Bird report for the proposed

ALPHA

Solar Power Plant

Fig. 1. Thornveld savannah on red Kalahari sand. The thorntrees supported the greater number, and diversity, of birds on the Alpha site.

Prepared for: **Alpha Solar Power Plant (RF)(Pty) Ltd**.

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EXECUTIVE SUMMARY

Alpha Solar Power Plant (RF) (Pty) Ltd. proposes to develop an up to 111MW photovoltaic Solar Power Plant (hereafter SPP) with associated infrastructure on ca. 285 hectares on portion 3 of the farm Middel Pan 605, 30 km west of the town Vryburg in the Naledi Local Municipality of South Africa's North West Province. This scoping report concerns the potential impacts the development may have on birds of the directly affected, and immediately surrounding, areas.

Field observations across 3 calendar days recorded 63 bird species. Use of available databases indicates that the broader area is likely to have populations of some 200 species of birds. No conservation red listed species were recorded during the field observations, nor are any considered to make frequent use of the Alpha site in its present condition.

The site proposed for the Alpha SPP is a relatively flat area of Southern Kalahari savannah. There are two basic habitats. Most of the site is largely covered with grass but in parts there are thorn trees at varying density, in addition there are some patches of dry shrubs. Similar habitat occurred in adjacent lands. The number and diversity of birds was low in the grassed areas – as shown by both drive and walk transects. This reflects the lack of vegetation structure and diversity. The thorn trees and shrubs supported both greater numbers and diversity of birds. None of the species observed are considered threatened. There are extensive areas of similar habitat in areas adjacent to the proposed SPP into which displaced birds can move. Assuming that the adjoining habitat is already occupied to saturation, displaced birds will have to compete with established residents and the result is likely to be a reduction in the regional population of each species. However, due to the low productivity of the affected habitats the number of individuals per concerned species is small and the overall effect is considered negligible.

Though no red data listed bird species were observed at the site it is likely that individuals of these species may sometimes occur on or over the site in its current condition. However, in the absence of any particular feature to attract them, these individuals will be at most only transient users of the area to be developed. Thus the development of the proposed SPP will have no marked effect on red-listed species. The species most likely to be negatively impacted is the Northern Black Korhaan. These are ground foragers and may feed, and probably breed, in local habitat including that to be developed. Although the population that may be displaced is minimal, disturbance during construction may deter these and other birds from breeding in adjacent habitat.

At night polarized light from the PV panels gives the impression that there is a waterbody. This may cause night-flying waterbirds to descend and die from collision with the structures. It is recommended that monitoring for birds killed by collision be carried out through the first two years of the post-construction phase.

Development of the SPP is likely to produce a range of short-term and acute impacts on birds during construction. In addition there will be longer-term, chronic, impacts in the operational period. These impacts are mainly features that will, to varying extent, degrade habitats adjacent to the developed area. A number of mitigation measures are suggested that will reduce the effects of these impacts.

This report is based on a desk-top review of available information and field observations on three days following months of hot dry weather. Bird use of the area may differ somewhat after the regional rainy season. To check for any marked differences a follow-up bird survey is to be made towards the end of the rainy season.

The conclusion of this scoping report is that, provided the indicated mitigations are followed, the impacts of the proposed development on local bird populations are of an acceptable level.

1. INTRODUCTION

Alpha Solar Power Plant (RF) (Pty) Ltd. proposes to develop an up to 115MW photovoltaic Solar Power Plant (hereafter SPP) with associated infrastructure on ca. 285 hectares on portion 3 of the farm Middel Pan 605, 30 km west of the town Vryburg in the Naledi Local Municipality of South Africa's North West Province. African Insights was appointed to conduct the bird Scoping study for the Environmental Impact Assessment.

1.1 Proposed development

At application phase, the development footprint (construction and operation) is envisaged to cover an area of approximately 285 ha. Vegetation will be cleared from the core area. The construction will, in addition to the panels and associated cables, include:

- Internal unpaved roads
- Central inverters to convert DC current to AC
- A new, step-up, substation that will link to an existing powerline
- Storage and lay-down areas, water storage tanks, and a waste recycling area
- Subcontractor site camps, workshops and offices
- An above-ground power line to link the new substation to an existing 132 kV substation that is off-site

This report uses the results of desktop studies and, in particular, field observations during three visits across an eight day period, to assess the potential impacts of the proposed Alpha SPP development on birds during the construction and operational phases.

