# UYEKRAAL WIND ENERGY FACILITY

Avian impact assessment

- Scoping Phase -

AVISENSE CONSULTING

## EXECUTIVE SUMMARY

This study contains an extensive review of relevant literature on wind energy facility impacts on avifauna, and identifies potential impacts of the proposed Uyekraal Wind Energy Facility on the avifauna of the area. These expected impacts are: habitat destruction by construction of the facility itself and any associated power lines or substation/s, disturbance by both activities and possible displacement or disturbance of sensitive species by the operation of the facility, collision with blades of the wind turbines and other associated infrastructure.

The impact zone of the proposed wind energy facility features degraded, mixed Strandveld vegetation. The broader study area is likely to support over 200 bird species, including 15 red-listed species, 43 endemics, and three red-listed endemics. Commuting coastal and wetland species (especially flamingo spp. and Great White Pelican *Pelecanus onocratalus*) and large terrestrial species (especially Blue Crane *Anthropoides paradiseus*), and foraging raptors (especially African Marsh Harrier *Circus ranivorus*, Black Harrier *Circus maurus*, Peregrine Falcon *Falco peregrinus* and Lanner Falcon *Falco biarmicus*), are probably the species of greatest conservation significance most likely to be impacted by the wind energy facility, both in terms of the collision and disturbance impacts of the facility itself, and of the disturbance and mortality risks posed by its peripheral infrastructure. A suite of endemic passerines may also be affected by disturbance impacts.

These issues will be investigated in more detail during the EIA phase. In particular the significance of bird collisions with the turbines will be assessed in order to determine whether the risk warrants mitigation. The significance of this impact will depend mainly on the relative abundance of certain key species, and the distribution of their respective microhabitats. The result of the EIA phase will be a more detailed assessment of all impacts, recommended mitigation where necessary, and a comprehensive programme to fully monitor the actual impacts of the wind energy facility throughout construction and well into its operational phase.

## CONSULTANT'S DECLARATION OF INDEPENDENCE

Andrew Jenkins (*AVISENSE* Consulting cc) is an independent consultant to Savannah Environmental Pty (Ltd) and Crenersol (Pty) Ltd. He has no business, financial, personal or other interest in the activity, application or appeal in respect of which they were 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.

# 1. INTRODUCTION

CRENERSOL (Pty) Ltd is planning to erect a wind energy facility on the property Uyekraal 189, situated about 5 km southeast of Vredenburg and east of Saldanha, in the Western Cape Province, South Africa (Fig. 1). Savannah Environmental PTY (Ltd) were appointed to do the Environmental Impact Assessment study for this facility, and subsequently appointed *AVISENSE* Consulting to conduct the specialist avifaunal assessment. The study was conducted by Dr Andrew Jenkins, an ornithologist with over 20 years of experience in avian research and impact assessment work, including work on threatened endemic species in the Western Cape, and numerous power line and wind farm studies located in this and many other parts of South Africa.

# 2. TERMS OF REFERENCE

The terms of reference for the scoping phase, as supplied by Savannah Environmental Pty (Ltd), were to provide:

- A description of the affected environment and the manner in which it may be affected.
- A description and evaluation of the avian issues and impacts identified, including detail on the nature and extent of any potential direct, indirect and cumulative impacts.
- A statement on the potential significance of identified issues based on the above evaluation.
- A comparative evaluation of any identified, feasible alternatives.
- Identification of any potentially significant impacts which will require particular attention in the EIA phase, with recommendations on the methodology to be adopted in assessing such, expressed as a Plan of Study for the EIA.

# 3 STUDY METHODOLOGY

## 3.1. Approach

This desktop study included the following steps:

- A review of available published and unpublished literature pertaining to bird interactions with wind energy facilities is provided summarising the issues involved and the current level of knowledge in this field. Various information sources (listed below), including data on the birdlife of the area and previous studies of bird interactions with wind energy facility and electricity infrastructure, were examined.

- An inclusive, annotated list of the avifauna likely to occur within the impact zone of the proposed wind energy facility was compiled using a combination of the existing distributional data and previous experience/knowledge of the avifauna of the general area.
- A short-list of priority bird species (defined in terms of conservation status and endemicity) which could possibly be impacted by the proposed wind energy facility was extracted from the total bird list. These species were subsequently considered as adequate surrogates for the local avifauna generally, and mitigation of impacts on these species was considered likely to accommodate any less important bird populations that may also potentially be affected.
- A summary of more likely and significant impacts of the wind energy facility on the local avifauna was drawn up, and a brief methodology was devised for the EIA phase for confirming these impacts and developing an effective mitigation strategy.

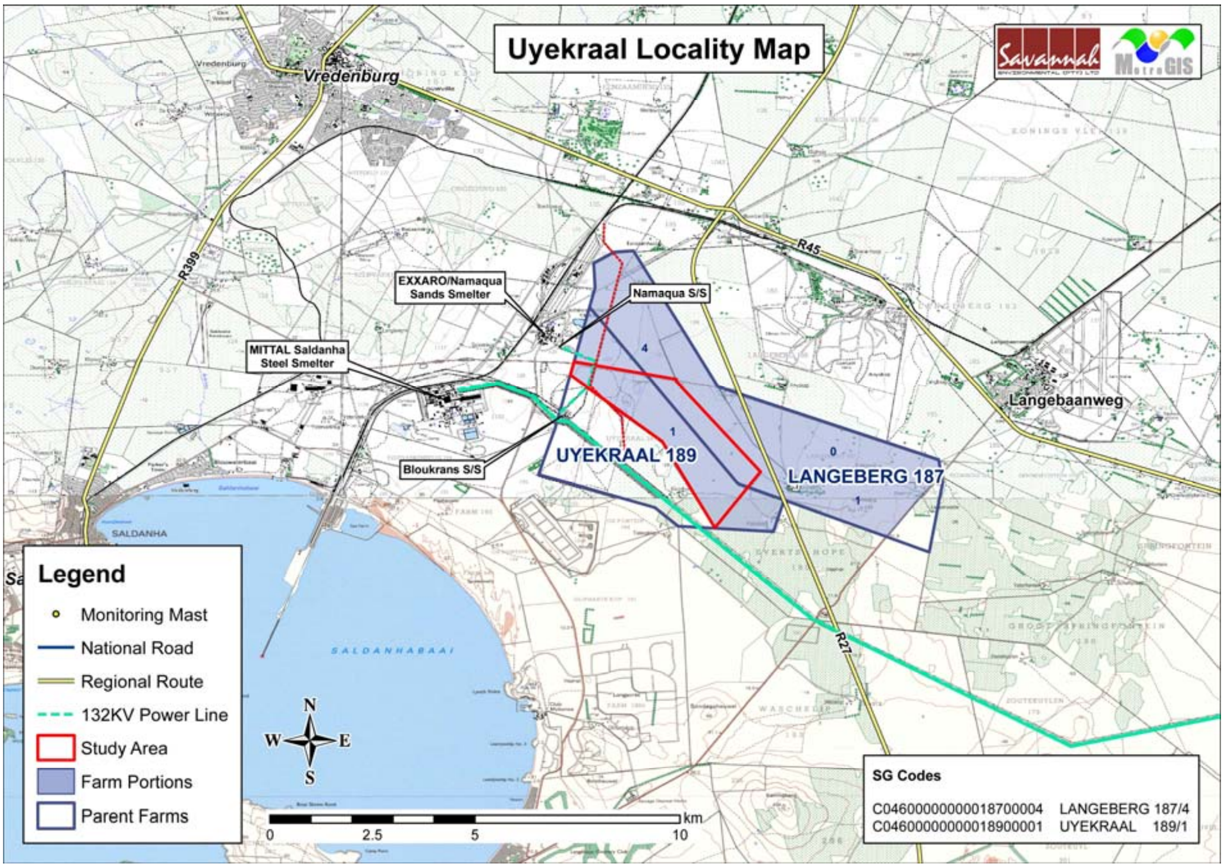


FIGURE 1. Location of the proposed Uyekraal Wind Energy Facility.

