
ENVIRONMENTAL IMPACT ASSESSMENT FOR THE
PROPOSED STRAUSSHEIM ALPHA, BRAVO AND CHARLIE
POWER PLANTS, KENHARDT, NORTHERN CAPE:
AVIFAUNAL SPECIALIST SCOPING STUDY



Produced for Cape EAPrac on behalf of AMDA Developments by:



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EXECUTIVE SUMMARY

The AMDA proposes to establish the Strausheim Alpha, Bravo and Charlie Power Plants on Portion 1 of N'Rougas Zuid No 121 near Kenhardt in the Northern Cape Province. Each plant would have a net generating capacity of 75 MW and will consist of solar panels covering an area of approximately 250 hectares each, an on-site substation, auxiliary buildings, access and internal roads and a 132kV power line linking the facility to the national grid. As part of the required EIA process, this avifaunal specialist scoping study describes and details the avian ecological features of the proposed site and provides an assessment of the avian ecological sensitivity of the site and provides a preliminary assessment of the likely impacts associated with the development.

Only 93 bird species have been recorded within the study area according to the SABAP databases (however this number is limited by the number of cards that have been recorded for the relevant area), including 10 red-listed or threatened species, 31 endemic species and 20 near-endemic species. The birds of greatest potential relevance and importance in terms of the possible impacts of the solar energy facility and its associated power infrastructure are likely to be local populations of endemic passerines, shy ground-nesting species, resident or visiting large terrestrial birds and resident or passing raptors.

The development will pose several impacts to avifauna, including: a **low** likely displacement impact caused by disturbance and habitat destruction associated with construction and maintenance activities off the proposed SEF and its associated power infrastructure; a **low** likely impact of electrocutions of birds on power infrastructure, with the implementation of mitigation measures; and a **medium** likely impact of avian collisions with power line infrastructure and solar panels. These impacts will be assessed in detail in the EIA phase, which reference to the specific avifaunal features within the development footprint of each facility and the final development footprint.

The study area and more specifically the proposed development area are not considered unique habitats in the landscape and are already subject to varying degrees of transformation and degradation. Although two threatened and/or priority species were recorded on-site – Karoo Korhaan and Lanner Falcon – the area is not considered critical for their conservation and the extent of habitat loss for these species would be considered low.

The proposed Strausheim SEF and its associated power infrastructure has been assessed as having a **medium-low** impact to priority species and general avifauna occurring in the study area and broader impact zone of the development. Overall, from an avifaunal perspective the site is considered favourable for the establishment of the solar power plants.

CONTENTS

EXECUTIVE SUMMARY	2
DECLARATION OF INDEPENDENCE	5
PROFESSIONAL EXPERIENCE	5
INDEMNITY.....	6
1. INTRODUCTION	7
1.1. BACKGROUND	7
1.2. RELEVANT ASPECTS OF THE DEVELOPMENT	7
1.3. RELEVANT LEGISLATION AND GUIDELINES	8
1.3.1. The Convention on Biological Diversity	8
1.3.2. The Convention on the Conservation of Migratory Species of Wild Animals	9
1.3.3. The Agreement on the Convention of African-Eurasian Migratory Water Birds	9
1.3.4. The National Environmental Management: Biodiversity Act	9
1.3.5. Guidelines to minimise the impacts on birds of Solar Facilities and Associated Infrastructure in South Africa	9
1.4. TERMS OF REFERENCE	10
1.5. STUDY METHODOLOGY	10
1.5.1. Approach.....	10
The avifaunal specialist scoping study included the following steps:	10
1.5.2. Data sources used	12
1.5.3. Limitations and assumptions	12
2. DESCRIPTION OF THE AFFECTED ENVIRONMENT.....	13
2.1. BROAD-SCALE VEGETATION PATTERNS.....	13
2.2. AVIAN MICROHABITATS.....	14
2.3. AVIFAUNA	16
2.4. AVIAN SITE SENSITIVITY MAP	19
3. ASSESSMENT OF IMPACTS	20
3.1. GENERAL DESCRIPTION OF BIRD INTERACTIONS WITH SOLAR ENERGY FACILITIES AND THEIR ASSOCIATED POWER INFRASTRUCTURE	20
3.1.1. Impacts of solar energy facilities	20
3.1.2. Impacts of associated power infrastructure.....	21
3.2. PROJECT SPECIFIC ASSESSMENT OF IMPACTS	22

3.3. SIGNIFICANCE OF IDENTIFIED IMPACTS OF THE AMDA SOLAR PV FACILITIES23

3.4. COMPARISON OF SITE ALTERNATIVES.....24

4. CONCLUSION.....24

5. REFERENCES26

6. APPENDIX28

DECLARATION OF INDEPENDENCE

I, **Blair Zoghby**, in my capacity as a specialist consultant, hereby declare that I:

- Act/acted as an independent specialist to Cape EAPrac for this project.
- Do not have any personal, business or financial interest in the project expect for financial remuneration for specialist investigations completed in a professional capacity as specified by the Environmental Impact Assessment Regulations, 2014.
- Will not be affected by the outcome of the environmental process, of which this report forms part of.
- Do not have any influence over the decisions made by the governing authorities.
- Do not object to or endorse the proposed developments, but aim to present facts and my best scientific and professional opinion with regard to the impacts of the development.
- Undertake to disclose to the relevant authorities any information that has or may have the potential to influence its decision or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2014.

PROFESSIONAL EXPERIENCE

Simon Todd Consulting has extensive experience in the assessment of renewable energy developments, having provided ecological assessments for more than 100 different renewable energy developments. This includes a variety of facilities in the immediate vicinity of the current site as well as in the broader North Cape region. Simon Todd is a recognised arid-areas ecological expert and is a past chairman of the Arid-Zone Ecology Forum and has 18 years' experience working throughout the country. Simon Todd is registered with the South African Council for Natural Scientific Professions (No. 400425/11).

Blair Zoghby has been involved in ornithological conservation and research for eight years and holds an MSc degree in Zoology/Conservation Biology obtained through the Percy FitzPatrick Institute of African Ornithology, University of Cape Town, South Africa. He has undertaken numerous avian impact assessments across the country and as such, has experience working with a wide variety of bird species and bird habitats.