1.2 Terms of reference

The terms of reference were to:

- Rate the development in terms of its potential impacts on birds taking into consideration baseline data;
- Suggest optional or essential ways in which to mitigate negative impacts and enhance any positive impacts;
- Where possible, take into consideration the cumulative effects associated with this and other projects which are either developed, or are in the process of being developed, in the local area;

The specialist reserves the right to amend this report, recommendations and conclusions at any stage, if extra information becomes available.

This report may not be altered without the specific and written consent of the specialist who authored it.

2 METHODS

2.1 Desktop study

Following the BirdLife South Africa best practise guidelines (Smit 2014) the following data banks held at the Animal Demography Unit, University of Cape Town were consulted: CAR (Co-ordinated Avian Road Counts), CWAC (Co-ordinated Waterbird Counts) and SABAP (South African Bird Atlas Project) phases 1 and 2.

This region of the North West Province has been subject to relatively little documentation of bird status so the information from these data bases is minimal. Neither CAR nor CWAC surveys have been conducted in the Quarter degree square (QDS) 2624CD in which the Alpha property is located. The property is a considerable distance from any public roads and SABAP 2 has neither reports for the pentad nor for the QDS 2624CD.

2.2 Field study

Observations of birds were made on three calendar days across an 8 day period in November 2015, i.e. in the early summer with hot and very dry conditions. These were late afternoon (after 15.00) surveys on two days and morning surveys on two days. On each day the areas was driven around by the two observers with particular watches at the two cattle watering points. Typical shrub areas were walked through on the morning visits. Drives around, and walks through, the grassy areas revealed few birds. During the field survey preference was given to observations in the savannah area where the number and diversity of birds was markedly higher.

Weather conditions varied across the survey period. The mornings were cool from 05.00 to 08.00 but then temperatures rose quickly to reach early afternoon shade temperatures in the mid to upper 30^0s. Conditions were hot but largely calm in the first two surveys. From Tuesday 17th thunder-clouds developed in the afternoons with rain showers from 14.00 h. The Alpha site was surveyed both before and after the occurrence of regional rain showers.

The observers were: Dr Williams, professional ornithologist since 1973; and Mr V Ward, a postgraduate student of Dr Williams's who is also a semi-professional bird guide.

3. THE AFFECTED ENVIRONMENT

The footprint area of the proposed Alpha SPP is a small section of an extensive area of low relief. There are neither permanent nor ephemeral waterbodies on the site to be developed, nor is there any nearby permanent wetland. The ground is covered by fine reddish Kalahari sands. The vegetation of the site is either grass with few or no trees, or savannah with scattered thorn trees (Figs. 1-3). There are extensive areas of similar vegetation, especially grassland, on other areas of the farm property and on adjoining properties.

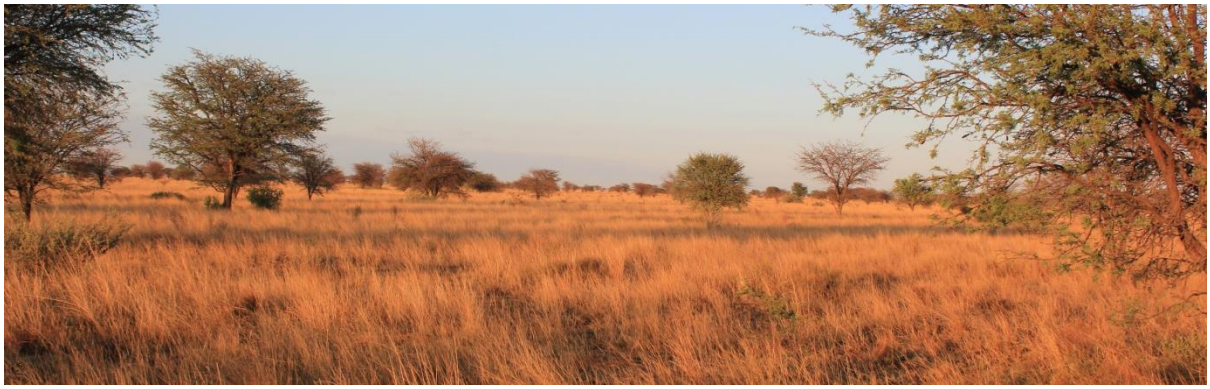

Fig. 2. Open savannah. Walks across this area registered most of the grass associated bird species

