ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED ATLANTIC ENERGY PARTNERS KATHU SOLAR PV ENERGY FACILITY AND ASSOCIATED INFRASTRUCTURE, KATHU, NORTHERN CAPE:

FAUNA & FLORA SPECIALIST SCOPING REPORT

Cape EAPrac

PRODUCED FOR CAPE EAPRAC ON BEHALF OF ATLANTIC ENERGY PARTNERS

BY

SIMON TODD CONSULTING
Simon.Todd@3foxes.co.za

MARCH 2016

CONTENTS

DECLARATION OF CONSULTANTS' INDEPENDENCE

- I Simon Todd, as the appointed independent specialist hereby declare that I:
- act/ed as the independent specialist in this application;
- 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, 2010 and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2010 (specifically in terms of regulation 17 of GN No. R. 543) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of regulation 71 of GN No. R. 543.

Note: The terms of reference must be attached.

Simon Todd Pr.Sci.Nat 400425/11.
March 2016

EXECUTIVE SUMMARY

AEP Kathu Solar (Pty) Ltd intend establishing a 75MW photovoltaic power generation facility and associated infrastructure on Portion 0 of Farm 460 south-east of Kathu in the Northern Cape. As part of the required EIA process, this Ecological Scoping report provides a preliminary characterisation of the ecological features of the site and identifies the likely impacts that may be associated with the development which will be assessed during the EIA phase. A site visit and desktop review of the available ecological information for the area was used to identify and characterize the ecological features of the site and develop an ecological sensitivity map for the site, which is depicted below.

There are three vegetation types present at the site, namely Kathu Bushveld, Kuruman Thornveld and Kuruman Mountains Bushveld, with Kathu Bushveld the predominant type at the site. Although these are relatively localised vegetation types, they have not been significantly impacted by transformation and are classified as Least Threatened. Although a number of listed mammals are likely to be present at the site, there are widespread species and the development would not generate significant habitat loss for such species.

Features of very high sensitivity identified within the Kathu Solar site include a limited extent of rocky hills and several areas with a high density of protected tree species, especially *Acacia erioloba* and *Acacia haematoxylon*. The western margin of the site is considered the lowest sensitivity and contains relatively low number of species of concern and provided that the development can be restricted to this area, the impacts of the development can be minimised within the context of the site.

Impacts associated with the development of the site would be largely restricted to the construction phase when vegetation clearing and construction activities would take place. In the long-term, the presence and operation of the facility would potentially impact broad-scale ecological processes such as landscape connectivity and the dispersal of fauna, especially as there are several other planned and existing PV facilities and mining-related disturbance in the area. Overall, provided that the sensitive parts of the site can be avoided, there do not however appear to be any impacts associated with the development that are considered likely to be of high significance and which would pose a significant obstacle to the development. As such, the site is considered potentially suitable for the development of a PV facility.

1 INTRODUCTION

AEP Kathu Solar (Pty) Ltd intend establishing a 75MW photovoltaic power generation facility and associated infrastructure on Portion 0 of Farm 460 south of Kathu in the Northern Cape. Although the property is approximately 1382ha in extent, an area of approximately 230ha would be required for the development.

In terms of the EIA Regulations published in terms of Section 24(5) of the National Environmental Management Act (NEMA, Act No. 107 of 1998), the development requires authorisation from the National Department of Environmental Affairs (DEA) before it can proceed. AEP Kathu Solar (Pty) Ltd has appointed Cape EAPrac to conduct the required EIA process and the scoping study for the development has already been completed and this report forms part of the EIA, which is currently in the Scoping Phase. As part of the specialist studies required for the EIA, Cape EAPrac has appointed Simon Todd Consulting to provide a specialist fauna and flora Scoping Study of the development site as part of the EIA process.

The purpose of the Ecological Scoping Report is to describe and detail the ecological features of the proposed site; provide a preliminary assessment of the ecological sensitivity of the site and identify the likely impacts that may be associated with the development. A desktop review of the available ecological information for the area is conducted in order to identify and characterize the ecological features of the site. Along with a preliminary site visit, this information is used to derive a draft ecological sensitivity map that presents the ecological constraints and opportunities for development at the site. The information and sensitivity map presented here provides an ecological baseline that can be used in the planning phase of the development to ensure that the potential negative ecological impacts associated with the development can be minimized. 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.

1.1 SCOPE OF STUDY

The specific terms of reference for the scoping study includes the following:

- a description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed project;
- a description and evaluation of potential environmental issues and potential impacts (including direct, indirect and cumulative impacts) that have been identified;
- Direct, indirect and cumulative impacts of the identified issues are evaluated within the Scoping Report 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 issue/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 include within the Plan of Study for EIA and include a description of the proposed method of assessing the potential environmental impacts associated with the project

1.2 ASSESSMENT APPROACH & PHILOSOPHY

The assessment will be conducted according to the EIA Regulations, published by the Department of Environmental Affairs (2014) as well as within the best-practice guidelines and principles for biodiversity assessment as outlined by Brownlie (2005) and De Villiers et al. (2005).

This includes adherence to the following broad principles:

- That a precautionary and risk-averse approach be adopted towards projects which may result in substantial detrimental impacts on biodiversity and ecosystems, especially the irreversible loss of habitat and ecological functioning in threatened ecosystems or designated sensitive areas: i.e. Critical Biodiversity Areas (as identified by systematic conservation plans, Biodiversity Sector Plans or Bioregional Plans) and Freshwater Ecosystem Priority Areas.

- Demonstrate how the proponent intends complying with the principles contained in section 2 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA), which, amongst other things, indicates that environmental management should.

    - In order of priority aim to: avoid, minimise or remedy disturbance of ecosystems and loss of biodiversity;
    - Avoid degradation of the environment;
    - Avoid jeopardising ecosystem integrity;
    - Pursue the best practicable environmental option by means of integrated environmental management;
    - Protect the environment as the people's common heritage;
    - Control and minimise environmental damage; and

- Pay specific attention to management and planning procedures pertaining to sensitive, vulnerable, highly dynamic or stressed ecosystems.

These principles serve as guidelines for all decision-making concerning matters that may affect the environment. As such, it is incumbent upon the proponent to show how proposed activities would comply with these principles and thereby contribute towards the achievement of sustainable development as defined by the NEMA.

In order to adhere to the above principles and best-practice guidelines, the following approach forms the basis for the study approach and assessment philosophy:
The study will include data searches, desktop studies, site walkovers / field survey of the property and baseline data collection, describing:

- A description of the broad ecological characteristics of the site and its surrounds in terms of any mapped spatial components of ecological processes and/or patchiness, patch size, relative isolation of patches, connectivity, corridors, disturbance regimes, ecotones, buffering, viability, etc.

In terms of **pattern**, the following will be identified or described:

Community and ecosystem level

- The main vegetation type, its aerial extent and interaction with neighbouring types, soils or topography;
- Threatened or vulnerable ecosystems (*cf. SA vegetation map/National Spatial Biodiversity Assessment, fine-scale systematic conservation plans, etc*).

Species level

- Red Data Book species (giving location if possible using GPS)
- The viability of an estimated population size of the RDB species that are present (include the degree of confidence in prediction based on availability of information and specialist knowledge, i.e. High=70-100% confident, Medium 40-70% confident, low 0-40% confident)
- The likelihood of other RDB species, or species of conservation concern, occurring in the vicinity (include degree of confidence).

Fauna

- Describe and assess the terrestrial fauna present in the area that will be affected by the proposed development.
- Conduct a faunal assessment that can be integrated into the ecological study.
- Describe the existing impacts of current land use as they affect the fauna.
- Clarify species of special concern (SSC) and that are known to be:
    - endemic to the region;
    - that are considered to be of conservational concern;
    - that are in commercial trade (CITES listed species);

- or, are of cultural significance.

- Provide monitoring requirements as input into the Environmental Management Plan (EMP) for faunal related issues.

Other pattern issues

- Any significant landscape features or rare or important vegetation associations such as seasonal wetlands, alluvium, seeps, quartz patches or salt marshes in the vicinity.
- The extent of alien plant cover of the site, and whether the infestation is the result of prior soil disturbance such as ploughing or quarrying (alien cover resulting from disturbance is generally more difficult to restore than infestation of undisturbed sites).
- The condition of the site in terms of current or previous land uses.

In terms of **process**, the following will be identified or described:

- The key ecological "drivers" of ecosystems on the site and in the vicinity, such as fire.
- Any mapped spatial component of an ecological process that may occur at the site or in its vicinity (i.e. *corridors* such as watercourses, upland-lowland gradients, migration routes, coastal linkages or inland-trending dunes, and *vegetation boundaries* such as edaphic interfaces, upland-lowland interfaces or biome boundaries)
- Any possible changes in key processes, e.g. increased fire frequency or drainage/artificial recharge of aquatic systems.
- Furthermore, any further studies that may be required during or after the EIA process will be outlined.
- All relevant legislation, permits and standards that would apply to the development will be identified.
- The opportunities and constraints for development will be described and shown graphically on an aerial photograph, satellite image or map delineated at an appropriate level of spatial accuracy.

1.3 RELEVANT ASPECTS OF THE DEVELOPMENT

The proposed development site is located south of Kathu on Portion 1 of Farm 460 situated in the District of Hay, Northern Cape Province, with an overall extent of 1067ha.

The development will consist of the following:

- The proposed facility is planned and designed with a net generating capacity (AC) of 75MWp, with an installed capacity (DC) of +/-90MWp.