### 3.2. Data sources used

The following data sources and reports were used in the compilation of this report:

- Bird distribution data of the Southern African Bird Atlas Project (SABAP – Harrison *et al.* 1997) were obtained from the Animal Demography Unit website (http://sabap2.adu.org.za/index.php) for the relevant quarter-degree square (SABAP 1, 3218CA & CC Velddrif and 3317 BB & 3318AA Saldanha) or pentad (SABAP 2: 3255_1800 and 3255_1805). A composite list of species likely to occur in the impact zone of the wind energy facility was drawn up as a combination of these data, refined by a more specific assessment of the actual habitats affected, based on general knowledge of the avifauna of the region (APPENDIX 1).
- Conservation status and endemicity of all species considered likely to occur in the area was determined as per the most recent iteration of the national Red-list for birds (Barnes 2000), and the most recent and comprehensive summary of southern African bird biology (Hockey *et al.* 2005).
- Data from the Animal Demography Unit's Coordinated Avifaunal Roadcount project (CAR: http://car.adu.org.za/, Young *et al.* 2003).
- EIA reports and any subsequent monitoring reports on the potential impacts on birds of other proposed and/or constructed and operational wind energy facilities in South Africa (van Rooyen 2001, Jenkins 2001, 2003, Küyler 2004, Jenkins 2008a, 2009).

### 3.3. Limitations & assumptions

Any inaccuracies in the above sources of information could limit this study. The SABAP 1 data for this area were substantial (>650 cards submitted for the two quarter-degree squares combined) but is now is now >15 years old (Harrison *et al.* 1997), and there are <10 full protocol cards submitted so far for the relevant SABAP 2 pentads. This deficiency will be rectified to some extent in a visit to the site as part of the EIA phase of this study.

Given that there are currently only three, very small wind energy facilities operative in South Africa (totaling only 8 turbines between them), practical experience of the environmental effects of wind energy facilities in this country is extremely limited, and we must base our estimates of the possible impacts of new facilities farms largely on lessons learnt internationally. While many of the established, general principles can probably be usefully applied here, care should be taken in adapting international knowledge and experience to uniquely South African birds and conditions.

# 4. BACKGROUND TO THE STUDY

## 4.1 Interactions between wind energy facilities and birds

Recent literature reviews (www.nrel.gov, Kingsley & Whittam 2005, Drewitt & Langston 2006, Kuvlevsky *et al.* 2007, Stewart *et al.* 2007, Drewitt & Langston 2008, Krijgsveld *et al.* 2009, Sovacool 2009) are essential summaries and sources of information in this field. While the number of comprehensive, longer-term analyses of the effects of wind energy facilities on birds is increasing, and the body of empirical data describing these effects is rapidly growing, scientific research in this field is still in its infancy (Madders & Whitfield 2006, Stewart *et al.* 2007), and much of the available information originates from short-term, unpublished, descriptive studies, most of which have been carried out in the United States, and more recently across western Europe, where wind power generation is a more established and developed industry.

Concern about the impacts of wind facilities on birds first arose in the 1980s when numerous raptor mortalities were detected at facilities at Altamont Pass Wind Resource Area (California, USA) and Tarifa (southern Spain). More recently, there has been additional concern about the degree to which birds avoid or are excluded from the areas occupied by wind energy facilities – either because of the visible action of the turbine blades or because of the noise they generate - and hence suffer a loss of habitat (Larsen & Guillemette 2007, Stewart *et al.* 2007, Devereaux *et al.* 2008. Pearce-Higgins *et al.* 2009). With a few important exceptions, most studies completed to date suggest low absolute numbers of bird fatalities at wind energy facilities (Kingsley & Whittam 2005), and low casualty rates relative to other existing sources of anthropogenic avian mortality on a per structure basis (Crockford 1992, Colson & associates 1995, Gill *et al.* 1996, and Erickson *et al*. 2001).

### *4.1.1 Collisions with turbines*

*Collision rates*

As more monitoring has been conducted at a growing number of sites, some generic standards and common units have been established, with bird collisions with turbine blades generally measured in mortalities/turbine/year, mortalities/Mega-Watt/year, or mortalities /Giga-Watt Hour (Smallwood & Thelander 2008, Sovacool 2009). Wherever possible, measured collision rates should allow for (i) casualty remains which are not detected by observers (searcher efficiency - Newton & Little 2009), and (ii) casualties which are removed by scavengers before detection, and the rate at which this occurs (scavenger removal rate). Also, although collision rates may appear relatively low in many instances, cumulative effects over time, especially when applied to large, long lived, slow reproducing and/or threatened species (many of which are collision-prone), may be of considerable conservation significance.

The National Wind Co-ordinating Committee (2004) estimates that 2.3 birds are killed per turbine per year in the US outside of California – correcting for searcher efficiency and scavenger rates. However, this index ranges from as low as 0.63 mortalities/turbine/year in Oregon, to as high as 10 mortalities/turbine/year in Tennessee (NWCC 2004), illustrating the wide variance in mortality rates between sites. Curry & Kerlinger (2000) found that only 13% of the >5000 turbines at Altamont Pass, California were responsible for all Golden Eagle *Aquila chrysaetos* and Red-tailed Hawk *Buteo jamaicensis* collisions, but the most recent aggregate casualty estimates for Altamont run to >1000 raptor mortalities/turbine/year, and nearly 3000 mortalities/turbine/year overall (Smallwood & Thelander 2008), including >60 Golden Eagles, and at a mean rate of about 2-4 mortalities/MW/year.

At the Tarifa and Navarre wind energy facilities on the Straits of Gibraltar, southern Spain, about 0.04-0.08 birds are killed per turbine/year (Janss 2000a, de Lucas *et al.* 2008), with relatively high collision rates for threatened raptors such as Griffon Vulture *Gyps fulvus*, of particular concern (Table 1). At the same sites, collisions have also been found to be non-randomly distributed between turbines, with >50% of the vulture casualties recorded at Tarifa being killed by only 15% of the turbine array at the facility (Acha 1997). Collision rates from other European sites are equally variable, with certain locations sporadically problematic (Everaert 2003, Newton & Little 2009, Table 1).

To date, only eight wind turbines have been constructed in South Africa at two pilot wind energy facilities at Klipheuwel and Darling in the Western Cape (van Rooyen 2001, Jenkins 2001, 2003) and, more recently, in the first phase of a bigger development at Coega in the Eastern Cape. An avian mortality monitoring program was established at the Klipheuwel facility once the turbines were operational, involving regular site visits to monitor both bird traffic through the area and detect bird mortalities (Küyler 2004). This study found that (i) 9-57% of birds observed within 500m of the turbines were flying at blade height, and (ii) 0-32% of birds sighted were flying either between the turbines or within the arc of the rotors of the outermost turbines. Five bird carcasses were found on the three-turbine site during the 8-month monitoring period, of which two, a Horus Swift *Apus horus* and a Large-billed Lark *Galerida magnirostris*, were thought to have been killed by collision with turbine blades, indicating a net collision rate for birds of about 1.00 mortality/turbine/year.

It is important to note here that simple estimates of aggregate collision rates for birds are not an adequate expression of biodiversity impact. Rather, consideration must be given to the conservation status of the species affected or potentially affected, and the possibility that even relatively low collision rates for some threatened birds may not be sustainable in the long term.