4 BIRD SURVEY RESULTS

4.1 Species recorded

A total of 63 bird species were recorded during observations on the 3 calendar days. Morning visits were from 05.00 until the heat drove most birds into shade. The afternoon visit was from 15.00-18.00. The entire area was driven around by the two observers on the initial afternoon visit. In the two morning visits observations were made by observers walking well apart through the tree savannah and associated grassland.

4.2 Priority species

No red listed species of high conservation concern were recorded. Nevertheless a range of red listed bird species could occur. The key issues are: 1) the degree to which the SPP area is essential habitat for them; and 2) whether they occur regularly. There are no special features on the site that are likely to be essential to support such priority species. Most of the red-listed species that can potentially occur require far larger areas of suitable habitat than occurs on the Khubu site. Thus most are only likely to be transients that make occasional, usually short-term, use of the Alpha area. This situation is insufficient reason to oppose development.

Of the resident, but not red-listed, species that of most conservation concern is the Northern Black Korhaan, however, the population on the Khubu site is 3 or 4 pairs at most.

4.3 Programme for further monitoring

The bird faunas of this part of South Africa are poorly known and especially for the area that includes the Alpha site. It is unwise to base decisions solely on the three days of bird observations all made towards the end of a hot, dry period. A repeat survey is scheduled for March 2016 at the end of the regional summer rainfall season. However, it is not anticipated that there will be any substantial change in recording of area resident species i.e. those most likely to be affected.

It should be a requirement for development of the Alpha SPP that after construction impacts on birds be appraised by regular monitoring. This monitoring should be continued over at least two years of operation as time is needed for plant life to develop and bird use of the area will increase as the plants grow. Surveys of bird presence, especially for collision victims, should be conducted over a few days in at least each summer and winter period. These surveys should be performed according to a protocol drawn up by a supervising bird specialist who should write annual reports. These reports will provide information for any further development at this proposed site and usefully provide information for the appraisal of the anticipated other solar array proposals in southern Africa.

4.4 Cumulative impacts

There is potential for cumulative impacts on regional bird populations as a result of other developments in the region. A number of additional SPPs have been proposed. There is the even greater potential impact in situations where farmers convert areas of natural vegetation into cropland. The regional proposed SPPs are being listed, along with other possible causes of cumulative impacts, in the full EIA report which will also comment on the perceived overall impact if these developments go ahead. All that can be said at this stage is that, if the other proposed SPPs go ahead, there will inevitably be increased loss and fragmentation of habitat for those bird species dependent on the habitats transformed. Fortunately, during assessment of six regionally proposed SPPs, including the Khubu SPP, no species were recorded that do not have extensive distributions, and so populations, in the wider region. Thus, whilst there will be a reduction in species populations, there is no reason to predict that any species will be threatened in terms of gross reduction in either its regional or global populations.

5. IMPACT ASSESSMENTS

5.1 Introduction

The key issue for this faunal report is the potential for impacts associated with the development of the SPP to affect the populations of local birds and especially those of conservation priority species. These impacts on birds may be either direct i.e. through loss of habitat as well as collision mortality; or indirect through affects on other elements of the environment which then affect the birds.

A photovoltaic solar energy facility has three life-phases: 1) construction; 2) operation; and 3) de-commissioning. These three phases differ in their environmental impacts. Construction and de-commissioning are short-term periods of dramatic and acute environmental disturbance whereas in the operational phase impacts are steady, long-term – over 20-30 years - and so of chronic impact.