- An area of 230 ha has been identified for the purposes of this study and which represents the preferred development area for the facility. This is based on preliminary ecological sensitivity mapping at the site and is purposed located within an area with presumed low sensitivity.

Infrastructure associated with the facility is likely to include:

» PV and/or concentrated PV with fixed, single or double axis tracking technology. The actual technology to be used will be decided at a later date.

» The grid connection would be to the Eskom Ferrum Substation via the proposed Sekgame Switching yard located west of the site.

» Auxiliary buildings of approximately 2ha. The functions within these buildings include (but is not limited to) to ablution, workshops, storage areas and site offices. Fencing height shall be below 5m, but expected to be below 3m.

» Access roads will be <6m in width and internal roads <5m.

» Approximately 2-5ha of laydown area will be required, but will not exceed 5ha.

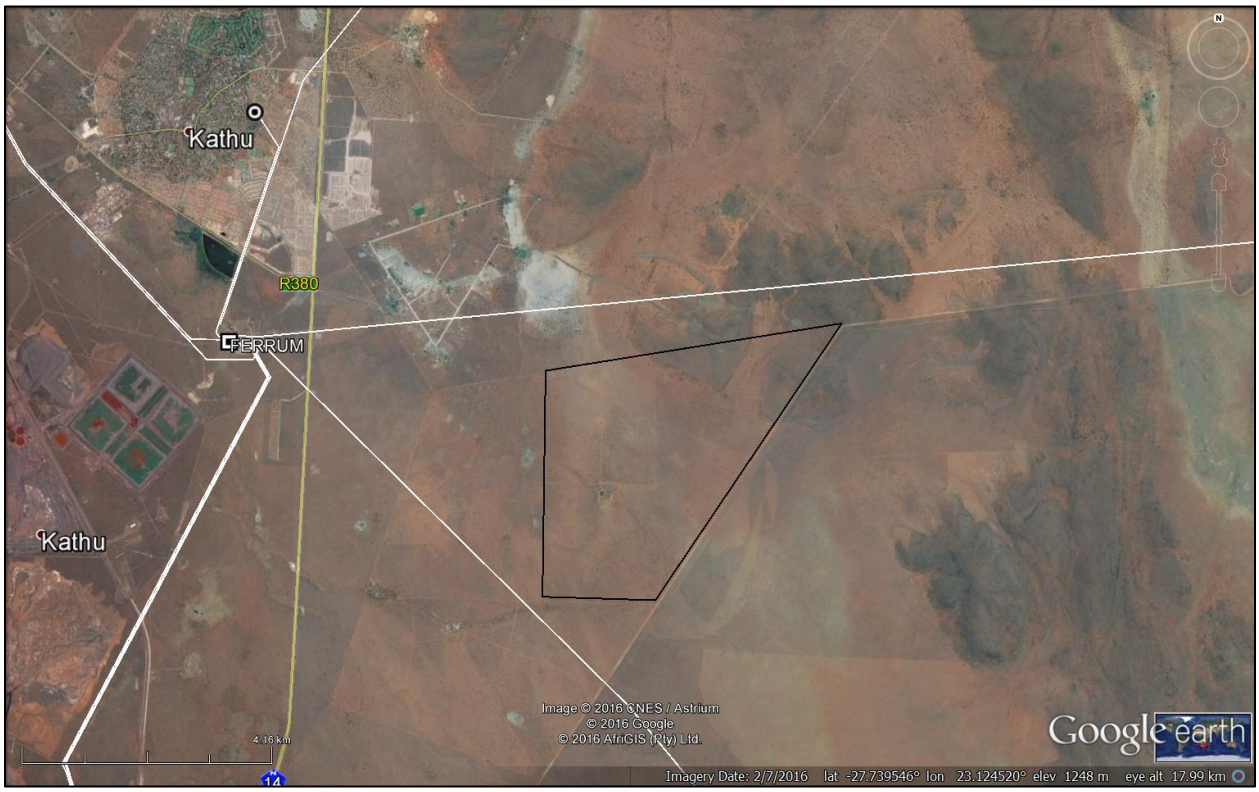

Figure 1. Satellite image of the Kathu Solar study site, illustrating the property boundary in black and the proximity of the site to Kathu and the Eskom Ferrum substation.

2 METHODOLOGY

2.1 DATA SOURCING AND REVIEW

Data sources from the literature consulted and used where necessary in the study includes the following:

Vegetation:

- Vegetation types and their conservation status were extracted from the South African National Vegetation Map (Mucina and Rutherford 2006) as well as the National List of Threatened Ecosystems (2011), where relevant.
- No Critical Biodiversity Areas (CBA) mapping or systematic conservation planning has been conducted for the area with the result that no detailed conservation priority area information is available for the area.
- Information on plant and animal species recorded for the Quarter Degree Square (QDS) 2723C was extracted from the SABIF/SIBIS database hosted by SANBI. This is a considerably larger area than the study area, but this is necessary to ensure a conservative approach as well as counter the fact that the site itself or the immediate area has not been well sampled in the past.
- The IUCN conservation status (Table 1) of the species in the list was also extracted from the database and is based on the Threatened Species Programme, Red List of South African Plants (2014).
- Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment, NFEPA (Nel et al. 2011).
- Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy 2008 (NPAES).

Fauna

- Lists of mammals, reptiles and amphibians which are likely to occur at the site were derived based on distribution records from the literature and various spatial databases (SANBI's SIBIS and BGIS databases).
- Literature consulted includes Branch (1988) and Alexander and Marais (2007) for reptiles, Du Preez and Carruthers (2009) for amphibians, Friedmann and Daly (2004) and Skinner and Chimimba (2005) for mammals.
- Apart from the literature sources, additional information on reptiles were extracted from the SARCA web portal, hosted by the ADU, http://vmus.adu.org.za
- The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site.
- The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria version 2014.2 (See Figure 1) and where species have not

been assessed under these criteria, the CITES status is reported where possible. These lists are adequate for mammals and amphibians, the majority of which have been assessed, however the majority of reptiles have not been assessed and therefore, it is not adequate to assess the potential impact of the development on reptiles, based on those with a listed conservation status alone. In order to address this shortcoming, the distribution of reptiles was also taken into account such that any narrow endemics or species with highly specialized habitat requirements occurring at the site were noted.

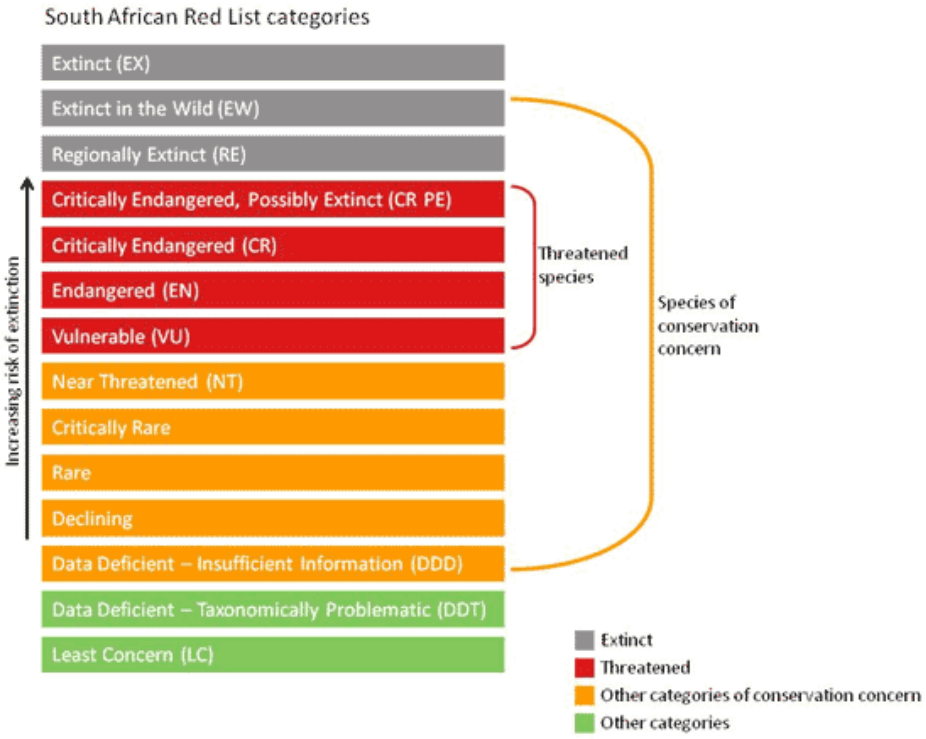

Figure 2. Schematic representation of the South African Red List categories. Taken from http://redlist.sanbi.org/redcat.php

2.2 SENSITIVITY MAPPING & ASSESSMENT

An ecological 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 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 terrestrial 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 faunal 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.

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.

2.3 SAMPLING LIMITATIONS AND ASSUMPTIONS

The current study is based on a desktop analysis, as well as a full site visit and field assessment. As such, the sensitivity map developed here is validated by field data and is not based on many assumptions and as such is considered highly reliable. Conditions at the time of site visit were however fairly dry and most of the grasses present were dormant at the time and there were few forbs and annuals growing at the time. However, at a broad scale, the ecological patterns at the site were clear and dominated by the presence of large woody species which characterise the different vegetation units at the site. It is not likely that there are any features of significance present that were not observed during the site visit. The species lists derived for the site include those observed in the area as well as those derived from the literature. The species lists are obtained from an area significantly larger than the study area and are likely to include a much wider array of species than actually occur at the site. This is a cautious and conservative approach which takes the study limitations into account.