*Causes of collision*

Multiple factors influence the number of birds killed at wind energy facilities. These can be classified into three broad groupings: (i) avian variables, (ii) location variables, and (iii) facility-related variables. Although only one study has so far shown a direct relationship between the abundance of birds in an area and the number of collisions (Everaert 2003), it would seem logical to assume that the more birds there are flying through an array of turbines, the higher the chances of a collision occurring. The nature of the birds present in the area is also very important as some species are more vulnerable to collision with turbines than others, and feature disproportionately frequently in collision surveys (Drewitt & Langston 2006, 2008, de Lucas *et al.* 2008). Species-specific variation in behaviour, from general levels of activity to particular foraging or commuting strategies, also affect susceptibility to collision (Barrios & Rodríguez 2004, Smallwood *et al.* 2009). There may also be seasonal and temporal differences in behaviour, for example breeding males displaying may be particularly at risk.

Landscape features can potentially channel birds towards a certain area, and in the case of raptors, influence their flight and foraging behaviour. Ridges and steep slopes are important factors in determining the extent to which an area is used by gliding and soaring birds (Barrios & Rodríguez 2004). High densities of prey will attract raptors, increasing the time spent hunting, and as a result reducing the time spent being observant. Poor weather affects visibility. Birds fly lower during strong headwinds (Hanowski & Hawrot 2000, Richardson 2000), so when the turbines are functioning at their maximum speed, birds are likely to be flying at their lowest, exponentially increasing collision risk (Drewitt & Langston 2006, 2008).

Larger wind energy facilities, with more turbines, are almost by definition more likely to incur significant numbers of bird casualties (Kingsley & Whittam 2005), and turbine size may be proportional to collision risk, with taller turbines associated with higher mortality rates in some instances (e.g. de Lucas *et al.* 2009, but see Howell 1995, Erickson *et al.* 1999, Barclay *et al.* 2007), although with newer technology, fewer, larger turbines are needed to generate equivalent or even greater quantities of power, possibly resulting in fewer collisions per Megawatt of power produced (Erickson *et al.* 1999). Certain turbine tower structures, and particularly the old-fashioned lattice designs, present many potential perches for birds, increasing the likelihood of collisions occurring as birds land at or leave these perch or roost sites. This generally is not a problem associated with more modern, tubular tower designs (Drewitt & Langston 2006, 2008), such as those proposed for this project.

Illumination of turbines and other infrastructure is often associated with increased collision risk (Winkelman 1995, Erickson *et al.* 2001), either because birds moving long distances at night do so by celestial navigation, and may confuse lights for stars (Kemper 1964), or because lights attract insects, which in turn attract birds. Changing constant lighting to intermittent lighting has been shown to reduce nocturnal collision rates

(Richardson 2000, APLIC 1994, Jaroslow 1979, Weir 1976) and changing flood-lighting from white to red can reduce mortality rates by up to 80% (Weir 1976).

Spacing between turbines at a wind facility can have an effect on the number of collisions. Some authors have suggested that paths should be left between turbines to allow free passage through the turbine strings (Drewitt & Langston 2006, Kuvlevsky *et al.* 2007, Drewitt & Langston 2008). This approach tallies well with wind energy generation principles, which require relatively large spaces between turbines in order to avoid wake and turbulence effects. An alternative perspective suggests that all attempts by birds to fly through wind energy facilities, rather than over or around them, should be discouraged to minimise collision risk (Drewitt & Langston 2006, Kuvlevsky *et al.* 2007, Drewitt & Langston 2008). This approach effectively renders the entire footprint of the facility as lost habitat (see below).

*Collision prone birds*

Collision prone birds are generally either (i) large species and/or species with high ratios of body weight to wing surface area (wing loading), which confers low maneuverability (cranes, bustards, vultures, gamebirds, waterfowl, falcons), (ii) species which fly at high speeds (gamebirds, pigeons and sandgrouse, swifts, falcons), (iii) species which are distracted in flight - predators or species with aerial displays (many raptors, aerial insectivores, some open country passerines), (iv) species which habitually fly in low light conditions, and (v) species with narrow fields of forward binocular vision (Drewitt & Langston 2006, 2008, Jenkins *et al.* 2010, Noguera *et al.* 2010). These traits confer high levels of *susceptibility*, which may be compounded by high levels of *exposure* to man-made obstacles such as overhead power lines and wind turbine areas (Jenkins *et al.* 2010). Exposure is greatest in (i) very aerial species, (ii) species inclined to make regular and/or long distance movements (migrants, any species with widely separated resource areas - food, water, roost and nest sites), (iii) species that regularly fly in flocks (increasing the chances of incurring multiple fatalities in single collision incidents).

Soaring species may be particularly prone to colliding with wind turbines where the latter are placed along ridges to exploit the same updrafts favoured by such birds - vultures, storks, cranes, and most raptors - for cross-country flying (Erickson et al. 2001, Kerlinger & Dowdell 2003, Drewitt & Langston 2006, 2008, Jenkins *et al.* 2010, Noguera *et al.* 2010). Large soaring birds – for example, many raptors and storks - depend heavily on external sources of energy for sustainable flight (Pennycuick 1989). In terrestrial situations, this generally requires that they locate and exploit pockets or waves of rising air, either in the form of bubbles of vertically rising, differentially heated air – thermal soaring - or in the form of wind forced up over rises in the landscape, creating waves of rising turbulence – slope soaring.

**Table 1.** Results of recent published studies of the effects of wind energy facilities on local avifauna.

| **Location** | ***n* wind farm/s assessed** | **Turbine hub height (m)** | ***n* turbines** | **Habitat** | **Bird groups assessed** | **Evidence of displacement?** | **Collision rate (birds/turbine/year)** | **Reference** |
|---|---|---|---|---|---|---|---|---|
| Tarifa, Southern Spain | 2 | 18-36 | 66-190 | Hilly woodland | Raptors | N/A | Raptors = 0.27, Griffon Vultures = 0.12 | Barrios & Rodríguez 2004 |
| Tarifa, Southern Spain | 2 | 28-36 | 66-190 | Hilly woodland | Raptors | N/A | 0.04-0.07, mostly Griffon Vultures | de Lucas *et al.* 2008 |
| East Anglia, UK | 2 | 60 | 8 | Croplands | Gamebirds, corvids, larks and see-eaters | Minimal, only gamebirds significantly affected | N/A | Devereaux *et al.* 2008 |
| Altamont Pass, California | 1 | 14-43 | 5400 | Hilly grassland | Various | N/A | 4.67 , raptors = 1.94 | Smallwood & Thelander 2008 |
| Southern Spain | 1 | 44 | 16 | Hilly woodland | Various | Yes, >75% reduction in raptor sightings | 0.03 | Farfán *et al.* 2009 |
| Netherlands | 3 | 67-78 | 7-10 | Farmland | Various | N/A | 27.0-39.0 | Krijgsveld *et al.* 2009 |
| Northumberland, UK | 1 | 30 | 9 | Coastal | Seabirds | N/A | 16.5-21.5, mostly large gulls | Newton & Little 2009 |
| N England & Scotland | 12 | 30-70 | 14-42 | Moorland | Gamebirds, shorebirds, raptors, passerines | Yes, 53% reduction in Hen Harrier *Circus cyaneus* sightings, other species also decreased | N/A | Pearce-Higgins *et al.* 2009 |

Certain species are morphologically specialised for flying in open landscapes with high relief and strong prevailing winds, and are particularly dependent on slope soaring opportunities for efficient aerial foraging and travel. South African examples might include Bearded *Gypaetus barbatus* and Cape Vulture *Gyps coprotheres*, Verreaux's Eagle *Aquila verreauxii*, Jackal Buzzard *Buteo rufofuscus*, Rock Kestrel *Falco rupicolus*, Peregrine Falcon *Falco peregrinus*, Lanner Falcon *Falco biarmicus* and Black Stork *Ciconia nigra* and, to a lesser extent, most other open-country raptors. Such species are potentially threatened by wind energy developments where turbines are situated to exploit the wind shear created by hills and ridge-lines. In these situations, birds and industry are competing for the same wind resource, and the risk that slope soaring birds will collide with the turbine blades, or else be prevented from using foraging habitat critical for their survival, is greatly increased. Evidence of these effects has been obtained from several operational wind energy facilities in other parts of the world – for example relatively high mortality rates of large eagles, buzzards and kestrels at Altamont Pass, California (>1100 raptors killed annually or 1.9 raptor casualties/MW/year, Smallwood & Thelander 2008), and of vultures and kestrels at Tarifa, Spain (0.15-0.19 casualties/turbine/year, Barrios & Rodríguez 2004, de Lucas *et al.* 2008, Table 1), and displacement of raptors generally in southern Spain (Farfán *et al.* 2009) and of large eagles in Scotland (Walker *et al.* 2005) – and one study has shown that the additive impact of wind farm mortality on an already threatened raptor could theoretically cause its localised extinction (Carrete *et al.* 2009).

