Environmental Impact Assessment for the Establishment of the Langhoogte Wind Farm, Western Cape Province

Environmental Scoping Report

BIRD IMPACT SCOPING STUDY

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Date: February 2012
DECLARATION OF INDEPENDENCE

I, Chris van Rooyen, as duly authorised representative of Chris van Rooyen Consulting, hereby confirm my independence as the Avifaunal specialist for the Langhoogte Wind Energy Development and declare that neither I nor Chris van Rooyen Consulting have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which Arcus GIBB was appointed as environmental assessment practitioner in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), other than fair remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act for the Langhoogte Wind Energy Development. I further declare that I am confident, within the parameters of the knowledge currently available to me, in the results of the studies undertaken and conclusions drawn as a result of it. I have disclosed, to the environmental assessment practitioner, in writing, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act. I have further provided the environmental assessment practitioner with written access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not. I am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2010 and any other specific and relevant legislation (national and provincial), policies, guidelines and best practice.

Signature:

Full Name: Chris van Rooyen
Date: 12 February 2012
Title / Position: Director
Qualification(s): BA LLB
Experience (years/ months): 14 years and 6 months
EXECUTIVE SUMMARY

The following potential impacts on avifauna have been identified at the proposed Langhoogte Windfarm:

- Collision mortality on the wind turbines
- Collision with the proposed power line
- Displacement due to disturbance
- Displacement caused by habitat transformation.

The investigation of potential impacts on birds caused by wind farms is a new field of study in South Africa, and has only been the focus of much attention since the middle of 2010. The concept of wind energy suddenly and rapidly gained momentum in South Africa in the latter part of 2010, resulting in a plethora of proposed wind farm applications which caught the ornithological community completely by surprise. The pace of proposed new developments is such that both developers and specialist ornithological consultants struggled (and are still struggling) to come to grips with the enormity of the task ahead, namely to ensure that scientifically robust studies are implemented at all proposed development sites to assess the potential impact on avifauna. As the results of pre-and post-construction monitoring programmes which currently are being implemented become available, those results will be applied to future developments in order to predict with increasing confidence what the likely impact of a particular wind farm development will be on avifauna. At present it has to be acknowledged that there is much to be learnt and this situation is likely to continue for some time. The monitoring at the proposed wind facility site has not yet commenced, therefore all conclusions in this scoping report should be viewed as preliminary and subject to change as the results of the recommended site specific monitoring becomes available.

Of the 22 priority species that could potentially occur at the Langhoogte Wind Farm site, 4 (18%) are associated with aquatic habitats to some extent. Dams and wetlands therefore constitute high risk habitat as far as potential collisions are concerned. Soaring species, which constitute 17 (77%) out of the 22 priority species, is also a group of species that could be potentially vulnerable to collisions. The biggest collision risk for soaring species would be where turbines are situated against slopes perpendicular to dominant wind directions. Several of the priority species identified as potentially occurring at the sites fall in this category, especially raptors, but also storks and occasionally Blue Cranes. These species could use wind currents on slopes for lift. It is important to note that all the agricultural lands in the study area may be used for foraging purposes by Blue Cranes and Denham’s Bustards. Short flights between foraging areas or foraging areas and roost sites will happen continuously, and specific flight paths cannot be predicted without on site surveys. There is a dearth of literature on the displacement effect of wind farm developments on key species assemblages in the study area, particularly cranes and bustards. Indications are that Great Bustard Otis tarda is displaced by wind farms within one kilometre of the facility (Langgemach 2008). If this happens with Denham’s Bustard (and Blue Cranes) in the current study area, it may have longer term habitat fragmentation impacts if the number of wind farms in the Overberg increases significantly. **Ultimately, the only reliable way of establishing whether the wind farm will pose a collision risk and/or lead to the displacement of priority species will be through the implementation of a monitoring programme, by comparing pre- and post construction densities of key species in the wind farm area.**

The scale of direct habitat loss resulting from the construction of a wind farm and associated infrastructure depends on the size of the project but, generally speaking, is likely to be small per turbine base. This is therefore not regarded as a major impact from an avifaunal perspective, relative to other impacts.

The proposed 132kV power line that will link the wind facility to the grid could pose a collision risk, irrespective of which alignments is used. The proposed alignments will have to be investigated and sensitive sections will have to be marked with Bird Flight Diverters (BFDs).
# ENVIRONMENTAL IMPACT ASSESSMENT FOR THE ESTABLISHMENT OF THE PROPOSED LANGHOOGTE WIND FARM, WESTERN CAPE PROVINCE: ENVIRONMENTAL SCOPING REPORT

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APPENDICES

Appendix A:  Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa. Version 2
Appendix B:  Bird habitats in the Langhoogte study area