INDEMNITY

- This report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken.
- This report is based on a desktop investigation using available information and data related to the site to be affected, *in situ* fieldwork, surveys and assessments and the specialists best scientific and professional knowledge.
- The Precautionary Principle has been applied throughout this investigation.
- The findings, results, observations, conclusions and recommendations given in this report are based on the specialist's best scientific and professional knowledge as well as available information at the time of study.
- Additional information may become known or available during a later stage of the process for which no allowance could have been made at the time of this report.
- The specialist reserves the right to modify this report, recommendations and conclusions at any stage should additional information become available.
- Information, recommendations and conclusions in this report cannot be applied to any other area without proper investigation.
- This report, in its entirety or any portion thereof, may not be altered in any manner or form or for any purpose without the specific and written consent of the specialist as specified above.
- Acceptance of this report, in any physical or digital form, serves to confirm acknowledgement of these terms and liabilities.



Blair Zoghby



Simon Todd Pr.Sci.Nat 400425/11.

May 2016

1. INTRODUCTION

1.1. BACKGROUND

AMDA, a renewable energy developer, is proposing the establishment of three 75 MW commercial photovoltaic (PV) solar power plants on Portion 1 of N'Rougas Zuid No 121 near Kenhardt in the Northern Cape Province. The developments will be known as the Strausheim Alpha, Bravo and Charlie Power Plants, each with their own special purpose vehicle to bring the projects to financial close.

The National Environmental Management Act (NEMA) (Act 107 of 1998) requires that an Environmental Impact Assessments (EIA) be conducted for any development which could have a significant effect on the environment, with the objective to identify, predict and evaluate the actual and potential impacts of these activities on ecological systems; identify alternatives; and provide recommendations for mitigation to minimize the negative impacts.

In order to meet these requirements and manage the EIA process, AMDA Developments (Pty) Ltd has appointed Cape EAPrac as independent environmental assessment practitioners. As part of the specialist studies required for the EIA, Cape EAPrac has enlisted Simon Todd Consulting to provide an avifaunal scoping study of the developable area.

The purpose of the avifaunal specialist scoping study is to describe and detail the avian ecological features of the proposed site, provide an assessment of the avian ecological sensitivity of the site, identify and provide a preliminary assessment of the likely impacts associated with the development. Although each of the three projects would require their own authorisation and hence EIA report, a single scoping report which covers all three reports is provided here for the Scoping phase because the sites are adjacent to one another and in terms of avifauna, there is little to differentiate the three facilities in terms of avifaunal impacts and avifaunal impacts are considered in light of the development as a whole.

1.2. RELEVANT ASPECTS OF THE DEVELOPMENT

- The proposed developable area of the three developments (Alpha, Bravo and Charlie) that make up the Strausheim SEF is located on Remainder 1 of N'Gouras Zuid No 121 and has a total extent of 5 232 ha.
- Each development is planned and designed with a net generating capacity 75 MW of power.
- The proposed developable area required to meet the proposed capacity will cover an area of 250 ha for each development.
- Grid connection will be via a 132kV power line from the on-site substation east to the proposed Eskom Nieuwehoop MTS substation. Approximate length of line 5.5 km.

- Infrastructure associated with the SEF is likely to include:
 - PV and/or concentrated PV panels, with fixed, single or double axis tracking technology;
 - Auxiliary buildings for control, equipment and maintenance;
 - Cabling between the above-mentioned infrastructures;
 - Access roads from the existing Kenhardt-Louisvale district road;
 - Internal access roads; and
 - Fencing surrounding the facility.

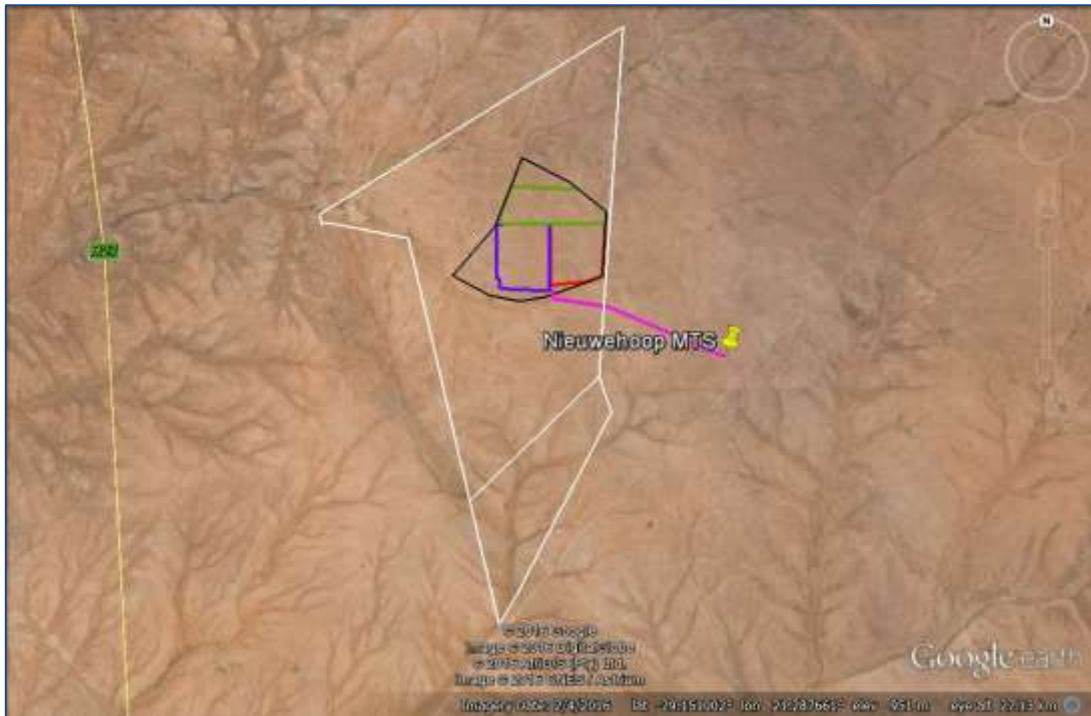


Figure 1: Satellite image of the Strausheim SEF illustrating the property boundaries (white), proposed development area (black), preferred site layouts (Alpha = Red, Bravo = Blue and Charlie = Green) and grid connection to the Eskom Nieuwehoop substation (purple).

1.3. RELEVANT LEGISLATION AND GUIDELINES

The following legislation is applicable to the proposed development:

1.3.1. The Convention on Biological Diversity

The Convention on Biological Diversity (CBD) is an international convention (to which South Africa is a signatory) and represents a commitment to sustainable development. The Convention has three main objectives: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources (<http://cbd.int/convention/guide/>). Although the convention does not include specific recommendations or guidelines pertaining to birds and energy

infrastructure interactions and impacts, it does make provisions for keeping and restoring biodiversity.