*Mitigating collision risk*

The only direct way to reduce the risk of birds colliding with turbine blades is to make the blades more conspicuous and hence easier to avoid. Blade conspicuity is compromised by a phenomenon known as 'motion smear' or retinal blur, in which rapidly moving objects become less visible the closer they are to the eye (McIsaac 2001, Hodos 2002). The retinal image can only be processed up to a certain speed, after which the image cannot be perceived. This effect is magnified in low light conditions, so that even slow blade rotation can be difficult for birds to see.

Laboratory-based studies of visual acuity in raptors have determined that (i) visual acuity appears superior when objects are viewed at a distance, suggesting that the birds may view nearby objects with one visual field and objects further away with another, (ii) moderate motion of the visual stimulus significantly influences acuity, and kestrels may be unable to resolve all portions of an object such as a rotating turbine blade because of motion smear, especially under low contrast or dim lighting conditions, (iii) this deficiency can be addressed by patterning the blade surface in a way which maximises the time between successive stimulations of the same retinal region, and (v) the easiest, cheapest and most visible blade pattern for this purpose, effective across the widest variety of backgrounds, is a single black blade in an array of white blades (McIsaac 2001, Hodos 2002). Hence blade marking may be an important means to reduce collision rates by making the rotating turbine blades as conspicuous as possible under the least favourable visual conditions, particularly at facilities where raptors are known or likely to be frequent collision casualties.

Even if the turbine rotors are marked in this way, many species may still be susceptible to colliding with them, especially during strong winds (when the rotor speed is high and birds tend to fly low and with less control) and when visibility is poor (at night or in thick mist). All other collision mitigation options operate indirectly, by reducing the frequency with which collision prone species are exposed to collision risk. This is achieved mainly by (i) siting farms and individual turbines away from areas of high avifaunal density or aggregation, regular commute routes or hazardous flight behavior, (ii) using low risk turbine designs and configurations, which discourage birds from perching on turbine towers or blades, and allow sufficient space for commuting birds to fly safely through the turbine strings, and (iii) carefully monitoring collision incidence, and being prepared to shut-down problem turbines at particular times or under particular conditions.

Effective mitigation can only be achieved with a commitment to rigorous pre- and post-construction monitoring (see below), ideally using a combination of occasional, direct observation of birds commuting or foraging through and around the wind energy facility, coupled with constant, remote tracking of avian traffic using specialised radar equipment (e.g. see http://www.detect-inc.com/wind.html). Such systems can be programmed to set the relevant turbines to idle as birds enter a pre-determined danger zone around the turbine array, and to re-engage those turbines once the birds have safely passed.

#### *4.1.2 Habitat loss – destruction, disturbance and displacement*

Although the final, destructive footprint of most wind energy facilities is likely to be relatively small, the construction phase of development inevitably incurs quite extensive temporary damage or permanent destruction of habitat, which may be of lasting significance in cases where wind energy facility sites coincide with critical areas for restricted range, endemic and/or threatened species. Similarly, construction, and to a lesser extent ongoing maintenance activities, are likely to cause some disturbance of birds in the general surrounds, and especially of shy and/or ground-nesting species resident in the area. Mitigation of such effects requires that generic best-practice principles be rigorously applied - sites are selected to avoid the destruction of key habitats, and construction and final footprints, as well as sources of disturbance of key species, must be kept to an absolute minimum. Some studies have shown significant decreases in the numbers of certain birds in areas where wind energy facilities are operational as a direct result of avoidance of the noise or movement of the turbines (e.g. Larsen & Guillemette 2007, Farfán *et al.* 2009, Table 1), while others have shown decreases which may be attributed to a combination of collision casualties and avoidance or exclusion from the impact zone of the facility in question (Stewart *et al.* 2007). Such displacement effects are probably more relevant in situations where wind energy facilities are built in natural habitat (Pearce-Higgins *et al.* 2009, Madders & Whitfield 2006) than in more modified environments such as farmland (Devereaux *et al.* 2008), and are highly species-specific in operation.

### 4.1.3 Impacts of associated infrastructure

Infrastructure commonly associated with wind energy facilities may also have detrimental effects on birds. The construction and maintenance of substations, and roadways causes both temporary and permanent habitat destruction and disturbance, and overhead power lines, substations and other live ancillary infrastructure may pose an electrocution risk to certain species (Van Rooyen 2004a, Lehman *et al.* 2007, Jenkins *et al.* 2010).

*Electrocution on power infrastructure*

Avian electrocutions occur when a bird perches or attempts to perch on an electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (van Rooyen 2004b, Lehman *et al.* 2007). Electrocution risk is strongly influenced by the voltage and design of the hardware installed (generally occurring on lower voltage infrastructure where air gaps are relatively small), and mainly affects larger, perching species, such as vultures, eagles and storks, easily capable of spanning the spaces between energised components. Mitigation of electrocution risk involves the use of bird-safe structures (ideally with critical air gaps >2 m), the physical exclusion of birds from high risk areas of live infrastructure, and comprehensive insulation of such areas (van Rooyen 2004b, Lehman *et al.* 2007).

*Habitat destruction during construction and maintenance of power lines and substations*

Some habitat destruction and alteration inevitably takes place during the construction of power lines, substations and associated roadways. Also, power line service roads or servitudes have to be cleared of excess vegetation at regular intervals in order to allow access to the line for maintenance, and to prevent vegetation from intruding into the legally prescribed clearance gaps between the ground and the conductors. These activities have an impact on birds breeding, foraging and roosting in or in close proximity to the servitude, and retention of cleared servitudes can have the effect of altering bird community structure along the length of any given power line (e.g. King & Byers 2002).

*Collision with power lines*

Power lines pose at least an equally significant collision risk to wind turbines, probably affecting the same suite of collision prone species (Bevanger 1994, 1995, 1998, Janss 2000b, Anderson 2001, van Rooyen 2004a, Drewitt & Langston 2008, Jenkins *et al.* 2010). Mitigation of this risk involves the informed selection of low impact alignments for new power lines relative to movements and concentrations of high risk species, and the use of either static or dynamic marking devices to the make the lines, and in particular the earthwires, more conspicuous. While various marking devices have been used globally, many remain largely untested in terms of their efficacy in reducing collision incidence, and those that have been fully assessed have all been found to be only partially effective (Drewitt & Langston 2008, Jenkins *et al.* 2010).

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### 4.2. Description of the proposed wind energy facility

The proposed wind energy facility will be located on portion 4 of the farm Langeberg 187, and portion 1 of the farm Uyekraal 189 (Fig. 1), in an inclusive area of about 541 ha, about 10 km south-east of Vredenburg in the Western Cape Province, South Africa. The facility will comprise up to 22 wind turbines, and will include a dedicated substation, a 132 kV power line link to the existing Eskom Blouwater substation, a workshop area, and a network of new or upgraded access and service roads.

## 5. DESCRIPTION OF THE AFFECTED ENVIRONMENT

### 5.1 Vegetation of the study area

The natural vegetation of the study area is probably dominated by Saldanha Flats Strandveld – low, quite open shrubland, with a sparse, emergent shrub layer and an undergrowth of succulents, possibly with patches of Saldanha Granite Strandveld - hilly, low-medium shrublands with some succulent elements, alternating with grassy, herbaceous areas, and rich in geophytes (Mucina & Rutherford 2006).