3 DESCRIPTION OF THE AFFECTED ENVIRONMENT- BASELINE

3.1 BROAD-SCALE VEGETATION PATTERNS

According to the national vegetation map (Mucina & Rutherford 2006), the site is dominated by the Kathu Bushveld vegetation type. This vegetation unit occupies an area of 7443 km2 and extends from around Kathu and Dibeng in the south through Hotazel and to the Botswana border between Van Zylsrus and McCarthysrus. In terms of soils the vegetation type is associated with aeolian red sand and surface calcrete and deep sandy soils of the Hutton and Clovelly soil forms. The main land types are Ah and Ae with some Ag. The Kathu Bushveld vegetation type is still largely intact and less than 2% has been transformed by mining activity and it is classified as Least Threatened. It is, however, poorly conserved and does not currently fall within any formal conservation areas. Although no endemic species are restricted to this vegetation type a number of Kalahari endemics are known to occur in this vegetation type such as *Acacia luederitzii* var *luederitzii*, *Anthephora argentea*, *Megaloprotachne albescens*, *Panicum kalaharense* and *Neuradopsis bechuanensis*. It is more fully described as it occurs at the site in the next section.

The western part of the site is mapped by Mucina & Rutherford as Kuruman Thornveld. This is also a restricted vegetation type which occupies 5794 km^2 of the Northern Cape and North West Provinces from the vicinity of Postmasburg and Danielskuil in the south, extending via Kuruman to Tsineng and Dewar in the North. It has been little impacted by transformation and more than 98% of the original extent is still intact and it is classified as Least Threatened. This vegetation unit occupies flat rocky plains and sloping hills with a very well developed, closed shrub layer and well-developed tree stratum usually consisting of *Acacia erioloba*. The most important land types are Ae, Ai, Ag and Ah with Hutton soil form. The only endemic taxon known from this vegetation type is *Gnaphalium englerianum*. Within the site there is little differentiation of the areas mapped as Kuruman Thornveld and Kathu Bushveld, with the main driver of vegetation compositon being soils depth, with the deeper soils in the northeast dominated by *Acacia erioloba* with some areas with a high abundance of *Acacia haematoxylon* and transitioning to shallow soils on calcrete along the western boundary of the site, dominated by *Tarchonanthus camphoratus*.

There are also some rocky hills in the northeast of the site which are classified as Kuruman Mountain Bushveld. This is not widely distributed and has a total mapped extent of 4360 km^2 which is a narrow range for an arid vegetation type. It is distributed in the Northern Cape and North-West Provinces from Asbestos Mountains southwest and northwest of Griekwastad, along the Kuruman Hills north of Danielskuil, passing west of Kuruman and re-emerging as isolated hills at Makhubung and around Pomfret. This vegetation unit is associated with rolling hills with gentle to moderate slopes and hill pediment areas and typically consists of an open shrubveld. Soils are shallow sandy soils of the Hutton form and

the most common land type is Ib with lesser amounts of Ae, Ic and Ag. Kuruman Mountain Bushveld has been little impacted by transformation and is classified as Least Threatened, but is not currently conserved within any formal conservation areas. One vegetation-type endemic species *Euphorbia planiceps* is known from Kuruman Mountain Bushveld.

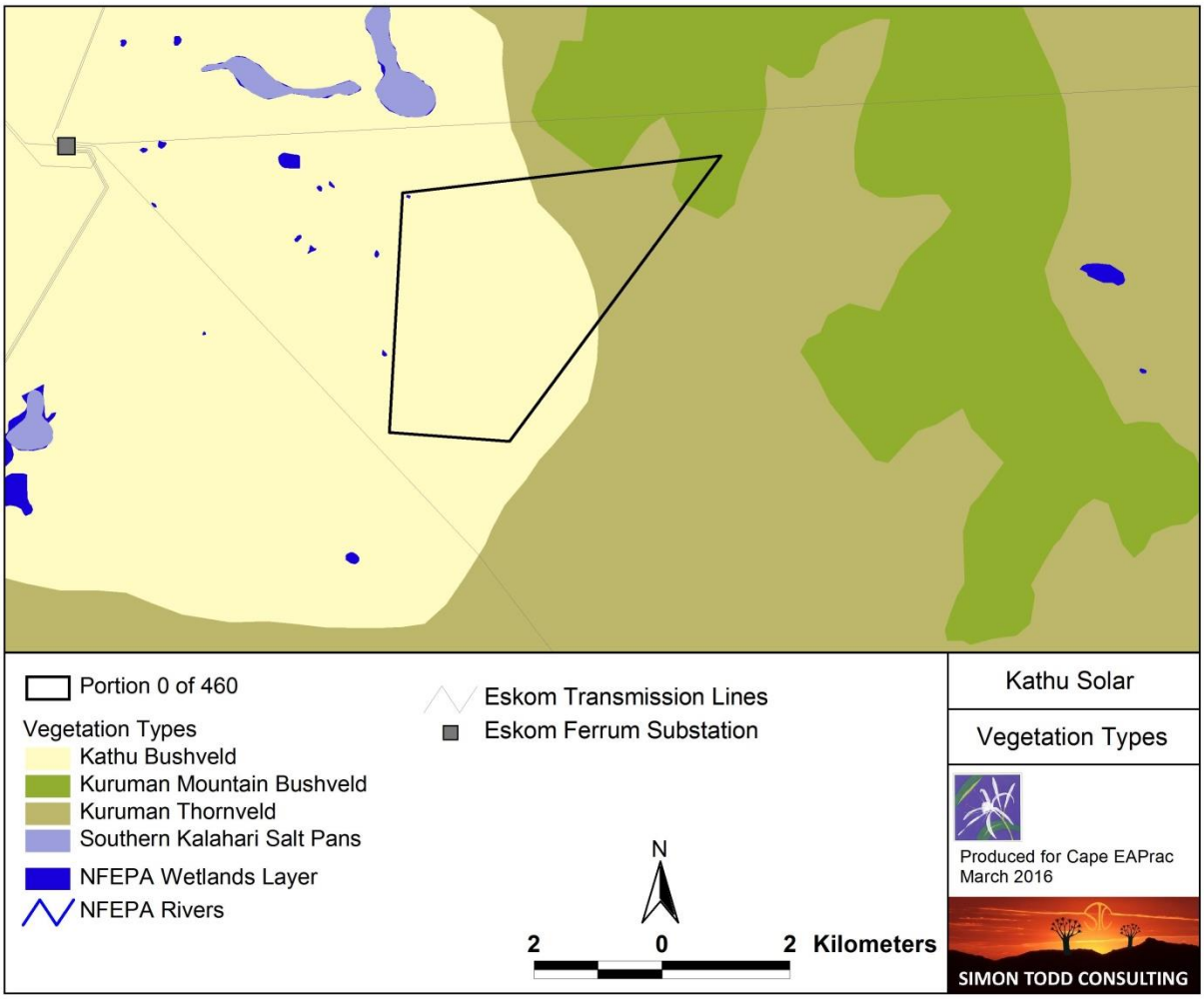

Figure 3. Broad-scale overview of the vegetation in and around the Kathu Solar site. The vegetation map is an extract of the national vegetation map as produced by Mucina & Rutherford (2006), and also includes wetlands delineated by the National Freshwater Ecosystem Priority Areas assessment (Nel et al. 2011). There are no mapped drainage lines within the site.

3.2 Listed and Protected Plant Species

The conservation status of the plant species which have been recorded in previous studies in the area listed below in Table 1. Of these only *Boophone disticha* and *Acacia erioloba* can

be confirmed present at the site. *Asparagus stipulaceus* does not occur in the area and is on the list as a result of the outdated taxonomy of historical species lists for the area, as this species is restricted to the coast and does not occur inland. In terms of protected species, *Acacia erioloba* and *Acacia haematoxylon* are abundant at the site and have a high density within some parts of the site.

Table 1. Listed plant species known from the broad vicinity of the proposed Magobe study area.

Family	Species	Status
AMARYLLIDACEAE	*Boophone disticha*	Declining
FABACEAE	*Acacia erioloba*	Declining
ASPARAGACEAE	*Asparagus stipulaceus*	NT
ASTERACEAE	*Gnaphalium declinatum*	NT
MESEMBRYANTHEMACEAE	*Antimima lawsonii*	Rare

3.3 Critical Biodiversity Areas & Broad-Scale Processes

No fine-scale conservation planning has been conducted for the region and as a result, no Critical Biodiversity Areas have been defined for the study area. In terms of other broad-scale planning studies, the site does not fall within a National Protected Areas Expansion Strategy Focus Area (NPAES), indicating that the area has not been identified as an area of exceptional biodiversity or of significance for the long-term maintenance of broad-scale ecological processes and climate change buffering within the region.

3.4 Site Description

3.4.1 Fine-Scale Vegetation Patterns

There are several different habitat units present at the site, the most conspicuous of which is the rocky hills in the north east of the site. The hills are considered sensitive on account of the high diversity of these areas as well as the presence of protected species including *Boscia albitrunca*. The rest of the site consists of sandy plains, with changes in composition driven largely by differences in soil depth. Towards the hills, the soils are deep and characterised by relatively dense stands of *Acacia erioloba*. Although overall diversity within these areas is not very high, this habitat is considered sensitive on account of the presence of large numbers of *Acacia erioloba* which is a protected species. Towards the centre of the site, the soils become shallower and are characterised by a high density of *Acacia haematoxylon* with occasional stands or areas dominated by *Acacia erioloba*. Due to the high density of these species, these areas are considered moderate to high sensitivity.