1.3.2. The Convention on the Conservation of Migratory Species of Wild Animals

The Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or the Bonn Convention) is an intergovernmental treaty and is the most appropriate instrument to deal with the conservation of terrestrial, aquatic and avian migratory species. The convention includes policy and guidelines with regards to the impact associated with man-made infrastructure. CMS requires that parties (South Africa is a signatory) take measures to avoid migratory species from becoming endangered (Art II, par. 1 and 2) and to make every effort to prevent the adverse effects of activities and obstacles that seriously impede or prevent the migration of migratory species i.e. power lines (Art 111, par. 4b and 4c).

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

The Agreement on the Conservation of African-Eurasian Migratory Water birds (AEWA) is an intergovernmental treaty dedicated to the conservation of migratory waterbirds and their habitat across Africa, Europe, the Middle East Central Asia, Greenland and the Canadian Archipelago. The AEWA covers 255 species of birds ecologically dependent on wetlands for at least part of their annual cycle and is a legally binding agreement by all contracting parties (South Africa included) to guarantee the conservation of migratory waterbirds within their national boundaries through species and habitat protection and the management of human activities.

1.3.4. The National Environmental Management: Biodiversity Act

The National Environmental Management: Biodiversity Act (No. 10 of 2004, NEMBA) regulations on Threatened and Protected Species (TOPS) provides for the consolidation of biodiversity legislation through establishing national norms and standards for the management of biodiversity across all sectors and by different management authorities. The national Act and several sets of provincial conservation legislation provide for among other things, the management and conservation of South Africa's biodiversity; protection of species and ecosystems that necessitate national protection and the sustainable use of indigenous biological resources.

1.3.5. Guidelines to minimise the impacts on birds of Solar Facilities and Associated Infrastructure in South Africa

The "Guidelines to minimise the impact on birds of Solar Facilities and Associated Infrastructure in South Africa" (Smit, 2012) is perhaps the most important (although not legally binding) document from an avifaunal impact perspective currently applicable to solar development in South Africa. The guidelines are published by BirdLife South Africa (BLSA) and detail the recommended procedure for conducting an avifaunal specialist study as well as list all of the potential impacts of interactions between birds and solar facilities and associated infrastructure. We are aware of changes to the BirdLife South Africa best-

practise guidelines recently published at the Birds and Renewable Energy Forum in Johannesburg (2015) and although the revised requirements are still a work in progress and have not yet been ratified, they will inform this assessment where applicable.

1.4. TERMS OF REFERENCE

The specific terms of reference for this avifaunal specialist scoping study include the following:

- A description of the environment of the study area in terms of the avian habitats present.
- A consolidated list of bird species and priority bird species (priority species will include nationally and/or globally threatened, rare, endemic or range-restricted bird species) likely to occur within the study area and broader impact zone of the development, with information on the relative value (in terms of breeding, nesting, roosting and foraging) of the site for these birds.
- A delineation of areas that are potentially highly sensitive, no-go areas that may need to be avoided by the development.
- A description and evaluation of the environmental issues and potential impacts (including direct, indirect and cumulative impacts) that the proposed development may have on the bird species present. Direct, indirect and cumulative impacts of the identified issues will be evaluated within the avifaunal specialist scoping study in terms of the following criteria:
 - The **nature**, which includes a description of what causes the effect, what will be affected and how it will be affected.
 - The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international.
- A statement regarding the potential significance of the identified issues based on the evaluation of the issues/impacts.
- Identification of potentially significant impacts to be assessed within the EIA phase and the details of the methodology to be adopted in assessing these impacts. This should be detailed enough to be included within the Plan of Study for the EIA and include a description of the proposed method of assessing the potential environmental impacts associated with the development.

1.5. STUDY METHODOLOGY

1.5.1. Approach

The avifaunal specialist scoping study included the following steps:

- A review of all available published and unpublished literature pertaining to bird interactions with SEFs and their associated power infrastructure, summarising the issues involved and the current level of knowledge in the field. Various information sources including data on the local avifauna of the area and previous studies of bird interactions with SEFs and their associated power infrastructure were be examined.
- A site visit of 3 days to the study area (24-26 February 2016) to determine the *in situ* local avifauna and avian habitats present on site 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.
- The compilation of a consolidated and annotated list of the avifauna likely to occur within the study area and the broader impact zone of the development based on a combination of existing distributional data, species seen during the site visit and previous experience of the avifauna of the area.
- The compilation of 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. 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.
- An avian site sensitivity map was generated by integrating avian microhabitats present on site and avifaunal information collected during the site visit. The avian sensitivity of the different units identified in the mapping procedure were 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 avifauna. 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. These areas usually comprise the bulk of habitats within an area. Development within these areas can proceed with relatively little ecological and avian impacts 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, sensitivity or important ecological role of the

area. 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, threatened, endemic or range-restricted species and/or perform critical ecological roles. These areas are essentially no-go areas from a development perspective and should be avoided as much as possible.

In some situations, areas were also classified between the above categories, such as *Medium-High*, where it was deemed that an area did not fit well into a certain category but rather fell most appropriately between two sensitivity categories.

- The construction of a matrix of potential impacts of the development on the local avifauna will be drawn up and the significance of these impacts will be assessed.
- A final statement on the overall significance of the potential impacts of the development on the avifauna of the area will be written up.

1.5.2. Data sources used

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

- The Southern African Bird Atlas Project 1 (SABAP 1; Harrison *et al.*, 1997) quarter degree squares (QDC) 2921AA (9 cards) and 2921AB (10 cards) as well as the Southern African Bird Atlas Project 2 (SABAP 2; <http://sabap2.adu.org.za/index.php>) pentads 2900_2115, 2905_2110, 2905_2115 and 2910_2115 (only 1 card between all pentads) were consulted to determine the bird species likely to occur within the study area and the broader impact zone of the development.
- The conservation status, endemism and biology of all species considered likely to occur within the study area was then 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.

1.5.3. Limitations and assumptions

The specialist made the assumption that the sources of information used in the compilation of this report are reliable. 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 vetted 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 complete absence of any local, empirical data describing the known impacts of existing SEFs on birds (Jenkins, 2011).
- The SABAP 1 data for the relevant quarter degree squares covering the developable area are now >18 years old (Harrison et al., 1997), while there is presently only 1 SABAP 2 atlas card recorded for the relevant pentads combined. No more reliable and/or more recent formal data on bird species distribution in the study area currently exists.
- Limited time in the field and no 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 development area does not contain many large trees, so it is highly unlikely that there are any significant nesting sites of larger species present within the affected area that would not have been observed.

