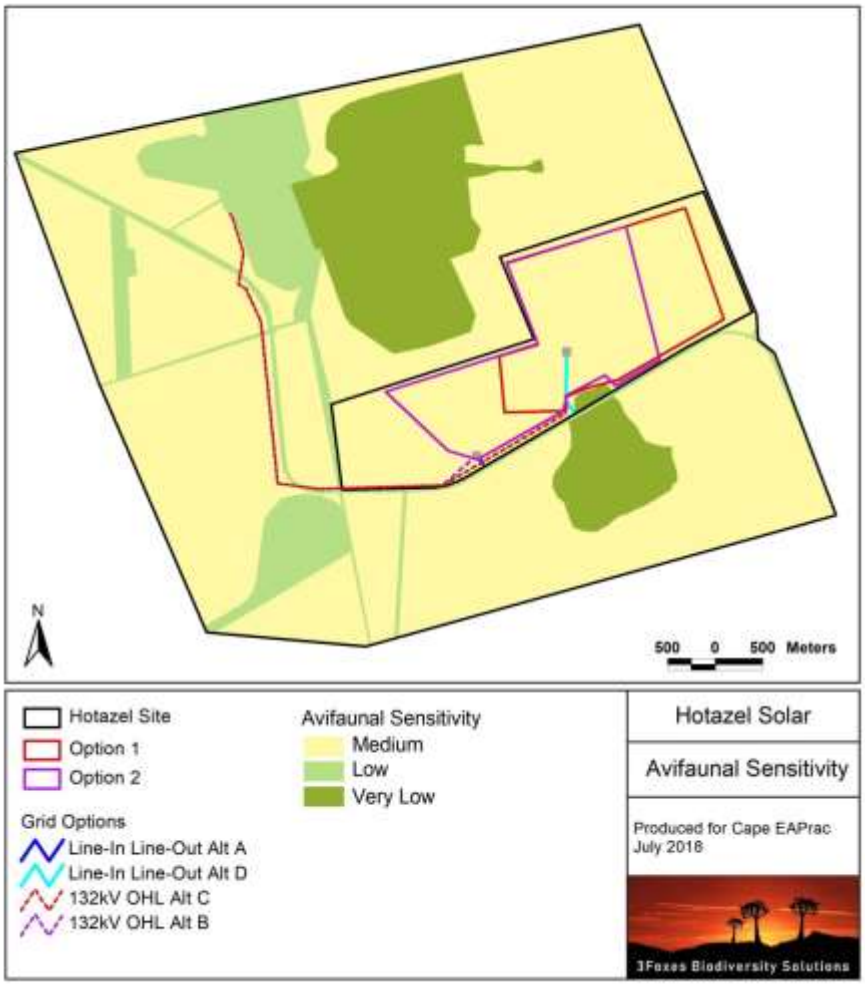

Figure 7. Sensitivity map for the Hotazel Solar project site and surrounding area, showing the two alternatives and the grid connection to the Hotazel substation to the north west of the site.

5 IDENTIFICATION & NATURE OF IMPACTS

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 Solar development will cover an area of up to approximately 275 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).

Looking into the Jasper PV facility where the study of Visser (2016) was conducted, showing the boundary fence with the electrified strands on the inside with a gap of approximately 20cm between the two fences. Sheep are used to keep the vegetation cover within the facility down and reduce the amount of vegetation control required.

5.1 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 their 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 SEF 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:

Preconstruction Phase

- Human presence and uncontrolled access to the site may result in negative impacts on the avifauna through poaching and uncontrolled collection of fauna and flora for traditional medicine or other purpose.
- Site clearing and exploration activities for site establishment may have a negative impact on biodiversity if this is not conducted in a sensitive manner.

Construction Phase

- Vegetation clearing for the PV field, access roads, site fencing and associated infrastructure will impact the local avifauna directly through habitat loss. Vegetation clearing will therefore lead potentially to the loss of avifaunal species, habitats and ecosystems as birds are displaced from their habitat.
- Presence and operation of construction machinery on site. This will create a physical impact as well as generate noise, pollution and other forms of disturbance at the site.
- Increased human presence can lead to poaching, illegal fauna collecting and other forms of disturbance such as fire.