Towards the western boundary of the site, the soils become shallow and overly calcrete and are characterised by the predominance of *Tarchonanthus camphoratus* with *Searsia ciliata* and *Grewia flava*. These areas are considered relatively degraded and of low sensitivity due to the low presence of species of concern within this habitat. These different habitats are illustrated below.

Example of the area dominated by *Tachonanthus camphoratus* along the western boundary of the site. Other conspicuous species include *Searsia ciliata* and *Grewia flava*. This area is not considered highly sensitive due to the low density of species or features of conservation within this habitat and it is considered the best opportunity for development at the site.

Typical area of Kathu Bushveld with a high density of *Acacia erioloba* and occasional *Acacia haematoxylon*. The yellow flowering shrubs in the foreground are *Gnidia polycephala*.

Example of the vegetation within the north-eastern part of the site mapped as Kuruman Thornveld, with a high density of *Acacia haematoxylon* and occasional dense stands of *Acacia erioloba*. As the impact on protected species in these areas would be high, these areas are considered sensitive.

Example of the rocky hills at the site which are classified as Kuruman Mountain Bushveld. Common and dominant species include *Acacia mellifera* which can be seen in flower in the foreground, *Tarchonanthus camphoratus*, *Grewia flava* and *Searsia ciliata*. The deeper Kalahari sands which form the adjacent plains can be seen in the foreground.

Example of the area which has been previously cleared of woody species apparently for the establishment of a centre pivot. It is not clear whether or not it was ever actually cultivated, but the grass cover has recovered and a lot of Acacia haematoxylon are now present within this area, which is a primary determinant of the sensitivity and development potential of the area.

3.5 FAUNAL COMMUNITIES

3.5.1 Mammals

The mammalian community at the site is likely to be of moderate diversity, as many as 44 terrestrial mammals and 9 bat species potentially occur in the area. The habitat diversity of the site is however relatively low and apart from the limited extent of rocky hills, consists of bushveld of varying degrees of density, with some relatively open areas of grassland on sandy soils giving way to dense *Tarchnanthus camphoratus* veld or areas of high *Acacia erioloba* or *Acacia haematoxylon* density on deeper sands. Species observed at or in the immediate vicinity of the site include Aardvark, Cape Porcupine, Springhare, South African Ground Squirrel, Vervet Monkey, Small-spotted Genet, Yellow Mongoose, Slender Mongoose, Black-Backed Jackal, Steenbok, Duiker, Springbok, Gemsbok and Kudu. Small mammals trapped in the area include Desert Pygmy Mouse *Mus indutus*, Multimammate Mouse *Mastomys coucha*, Bushveld Gerbil *Tatera leucogaster*, Pouched Mouse *Saccostomus campestris* and Grey Climbing Mouse *Dendromus melanotis*.

Five listed terrestrial mammal species potentially occur in the area; these are the Brown Hyaena *Hyaena brunnea* (Near Threatened), Honey Badger *Mellivora capensis* (IUCN LC and SARDB Endangered), Black-footed Cat *Felis nigripes* (Vulnerable), Ground Pangolin *Smutsia temminckii* (Vulnerable) and South African Hedgehog *Atelerix frontalis*. There are also four Near Threatened bat species present in the area. The Brown Hyaena is not likely to occur in the area on account of the agricultural land-use in the area which is not usually conducive to the persistence of large carnivores. The Black-footed Cat is a secretive species which would probably occur at the site given that it occurs within arid, open country. Similarly there is a high probability that the Honey Badger occurs at the site, while the Ground Pangolin may also occur in the area at typically low density. 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 on these species would be unlikely.

3.5.2 Avifauna

According to the SABAP 1 and 2 databases, 217 bird species have been recorded from the area. This total results from 135 species recorded from 39 cards from SABAP 2 and 164 species from 76 cards from SABAP 1. This suggests that the area has been reasonably well sampled and that the species list is likely to be fairly comprehensive. Eleven listed bird species are known from the area, all of which are classified as Vulnerable or Near Threatened (Table 2 below). The site does not fall within or near any of the Important Bird Areas defined by Birdlife South Africa. A number of the listed species are associated with water and are not likely to be resident at the site but may occasionally pass over the site, but are unlikely to be directly impacted by any habitat loss. Direct habitat loss is not likely to be a highly significant impact for most species and the major potential source of impact

would potentially come from electrocution and collisions with the power lines. Although not all species are vulnerable to these impacts, flamingos, bustards and storks are highly vulnerable to collisions with power lines, while many of the raptors are susceptible to electrocution as well as collision. Given the relative proximity of the site to the Eskom Ferrum Substation which is 6 km from the site, these impacts are likely to be low especially given that the power line route is in of high anthropogenic activity.

Table 2. Listed bird species known from the vicinity of the Kathu Solar site, according to SABAP 1 and 2. The frequency refers to the reporting rate from SABAP 1 and 2 and gives an indication of the frequency with which the species is likely to be encountered at the site, as a resident or passing over.

Family	Species Name	Common Name	Status	Frequency
Charadriidae	*Charadrius pallidus*	Chestnut-banded Plover	NT	V.Low
Ciconiidae	*Ciconia nigra*	Black Stork	NT	Medium-Low
Ciconiidae	*Mycteria ibis*	Yellow-billed Stork	NT	V.Low
Falconidae	*Falco biarmicus*	Lanner Falcon	NT	Low
Falconidae	*Falco naumanni*	Lesser Kestrel	VU	Medium
Phoenicopteridae	*Phoenicopterus minor*	Lesser Flamingo	NT	Medium-Low
Phoenicopteridae	*Phoenicopterus ruber*	Greater Flamingo	NT	High
Sagittariidae	*Sagittarius serpentarius*	Secretary Bird	NT	Low
Accipitridae	*Aquila rapax*	Tawny Eagle	VU	Low
Accipitridae	*Circus ranivorus*	African Marsh-harrier	VU	V.Low
Accipitridae	*Polemaetus bellicosus*	Martial Eagle	VU	Low

3.5.3 Reptiles

The Kathu Solar site lies in or near the distribution range of at least 37 reptile species (Appendix 3). This is a comparatively low total suggesting that the site has relatively low reptile species richness. Based on distribution maps and habitat requirements, the composition of the reptile fauna is likely to comprise 1 terrapin, 2 tortoises, 15 snakes, 13 lizards and skinks and 5 geckos. No species of conservation concern are known to occur in the area. The habitat diversity within the study area is relatively low as no rocky outcrops or drainage lines are present within the study area. As a result, the number of reptile species present within the site is likely to be relatively low.

Species observed in the area in the past include Cape Cobra *Naja nivea*, Ground Agama *Agama aculeata*, Spotted Sand Lizard *Pedioplanis lineoocellata*, Variable Skink *Trachylepis varia*, Bibron's Blind Snake *Afrotyphlops bibronii*, Western Rock Skink *Mabuya sulcata sulcata*, Cape Gecko *Lygodactylus capensis capensis*, Speckled Rock Skink *Trachylepis punctatissima*, Striped Skaapsteker *Psammophylax tritaeniatus* and Boomslang *Dispholidus typus typus*. The only species of potential conservation concern which may occur at the site is the Namaqua Plated Lizard *Gerrhosaurus typicus* which was classified as Near Threatened (IUCN 2009), but has since been downgraded to Least Concern by SARCA (Bates *et al*.).

Impacts on reptiles are likely to be restricted largely to habitat loss within the development footprint.

3.5.4 Amphibians

The site lies within or near the range of 11 amphibian species, indicating that the site potentially has a moderately diverse frog community for an arid area. There is no natural permanent water or artificial earth dams within the site that would represent suitable breeding habitat for most of these species. Given the paucity of permanent water at the site, only those species which are relatively independent of water are likely to occur in the area. Species observed in the area include Eastern Olive Toad *Amietophrynus garmani* and Bushveld Rain Frog *Breviceps adspersus*.

The only species of conservation concern which may occur at the site is the Giant Bullfrog *Pyxicephalus adspersus*. The site lies at the margin of the known distribution of this species and it has not been recorded from any of the quarter degree squares around the site, suggesting that it is unlikely to occur at the site. Impacts on amphibians are however likely to be low and restricted largely to habitat loss during construction.

3.6 SITE SENSITIVITY ASSESSMENT

The sensitivity map for the Kathu Solar site is illustrated below in Figure 4. Areas of higher specific sensitivity include the rocky hills and the areas of high protected species density. There are parts of the site which have a very high density of *Acacia erioloba* and/or *Acacia haematoxylon* and would generate high impacts if developed. Although the ecological impacts of development within the areas dominated by *Acacia haematoxylon* is not considered very high as these are not the typical dune areas where this species frequently occurs, but flat plains where the risks of wind and other erosion problems are relatively low. In addition, these are not large trees and are not considered ecologically significant as is the case for large individuals of *Acacia erioloba* which develop specific associated faunal communities. However, *Acacia haematoxylon* is a nationally protected tree species and development within these areas would result in the loss of several thousand individuals which would be likely to trigger an objection or an offset requirement from DAFF.