The Alpha SPP is to be located in the southern Kalahari biome environment which is semi-arid. This environment is one of low productivity. The pace of soil development, of plant growth, ecological succession, and hence any ecological recovery, is slow. Indeed, environmental restoration may be unfeasible. The impacts of the SPP are likely to continue to affect the local environment, and so the local bird fauna, for decades after de-commissioning. However, it is likely that as the proposed PV panels reach the end of their operational life they will be replaced so in terms of the time envisaged in this report the development situation is permanent. In the event that panel renewal does not happen legislation requires that a de-commissioning EIA be conducted. Consequently de-commissioning is not further considered in this report.

Accessible information on the environmental impacts of SPPs is severely limited. This is due, in part, to the relatively recent development of SPPs and the normal lag time before impacts are realised, assessed and the results published. Most information is in environmental compliance documents and other, non-peer reviewed, grey literature of limited distribution and accessibility. Two recent over-views of the environmental impacts of renewable energy facilities have stressed that, on an international basis, information on the effects of solar energy developments is particularly limited (Hotker*et al*. 2005, Lovich & Ennen 2011). Nevertheless, a range of known, or potential, environmental impacts as a result of SPPs have been identified (Lovich & Ennen 2011). As these might directly or indirectly affect birds at Alpha all the identified impacts on the local fauna and are considered here.

The development will have impacts on two broadly defined areas: 1) the “core” of the SPP where existing terrain will be covered by structures or converted into roads and other infrastructure; and 2) the “surrounds” where the terrain will be not be developed but where there will be indirect effects emanating from the core. The “surrounds” include undeveloped patches within the overall core, and immediately adjoining off-site areas. It is impossible to precisely define the outer periphery of the surrounds as the distance over which impacts have effect will vary with weather, especially wind, as well as moonlight etc. conditions.

No alternatives were supplied for the development site.

5.2 Construction period

This is the period of most dramatic and acute potential impacts on local fauna. It is not feasible at this pre-approval stage to indicate the time frame and seasonality of construction although both factors will potentially affect the scale of impacts. The key impacts in this period, in diminishing order of importance, are the destruction of habitats, disturbance, and dust emission.

5.2.1 Disturbance

Construction period disturbance will be greatest in the core area. This will cause the displacement of birds and most other larger vertebrates (tortoises, hares, mongooses etc.) and the likely death of animals that do not leave

(e.g. lizards and rodents). Disturbance during this period will also have potentially considerable impact on the surrounds. It will suppress bird activities and may lead to temporary displacement from affected areas i.e. those closest to lay-down areas or where buildings are constructed. Changes in sound volume of only a few decibels can lead to substantial animal responses. Noise will especially be generated during construction

5.2.2 General pollution

During construction, the use of heavy machinery and vehicles, and the mixing and use of cement, will inevitably lead to some chemical pollution of soil and ground water. Waste water, fuel spills and other pollutants such as herbicides and pesticides will contaminate the environment and may poison insects which birds prey upon. Pollution of soil can be especially damaging if it occurs in areas that are intended for later rehabilitation to a natural state. Nutrient-rich effluents, such as sewage, can cause water pollution.

5.2.3 Dust

Development of the SPP involves clearance of existing vegetation from the core and some grading of the soil surface. The soils of the core area are red Kalahari sands with a high proportion of fine material which if disturbed results in dust. Clearance of the stabilizing vegetation, and especially grading, will expose the soil surface to wind and, unless this is suppressed, will create large quantities of dust through the construction period and until a stable condition is re-established.

Depending upon wind conditions dust can carry over large distances. Dust can have dramatic effects on ecological processes at all scales (reviewed by Field *et al*. 2010). Dust adheres to plants downwind of a source. This affects the gas exchange, photosynthesis, and water use of the dusted plants and together these affects reduce the plants' primary production. Wind driven dust also abrades soft plant materials. In these ways dust can, indirectly, affect agricultural food crops and wildlife food plants (Farmer 1993; Greening 2011). Dusted plants are less palatable to animals, especially insects, and so this will affect local food resources for birds. However, dust deposited down-wind, whilst having a temporary negative impact, should have a mild fertilizing effect after the silt is washed off plants by rain and deposited on the ground.

The removal of finer soil materials as dust has long-term local effects as these materials contain most of the cation-exchange capacity, water holding capacity, and fertility of soil. In particular the loss of fine materials from soil reduces the ability of plants to re-establish since germinants rely on soil resources and water held in the uppermost soil layers. The loss of dust will affect any re-growth under the panels and along internal dirt service roads.