### 5.2 Avian microhabitats

These will be defined more accurately after a site visit during the EIA phase of the project, but will probably comprise limited and degraded fragments of **natural vegetation**, a scattering of small **wetlands** (mostly farm dams) and stands of **woodland** (comprising alien trees), set in a matrix of flat, open, fallow or active cereal **croplands** and pastures. In a broader context, the site is about 10 km north of the Langebaan Lagoon and the West Coast National Park, and <30 km south of the Berg River estuary and mouth, both of which are listed as regional Important Bird Areas (Fig. 2, Barnes 1998).

### 5.3 Avifauna of the impact area

Over 200 bird species are considered likely to occur with some regularity within the combined impact zones of the wind energy facility (Appendix 1), including 43 endemic or near-endemic species, 15 red-listed species, and three species – Ludwig's Bustard *Neotis ludwigii*, Blue Crane *Anthropoides paradiseus* and Black Harrier *Circus maurus* - which are both endemic and red-listed (Barnes 1998, 2000, Table 1, Appendix 1).

The birds of greatest potential relevance and importance in terms of (i) conservation status, (ii) relative abundance in the immediate area, and (iii) possible impacts of the proposed wind energy facility are likely to be:

(i) Numbers of waterbirds (shorebirds, coastal birds, wetland birds), including Great White Pelican *Pelecanus onocrotalus* and flamingo spp., commuting between Langebaan Lagoon and the Berg River mouth (Fig. 2).

(ii) Non-breeding flocks or breeding pairs of Blue Crane, and erratic, seasonal influxes Ludwig's Bustards, (Young *et al.* 2003, Hockey *et al.* 2005, Shaw *et al.* 2010).

(iii) Locally resident or passing Black Harriers and African Marsh Harriers *Circus ranivorous* (Barnes 1998, Curtis *et al.* 2004), Peregrine Falcons *Falco peregrinus* and Lanner Falcons *F. biarmicus* (Barnes 1998, Hockey *et al.* 2005).

(iv) A suite of restricted range endemic passerines.

In addition, the study site lies within the known foraging range of a pair of Verreaux's Eagles *Aquila verreauxii* resident either in the 'Mykonos Quarry' (about 5 km to the south) or at the 'Witteklip' (about 10 km to the northwest) (Jenkins 2007), and these birds and their off-spring each year may be exposed to the risk of collision with the turbines and/or displacement from important foraging areas.

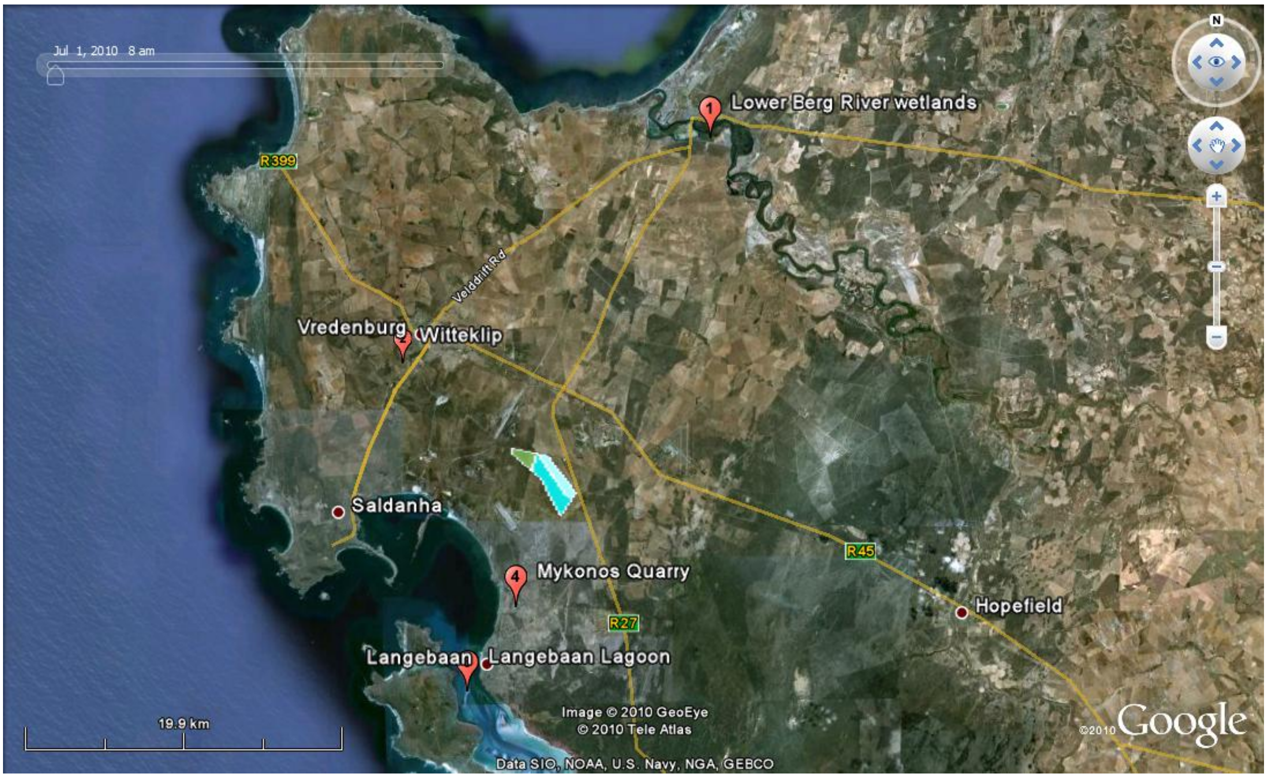


FIGURE 2. Location of the proposed Uyekraal Wind Energy Facility in relation to important bird areas and sites in the Saldanha/Vredenburg area.

**Table 1.** Red-listed species considered likely to occur with some regularity within the impact zone of the proposed wind energy facility, with estimates of their relative susceptibility to the environmental impacts of the construction and operational phases of the development. Red-listed endemic species are highlighted in grey.

| Common name | Conservation status | Regional endemicity | Relative importance of local population[1] | Risk of collision | Risk of electrocution | Risk of disturbance |
|---|---|---|---|---|---|---|
| Ludwig's Bustard | Vulnerable | Near-endemic | Low | High | Low | Moderate |
| Blue Crane | Vulnerable | Endemic | Moderate | High | Low | High |
| African Marsh Harrier | Vulnerable | - | Moderate | Moderate | Low | Moderate |
| Black Harrier | Near-threatened | Endemic | High | Moderate | Low | High |
| Martial Eagle | Vulnerable | - | Low | Moderate | High | Low |
| Secretarybird | Near-threatened | - | Low | High | Low | Moderate |
| Lesser Kestrel | Vulnerable | - | Low | High | Low | Low |
| Lanner Falcon | Near-threatened | - | Moderate | High | Moderate | Low |
| Peregrine Falcon | Near-threatened | - | Moderate | High | Moderate | Low |
| Greater Flamingo | Near-threatened | - | Moderate | High | Low | Low |
| Lesser Flamingo | Near-threatened | - | Moderate | High | Low | Low |
| Great White Pelican | Near-threatened | | Moderate | High | Low | Low |
| Black Stork | Near-threatened | - | Low | High | Moderate | Low |

[1]Relative to the national/global population.

## 6. PROVISIONAL ASSESSMENT OF IMPACTS

Of the conservation priority, red-listed species, all are considered to be at some risk of colliding with the blades of the turbines or associated power lines, four species are considered to be at risk of electrocution on any bird-unfriendly power infrastructure associated with the wind energy facility, and five species are considered to be at risk of being disturbed and/or losing habitat during construction and possibly in the longer term (Table 1).