The western margin of the site dominated by *Tarchonanthus* is considered the most suitable for development. This area has few protected plant species present and is also of low sensitivity from a faunal perspective. The substrate in this area is also the most suitable for development as the underlying calcrete would limit the potential for large-scale mobilisation of the sands which are deep in some other parts of the site. As there are also developments planned on the adjacent properties, it would limit the overall cumulative impact of development if the development was located along the western boundary of the

site in close proximity to the other developments. Provided that the development can be restricted to the lower sensitivity area along the western boundary of the site, then the impacts associated with the development of the solar energy facility are likely to be largely local in nature and not of broader significance.

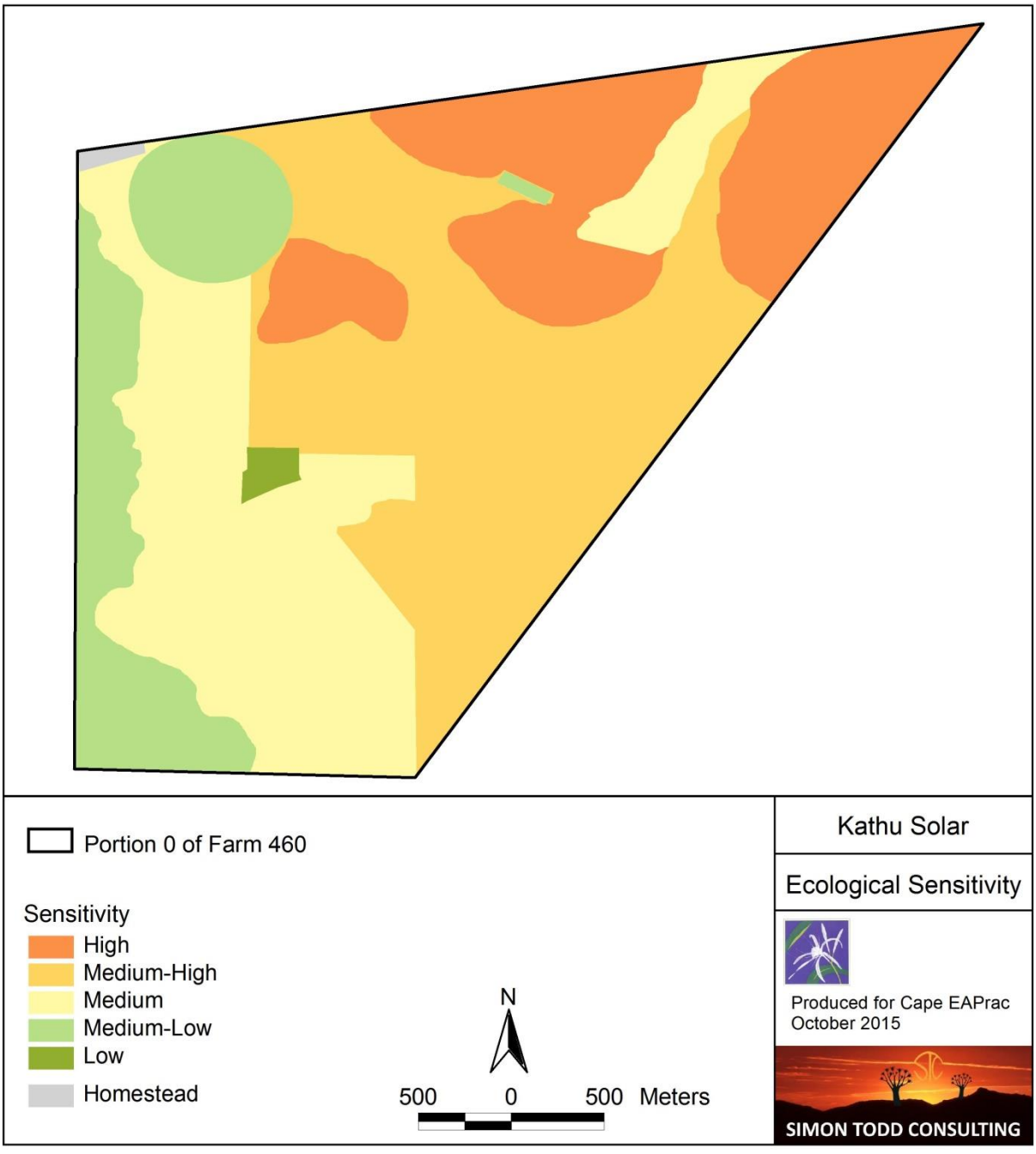

Figure 4. Ecological sensitivity map of the Kathu Solar site, showing areas of high sensitivity associated with areas of high *Acacia erioloba* or *Acacia haematoxylon* density.

4 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.

4.1 IDENTIFICATION OF POTENTIAL IMPACTS AND DAMAGING ACTIVITIES

Potential ecological impacts resulting from the development of the Kathu Solar PV Energy Facility 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 fauna and flora through poaching of fauna and uncontrolled collection of plants for traditional medicine or other purpose.
- Site clearing & exploration activities for site establishment would have a negative impact on biodiversity if this was not conducted in a sensitive manner.

Construction Phase

- Vegetation clearing for the reflector field, access roads, site fencing etc could impact listed plant species as well as high-biodiversity plant communities. Vegetation clearing will also lead to habitat loss for fauna and potentially the loss of sensitive faunal species, habitats and ecosystems.
- Increased erosion risk would occur due to the loss of plant cover and soil disturbance created during the construction phase. This may impact downstream riparian and wetland habitats if a lot of silt enters the drainage systems.
- 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 plant harvesting and other forms of disturbance such as fire.

Operational Phase

- The operation of the facility will generate noise and disturbance which may deter some fauna from the area.
- The areas inside the facility will requirement 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.

Cumulative Impacts

- The loss of unprotected vegetation types on a cumulative basis from the broad area may impact the countries' ability to meet its conservation targets.
- 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.

4.2 IDENTIFICATION OF IMPACTS TO BE ASSESSED IN THE EIA PHASE

In this section each of the potential impacts identified above 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.

Impacts on vegetation and protected plant species

It is highly likely that some protected species occur at the site which may be impacted by the development. Vegetation clearing during construction will lead to the loss of currently intact habitat within the development footprint and is an inevitable consequence of the development. As this impact is certain to occur it will be assessed for the construction phase.

Soil erosion and associated degradation of ecosystems

The large amount of disturbance created during construction would potentially leave the site vulnerable to soil erosion, from both wind and water. Vegetation clearing, the panel arrays and access roads will all result in increased levels of runoff which will need to be managed and which would pose an erosion risk. Soil erosion is therefore considered a likely potential impact and will be assessed for the construction phase and operational phase.

Direct faunal impacts

Increased levels of noise, pollution, disturbance and human presence during construction will be detrimental to fauna. Sensitive and shy fauna would move away from the area during the construction phase as a result of the noise and human

activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed. Some impact on fauna is highly likely to occur during construction as well as operation and this impact will therefore be assessed for the construction phase and operational phase.

Impacts on Avifauna

The development would result in some habitat loss for avifauna. However, as the extent of the site is relatively low and the affected vegetation type is still largely intact, this is not likely to be of high significance. Although a power line is required by the development and it would potentially generate significantly more impact than habitat loss, the grid connection is not part of the current assessment and is not considered here. An impact on avifauna due to habitat loss is a possibility and it will be assessed for the operational phase of the development.

Alien Plant Invasion

The disturbance created during construction is highly likely to encourage the invasion of the disturbed areas by alien species. It is possible that species will colonise the disturbed areas if given the opportunity. This impact is deemed highly likely to occur and will be assessed as a likely impact associated with the development.

Reduced ability to meet conservation obligations & targets

The loss of unprotected vegetation types on a cumulative basis from the broad area may impact the countries' ability to meet its conservation targets. Although the receiving vegetation types in the study area are classified as Least Threatened and are still more than 98% intact, they are relatively restricted vegetation types for an arid area and would therefore be vulnerable to cumulative impact. This impact will therefore be assessed in light of the current development as well as any other developments in the surrounding area which would also contribute to cumulative impacts.

Impact on broad-scale ecological processes

Transformation of intact habitat on a cumulative basis 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. Due to the presence of a number of other renewable energy and mining developments in the area, this is a potential cumulative impact of the development that will be assessed during the EIA.

4.3 PRELIMINARY ASSESSMENT OF IMPACTS

A preliminary assessment of the likely extent and significance of each impact identified above is made below.

Impacts on vegetation and listed plant species

Nature: Site preparation and construction will result in a lot of disturbance which would impact indigenous vegetation and possibly listed species as well. For some species translocation may partially mitigate the impact, but most woody species cannot be translocated and would be lost from the development footprint.

Extent: The total extent of the development would result in a concentrated local impact 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 development would have an impact on flora beyond the local on-site scale.

Potential Significance: The significance of this impact would be likely to be **Very High** without mitigation, but if the development can be restricted to the lower sensitivity areas, then the impact can be reduced to a **Moderate to Low** level and of local significance only.

Soil Erosion

Nature: Disturbance at the site during construction would leave the site vulnerable to soil erosion. Erosion would impact drainage systems as well as biodiversity through topsoil loss as well as through loss of ecological function (resource capture), resilience and decreased hydrological functional.

Extent: The extent of this impact would most likely be restricted to local area around the PV arrays, but could impact drainage systems which receive a large amount of silt or eroded material.

Potential Significance: The site is fairly flat and so the risk of erosion is likely to be fairly low and manageable with mitigation. The significance of this impact is likely to be **Low after mitigation**.