The site visit as well as personal experience of the avifauna of the area and of similar species in different parts of South Africa, through the specialist's experience working across the country, goes some way to remedying any knowledge deficiencies.

2. DESCRIPTION OF THE AFFECTED ENVIRONMENT

2.1. BROAD-SCALE VEGETATION PATTERNS

According to the national vegetation map (Mucina & Rutherford, 2006), the site falls entirely within the Bushmanland Arid Grassland vegetation type (Figure 2). This vegetation type is made up largely of extensive plains dominated by white grasses and patches of low shrub. It is classified as *Least Threatened*, with very little of the area of this vegetation type having been transformed. Altitude of this vegetation type varies mostly from 600-1 200 m.

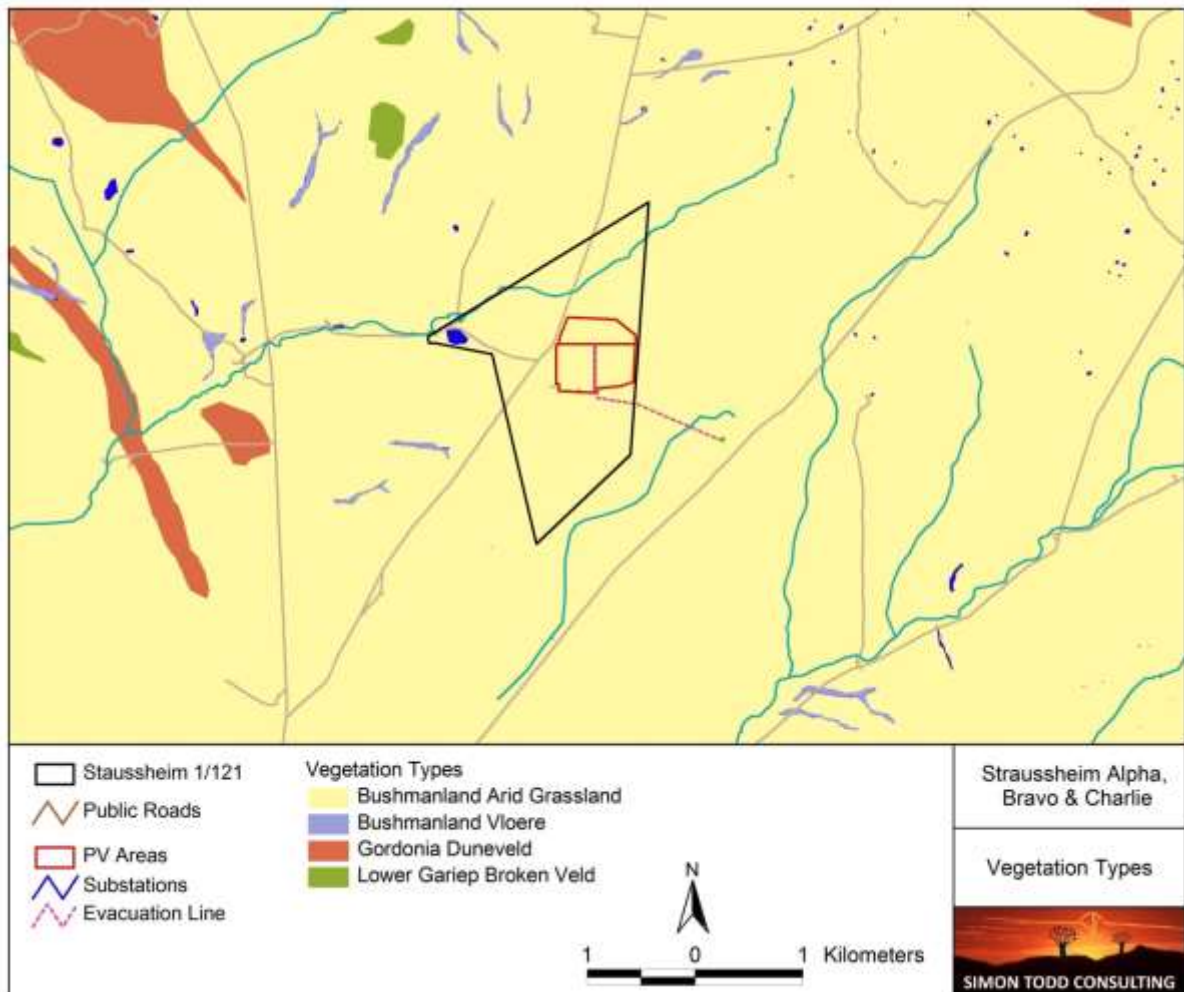


Figure 1. Vegetation of the area, based on Mucina and Rutherford (2006), showing the Straussheim and the development areas and grid connection to the Eskom Nieuwehoop MTS.

2.2. AVIAN MICROHABITATS

While broad-scale vegetation patterns influence the distribution and abundance of bird species holistically, it is the fine-scale vegetation patterns and various avian microhabitats in an area that determine local avifauna populations.

A number of different avian microhabitats were identified at the site and these formed the basis of the avian site sensitivity map. These units include:

- *Karoo grassland/shrubland*: This habitat unit represents the majority of the vegetation in the study area (Bushmanland Arid Grassland) and is largely made up of extensive plains of white grasses and low shrubs. Although this habitat unit does not support the highest diversity and abundance of species, it does support numerous

species of conservation concern (Kori Bustard *Ardeotis kori*, Ludwig's Bustard *Neotis ludwigii* and Karoo Korhaan *Eupodotis vigorsii*) as well as endemic and near-endemic passerine species.

- *Tall Shrubland*: Small patches of *taller shrubland* are scattered across the wider study area. This habitat unit supports a woodier component to the vegetation, with the small trees such as *Aloe dichotoma* and *Acacia mellifera* providing nesting and roosting sites for endemic passerines in the study area.
- *Washes & Drainage lines*: A number of small drainage lines bisect the study area and although many of these will seldom contain surface water, they are important for ecosystem functioning. The slightly deeper soils support a marginally higher biomass including woody species and provide a structural and compositional variation in the vegetation to the surrounding shrublands.

It should however be noted, that the study area has already been subject to varying degrees of disturbance and degradation caused by past and present land-use practises. Evidence of high stocking rates and grazing pressure is apparent. There is also a network of minor farm roads throughout.



Figure 3: Karoo grassland/shrubland (Bushmanland Arid Grassland) habitat unit, which forms the majority of the site as well as the majority of the development area.