It is not possible at this stage to determine with confidence the relative significance of these various potential impacts, mainly because too little information is available on the relative abundance and movements of local populations of the implicated species (Table 1). The significance of impacts will be investigated in more detail during the EIA phase after spending some field time at the site.

What is known now is that is that there are substantial coastal and wetland bird populations located within the proposed Wind Energy Facility site, at the West Coast National Park and

Langebaan Lagoon to the south, and the Lower Berg River Wetlands and Verloren Vlei to the north (Fig. 2, Barnes 1998), and that these may commute through the proposed wind energy site and be exposed to collision risk. Further, the broader area around the facility supports numbers of Blue Crane (Young *et al.* 2003), Black Harrier (Curtis *et al.* 2004) and Peregrine and Lanner Falcons (A.R. Jenkins pers. obs). On the basis of this information, it is possible to *speculate* on the biology and possible mitigation of the most likely risk factors (Table 2), an exercise which strongly suggests that **collision mortality is possible, may be significant, and could require considerable mitigation effort.**

**Table 2.** Provisional bird impacts matrix for the Uyekraal Wind Energy Facility.

| Impact | Cause | Affected taxa | Likeli-hood | Duration | Extent | Signifi-cance | Mitigation |
|---|---|---|---|---|---|---|---|
| Disturbance | Construction & maintenance | Endemic passerines | High | Short | Local | Low | Minimise duration of construction activity |
| | Operation - noise and movement | Endemic passerines, roosts, nesting and feeding areas of large terrestrial species, raptors and possibly coastal birds | Moderate | Life of the facility | Cannot be specified at this stage | Cannot be specified at this stage | Minimise noise output of facility |
| Habitat loss: habitat destruction | Construction footprint | Endemic passerines, large terrestrial species, raptors | High | Life of the facility | Local | Low | Minimise construction footprint |
| Habitat loss: displacement | Operation - noise and movement | Endemic passerines, commuting coastal and wetland birds, raptors, cranes | Moderate | Life of the facility | Local | Cannot be specified at this stage | None? |
| Mortality | Electrocution on associated infrastructure | Raptors and storks | High | Life of facility | Regional | Cannot be specified at this stage | Use bird friendly hardware and power line designs |
| Mortality | Collision with turbine blades and associated power lines | Some endemic passerines, commuting coastal and wetland birds, raptors, cranes, bustards | Moderate | Life of the facility | Regional | Cannot be specified at this stage | Turbine and power line siting, mark turbine blades and power lines, limit operational times or conditions |

## 7. CONCLUSIONS AND PLAN OF STUDY FOR EIA PHASE

The scoping phase has identified potential avifaunal issues associated with the proposed wind energy facility and its possible associated infrastructure. These issues will be investigated in more detail during the full EIA phase. In particular, the significance of bird collisions with the turbines will be assessed in order to determine whether the risk warrants mitigation such as no-go areas for turbines, patterning of turbine blades, or periodic shutting down of the wind energy facility (as discussed above). This will be assessed mainly in terms of (i) the actual or estimated abundance of priority bird species in the area, and (ii) the distribution of relevant microhabitats and food resources, and the way in which the latter is likely to influence aggregation and movement of these birds through the impact zone of the proposed wind energy facility.

The EIA phase will emphasise the outcome of the site visit, which in turn will include:

- (i) Absolute of sample surveys of large terrestrial species, raptors and endemic passerines within the study area to determine the relative importance of local populations of these key taxa,
- (ii) Estimates of the extent and direction of possible movements of these species within/through the anticipated impact zone of the wind energy facility, in relation to the distribution of available resources – nesting or roosting sites (cliff-lines, wetlands, stands of trees, existing power lines) and foraging areas (croplands, wetlands), and
- (iii) Identification of the least sensitive/lowest risk areas to locate wind turbines within the broader study area, in terms of (i) and (ii) above.

The results will include a more detailed assessment of all impacts, recommended mitigation where necessary (particularly with reference to the siting of turbines) and, perhaps most importantly, a comprehensive, long-term programme for monitoring actual impacts from pre- to post-construction phases of the development, and improving our understanding of the long-term effects of wind energy developments on South African avifauna.

An additional component of the EIA will be to set the anticipated impacts of this individual wind energy project in the context of other, existing or proposed facilities in the area (Fig. 2), and to estimate the combined and/or cumulative impact of what may be several facilities on the same avifauna (Masden *et al.* 2009).

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AVISENSE CONSULTING

Dr Andrew Jenkins
*AVISENSE* Consulting cc
Email: Andrew@avisense.co.za
Cell: 082 959 9238
Web: avisense.co.za

**Appendix 1.** Annotated list of the bird species considered likely to occur within the inclusive impact zone of the proposed wind energy facility.

| SPECIES | SCIENTIFIC NAME | CONSERVATION STATUS | ENDEMICITY | HABITAT | | | |
|---|---|---|---|---|---|---|---|
| | | | | **Natural vegetation fragments** | **Grain croplands or pasture** | **Alien trees** | **Wetlands** |
| Grey-winged Francolin | *Francolinus africanus* | - | Endemic | X | X | | |
| Cape Spurfowl | *Pternistis capensis* | - | Endemic | X | | | |
| Common Quail | *Coturnix coturnix* | - | - | X | X | | |
| Helmeted Guineafowl | *Numida meleagris* | - | - | X | X | | |
| Egyptian Goose | *Alopochen aegyptiaca* | - | - | | X | | X |
| South African Shelduck | *Tadorna cana* | - | Endemic | | X | | X |
| Spur-winged Goose | *Plectropterus gambensis* | - | - | | X | | |
| Cape Teal | *Anas capensis* | - | - | | | | X |
| Yellow-billed Duck | *Anas undulata* | - | - | | X | | X |
| Cape Shoveler | *Anas smithii* | - | - | | | | X |
| Red-billed Teal | *Anas erythrorhyncha* | - | - | | X | | X |
| Greater Honeyguide | *Indicator indicator* | - | - | X | | X | |
| Ground Woodpecker | *Geocalaptes olivaceus* | - | Endemic | X | | | |
| Acacia Pied Barbet | *Tricholaema leucomelas* | - | Near-endemic | X | | X | |
| African Hoopoe | *Upupa africana* | - | - | X | | X | |
| Giant Kingfisher | *Megaceryle maximus* | - | - | | | | X |
| Pied Kingfisher | *Ceryle rudis* | - | - | | | | X |
| European Bee-eater | *Merops apiaster* | - | - | | | | |
| White-backed Mousebird | *Colius colius* | - | Endemic | X | | | |
| Speckled Mousebird | *Colius striatus* | - | - | X | | | |
| Red-faced Mousebird | *Urocolius indicus* | - | - | X | | | |
| Klaas's Cuckoo | *Chrysococcyx klaas* | - | - | X | | X | |
| Diderick Cuckoo | *Chrysococcyx caprius* | - | - | X | | X | |
| Burchell's Coucal | *Centropus burchelli* | - | - | X | | | |
| Alpine Swift | *Tachymarptus melba* | - | - | X | X | | X |
| Common Swift | *Apus apus* | - | - | X | X | | X |
| African Black Swift | *Apus barbatus* | - | - | X | X | | X |