Direct Faunal Impacts

Nature: Increased levels of noise, pollution, disturbance and human presence will be detrimental to fauna. Sensitive and shy fauna are likely to move away from the area during the construction phase as a result of the noise and human activities present. Some mammals and reptiles such as tortoises would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present.

Extent: The extent of the impact would be largely restricted to the local area.

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

Avifaunal Impacts

Nature: The development of the site would result in some habitat loss for avifauna. Although this is not likely to generate significant impacts on larger wide-ranging species, smaller resident species within the development footprint would be affected

Extent: The extent of this impact would be local in nature given the relatively low extent of the development.

Potential Significance: This impact would be of **low significance** as there are no listed species that would be highly impacted by the development.

Alien Plant Invasion

Nature: Disturbance at the site during construction would leave the site vulnerable to alien plant invasion. If such infestation is not controlled it may affect adjacent intact areas resulting in an impact on biodiversity or ecosystem function.

Extent: The extent of this impact would most likely be restricted to local area around the PV arrays, but could impact a wider area if severe infestations occur.

Potential Significance: Although this impact has potential significance, it can be reduced to a **low level** through clearing and alien plant management. Woody species would generate the most significant impacts, but these are relatively easily controlled.

Reduced ability to meet conservation obligations & targets

Nature: The loss of unprotected vegetation types on a cumulative basis from the broad area may impact the countries' ability to meet its conservation targets.

Extent: The extent of the impact would be restricted to the local region.

Potential Significance: The significance of this impact is likely to be **low** as the site is within an area with a large amount of existing activity that would make it broadly unsuitable for conservation purposes.

Impacts on Broad-Scale Ecological Processes

Nature: The development of the site will contribute towards the cumulative disruption of landscape connectivity as it will represent a hostile environment to many species which will be prevented from passing through the area.

Extent: The extent of the impact would be restricted to the local region.

Potential Significance: The significance of this impact is likely to be **low** as there is little evidence to suggest that the site is within an important ecological gradient or movement corridor for fauna.

5 ASSESSMENT METHODOLOGY

Direct, indirect and cumulative impacts of the issues identified above, will assessed during the Impact Assessment phase of the project according to the following standard methodology:

- The **nature** which shall include a description of what causes the effect what will be affected and how it will be affected.

- The **extent** wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):

- The **duration** wherein it will be indicated whether:

    - the lifetime of the impact will be of a very short duration (0- 1 years).
    - the lifetime of the impact will be of a short duration (2-5 years).
    - medium-term (5-15 years).
    - long term (> 15 years); or
    - permanent

- The **magnitude** quantified as small and will have no effect on the environment, minor and will not result in an impact on processes, low and will cause a slight impact on processes, moderate and will result in processes continuing but in a modified way, high (processes are altered to the extent that they temporarily cease) and very high and results in complete destruction of patterns and permanent cessation of processes.

- The **probability** of occurrence, which shall describe the (likelihood of the impact actually occurring. Probability will be estimated as very improbable (probably will not happen), improbable (some possibility, but of low likelihood), probable (distinct possibility), highly probable (most likely) and definite (impact will occur regardless of any prevention measures).

The **significance** which shall be determined through a synthesis of the characteristics described above and will be assessed as follows:

- **No significance**: the impacts do not influence the proposed development and/or environment in any way.

- **Low significance**: the impacts will have a minor influence on the proposed development and/or environment. These impacts require some attention to modification of the project design where possible, or alternative mitigation.
- **Moderate significance**: the impacts will have a moderate influence on the proposed development and/or environment. The impact can be ameliorated by a modification in the project design or implementation of effective mitigation measures.
- **High significance**: the impacts will have a major influence on the proposed development and/or environment and will result in the "no-go" option on the development or portions of the development regardless of any mitigation measures that could be implemented. This level of significance must be well motivated.

and;
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.

6 CONCLUSION & RECOMMENDATIONS

Although there are some sensitive features present in the vicinity of the Kathu Solar site, in particular the rocky hills and the areas of high protected tree density. Provided that the development area is located within the lower sensitivity part of the site along the western boundary, the impacts of the development can be minimised within the context of the site. Although there are a number of listed fauna which may be present at the site, these are widespread species and the extent of habitat loss for these species would be considered low.

Impacts associated with the development of the site would be largely restricted to the construction phase when vegetation clearing and construction activities would take place. This would result in habitat loss and disturbance for resident fauna, largely on a local scale. In the long-term the presence and operation of the facility would potentially impact broad-scale ecological processes such as landscape connectivity and the dispersal of fauna. Overall, provided that the areas of high protected tree density can be avoided, there do not appear to be any impacts associated with the development that are considered likely to be of high significance and which would pose a significant obstacle to the development. As a result it is concluded that the Kathu Solar site is potentially suitable for the development of a solar energy facility.

7 PROPOSED ACTIVITIES FOR THE EIA PHASE

The current study consists of a desktop study as well as field assessment during a favourable time of year. As such, there are few limitations inherent to the study and the results are considered highly reliable and additional fieldwork at the site is not likely to provide additional insight. The EIA study will further interrogate the data collected at the site and consider the likely impacts of the development in light of the final development footprint and the characteristics of the site. The following will be specifically considered:

- Characterise the vegetation and plant communities present within the site in greater detail in order to assess the likely impact of the development on associated fauna.
- Consider the impact of the development on protected plant species which are confirmed present at the site including *Acacia erioloba* and *Acacia haematoxylon*.
- Further evaluate the likely presence of listed faunal species at the site and identify associated habitats and mitigation measures that should be implemented to reduce impact to such species.
- There are several other solar developments in the immediate and wider area and the development would contribute to cumulative impacts on habitat and landscape connectivity in the area. These impacts will be further explored and examined in the EIA phase.
- Evaluate, based on the site attributes, 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.
- Consider and address all comments and feedback received on the Scoping Study.
- Assess the impacts identified above in light of the site-specific findings and the final layout to be provided by the developer.

8 REFERENCES

Alexander, G. & Marais, J. 2007. *A Guide to the Reptiles of Southern Africa*. Struik Nature, Cape Town.

Bates, M.F., Branch, W.R., Bauer, A.M., Burger, M., Marais, J., Alexander, G.J. & de Villiers, M. S. 2014. Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland. Strelitzia 32. SANBI, Pretoria.

Branch W.R. 1998. *Field guide to snakes and other reptiles of southern Africa*. Struik, Cape Town.

Du Preez, L. & Carruthers, V. 2009. *A Complete Guide to the Frogs of Southern Africa*. Struik Nature., Cape Town.

Marais, J. 2004. *Complete Guide to the Snakes of Southern Africa*. Struik Nature, Cape Town.

Nel, J.L., Murray, K.M., Maherry, A.M., Petersen, C.P., Roux, D.J., Driver, A., Hill, L., Van Deventer, H., Funke, N., Swartz, E.R., Smith-Adao, L.B., Mbona, N., Downsborough, L. and Nienaber, S. (2011). Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.

Minter LR, Burger M, Harrison JA, Braack HH, Bishop PJ & Kloepfer D (eds). 2004. Atlas and Red Data book of the frogs of South Africa, Lesotho and Swaziland. SI/MAB Series no. 9. Smithsonian Institution, Washington, D.C.

Mucina L. & Rutherford M.C. (eds) 2006. *The Vegetation of South Africa, Lesotho and Swaziland*. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

Skinner, J.D. & Chimimba, C.T. 2005. The mammals of the Southern African Subregion. Cambridge University Press, Cambridge.

9 ANNEX 1. LIST OF MAMMALS

List of mammals which are likely to occur in the vicinity of the Kathu Solar site. Habitat notes and distribution records are based on Skinner & Chimimba (2005), while conservation status is from the IUCN Red Lists 2014.2 and South African Red Data Book for Mammals. Confirmed species are those observed in the area, not necessarily from the site itself.

Scientific Name	Common Name	Status	Habitat	Likelihood
Macroscledidea (Elephant Shrews):				
Macroscelides proboscideus	Round-eared Elephant Shrew	LC	Species of open country, with preference for shrub bush and sparse grass cover, also occur on hard gravel plains with sparse boulders for shelter, and on loose sandy soil provided there is some bush cover	High
Elephantulus rupestris	Western Rock Elephant Shrew	LC	Rocky koppies, rocky outcrops or piles of boulders where these offer sufficient holes and crannies for refuge.	High
Tubulentata:				
Orycteropus afer	Aardvark	LC	Wide habitat tolerance, being found in open woodland, scrub and grassland, especially associated with sandy soil	Confirmed
Hyracoidea (Hyraxes)				
Procavia capensis	Rock Hyrax	LC	Outcrops of rocks, especially granite formations and dolomite intrusions in the Karoo. Also erosion gullies	Confirmed
Lagomorpha (Hares and Rabbits):				
Lepus capensis	Cape Hare	LC	Dry, open regions, with palatable bush and grass	Confirmed
Lepus saxatilis	Scrub Hare	LC	Common in agriculturally developed areas, especially in crop-growing areas or in fallow lands where there is some bush development.	High
Rodentia (Rodents):				
Cryptomys hottentotus	African Mole Rat	LC	Wide diversity of substrates, from sandy soils to heavier compact substrates such as decomposed schists and stony soils	Confirmed
Hystrix africaeaustralis	Cape Porcupine	LC	Catholic in habitat requirements.	Confirmed
Pedetes capensis	Springhare	LC	Occur widely on open sandy ground or sandy scrub, on overgrazed grassland, on the fringes of vleis and dry river beds.	High
Xerus inauris	South African Ground Squirrel	LC	Open terrain with a sparse bush cover and a hard substrate	Confirmed
Graphiurus ocularis	Spectacled Dormouse	LC	Associated with sandstones of Cape Fold mountains, which have many vertical and horizontal crevices.	High
Rhabdomys pumilio	Four-striped Grass Mouse	LC	Essentially a grassland species, occurs in wide variety of habitats where there is good grass cover.	High
Mus minutoides	Pygmy Mouse	LC	Wide habitat tolerance	High
Mastomys coucha	Southern Multimammate Mouse	LC	Wide habitat tolerance.	High
Aethomys namaquensis	Namaqua Rock Mouse	LC	Catholic in their habitat requirements, but where there are rocky koppies, outcrops or boulder-strewn hillsides they use these	Confirmed