5.2.4 Habitat destruction and fragmentation

The final footprint of the proposed SPP is quite small. However, during construction, there will be fairly extensive habitat destruction, alteration and fragmentation. Some of this may be temporary, e.g., laydown areas for machinery and materials, but in some cases it may be permanent e.g. workshops, substations, roads and power line servitudes. This will result in localised destruction of food resources and prey species, with low magnitude of impact, but the duration of the effect will be long-term, extending beyond the lifetime of the SPP.

The SPP and its associated environmental changes may fragment the habitat for non-volant, and especially small, animals but is unlikely to have substantial impact on birds which can quickly fly across the area.

5.3 Operational period

A number of factors will create potentially negative impacts on birds through the predicted 20-25 year operational life of the PV panels. These relatively long-term and chronic impacts are: a) continued disturbances; b) light pollution – both ecological and polarizing; c) electromagnetic radiation; and d) dust.

5.3.1 Light pollution

Photovoltaic solar energy facilities cause two types of light pollution. These are ecological light pollution (ELP), which has different impacts by day and at night, and polarizing light pollution (PLP). The Vryburg region has low levels of existing light pollution so the localized effects of nocturnal light pollution are likely to be greater than in areas where there are already higher levels of existing light pollution.

5.3.2 Ecological Light Pollution (ELP)

Daylight reflected from the PV panels can adversely affect animal physiology, behaviour, and population ecology potentially through alteration of predation, competition and reproduction (Longcore & Rich 2004). Animals may experience increased orientation or disorientation, and are attracted to or repulsed by glare. This can affect their foraging, reproduction, communication and other critical behaviours.

It is unclear to what extent there may be night illumination associated with the SPP. Outdoor lighting of the short-wavelength type (white and blue lights) attracts night-flying insects from considerable distances. This can lead to high levels of mortality of insects, many of which are critically important to normal ecosystem functioning and form an important part of the diet of some nocturnal birds – thick-knees and nightjars.

5.3.3 Polarized Light Pollution (PLP)

Many kinds of animals, especially those that are night active, are well tuned to polarized light and use it as a source of information. Horvath *et al*. (2009) have reviewed the effects of polarized light. Polarizing light is more effectively reflected from smooth dark surfaces. In nature water surfaces are the primary source of horizontal polarization by reflection. Many aquatic insects and night dispersing waterbirds use PL to find suitable water bodies for feeding and breeding habitat. Glass, or similar smooth surfaces, share important physical characteristics with the surface of dark water and polarize light strongly. SPPs with their extensive banks of light polarizing panels may form supernormal optical stimuli and appear as exaggerated water surfaces. This can impact the animals' ability to judge safe and suitable habitats. This is especially important for insects with limited flight duration. Many waterbirds fly by night and apparently use moon and star polarized light reflected off water to indicate the presence of a waterbody. If such birds fly down to land at what they assume is a waterbody they may collide with the panels and deaths from such collisions have been recorded at a solar energy facility in North America (McCrary *et al*. 1986).

5.3.4 Electro-Magnetic Radiation (EMR)

When electricity is passed through cables it generates electric and magnetic fields. To transmit energy internally within SPPs a distribution system of buried electricity cables is used. These can lead to chronic, but localized, electromagnetic radiation (EMR). Balmori (2009) has reviewed the impacts of increased local EMR on animals. These impacts include: reduced male fertility; embryonic deformities; weakened immune systems and so susceptibility to infectious diseases, bacteria, viruses and parasites. Insects are especially impacted and their local populations decline. Bird navigation abilities may also be impacted by EMR.

EMR at the Alpha SPP could have both positive and negative impacts. The positive impact is that if EMR leads to a major local reduction of insects this will decrease the attraction of the SPP to birds and so reduce the impact of other potential negative impacts. However, on the negative side, a lack of insects may then reduce the breeding success, and numbers, of birds in the adjoining areas. Reduced insect availability will, through lack of food, especially increase infant mortality in birds.