| SPECIES | SCIENTIFIC NAME | CONSERVATION STATUS | ENDEMICITY | HABITAT | | | |
|---|---|---|---|---|---|---|---|
| | | | | Natural vegetation fragments | Grain croplands or pasture | Alien trees | Wetlands |
| Little Swift | *Apus affinis* | - | - | X | X | | X |
| Horus Swift | *Apus horus* | - | - | X | X | | X |
| White-rumped Swift | *Apus caffer* | - | - | X | X | | X |
| Barn Owl | *Tyto alba* | - | - | X | X | X | |
| Cape Eagle-Owl | *Bubo capensis* | - | - | X | | | |
| Spotted Eagle-Owl | *Bubo africanus* | - | - | X | X | X | |
| Fiery-necked Nightjar | *Caprimulgus pectoralis* | - | - | X | | X | |
| Freckled Nightjar | *Caprimulgus tristigma* | - | - | X | | | |
| Rock Dove | *Columba livia* | - | - | | X | | |
| Speckled Pigeon | *Columba guinea* | - | - | | X | | |
| Laughing Dove | *Streptopelia senegalensis* | - | - | | X | | |
| Cape Turtle-Dove | *Streptopelia capicola* | - | - | X | X | | |
| Red-eyed Dove | *Streptopelia semitorquata* | - | - | | X | X | |
| Namaqua Dove | *Oena capensis* | - | - | | X | | |
| Southern Black Korhaan | *Afrotis afra* | - | Endemic | X | X | | X |
| Blue Crane | *Anthropoides paradiseus* | Vulnerable | Endemic | | X | | X |
| Black Crake | *Amourornis flavirostris* | - | - | | | | X |
| African Purple Swamphen | *Porphyrio madagascariensis* | - | - | | | | X |
| Common Moorhen | *Gallinula chloropus* | - | - | | | | X |
| Red-knobbed Coot | *Fulica cristata* | - | - | | | | X |
| Namaqua Sandgrouse | *Pterocles namaqua* | - | - | | X | | |
| African Snipe | *Gallinago nigripennis* | - | - | | | | X |
| Greater Painted Snipe | *Rostratula benghalensis* | Near-threatened | - | | | | X |
| Bar-tailed Godwit | *Limosa lapponica* | - | - | | | | X |
| Eurasian Curlew | *Numenius arquata* | - | - | | | | X |
| Common Whimbrel | *Numenius phaeops* | - | - | | | | X |
| Marsh Sandpiper | *Tringa stagnatilus* | - | - | | | | X |
| Common Greenshank | *Tringa nebularia* | - | - | | | | X |
| Common Sandpiper | *Actitis hypoleucos* | - | - | | | | X |
| Ruddy Turnstone | *Arenaria interpres* | - | - | | | | X |

| SPECIES | SCIENTIFIC NAME | CONSERVATION STATUS | ENDEMICITY | HABITAT | | | |
|---|---|---|---|---|---|---|---|
| | | | | Natural vegetation fragments | Grain croplands or pasture | Alien trees | Wetlands |
| Red Knot | *Calidris canutus* | - | - | | | | X |
| Sanderling | *Calidris alba* | - | - | | | | X |
| Little Stint | *Calidris minuta* | - | - | | | | X |
| Curlew Sanpiper | *Calidris ferruginea* | - | - | | | | X |
| Ruff | *Philomachus pugnax* | - | - | | | | X |
| Water Thick-knee | *Burhinus vermiculatus* | | | | X | | X |
| Spotted Thick-knee | *Burhinus capensis* | - | - | | X | | |
| Black-winged Stilt | *Himantopus himantopus* | - | - | | X | | X |
| Pied Avocet | *Recurvirostra avosetta* | - | - | | | | X |
| Grey Plover | *Pluvialis squaterola* | - | - | | | | X |
| Common Ringed Plover | *Charadrius hiaticula* | - | - | | | | X |
| Kittlitz's Plover | *Charadrius pecuarius* | - | - | | | | X |
| Three-banded Plover | *Charadrius tricollaris* | - | - | | | | X |
| Chestnut-banded Plover | *Charadrius pallidus* | Near-threatened | - | | | | X |
| White-fronted Plover | *Charadrius marginatus* | - | - | | | | X |
| Blacksmith Lapwing | *Vanellus armatus* | - | - | | X | | X |
| Crowned Lapwing | *Vanellus coronatus* | - | - | | X | | X |
| Kelp Gull | *Larus dominicanus* | - | - | | X | | X |
| Grey-headed Gull | *Larus cirrocephalus* | - | - | | | | X |
| Hartlaub's Gull | *Larus hartlaubii* | - | Endemic | | | | X |
| Caspian Tern | *Sterna caspia* | Near-threatened | - | | | | X |
| Swift Tern | *Sterna bergii* | - | - | | | | X |
| Sandwich Tern | *Sterna sandvicensis* | - | - | | | | X |
| Common Tern | *Sterna hirundo* | - | - | | | | X |
| Arctic Tern | *Sterna paradisaea* | - | - | | | | X |
| Antarctic Tern | *Sterna vittata* | - | - | | | | X |
| Little Tern | *Sternaalbifrons* | - | - | | | | X |
| Black-shouldered Kite | *Elanus caeruleus* | - | - | | X | X | |
| Black Kite | *Milvus migrans* | - | - | | | X | |
| Osprey | *Pandion haliaetus* | - | - | | | | X |
| African Fish-Eagle | *Haliaeetus vocifer* | - | - | | X | X | X |

| SPECIES | SCIENTIFIC NAME | CONSERVATION STATUS | ENDEMICITY | HABITAT | | | |
|---|---|---|---|---|---|---|---|
| | | | | **Natural vegetation fragments** | **Grain croplands or pasture** | **Alien trees** | **Wetlands** |
| Black-chested Snake-Eagle | *Circaetus pectoralis* | - | - | X | X | | |
| African Marsh-Harrier | *Circus ranivorus* | Vulnerable | - | X | X | | X |
| Black Harrier | *Circus maurus* | Near-threatened | Endemic | X | X | | |
| Rufous-chested Sparrowhawk | *Accipiter rufiventris* | - | - | | | X | |
| Black Sparrowhawk | *Accipiter melanoleucus* | - | - | | X | X | |
| Steppe Buzzard | *Buteo vulpinus* | - | - | X | X | X | |
| Jackal Buzzard | *Buteo rufofuscus* | - | Endemic | X | X | X | |
| Verreauxs' Eagle | *Aquila verreauxii* | - | - | X | | | |
| Booted Eagle | *Aquila pennatus* | - | - | X | X | | |
| Martial Eagle | *Polemaetus bellicosus* | Vulnerable | - | X | X | X | |
| Secretarybird | *Sagittarius serpentarius* | Near-threatened | - | X | X | | |
| Lesser Kestrel | *Falco naumanni* | Vulnerable | - | X | X | X | |
| Rock Kestrel | *Falco rupicolus* | - | - | X | X | | |
| Lanner Falcon | *Falco biarmicus* | Near-threatened | - | X | X | | |
| Peregrine Falcon | *Falco peregrinus* | Near-threatened | - | X | X | | |
| Little Grebe | *Tachybaptus ruficollis* | - | - | | | | X |
| Great Crested Grebe | *Podiceps cristatus* | - | - | | | | X |
| Black-necked Grebe | *Podiceps nigricollis* | - | - | | | | X |
| African Darter | *Anhinga rufa* | - | - | | | | X |
| Reed Cormorant | *Phalacrocorax africanus* | - | - | | | | X |
| White-breasted Cormorant | *Phalacrocorax lucidus* | - | - | | | | X |
| Little Egret | *Egretta garzetta* | - | - | | X | | X |
| Yellow-billed Egret | *Egretta intermedia* | - | - | | | | X |
| Grey Heron | *Ardea cinerea* | - | - | | | X | X |
| Black-headed Heron | *Ardea melanocephala* | - | - | | X | X | X |
| Cattle Egret | *Bubulcus ibis* | - | - | | X | X | X |
| Hamerkop | *Scopus umbretta* | - | - | | X | X | X |
| Greater Flamingo | *Phoenicopterus ruber* | Near-threatened | - | | | | X |
| Lesser Flamingo | *Phoenicopterus minor* | Near-threatened | - | | | | X |
| Glossy Ibis | *Plegadis falcinellus* | - | - | | | | X |