			preferentially	
Parotomys brantsii	Brants' Whistling Rat	LC	Associated with a dry sandy substrate in more arid parts of the Nama-karoo and Succulent Karoo. Species selects areas of low percentage of plant cover and areas with deep sands.	High
Parotomys littledalei	Littledale's Whistling Rat	LC	Riverine associations or associated with Lycium bushes or Psilocaulon absimile	High
Otomys unisulcatus	Bush Vlei Rat	LC	Shrub and fynbos associations in areas with rocky outcrops Tend to avoid damp situations but exploit the semi-arid Karoo through behavioural adaptation.	Low
Desmodillus auricularis	Cape Short-tailed Gerbil	LC	Tend to occur on hard ground, unlike other gerbil species, with some cover of grass or karroid bush	High
Gerbillurus paeba	Hairy-footed Gerbil	LC	Gerbils associated with Nama and Succulent Karoo preferring sandy soil or sandy alluvium with a grass, scrub or light woodland cover	High
Gerbilliscus leucogaster	Bushveld Gerbil	LC	Predominantly associated with light sandy soils or sandy alluvium	Low
Gerbilliscus brantsii	Higheld Gerbil	LC	Sandy soils or sandy alluvium with some cover of grass, scrub or open woodland	Low
Malacothrix typica	Gerbil Mouse	LC	Found predominantly in Nama and Succulent Karoo biomes, in areas with a mean annual rainfall of 150-500 mm.	High
Primates:				
Papio ursinus	Chacma Baboon	LC	Can exploit fynbos, montane grasslands, riverine courses in deserts, and simply need water and access to refuges.	High
Eulipotyphla (Shrews):				
Crocidura cyanea	Reddish-Grey Musk Shrew	LC	Occurs in relatively dry terrain, with a mean annual rainfall of less than 500 mm. Occur in karroid scrub and in fynbos often in association with rocks.	High
Erinaceomorpha (Hedgehog)				
Atelerix frontalis	South African Hedgehog	LC	Generally found in semi-arid and subtemperate environments with ample ground cover	Low
Carnivora:				
Proteles cristata	Aardwolf	LC	Common in the 100-600mm rainfall range of country, Nama-Karoo, Succulent Karoo Grassland and Savanna biomes	High
Caracal caracal	Caracal	LC	Caracals tolerate arid regions, occur in semi-desert and karroid conditions	High
Felis silvestris	African Wild Cat	LC	Wide habitat tolerance.	Confirmed
Felis nigripes	Black-footed cat	VU	Associated with arid country with MAR 100-500 mm, particularly areas with open habitat that provides some cover in the form of tall stands of grass or scrub.	High
Genetta genetta	Small-spotted genet	LC	Occur in open arid associations	High
Suricata suricatta	Meerkat	LC	Open arid country where substrate is hard and stony. Occur in Nama and Succulent Karoo but also fynbos	High

Cynictis penicillata	Yellow Mongoose	LC	Semi-arid country on a sandy substrate	Confirmed
Herpestes pulverulentus	Cape Grey Mongoose	LC	Wide habitat tolerance	High
Vulpes chama	Cape Fox	LC	Associated with open country, open grassland, grassland with scattered thickets and coastal or semi-desert scrub	High
Canis mesomelas	Black-backed Jackal	LC	Wide habitat tolerance, more common in drier areas.	Confirmed
Otocyon megalotis	Bat-eared Fox	LC	Open country with mean annual rainfall of 100-600 mm	Confirmed
Ictonyx striatus	Striped Polecat	LC	Widely distributed throughout the sub-region	Confirmed
Mellivora capensis	Ratel/Honey Badger	IUCN LC/SA RDB EN	Catholic habitat requirements	High
Rumanantia (Antelope):				
Oryx gazella	Gemsbok	LC	Open arid country	Confirmed
Sylvicapra grimmia	Common Duiker	LC	Presence of bushes is essential	High
Antidorcas marsupialis	Springbok	LC	Arid regions and open grassland.	Confirmed
Raphicerus campestris	Steenbok	LC	Inhabits open country,	Confirmed

10 ANNEX 2. LIST OF REPTILES

List of reptiles which are likely to occur at the proposed Kathu Solar site, based on the SARCA database. Conservation status is from Bates et al. (2014).

Family	Genus	Species	Subspecies	Common name	Red list category	No. records
Agamidae	*Agama*	*aculeata*	*aculeata*	Common Ground Agama	Least Concern	4
Agamidae	*Agama*	*anchietae*		Anchieta's Agama	Least Concern	5
Colubridae	*Boaedon*	*capensis*		Brown House Snake	Least Concern	3
Colubridae	*Dasypeltis*	*scabra*		Rhombic Egg-eater	Least Concern	1
Colubridae	*Psammophis*	*namibensis*		Namib Sand Snake	Least Concern	1
Colubridae	*Psammophis*	*notostictus*		Karoo Sand Snake	Least Concern	3
Colubridae	*Telescopus*	*beetzii*		Beetz's Tiger Snake	Least Concern	2
Cordylidae	*Karusasaurus*	*polyzonus*		Karoo Girdled Lizard	Least Concern	3
Gekkonidae	*Chondrodactylus*	*angulifer*	*angulifer*	Common Giant Ground Gecko	Least Concern	5
Gekkonidae	*Chondrodactylus*	*bibronii*		Bibron's Gecko	Least Concern	14
Gekkonidae	*Pachydactylus*	*capensis*		Cape Gecko	Least Concern	4
Gekkonidae	*Pachydactylus*	*latirostris*		Quartz Gecko	Least Concern	6
Gekkonidae	*Pachydactylus*	*rugosus*		Common Rough Gecko	Least Concern	5
Gekkonidae	*Ptenopus*	*garrulus*	*maculatus*	Spotted Barking Gecko	Least Concern	6
Lacertidae	*Heliobolus*	*lugubris*		Bushveld Lizard	Least Concern	1
Lacertidae	*Nucras*	*tessellata*		Western Sandveld Lizard	Least Concern	1
Lacertidae	*Pedioplanis*	*inornata*		Plain Sand Lizard	Least Concern	3
Lacertidae	*Pedioplanis*	*lineoocellata*	*lineoocellata*	Spotted Sand Lizard	Least Concern	39
Lacertidae	*Pedioplanis*	*namaquensis*		Namaqua Sand Lizard	Least Concern	9
Scincidae	*Acontias*	*lineatus*		Striped Dwarf Legless Skink	Least Concern	1
Scincidae	*Trachylepis*	*capensis*		Cape Skink	Least Concern	2
Scincidae	*Trachylepis*	*occidentalis*		Western Three-striped Skink	Least Concern	6
Scincidae	*Trachylepis*	*sparsa*		Karasburg Tree Skink	Least Concern	1
Scincidae	*Trachylepis*	*spilogaster*		Kalahari Tree Skink	Least Concern	2
Scincidae	*Trachylepis*	*sulcata*	*sulcata*	Western Rock Skink	Least Concern	6
Scincidae	*Trachylepis*	*variegata*		Variegated Skink	Least Concern	17
Testudinidae	*Psammobates*	*tentorius*	*verroxii*	Verrox's Tent Tortoise	Not listed	12
Testudinidae	*Stigmochelys*	*pardalis*		Leopard Tortoise	Least Concern	1
Typhlopidae	*Rhinotyphlops*	*lalandei*		Delalande's Beaked	Least Concern	1

				Blind Snake		
Viperidae	*Bitis*	*arietans*	*arietans*	Puff Adder	Least Concern	1

11 ANNEX 3. LIST OF AMPHIBIANS

List of amphibians which are likely to occur in the vicinity of the Kathu Solar Site, according to the Southern African Atlas of Frogs. Conservation is from Minter et al. (2004).

Family	Genus	Species	Common name	Red list category
Brevicepitidae	*Breviceps*	*adspersus*	Bushveld Rain Frog	Least Concern
Bufonidae	*Amietophrynus*	*gutturalis*	Guttural Toad	Least Concern
Bufonidae	*Amietophrynus*	*poweri*	Power's Toad	Least Concern
Bufonidae	*Amietophrynus*	*rangeri*	Raucous Toad	Least Concern
Bufonidae	*Poyntonophrynus*	*vertebralis*	Southern Pygmy Toad	Least Concern
Bufonidae	*Vandijkophrynus*	*gariepensis*	Karoo Toad	Least Concern
Pipidae	*Xenopus*	*laevis*	Common Platanna	Least Concern
Pyxicephalidae	*Amietia*	*angolensis*	Common or Angola River Frog	Least Concern
Pyxicephalidae	*Cacosternum*	*boettgeri*	Common Caco	Least Concern
Pyxicephalidae	*Pyxicephalus*	*adspersus*	Giant Bull Frog	Near Threatened
Pyxicephalidae	*Tomopterna*	*cryptotis*	Tremelo Sand Frog	Least Concern

12 ANNEX 4. LIST OF BIRDS

List of birds which are likely to occur in the vicinity of the Kathu Solar site, according to the SABAP 2 database. Listed species were drawn from a larger area and also included the SABAP1 database, but are listed in the text and not in the table below. South African conservation status from the list of threatened birds available from the Bird Life South Africa website, http://www.birdlife.org.za.