5.3.5 Power line strikes and electrocution

Power lines pose a collision risk to some bird species, particularly larger birds (Jenkins *et al*. 2010). Collision risk is largely influenced by the situation of power lines, but also by their visibility (especially of the earth wire) to birds. Animals will be electrocuted if, when attempting to perch on an electrical structure, they succeed in

bridging the air gap between live and earthed components. The risk of electrocution is highest on low voltage infrastructure with relatively small air gaps.

No powerline layout was available at the time this bird report was written. Bird collision mortality with powerlines is usually only considered important where lines pass close to waterbodies. Where they do they should be provided with bird diverters that are visible by day and especially at night. Suitable solar powered diverters are available.

6 SUGGESTED MITIGATIONS

Unlike the situation in windfarms where bird observations may suggest relocation of structures, there is no reason from a bird perspective why the proposed layout should be subject to any change. The mitigations recommended here are for smaller scale features and actions.

6.1 Minimize the direct impact area

Wherever possible, natural vegetation should be left intact. Corridors of natural vegetation should be maintained between developed areas on site (e.g. lay-down areas and PV panel field). Construction and final footprints should be kept to an absolute minimum. During construction, the footprint area of each construction site must be demarcated with stakes and hazard tape (or some equivalent method) prior to site clearance, and should remain marked out during construction. Keep peripheral developments to a minimum and as close to planned development nodes as possible. Rehabilitate all disturbed areas immediately after the completion of construction. Consult an ecologist to give input into rehabilitation specifications.

6.2 Reduce impacts in the developed area

Use low-impact methods of excavation and avoid the use of explosives. Where possible, create lay-downs in previously disturbed areas and make use of existing power lines and substations. After construction, remove all infrastructure and equipment not required for the post-decommissioning functioning of the facility.

6.3 Pollutants

Do not use herbicides or pesticides on site. During the construction phase, apply standard measures to avoid spills and mitigate those that occur. Specifically spoil or waste material should not be dumped within 50 m of natural areas, remove it to a licensed dump site. Effluents or polluted water generated during construction must not be discharged into natural areas.

6.4 Dust

Reduce and control construction dust through the use of approved dust-suppression techniques, e.g. : 1) Use fine water sprays to dampen down the site; 2) screen the whole site to stop dust spreading; 3) cover skips and trucks loaded with construction materials and continually damp transported materials with low levels of water.

6.5 Disturbance

Keep construction and maintenance periods as short as possible. Restrict construction and maintenance activities to daylight hours. Keep blasting to an absolute minimum. If blasting is necessary, employ techniques that minimise noise, vibration and dust. Reduce the noise associated with construction and maintenance activities as far as possible.

6.6 Limit light pollution

To minimize any impacts on birds all lighting at the SPP should be kept to a minimum. Where lighting is necessary, it is recommended that long-wavelength (red or orange) low-pressure sodium lights are used, or that lights are fitted with ultraviolet filters. Light fittings should be directional and shielded. Install sealed light fittings so that insects cannot reach the light source. Screen interior lighting with blinds, curtains, etc. to prevent exterior light pollution. Long lines of lights should be avoided.

7. IMPACT EVALUATIONS

Suggested mitigations will have minor affects on significance and probability

Criteria	Rating	Description	Significance	Probability
HABITAT LOSS & FRAGMENTATION				
Extent of spatial influence	Low	Site specific	Low	Definite
Impact magnitude	High	No mitigation is possible		
Duration	High	Beyond de-commissioning		
POLARIZING LIGHT POLLUTION				
Extent of spatial influence	Medium	Within 10 km radius	High	Definite
Impact magnitude	Medium	Design modification		
Duration	Medium	Project lifespan		
ECOLOGICAL LIGHT POLLUTION				
Extent of spatial influence	Low	Site specific	Low	Definite
Impact magnitude	Very low			
Duration	Medium	Project lifespan		
ELECTROMAGNETIC RADIATION				
Extent of spatial influence	Low	Site specific	Medium	Definite
Impact magnitude	Medium			
Duration	Medium	Project lifespan		
DUST POLLUTION				
Extent of spatial influence	Medium		Low	Definite
Impact magnitude	Medium			
Duration	High	Beyond de-commissioning		
NOISE				
Extent of spatial influence	Low	Site specific	Low	Probable
Impact magnitude	Very low			
Duration	Medium	Project lifespan		