Figure 4: Tall Shrubland habit unit with small trees such as *Aloe dichotoma* and *Acacia mellifera*. This habitat does not occur within the current proposed development footprint.



Figure 5: Washes and drainage lines habitat unit with marginally higher biomass, dominated mostly by *Phaeoptilum spinosum*.

2.3. AVIFAUNA

According to the SABAP 1 and SABAP 2 databases, only 93 bird species have been recorded within the study area and broader impact zone of the development (Appendix 1). This total is limited by the number of SABAP cards recorded, with more species expected to occur. Of the species known to occur in the study area, 10 are red-listed or threatened (Table 1), 31 are endemic and 20 are near-endemic. A total of 22 species were recorded during the site visit, most notable of which being the sightings of a pair of Karoo Korhaans and a Lanner Falcon *Falco biarmicus*.

The birds of greatest potential relevance and importance in terms of the possible impacts of the SEF and its associated power infrastructure are likely to be local populations of threatened or endemic passerines (Karoo Long-billed Lark *Certhilauda subcoronata*, Sclater's Lark *Spizocorys sclateri* and Black-eared Sparrowlark *Eremopterix australis*), shy ground-nesting species (Burchell's Courser *Cursorius rufus* and Double-banded Courser *Rhinoptilus africanus*), resident or visiting large terrestrial birds (Karoo Korhaan, Ludwig's Bustard, Kori Bustard and Secretarybird *Sagittarius serpentarius*) and resident or passing raptors (Lanner Falcon, Martial Eagle *Polemaetus bellicosus* and Verreaux's Eagle *Aquila verreauxii*).

In general, at the time of the site visit (24-26 February 2016), bird diversity and abundance was relatively low throughout the study area, with no particular avian microhabitat boosting a higher diversity or abundance than the other.

On the basis of the observations recorded during the field visit, and in combination with already documented information on the avifauna of the study area, 10 priority species are considered central in this avifaunal impact study (Table 1). These are mostly threatened species which are known to occur, or could occur, in relatively high numbers in the study area and the broader impact zone of the development and which are likely to be, or could be, negatively affected by the SEF. Two species, Karoo Korhaan and Lanner Falcon, were recorded within the study area.

Overall, the avifauna of the study area and the broader impact zone of the SEF is not considered unique and is typical of what occurs across large areas of the Nama Karoo Biome, which therefore suggests that the sensitivity of the site, from an avian perspective, will not be of any great significance.

Table 1: Priority species list considered central to the avifaunal impact study for the proposed Straussheim Alpha, Bravo and Charlie Power Plants, selected on the basis of conservation status (Taylor *et al.*, 2015).

Common name	Scientific name	Conservation status	Regional endemism	Estimated importance of local population	Preferred habitat	Likelihood of occurring in study area	Susceptible to
Bustard, Kori	<i>Ardeotis kori</i>	Near-threatened	-	Moderate	Dry open savanna woodland, dwarf shrubland and occasionally grassland	High	Collision
Bustard, Ludwig's	<i>Neotis ludwigii</i>	Endangered	Near-endemic	Low	Semi-arid dwarf shrubland, also in arid savanna and fynbos	Moderate	Collision
Cursorer, Burchell's	<i>Cursorius rufus</i>	Vulnerable	Near-endemic	Low	Sparsely vegetated arid regions	Low	Disturbance
Eagle, Martial	<i>Polemaetus bellicosus</i>	Endangered	-	Moderate	Open savanna and woodland on plains, also semi-arid shrublands	Low	Collision, electrocution
Eagle, Verreaux's	<i>Aquila verreauxii</i>	Vulnerable	-	Low	Mountainous regions and rocky areas with cliffs	Low	Collision
Falcon, Lanner	<i>Falco biarmicus</i>	Vulnerable	-	Low	Open grassland or woodland near cliff or electricity pylons	High	Collision, disturbance
Harrier, Black	<i>Circus maurus</i>	Near-threatened	-	Low	Fynbos, shrubland, dry grassland and croplands	Low	Collision, disturbance
Korhaan, Karoo	<i>Eupodotis vigorsii</i>	Near-threatened	Endemic	Moderate	Shrublands	High	Collision, disturbance
Lark, Sclater's	<i>Spizocorys sclateri</i>	Near-threatened	Endemic	Moderate	Arid to semi-arid sparsely vegetated stony plains	High	Disturbance
Secretarybird	<i>Sagittarius serpentarius</i>	Vulnerable	-	Moderate	Open grassland with scattered trees and shrubs	Moderate	Collision

2.4. AVIAN SITE SENSITIVITY MAP

The avian site sensitivity map (Figure 5) was generated by integrating avian microhabitats present on site and avifaunal information collected during the site visit. It is important to delineate sensitive avian microhabitats within the study area in order to ensure the development does not have a long term negative impact on these habitats. Important avian microhabitats in the developable area play an integral role within the landscape, providing nesting, foraging and reproductive benefits to the local avifauna.

A series of *Medium-High* avian sensitivity areas have been identified in the study area - these were associated with the *Washes and Drainage lines* habitat unit. Well developed *Drainage lines* are considered to have a *High* sensitivity due to the fact that they support a higher biomass and provide structural and compositional variation in the vegetation, which therefore supports a higher diversity and abundance of bird species. However, within the affected portions of the site, no well-developed drainage lines are present and the vegetation in the washes of study area is not markedly different to that of the surrounding *Karoo grassland/shrubland* and therefore did not support a high diversity and abundance of bird species and is not considered high sensitivity as a result.

The remainder of the study area was assessed as being of *Medium* avian sensitivity. The vegetation in these areas is associated with the *Karoo grassland/shrubland* habitat unit which is fairly homogenous across the study area. This habitat unit lacks structural and composition variation and therefore does not support a high diversity or abundance of bird species.



Figure 5: Avian site sensitivity map of the Strausheim SEF illustrating the property boundaries (white), study area (black) and preferred site layouts (Alpha = Red, Bravo = Blue and Charlie = Green). Avifaunal sensitivity: Yellow = *Medium* and Orange = *Medium-High*.

3. ASSESSMENT OF IMPACTS

3.1. GENERAL DESCRIPTION OF BIRD INTERACTIONS WITH SOLAR ENERGY FACILITIES AND THEIR ASSOCIATED POWER INFRASTRUCTURE

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.