ABBREVIATIONS

BACI  Before-After-Control Impact Study
BAWESG  Bird and Wind Energy Specialist Group
BFD  Bird Flight Diverter
BLSA  Birdlife South Africa
CAR  Coordinated Avifaunal Roadcount
CBD  Convention on Biological Diversity
DEA  Department of Environmental Affairs
EIA  Environmental Impact Assessment
EWT  Endangered Wildlife Trust
IBA  Important Bird Area
NEMA  National Environmental Wildlife Trust
NWCC  National Wind Power Coordinating Committee
QDGC  Quarter Degree Grid Cell
SABAP1  Atlas of Southern African Birds 1
SABAP2  The South African Bird Atlas 2
1 INTRODUCTION

1.1 Background

SAGIT Energy Ventures plans to construct a wind facility near Bot River in the Theewaterskloof Municipality in the Western Cape Province. According to the background information supplied by Arcus GIBB, the following farms are being considered for the placement of the turbines: the Remainder and Portion 1 of the Farm 791; portion 1 of the Farm 348 (Schulpads Gat); the Remainder and Portion 2 of Farm 350 (Keissies Kraal); the Remainder of Farm 351; the Remainder and Portions 1 and 2 of the Farm 362 (Langhoogte); the Remainder and Portion 2 of the Farm 357 (Langhoogte); Farm 354; Farm 355 (Bruinklip); Farm 356; Portion 11 of the Farm 259 (Rietfontein); Farm 749; and Portions 6 and 12 of the Farm 426 (see Figure 1.1 below).

![Figure 1.1: Location of Langhoogte wind energy facility (Source: Arcus GIBB)](image)

Infrastructure associated with the wind energy facility will include:

- A 50MW Wind Energy Facility comprising approximately 30 wind turbines;
- Concrete foundations of typically 30 x 30 x 3 m set in the ground surface to support the turbine towers;
- Underground cables to connect the turbines;
- A 132kV overhead power line feeding into the Eskom electricity distribution network;
- Access roads to the site from the main road (N2 & R43) within the area; and
- Internal access roads to each wind turbine and to the substation/s.
During the construction period, corridors of landscape disturbance will also occur as lay-down areas will need to be prepared, heavy lift cranes and abnormal load trucks brought on to the site.

While specifications have yet to be determined, each turbine typically consists of a concrete foundation on to which a steel column (usually 80m high) is bolted. On top of each column is the nacelle and the turbine blades which can be up to 40m in length. Turbines will be optimally positioned to make the most of the wind conditions, but are generally spaced several hundred meters apart. Since wind turbines utilize such a small portion of the land surface, once the facility is established normal agricultural activity can continue on the land. The study area is zoned agricultural. No re-zoning is required as the land will continue to be used for agricultural purpose.

Chapter 5 of the National Environmental Management Act (NEMA) (Act 107 of 1998) requires that an Environmental Impact Assessment (EIA) is conducted for the proposed development. Arcus GIBB was appointed by the proponent as the independent impact assessment consultants to manage the EIA process. They in turn appointed Chris van Rooyen Consulting to investigate the potential impacts that the proposed facility could have on birds.

### 1.2 Legislative and Policy Context

No specific legal requirements are applicable that pertain to avifauna.

From an international perspective, the Convention on Biological Diversity (CBD), is applicable. The overall objective of the CBD is the “…conservation of biological diversity, [and] the sustainable use of its components and the fair and equitable sharing of the benefits …” (http://www.cbd.int/).

The Convention on the Conservation of Migratory Species of Wild Animals (http://www.unep-aewa.org) is also applicable. This Convention, commonly referred to as the Bonn Convention, (after the German city where it was concluded in 1979), came into force in 1983. This Convention’s goal is to provide conservation for migratory terrestrial, marine and avian species throughout their entire range. This is very important, because failure to conserve these species at any particular stage of their life cycle could adversely affect any conservation efforts elsewhere. The fundamental principle of the Bonn Convention, therefore, is that the Parties to the Bonn Convention acknowledge the importance of migratory species being conserved and of Range States agreeing to take action to this end whenever possible and appropriate, paying special attention to those migratory species whose conservation status is unfavourable, and individually, or in co-operation taking appropriate and necessary steps to conserve such species and their habitat. Parties acknowledge the need to take action to avoid any migratory species becoming endangered.

The most important guidance document from an avifaunal impact perspective that is currently applicable to wind energy development is the “Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa” (Jenkins et al 2011). This document was published by the Endangered Wildlife Trust (EWT) and Birdlife South Africa (BLSA) on 31 March 2011. This protocol prescribes a pre-construction period that
stretches over a minimum of 12 months and includes all major periods of bird usage in that period, as well as a post-construction component. This document is not legally binding on developers, but has the full support of the South African Wind Energy Association (SAWEA).