Operational Phase

- The operation of the facility will generate noise and disturbance which may deter some avifauna from the area, especially red-listed avifaunal species which are less tolerant of disturbances.

- Mortality among the local avifauna may result due to direct collisions with solar panels (Kagan *et al*., 2014) or entrapment along the fenced boundaries of the facility (Visser, 2016).
- The areas inside the facility will require management and if this is not done appropriately, it could impact adjacent intact areas through impacts such as erosion, alien plant invasion and contamination from pollutants, herbicides or pesticides.
- The associated overhead power lines will pose a risk to avifauna susceptible to collisions and electrocution with power line infrastructure (Jenkins *et al*., 2010).

Cumulative Impacts

- Transformation of intact habitat would contribute to the fragmentation of the landscape and would potentially disrupt the connectivity of the landscape for fauna and flora and impair their ability to respond to environmental fluctuations. This is particularly a concern with regards to species and ecosystems with limited geographical distributions (Rudman *et al.*, 2017).

Project specific impacts on particular groups of avifauna are as follows:

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, Pale Chanting Goshawk *Melierax canorus*, Greater Kestrel *Falco rupicoloides*, and the ground-dwelling Burchell's Sandgrouse *Pterocles burchelli*, Northern Black Korhaan, and Red-crested Korhaan. 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 maintenance of the facility is 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). All 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).

6 SCOPING PHASE ASSESSMENT OF IMPACTS

The various identified impacts are assessed below for the different phases of the development. It is important to note that this is a scoping-phase assessment and subject to change based on any changes to the layout or project description that might occur before the EIA Phase.

6.1 HOTAZEL SOLAR PV DEVELOPMENT

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

6.1.1 Planning & Construction Phase

Nature of impact	**Direct Avifaunal Impacts During Construction – habitat loss and disturbance**							
Option	**Spatial Extent**	**Duration**	**Intensity**	**Probability**	**Reversibility**	**Significance and Status**		**Confidence level**
						Without Mitigation	**With Mitigation**	
Option 1	Local	Short- Term	Medium	High	High	Medium Negative	Medium-Low Negative	High
Option 2	Local	Short- Term	Medium	High	High	Medium Negative	Medium-Low Negative	High

Mitigation/Management Actions

- The destruction of habitat during construction should also be strictly contained within the development footprint.
- 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.
- 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.
- 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.
- 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.
- 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.
- Sensitive microhabitats should be avoided, such as nesting sites during the breeding season of large terrestrial birds (generally summer; Hockey *et al.*, 2005).
- Any avifauna threatened by the construction activities should be removed to safety by the ECO or appropriately qualified environmental officer.
- 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.
- 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.

6.1.2 Operational Phase Impacts

Nature of Impact	**Avifaunal Impacts due to operational activities – disturbance and collisions with PV panels**							
Option	**Spatial Extent**	**Duration**	**Intensity**	**Probability**	**Reversibility**	**Significance and Status**		Confidence level
						Without Mitigation	**With Mitigation**	
Option 1	Local	Long-term	Medium-Low	Moderate	High	Medium-Low Negative	Low-Negative	High
Option 2	Local	Long-term	Medium-Low	Moderate	High	Medium-Low Negative	Low-Negative	High

Mitigation/Management Actions

- 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.
- 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.
- 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.
- Any movements by vehicle and personnel should be limited to within the footprint of power lines and other associated infrastructure, especially during routine maintenance procedures. Utmost care should be taken to not disturb nests that may be constructed on power line structures.
- All food waste and litter at the site should be placed in bins with lids and removed from the site on a regular basis.
- 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.

6.2 HOTAZEL SOLAR GRID CONNECTION

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

6.2.1 Planning & Construction Phase

Impact Nature	**Direct Avifaunal Impacts During Construction**							
Option	**Spatial Extent**	**Duration**	**Intensity**	**Probability**	**Reversibility**	**Significance and Status**		**Confidence level**
						Without Mitigation	**With Mitigation**	
Option 1	Local	Short- Term	Medium-Low	High	High	Medium-Low Negative	Low Negative	High
Option 2	Local	Short- Term	Medium-Low	High	High	Medium-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 nocturnal and crepuscular species (e.g. nightjars, thick-knees and owls) which sometimes forage or rest on roads, especially at night.
- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
- 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*., 2016).
- 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 lines 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.