3.1.1. Impacts of solar energy facilities

Habitat loss

Although the degree of this impact is dependent on the location and scale of the development, this is potentially the most significant impact associated with the construction and operation (maintenance) of SEFs. Extensive areas of vegetation (habitat) are cleared to accommodate the considerable amount of infrastructure required at these facilities, reducing the amount of habitat available to birds for foraging, roosting and breeding (Smallie, 2013). Given the considerable space requirements of commercially viable facilities (> 200 ha), this effect could be significant in some instances, particularly given the possibility that the initial footprint of successful facilities may be expanded over time, and allowing for the possible cumulative effects of multiple facilities in one area. This impact is likely to affect smaller bird species (i.e. larks and pipits) with small home ranges, as entire territories could be removed during construction activities.

Disturbance and displacement

Construction of SEFs requires a significant amount of machinery and labour to be present on site for a period of time. For shy, sensitive species or ground-nesting birds resident in the area, construction activities are likely to cause a temporary disturbance or even result in displacement from the site entirely. In addition, species commuting around the site may become disorientated by the reflected light and consequently fly longer distances to avoid the area, potentially resulting in displacement and energy implications (Smallie, 2013). Similarly, but to a lesser extent, ongoing maintenance activities at the operational facility are likely to cause some degree of disturbance to birds in the general vicinity.

Mortality

Bird mortality has been shown to occur due to direct collisions with solar panels. Species affected include waterbirds, small raptors, doves, sparrows and warblers (Kagan et al., 2014). The reflective surfaces of PV panels may confuse approaching birds and in some cases act as an attractant, being mistaken for large water bodies, resulting in injuries and/or mortalities when birds attempt to land on the installations.

Human conflict

Certain bird species may seek to benefit from the installations, using the erected structures as prominent perches, sheltered roost sites or even nesting sites, and possibly foraging around the infrastructure in response to changes in the distribution of preferred foods (i.e. plants growing under the panelling and other animals attracted to the facility). This may result in the fouling of critical components in the solar array, bringing local bird populations into conflict with facility operators.

3.1.2. Impacts of associated power infrastructure

Collisions with power line infrastructure

Power lines pose a significant collision risk to birds, affecting a particular suite of collision prone species. These are mostly heavy-bodied birds such as bustards, cranes, storks, large eagles and various species of waterbirds that have limited manoeuvrability in flight, which

makes it difficult for them to take the necessary evasive action to avoid colliding with power lines (Anderson, 2001; van Rooyen 2004a; Jenkins *et al.*, 2010).

Electrocutions on power line and power infrastructure

Avian electrocutions occur when a bird perches or attempts to perch on an electrical structure and causes an electrical short circuit by physically bridging the gap between live components and/or live and earthed components (van Rooyen, 2004b; Lehman *et al.*, 2007). Electrocutation risk is strongly influenced by the power line voltage and the design of the pole structure and mainly affects larger, perching species such as vultures, eagles and storks that are capable of spanning the spaces between energised components.

Habitat destruction and disturbance associated with the construction and maintenance of power lines, substations and services roads

During the construction phase and maintenance of power lines, substations and service roads, some habitat destruction and alteration inevitably takes place. These activities have an impact on birds breeding, foraging and roosting in close proximity to the servitude through the modification of habitats and disturbance, particularly during breeding activities.

3.2. SCOPING-LEVEL ASSESSMENT OF IMPACTS

Specific impacts of the proposed Strausheim SEF are most likely to be manifested in the following ways:

- Disturbance and displacement of local endemic passerines – Karoo Long-billed Lark, Sclater’s Lark and Black-eared Sparrowlark – and shy ground-nesting species – Burchell’s Courser and Double-banded Courser – from nesting and/or foraging areas by construction and/or operation and/or decommissioning of the SEF.
- Disturbance and displacement of resident or visiting large terrestrial species –Karoo Korhaan, Ludwig’s Bustard, Kori Bustard and Secretarybird– from nesting and/or foraging areas by construction and/or operation and/or decommissioning of the SEF, and/or mortality of these species in collisions with new power lines whilst flying *en route* to distant resource areas.
- Disturbance and displacement of resident or visiting raptors – Lanner Falcon, Martial Eagle and Verreaux’s Eagle – from foraging areas by construction and/or operation and/or decommissioning of the SEF, and/or mortality of these species in collisions with new power lines or by electrocutions when perched on power infrastructure.

Generally, however, the anticipated impacts on avifauna of the proposed development are not considered to be of any great significance if mitigation measures are applied. There will be some habitat loss for endemic passerines, some species – endemic passerines, large terrestrial species and raptors – may be displaced from a broader area either temporarily by construction and maintenance activities, or more permanently by the disruptive, reflective

properties of the solar panels and ongoing activities at the operational development, and some species (large terrestrials and raptors) may be killed in interactions (collisions and electrocutions) with the new power lines and power infrastructure, but numbers affected are likely to be low.

3.3. LIKELY SIGNIFICANCE OF IDENTIFIED IMPACTS OF THE AMDA SOLAR PV FACILITIES

Habitat loss due to construction and maintenance activities

Nature: All construction and maintenance activities would result in a loss of vegetation and habitat affecting endemic passerines, large terrestrial species and raptors through site clearance for solar panels and power infrastructure, the construction of internal roads and the establishment of auxiliary buildings.

Extent: The total extent of the development is relatively low and would result in a concentrated local impact on avifauna up to a few hundred hectares. Within this area, the impact is likely to be relatively high, but if appropriate areas within the site are used, then it is not likely that the developments would have an impact on avifauna beyond the local on-site scale.

Potential significance: Habitat loss is likely to have a **low** impact due to the relatively small spatial extent of the proposed development and the already degraded nature of the study area.

Disturbance during construction and maintenance activities

Nature: All construction and maintenance activities would result in a disturbance impact affecting endemic passerines, large terrestrial species and raptors through vegetation clearing and the noise and movement of equipment and personnel.

Extent: The extent of this impact would largely be restricted to the local on-site scale, but may also impact bird species within a nearby radius of the development area.

Potential Significance: Disturbance and displacement during the construction phase is likely to be **medium** as a result of vegetation clearing, noise and human presence. However, during the operational phase, impacts are likely to be of **low** significance given the low activity levels which will occur at this time.

Collisions with power line infrastructure and solar panels

Nature: Collisions are the single biggest threat posed by power lines in South Africa (van Rooyen, 2004). Avian species most susceptible and impacted upon are bustards, storks, korhaans and certain raptors. Similarly so, but less of a threat, avifauna can be disorientated by the reflected light and confuse solar arrays for large bodies of water and attempt to land on them and injure/kill themselves in the process.