| SPECIES | SCIENTIFIC NAME | CONSERVATION STATUS | ENDEMICITY | HABITAT | | | |
|---|---|---|---|---|---|---|---|
| | | | | Natural vegetation fragments | Grain croplands or pasture | Alien trees | Wetlands |
| Hadeda Ibis | *Bostrychia hagedash* | - | - | | X | X | X |
| African Sacred Ibis | *Threskiornis aethiopicus* | - | - | | X | | X |
| African Spoonbill | *Platalea alba* | - | - | | | | X |
| Great White Pelican | *Pelecanus onocrolatus* | Near-threatened | - | | | | X |
| Black Stork | *Ciconia nigra* | Near-threatened | - | | | | X |
| White Stork | *Ciconia ciconia* | - | - | | X | | |
| Southern Boubou | *Laniarius ferrugineus* | - | Endemic | X | | | |
| Bokmakierie | *Telophorus zeylonus* | - | Near-endemic | X | | | |
| Cape Crow | *Corvus capensis* | - | - | | X | X | |
| Pied Crow | *Corvus albus* | - | - | | X | X | |
| White-necked Raven | *Corvus albicollis* | - | - | X | X | | |
| Common Fiscal | *Lanius collaris* | - | - | X | | | |
| Cape Penduline Tit | *Anthroscopus minutus* | - | Near-endemic | X | | | |
| Grey Tit | *Parus afer* | - | Endemic | X | | | |
| Brown-throated Martin | *Riparia paludicola* | - | - | X | X | | X |
| Banded Martin | *Riparia cincta* | - | - | X | X | | X |
| Barn Swallow | *Hirundo rustica* | - | - | X | X | | X |
| White-throated Swallow | *Hirundo albigularis* | - | - | X | X | | X |
| Pearl-breasted Swallow | *Hirundo dimidiata* | - | - | X | X | | X |
| Greater Striped Swallow | *Hirundo cucullata* | - | - | X | X | | X |
| Rock Martin | *Hirundo fuligula* | - | - | X | X | | X |
| Common House-Martin | *Delichon urbicum* | - | - | X | X | | X |
| Cape Bulbul | *Pycnonotus capensis* | - | Endemic | X | | | |
| Cape Grassbird | *Sphenoeacus afer* | - | Endemic | X | | | |
| Long-billed Crombec | *Sylvietta rufescens* | - | - | X | | | |
| Yellow-bellied Eremomela | *Eremomela icteropygialis* | - | - | X | | | |
| Little Rush Warbler | *Bradypterus baboecala* | - | - | | | | X |
| African Reed Warbler | *Acrocephalus baeticatus* | - | - | | | | X |
| Lesser Swamp Warbler | *Acrocephalus gracilirostris* | - | - | | | | X |
| Layard's Tit-Babbler | *Parisoma layardi* | - | Endemic | X | | | |

| SPECIES | SCIENTIFIC NAME | CONSERVATION STATUS | ENDEMICITY | HABITAT | | | |
|---|---|---|---|---|---|---|---|
| | | | | Natural vegetation fragments | Grain croplands or pasture | Alien trees | Wetlands |
| Chestnut-vented Tit-Babbler | *Parisoma subcaeruleum* | - | - | X | | | |
| Cape White-eye | *Zosterops virens* | - | Endemic | X | | X | |
| Grey-backed Cisticola | *Cisticola subruficapilla* | - | - | X | | | |
| Levaillant's Cisticola | *Cisticola tinniens* | - | - | X | | | |
| Neddicky | *Cisticola fulvicapilla* | - | - | X | | | |
| Zitting Cisticola | *Cisticola juncidis* | - | - | | X | | |
| Cloud Cisticola | *Cisticola textrix* | - | Near-endemic | | X | | |
| Karoo Prinia | *Prinia maculosa* | - | Endemic | X | X | | |
| Bar-throated Apalis | *Apalis thoracica* | - | - | X | | | |
| Cape Clapper Lark | *Mirafra apiata* | - | Endemic | X | X | | |
| Karoo Lark | *Calendulauda albescens* | - | Endemic | X | X | | |
| Cape Long-billed Lark | *Certhilauda curvirostris* | - | Endemic | X | X | | |
| Grey-backed Sparrowlark | *Eremopterix verticalis* | - | - | X | X | | |
| Red-capped Lark | *Calandrella cinerea* | - | - | | X | | |
| Large-billed Lark | *Galerida magnirostris* | - | Endemic | | X | | |
| Cape Rock Thrush | *Monticola rupestris* | - | Endemic | X | | | |
| Fiscal Flycatcher | *Sigelus silens* | - | Endemic | | | X | |
| Cape Robin-Chat | *Cossypha caffra* | - | - | X | | X | |
| Karoo Scrub-Robin | *Cercotrichas coryphoeus* | - | Endemic | X | | | |
| African Stonechat | *Saxicola torquatus* | - | - | X | X | | |
| Mountain Wheatear | *Oenanthe monticola* | - | Near-endemic | X | X | | |
| Capped Wheatear | *Oenanthe pileata* | - | - | | X | | |
| Sickle-winged Chat | *Cercomela sinuata* | - | Endemic | X | X | | |
| Familiar Chat | *Cercomela familiaris* | - | - | X | X | | |
| Ant-eating Chat | *Myrmecocichla formicivora* | - | Endemic | X | X | | |
| Red-winged Starling | *Onychognathus morio* | - | - | | | | |
| Pied Starling | *Spreo bicolor* | - | Endemic | | X | | |
| Wattled Starling | *Creatophora cinerea* | - | - | | X | | |
| Common Starling | *Sturnus vulgaris* | - | - | | X | X | |
| Orange-breasted Sunbird | *Anthobaphes violacea* | - | Endemic | X | | | |

| SPECIES | SCIENTIFIC NAME | CONSERVATION STATUS | ENDEMICITY | HABITAT | | | |
|---|---|---|---|---|---|---|---|
| | | | | Natural vegetation fragments | Grain croplands or pasture | Alien trees | Wetlands |
| Malachite Sunbird | *Nectarinia famosa* | - | - | X | | | |
| Southern Double-collared Sunbird | *Cinnyris chalybeus* | - | Endemic | X | | X | |
| Cape Sugarbird | *Promerops cafer* | - | Endemic | X | | | |
| Dusky Sunbird | *Cinnyris fuscus* | - | Near-endemic | X | | | |
| Cape Weaver | *Ploceus capensis* | - | Endemic | X | X | X | X |
| Southern Masked-Weaver | *Ploceus velatus* | - | - | X | X | X | X |
| Red-billed Quelea | *Quelea quelea* | - | - | | X | | |
| Yellow Bishop | *Euplectes capensis* | - | - | X | X | | |
| Southern Red Bishop | *Euplectes orix* | - | - | X | X | | |
| African Quailfinch | *Ortygospiza atricollis* | - | - | | X | | |
| Common Waxbill | *Estrilda astrild* | - | - | | X | | |
| Pin-tailed Whydah | *Vidua macroura* | - | - | | X | | |
| House Sparrow | *Passer domesticus* | - | - | | X | X | |
| Cape Sparrow | *Passer melanurus* | - | Near-endemic | X | X | X | |
| Cape Wagtail | *Motacilla capensis* | - | - | | | | X |
| Cape Longclaw | *Macronyx capensis* | - | Endemic | X | | | |
| African Pipit | *Anthus cinnamomeus* | - | - | X | X | | |
| Plain-backed Pipit | *Anthus leucophrys* | - | - | X | X | | |
| Cape Canary | *Serinus canicollis* | - | Endemic | X | X | X | |
| Black-headed Canary | *Serinis alario* | - | Endemic | X | X | | |
| Yellow Canary | *Crithagra flaviventris* | - | Near-endemic | X | X | | |
| Brimstone Canary | *Crithagra sulphuratus* | - | - | X | | X | |
| White-throated Canary | *Crithagra albogularis* | - | Near-endemic | | X | | |
| Streaky-headed Seedeater | *Crithagra gularis* | - | - | | X | | |
| Lark-like Bunting | *Emberiza impetuani* | - | - | | X | | |
| Cape Bunting | *Emberiza capensis* | - | Near-endemic | X | | | |