6.3 CUMULATIVE IMPACTS

The following are the cumulative impacts that are assessed as being a likely consequence of the development of the Hotazel Solar PV 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**							
Option	**Spatial Extent**	**Duration**	**Intensity**	**Probability**	**Reversibility**	**Significance and Status**		**Confidence level**
						Without Mitigation	**With Mitigation**	
Option 1	Regional	Long-Term	Medium	Moderate	Low	Medium-Low Negative	Medium Low Negative	Moderate-High
Option 2	Regional	Long-Term	Medium	Moderate	Low	Medium-Low Negative	Medium Low Negative	Moderate-High

Mitigation/Management Actions

- 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 (Venter, 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.

7 CONCLUSION & RECOMMENDATIONS

Although the Hotazel Solar Energy Facility development is in the Scoping Phase, the current study is based on a relatively detailed field assessment of the proposed development area. Consequently, the scoping impact assessment and sensitivity map presented herein are based on detailed on-site information and as such have a high degree of confidence. Consequently, there is little uncertainty with regards to the results of the current study and the conclusions reached are based on actual information collected at the site.

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 of 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 maintenance 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 can 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. The spacing of PV panels to conform to bird-friendly configurations during the construction phase can contribute to mitigating avifaunal collisions during the operational phase. 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. 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 that should prevent it from proceeding.

Cumulative impacts in the area are a concern due to the proliferation of solar energy development in the Kathu/Hotazel area. In terms of habitat loss, the affected Kathu Bushveld vegetation type is still approximately 90% intact, and while this is not a very extensive vegetation type, the loss of 275 ha of partially degraded habitat is not considered highly significant, especially given the spatial context of the site. The site does not lie within a likely avifaunal movement corridor or along an important ecological 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.

There are no significant differences in avifaunal sensitivity between the two development options and the site is considered generally acceptable and there are no impacts on avifauna associated with the development that are considered to be of high significance and which cannot be mitigated to a low level. Therefore, based on the results of this assessment, there are no reasons to indicate that the development should not move into the EIA phase. A proposed plan of study for the EIA phase is detailed below.

8 PLAN OF STUDY FOR THE EIA PHASE

The current study is based on three-day site visit during which intense avifaunal surveys were undertaken at a favourable time of year. The field-assessment component of the study is therefore considered to provide a reliable characterisation of the avifauna of the site. As such, the major tasks remaining prior to the EIA phase revolve around assessing the final layout, assessing the cumulative impacts associated with the development in more detail, and making the appropriate recommendations with regards to the most appropriate mitigation and avoidance measures to be included in the EMPr for the development.

Based on the results of the current study and the features of the site, the following activities and outputs are planned to inform the EIA phase of the development:

- Provide a more detailed assessment of cumulative impacts on avifauna associated with the development of the site. Including an assessment of the extent of habitat lost to solar energy development in the area to date and the likely future potential loss from the current as well as other proposed developments in the area.

- Evaluate, based on the site attributes and final layout of the development, what the most applicable mitigation measures to reduce the impact of the development on the

site would be and if there are any areas where specific precautions or mitigation measures should be implemented. Particular attention will be paid to potential impacts on important landscape features in the vicinity of the site such as the dense *Acacia haematoxylon-Acacia mellifera* savanna where sensitive avifaunal species may nest or roost.

- Assess the impacts identified above in light of the site-specific findings and the final layout for assessment in the EIA Phase to be provided by the developer.
- Address any comments received on the scoping study from IAPs and commenting authorities and ensure that that study complies with best practice and the requirements of the 2014 EIA regulations as amended.

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10 ANNEX 1. LIST OF AVIFAUNA

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

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

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

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

Woodpecker, Cardinal	*Dendropicos fuscescens*	12.5
Woodpecker, Golden-tailed	*Campethera abingoni*	25.0