Extent: The extent of this impact would be local-regional, as transient birds may be affected as well.

Potential Significance: Collisions with power lines are likely to have a **medium** impact, as even with mitigation, it is envisaged that mortalities will still occur.

Avian electrocutions on power infrastructure

Nature: Avian electrocutions occur when a bird perches or attempts to perch on an electrical structure and causes an electrical short circuit by physically bridging the gap between live components and/or live and earthed components (van Rooyen, 2004b; Lehman *et al.*, 2007). Electrocutions of birds on associated power infrastructure results in injuries or death and could potentially affect large, perching species in the area such as raptors and storks.

Extent: The extent of this impact would be local-regional, as transient birds may be affected as well.

Potential Significance: Avian electrocutions are likely to have a **low** impact, as mitigation measures are usually effective in greatly reducing this impact.

3.4. COMPARISON OF SITE ALTERNATIVES

No site alternatives are being considered for the Alpha, Bravo and Charlie Power Plants. This is because the location of the sites followed an early-stage site visit to the area by the ecological specialist to eliminate sensitive area from the development footprint and identify the most favourable areas at the site for development. The results of this study support this result and no highly sensitive avifaunal features are within the development footprint. The following is a description of the site layout options in terms of their avian sensitivity.

Alpha, Bravo and Charlie site layout options

The preferred site layout options of the three developments that make up the Strausheim SEF fall within *Medium* sensitivity areas, associated with the *Karoo grassland/shrubland* habitat unit. The layout options avoid the *Medium-High* sensitivity *Draingae lines* and because all three developments are concentrated in one section of the developable area, it will reduce the overall footprint and contain impacts to that particular area. Bird species diversity and abundance was relatively low and as such, in terms of the potential impacts to avifauna, is considered to have acceptable levels of impact.

4. CONCLUSION

The study area and more specifically the proposed development area are not considered unique habitats in the landscape and are already subject to varying degrees of

transformation and degradation. Although two threatened and/or priority species were recorded on-site – Karoo Korhaan and Lanner Falcon – the area is not considered critical for their conservation and the extent of habitat loss for these species would be considered low.

The proposed Strausheim Alpha, Bravo and Charlie Power Plants and their associated power infrastructure has been assessed as having a **medium-low** impact on priority species and general avifauna occurring in the study area and broader impact zone of the development. The development will pose several impacts to avifauna, including: a **low** displacement impact caused by disturbance and habitat destruction associated with construction and maintenance activities of the proposed SEF and its associated power infrastructure; a **low** impact of electrocutions of birds on power infrastructure, with the implementation of mitigation measures; and a **medium** impact of avian collisions with power line infrastructure and solar panels. Overall, from an avifaunal perspective the site is considered favourable for the establishment of the solar power plants.

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6. APPENDIX

Appendix 1: Consolidated species list of the proposed Straussheim SEF, including SABAP 1, SABAP 2 and field visit data. Species highlighted in bold are those that were recorded during the field visit.

Common name	Scientific name	Conservation status	Regional endemism	Susceptibility to		
				Collision	Electrocution	Disturbance / habitat loss
Barbet, Acacia Pied	<i>Tricholaema leucomela</i>	-	Near-endemic	-	-	Moderate
Batis, Pririt	<i>Batis pririt</i>	-	Near-endemic	-	-	Moderate
Bokmakierie	<i>Telophorus zeylonus</i>	-	Near-endemic	-	-	Moderate
Bulbul, African Red-eyed	<i>Pycnonotus capensis</i>	-	Near-endemic	-	-	Moderate
Bunting, Lark-like	<i>Emberiza impetuani</i>	-	Near-endemic	-	-	Moderate
Bustard, Kori	<i>Ardeotis kori</i>	Near-threatened	-	High	-	Moderate
Bustard, Ludwig's	<i>Neotis ludwigii</i>	Endangered	Endemic	High	-	High
Buzzard, Jackal	<i>Buteo rufofuscus</i>	-	Endemic	-	Moderate	Moderate
Canary, Black-headed	<i>Crithagra alario</i>	-	Endemic	-	-	Moderate
Canary, Black-throated	<i>Crithagra atrogularis</i>	-	-	-	-	Moderate
Canary, White-throated	<i>Crithagra albogularis</i>	-	Near-endemic	-	-	Moderate
Canary, Yellow	<i>Crithagra flaviventris</i>	-	Near-endemic	-	-	Moderate
Chat, Ant-eating	<i>Myrmecocichla formicivora</i>	-	Endemic	-	-	Moderate
Chat, Familiar	<i>Cercomela familiaris</i>	-	-	-	-	-
Chat, Karoo	<i>Cercomela schlegelii</i>	-	Near-	-	-	Moderate

Avifaunal Specialist Scoping Study

Chat, Sickle-winged	<i>Cercomela sinuata</i>	-	endemic	-	-	Moderate
Chat, Tractrac	<i>Cercomela tractrac</i>	-	Near-endemic	-	-	Moderate
Cisticola, Grey-backed	<i>Cisticola subruficapilla</i>	-	Near-endemic	-	-	Moderate
Cursorer, Burchell's	<i>Cursorius rufus</i>	Vulnerable	Near-endemic	-	-	Moderate
Cursorer, Double-banded	<i>Rhinoptilus africanus</i>	-	-	-	-	Moderate
Crombec, Long-billed	<i>Sylvietta rufescens</i>	-	-	-	-	Moderate
Crow, Pied	<i>Corvus ablus</i>	-	-	Moderate	Moderate	-
Cuckoo, Diederick	<i>Chrysococcyx caprius</i>	-	-	-	-	Moderate
Dove, Cape Turtle	<i>Streptopelia capicola</i>	-	-	-	-	-
Dove, Laughing	<i>Spilopelia senegalensis</i>	-	-	-	-	-
Dove, Namaqua	<i>Oena capensis</i>	-	-	-	-	Moderate
Drongo, Fork-tailed	<i>Dicrurus adsimilis</i>	-	-	-	-	-
Eagle, Martial	<i>Polemaetus bellicosus</i>	Endangered	-	High	High	Moderate
Eagle, Verreaux's	<i>Aquila verreauxii</i>	Vulnerable	-	Moderate	High	Moderate
Eagle-Owl, Spotted	<i>Bubo africanus</i>	-	-	-	High	Moderate
Eremomela, Yellow-bellied	<i>Eremomela icteropygialis</i>	-	-	-	-	Moderate
Falcon, Lanner	<i>Falco biarmicus</i>	Vulnerable	-	High	Moderate	-
Falcon, Pygmy	<i>Polihierax semitorquatus</i>	-	-	-	-	Moderate
Finch, Red-headed	<i>Amadina erythrocephala</i>	-	Near-endemic	-	-	Moderate
Finch, Scaly-feathered	<i>Sporopipes squamifrons</i>	-	Near-endemic	-	-	Moderate
Fiscal, Common	<i>Lanius collaris</i>	-	-	-	-	-
Flycatcher, Chat	<i>Bradornis infuscatus</i>	-	Near-endemic	-	-	Moderate
Flycatcher, Fairy	<i>Stenostira scita</i>	-	Endemic	-	-	Moderate
Fly-catcher, Fiscal	<i>Sigelus silens</i>	-	Endemic	-	-	Moderate