8. CONCLUSIONS

The loss of habitat due to development of the SPP will have the greatest impact on those bird species that are currently dependent on the savannah and grassland habitats. These species have generally extensive distributions in the Southern Kalahari biome and the small number of individuals displaced from the proposed development is not considered of conservation importance. None of the conservation priority species will be particularly affected as they range over considerably wider areas than that to be affected. Nor, currently, are there other marked developments known in the Vryburg region, in particular near the relatively remote Alpha area, that might stress the regional populations through an accumulation of negative impacts. Those bird species – the majority in terms of both diversity and numbers – that occur in the wider area are unlikely to experience notable negative impacts as a result of the development. The one issue of concern is the potential for waterbirds

traversing the area at night to mistake the polarized light from the PV panels for a waterbody with the subsequent risk of their death through collision with the structures. Based on currently available information the impact significance on birds is expected to be low and this assessment is viewed as having acceptable detail in terms of impact assessment. Further bird impact assessment following the regional rainy season is needed for the EIA process.

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10. APPENDICES

10.1 DECLARATION OF CONSULTANT'S INDEPENDENCE AND QUALIFICATIONS

Dr. Anthony (Tony) Williams is an independent consultant. He has no business, financial, personal or other interest in the activity, application or appeal in respect of which he was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of this specialist performing such work.

Dr. Williams has been a professional ornithologist for 46 years, including: 1) 9 years as a researcher at the FitzPatrick Institute of African Ornithology, at Cape Town University; 2) 25 years as specialist ornithologist in the conservation departments of South West Africa (1982-1988) and the Cape (latterly Western Cape) Province of South Africa (including five years secondment at the (then) Avian Demography Unit at Cape Town University; and 3) 12 years as a ornithological consultant and independent researcher.

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge, as well as available information.

Fig. 3. Savannah woodland on Kalahari sands, with areas of coarse grass and bare ground. The increased physical structure supports a greater bird diversity than the grass and thicket vegetation. There was a hatch of large moth caterpillars from cocoons on many thorn trees. This attracted many cuckoos including three migrant species that may have arrived following the first thunder showers.

10.2 LIST OF BIRDS OBSERVED

Bird species recorded in or close to the proposed Alpha SPP site in November 2015

RESIDENT PASSERINES

Babbler, Southern Pied
Bunting, Golden-breasted
Canary, Black-throated
Canary, Yellow
Chat, Ant-eating
Cisticola, Desert
Cisticola, Neddicky
Cisticola, Tinkling
Crombec, Long-billed
Crow, Pied
Drongo, Fork-tailed
Eremomela, Yellow-bellied
Finch, Scaly-feathered
Flycatcher, Fiscal
Flycatcher, Marico
Lark, Spike-heeled
Lark, Fawn-coloured
Lark, Rufous-naped
Lark, Eastern Clapper
Prinia, Black-chested
Scrub-robin, Kalahari
Shrike, Puff-back
Shrike, Brubru
Shrike, Crimson-breasted
Shrike, Common Fiscal
Sparrow, Cape
Sparrow-weaver, White-browed
Starling, Cape Glossy

NON-PASSERINES

Bustard, Kori
Dove, Cape Turtle
Dove, Laughing
Dove, Namaqua
Francolin, Orange River
Goshawk, Pale Chanting
Guineafowl, Helmeted
Hoopoe, African
Hornbill, Red-billed
Ibis, Hadeda
Kestrel, Greater
Korhaan, Northern Black
Lapwing, Crowned
Lapwing, Blacksmith
Mousebird, White-backed
Mousebird, Red-faced
Owl, Spotted Eagle
Sandgrouse, Burchell's
Scimitarbill
Thick-knee, Spotted
Woodpecker, Golden-tailed

AERIALS & MIGRANTS

Bee-eater, European
Bee-eater, Swallow-tailed
Cuckoo, Dideric
Cuckoo, Jacobin

Tchagra, Black-crowned
Tit, Ashy
Tit-babbler, Chestnut-vented
Thrush, Groundscraper
Weaver, Southern Masked
Waxbill, Violet-eared
Cuckoo, Black
Cuckoo, Greater Spotted
Martin, Banded
Swallow, Barn