Scientific Name	English Name	Sightings	Reporting rate
Streptopelia senegalensis	Laughing Dove	16	88.90%
Pycnonotus nigricans	African Red-eyed Bulbul	15	83.30%
Zosterops pallidus	Orange River White-eye	13	72.20%
Passer domesticus	House Sparrow	13	72.20%
Columba guinea	Speckled Pigeon	13	72.20%
Motacilla capensis	Cape Wagtail	13	72.20%
Colius colius	White-backed Mousebird	13	72.20%
Riparia paludicola	Brown-throated Martin	12	66.70%
Tricholaema leucomelas	Acacia Pied Barbet	12	66.70%
Turdus smithi	Karoo Thrush	12	66.70%
Cossypha caffra	Cape Robin-Chat	12	66.70%
Passer melanurus	Cape Sparrow	11	61.10%
Lamprotornis nitens	Cape Glossy Starling	11	61.10%
Bostrychia hagedash	Hadeda Ibis	10	55.60%
Streptopelia semitorquata	Red-eyed Dove	10	55.60%
Cercomela familiaris	Familiar Chat	9	50.00%
Apus affinis	Little Swift	9	50.00%
Ceryle rudis	Pied Kingfisher	9	50.00%
Phalacrocorax carbo	White-breasted Cormorant	8	44.40%
Crithagra flaviventris	Yellow Canary	8	44.40%
Philetairus socius	Sociable Weaver	8	44.40%
Lanius collaris	Common Fiscal	8	44.40%
Ploceus velatus	Southern Masked-Weaver	8	44.40%
Streptopelia capicola	Cape Turtle-Dove	8	44.40%
Euplectes orix	Southern Red Bishop	8	44.40%
Alopochen aegyptiacus	Egyptian Goose	7	38.90%
Hirundo cucullata	Greater Striped Swallow	7	38.90%
Vanellus armatus	Blacksmith Lapwing	7	38.90%
Upupa africana	African Hoopoe	7	38.90%
Trachyphonus vaillantii	Crested Barbet	7	38.90%
Ardea cinerea	Grey Heron	7	38.90%
Phalacrocorax africanus	Reed Cormorant	7	38.90%
Prinia flavicans	Black-chested Prinia	7	38.90%
Myrmecocichla formicivora	Anteating Chat	6	33.30%
Scopus umbretta	Hamerkop	6	33.30%
Motacilla aguimp	African Pied Wagtail	6	33.30%

Urocolius indicus	Red-faced Mousebird	6	33.30%
Anhinga rufa	African Darter	6	33.30%
Acrocephalus gracilirostris	Lesser Swamp-Warbler	6	33.30%
Sigelus silens	Fiscal Flycatcher	6	33.30%
Cercotrichas coryphoeus	Karoo Scrub-Robin	6	33.30%
Telophorus zeylonus	Bokmakierie	6	33.30%
Parisoma subcaeruleum	Chestnut-vented Tit-Babbler	5	27.80%
Hirundo fuligula	Rock Martin	5	27.80%
Haliaeetus vocifer	African Fish-Eagle	5	27.80%
Passer diffusus	Southern Grey-headed Sparrow	5	27.80%
Hirundo rustica	Barn Swallow	5	27.80%
Apus caffer	White-rumped Swift	5	27.80%
Crithagra albogularis	White-throated Canary	5	27.80%
Polihierax semitorquatus	Pygmy Falcon	5	27.80%
Oena capensis	Namaqua Dove	5	27.80%
Calendulauda sabota	Sabota Lark	5	27.80%
Anas undulata	Yellow-billed Duck	4	22.20%
Onychognathus nabouroup	Pale-winged Starling	4	22.20%
Merops hirundineus	Swallow-tailed Bee-eater	4	22.20%
Plocepasser mahali	White-browed Sparrow-Weaver	4	22.20%
Estrilda astrild	Common Waxbill	4	22.20%
Merops bullockoides	White-fronted Bee-eater	4	22.20%
Anas sparsa	African Black Duck	4	22.20%
Merops apiaster	European Bee-eater	4	22.20%
Cinnyris fuscus	Dusky Sunbird	4	22.20%
Corvus albus	Pied Crow	4	22.20%
Tadorna cana	South African Shelduck	4	22.20%
Lagonosticta senegala	Red-billed Firefinch	3	16.70%
Alcedo cristata	Malachite Kingfisher	3	16.70%
Hirundo albigularis	White-throated Swallow	3	16.70%
Charadrius tricollaris	Three-banded Plover	3	16.70%
Tachybaptus ruficollis	Little Grebe	3	16.70%
Columba livia	Rock Dove	3	16.70%
Anas capensis	Cape Teal	2	11.10%
Pterocles namaqua	Namaqua Sandgrouse	2	11.10%
Sporopipes squamifrons	Scaly-feathered Finch	2	11.10%
Eremomela icteropygialis	Yellow-bellied Eremomela	2	11.10%
Estrilda erythronotos	Black-faced Waxbill	2	11.10%
Eupodotis vigorsii	Karoo Korhaan	2	11.10%
Threskiornis aethiopicus	African Sacred Ibis	2	11.10%
Megaceryle maximus	Giant Kingfisher	2	11.10%
Cisticola subruficapilla	Grey-backed Cisticola	2	11.10%

Vanellus coronatus	Crowned Lapwing	2	11.10%
Anas smithii	Cape Shoveler	2	11.10%
Batis pririt	Pririt Batis	2	11.10%
Dendrocygna viduata	White-faced Duck	2	11.10%
Tyto alba	Barn Owl	2	11.10%
Parus cinerascens	Ashy Tit	2	11.10%
Phylloscopus trochilus	Willow Warbler	2	11.10%
Cisticola tinniens	Levaillant's Cisticola	2	11.10%
Bradornis infuscatus	Chat Flycatcher	2	11.10%
Creatophora cinerea	Wattled Starling	2	11.10%
Numida meleagris	Helmeted Guineafowl	2	11.10%
Melierax canorus	Southern Pale Chanting Goshawk	2	11.10%
Cypsiurus parvus	African Palm-Swift	2	11.10%
Crithagra atrogularis	Black-throated Canary	2	11.10%
Quelea quelea	Red-billed Quelea	2	11.10%
Cercotrichas paena	Kalahari Scrub-Robin	2	11.10%
Acrocephalus baeticatus	African Reed-Warbler	2	11.10%
Burhinus capensis	Spotted Thick-knee	2	11.10%
Amadina erythrocephala	Red-headed Finch	1	5.60%
Vidua macroura	Pin-tailed Whydah	1	5.60%
Pernis apivorus	European Honey-Buzzard	1	5.60%
Chersomanes albofasciata	Spike-heeled Lark	1	5.60%
Cisticola aridulus	Desert Cisticola	1	5.60%
Glaucidium perlatum	Pearl-spotted Owlet	1	5.60%
Phragmacia substriata	Namaqua Warbler	1	5.60%
Circus maurus	Black Harrier	1	5.60%
Dendropicos fuscescens	Cardinal Woodpecker	1	5.60%
Oenanthe monticola	Mountain Wheatear	1	5.60%
Aquila verreauxii	Verreaux's Eagle	1	5.60%
Apus barbatus	African Black Swift	1	5.60%
Aquila pennatus	Booted Eagle	1	5.60%
Campethera abingoni	Golden-tailed Woodpecker	1	5.60%
Prinia maculosa	Karoo Prinia	1	5.60%
Pternistis capensis	Cape Spurfowl	1	5.60%
Philomachus pugnax	Ruff	1	5.60%
Certhilauda subcoronata	Karoo Long-billed Lark	1	5.60%
Turdus olivaceus	Olive Thrush	1	5.60%
Centropus burchelli	Burchell's Coucal	1	5.60%
Tringa glareola	Wood Sandpiper	1	5.60%
Malcorus pectoralis	Rufous-eared Warbler	1	5.60%
Spizocorys starki	Stark's Lark	1	5.60%
Neotis ludwigii	Ludwig's Bustard	1	5.60%
Sylvietta rufescens	Long-billed Crombec	1	5.60%

Anthus cinnamomeus	African Pipit	1	5.60%
Lanius collurio	Red-backed Shrike	1	5.60%
Zosterops virens	Cape White-eye	1	5.60%
Charadrius pecuarius	Kittlitz's Plover	1	5.60%
Monticola brevipes	Short-toed Rock-Thrush	1	5.60%
Egretta garzetta	Little Egret	1	5.60%
Emberiza impetuani	Lark-like Bunting	1	5.60%
Oenanthe pileata	Capped Wheatear	1	5.60%
Chrysococcyx caprius	Diderick Cuckoo	1	5.60%
Ixobrychus minutus	Little Bittern	1	5.60%
Halcyon albiventris	Brown-hooded Kingfisher	1	5.60%
Cercomela schlegelii	Karoo Chat		Incidental