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Goshawk, Southern Pale Chanting	<i>Melierax canorus</i>	-	Near-endemic	-	Moderate	Moderate
Harrier, Black	<i>Circus maurus</i>	Endangered	Endemic	Moderate	-	High
Kestrel, Greater	<i>Falco rupicoloides</i>	-	-	-	Moderate	Moderate
Kestrel, Rock	<i>Rfalco rupicolus</i>	-	-	-	-	Moderate
Korhaan, Karoo	<i>Eupodotis vigorsii</i>	Near-threatened	Endemic	High		High
Korhaan, Northern Black	<i>Afrotis afraoides</i>	-	Endemic	High	-	Moderate
Lapwing, Crowned	<i>Vanellus coronatus</i>	-	-	-	-	-
Lark, Eastern Clapper	<i>Mirafra fasciolata</i>	-	Near-endemic	-	-	High
Lark, Fawn-coloured	<i>Calendulauda semitorquata</i>	-	Near-endemic	-	-	Moderate
Lark, Karoo Long-billed	<i>Certhilauda subcoronata</i>	-	Endemic	-	-	High
Lark, Sabota	<i>Calendulauda sabota</i>	-	Near-endemic	-	-	Moderate
Lark, Sclater's	<i>Spizocorys sclateri</i>	Near-threatened	Endemic	-	-	High
Lark, Spike-heeled	<i>Chersomanes albofasciata</i>	-	Near-endemic	-	-	Moderate
Lark, Stark's	<i>Spizocorys starki</i>	-	Near-endemic	-	-	High
Lovebird, Rosy-faced	<i>Agapornis roseicollis</i>	-	Near-endemic	-	-	-
Martin, Rock	<i>Ptyonoprogne fuligula</i>	-	-	-	-	Moderate
Masked-Weaver, Southern	<i>Ploceus velatus</i>	-	-	-	-	Moderate
Mousebird, Red-faced	<i>Urocolius indicus</i>	-	-	-	-	Moderate
Mousebird, White-backed	<i>Colius colius</i>	-	Endemic	-	-	Moderate
Penduline-Tit, Cape	<i>Anthoscopus miutus</i>	-	Near-endemic	-	-	Moderate
Pigeon, Speckled	<i>Columba guinea</i>	-	-	-	-	-
Pipit, African	<i>Anthus cinnamomeus</i>	-	-	-	-	Moderate
Prinia, Black-chested	<i>Prinia flavicans</i>	-	Near-endemic	-	-	Moderate

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Quelea, Red-billed	<i>Quelea quelea</i>	-	-	-	-	-
Sandgrouse, Namaqua	<i>Pterocles namaqua</i>	-	Near-endemic	-	-	Moderate
Scimitarbill, Common	<i>Rhinopomastus cyanomelas</i>	-	-	-	-	Moderate
Scrub-Robin, Kalahari	<i>Erythropygia paena</i>	-	Near-endemic	-	-	Moderate
Scrub-Robin, Karoo	<i>Erythropygia coryphaeus</i>	-	-	-	-	Moderate
Secretarybird	<i>Sagittarius serpentarius</i>	Vulnerable	-	High	-	Moderate
Shelduck, South African	<i>Tadorna cana</i>	-	Endemic	Moderate	-	-
Snake-Eagle, Black-chested	<i>Circaetus pectoralis</i>	-	-	-	Moderate	Moderate
Sparrow, Cape	<i>Passer melanurus</i>	-	Near-endemic	-	-	-
Sparrow, House	<i>Passer domesticus</i>	-	-	-	-	-
Sparrowlark, Black-eared	<i>Eremopterix australis</i>	-	Endemic	-	-	Moderate
Sparrowlark, Grey-backed	<i>Eremopterix verticalis</i>	-	Near-endemic	-	-	Moderate
Sparrow-Weaver, White-browed	<i>Plocepasser mahali</i>	-	-	-	-	Moderate
Starling, Cape Glossy	<i>Lamprotornis nitens</i>	-	-	-	-	-
Starling, Pale-winged	<i>Onychognathus nabouroup</i>	-	Near-endemic	-	-	-
Sunbird, Dusky	<i>Cinnyris fuscus</i>	-	Near-endemic	-	-	Moderate
Swallow, Barn	<i>Hirundo rustica</i>	-	-	-	-	Moderate
Swallow, Greater-striped	<i>Cecropis cucullata</i>	-	-	-	-	Moderate
Swallow, White-throated	<i>Hirundo albicularis</i>	-	-	-	-	Moderate
Swift, Common	<i>Apus apus</i>	-	-	-	-	-
Swift, Little	<i>Apus affinis</i>	-	-	-	-	-
Thrush, Karoo	<i>Turdus smithii</i>	-	Endemic	-	-	Moderate
Tit, Ashy	<i>Parus cinerascens</i>	-	-	-	-	Moderate
Tit-Babblers, Chestnut-vented	<i>Sylvia subcaerulea</i>	-	Near-	-	-	Moderate

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			endemic			
Tit-Babbler, Layard's	<i>Sylvia layardi</i>	-	Endemic	-	-	High
Wagtail, Cape	<i>Motacilla capensis</i>	-	-	-	-	-
Warbler, Namaqua	<i>Phragmacia substriata</i>	-	Endemic	-	-	High
Warbler, Rufous-eared	<i>Malcorus pectoralis</i>	-	Endemic	-	-	Moderate
Weaver, Sociable	<i>Philetairus socius</i>	-	Endemic	-	-	Moderate
Wheatear, Capped	<i>Oenanthe pileata</i>	-	-	-	-	Moderate
Wheatear, Mountain	<i>Oenanthe monticola</i>	-	Near-endemic	-	-	Moderate