1.3 Assessment Methodology

The following data sources were consulted for purposes of the study:

- Bird distribution data of the South African Bird Atlas Project 2 (SABAP2) was consulted. A data set was obtained for each of the two QDGCs (Quarter Degree Grid Cells) within which the development will take place, namely 3419AA and 3419AB. A QDGC corresponds to the area shown on a 1:50 000 map (15’ x 15’) and is approximately 27 km long (north-south) and 23 km wide (east-west).
- Information on large terrestrial avifauna and habitat use was obtained from the Coordinated Avifaunal Roadcounts (CAR) project of the Animal Demographic Unit (ADU) of the University of Cape Town.
- The national conservation status of all bird species occurring in the aforementioned QDGCs was determined with the use of Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland (Barnes 2000).
- A classification of the vegetation types from an avifaunal perspective in the QDGCs was obtained from SABAP1.
- Detailed satellite imagery from Google Earth (imagery date 2009) was used in order to view the study area on a landscape level and to help identify bird habitat on the ground.
- An extensive review of relevant international literature on birds and wind farm impacts was conducted.
- Information on the micro habitat level was obtained through a reconnaissance site visit in September 2011. An attempt was made investigate the total study area as far as was practically possible, and to visit potential sensitive areas identified from Google Earth imagery.
- An interview was conducted with Mr. Luke Cornell, a landowner living in the western part of the study area (near Van der Stel's Pass), with regard to the birds that breed and forage in the general area.
- Technical details of the planned wind facility infrastructure were obtained from Arcus GIBB.
- The Birdlife South Africa (BLSA) List of Priority Species for Wind Farms (Birdlife SA 2012) was used as primary reference for the identification of priority species potentially occurring in the study area.
- In the tables below, the habitat in the study area was categorized in terms of the potential for an impact to occur. Emphasis was placed on priority species (see Table 2.1).
Table 1.1: Impact: Displacement due to disturbance and habitat transformation

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<tr>
<td><strong>Lower Sensitivity</strong></td>
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<tr>
<td>Exotic trees, homesteads, roads</td>
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<tr>
<td><strong>Medium Sensitivity</strong></td>
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<tr>
<td>Agricultural areas, wetlands, and dams</td>
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<tr>
<td><strong>Higher Sensitivity</strong></td>
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<tr>
<td>Natural vegetation</td>
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Table 1.2: Impact: Collisions with the turbines

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<td><strong>Lower Sensitivity</strong></td>
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<td>Exotic trees, homesteads, roads</td>
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<td><strong>Medium Sensitivity</strong></td>
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<tr>
<td>Agricultural areas</td>
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<tr>
<td><strong>Higher Sensitivity</strong></td>
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<tr>
<td>Natural vegetation on steeper south facing slopes, wetlands, and dams</td>
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Table 1.3: Impact: Collisions with the power line

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<td><strong>Lower Sensitivity</strong></td>
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<td>Exotic trees, homesteads, roads</td>
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<td><strong>Medium Sensitivity</strong></td>
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<tr>
<td>Natural vegetation</td>
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<tr>
<td><strong>Higher Sensitivity</strong></td>
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<td>Agricultural areas, wetlands and dams</td>
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Table 1.4: Combined sensitivity analysis: All impacts

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<td><strong>Lower Sensitivity</strong></td>
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<tr>
<td>Exotic trees, homesteads, roads</td>
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<tr>
<td><strong>Medium Sensitivity</strong></td>
</tr>
<tr>
<td>Agricultural areas, natural vegetation</td>
</tr>
<tr>
<td><strong>Higher Sensitivity</strong></td>
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<tr>
<td>Wetlands, dams and steeper south facing slopes with natural vegetation</td>
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1.4 Scope and Limitations

The terms of reference for this bird impact scoping report are as follows:

- description of existing environment, bird communities and micro habitats;
- description of potential impacts;
- indication of confidence levels and any gaps in baseline data;
- preliminary assessment of impacts;
- the identification of issues that require further investigation during the EIA phase.

This study made the basic assumption that the sources of information used are reliable. However, it must be noted that there are factors may potentially detract from the accuracy of the predicted results:
• At this point in time (February 2012), the QDGCs are not equally well covered by the South African Bird Atlas 2 (SABAP2). In the case of 3419AA, 177 checklists have been completed to date, and 68 checklists have been completed for 3419AB.

• Little detailed, verified information on micro-habitat level was available of bird occurrence, densities and movements, therefore most conclusions are based on secondary sources, as systematic data capturing of flight patterns has not yet taken place at the site. With certain classes of birds, particularly cranes and bustards, very little research has been conducted on potential impacts with wind facilities worldwide. The only primary observations were those conducted during the site visits, and these observations were not detailed enough to establish actual flight patterns, which should happen as part of dedicated pre-construction site specific avifaunal survey. The precautionary principle was therefore applied throughout. The World Charter for Nature, which was adopted by the UN General Assembly in 1982, was the first international endorsement of the precautionary principle. The principle was implemented in an international treaty as early as the 1987 Montreal Protocol and among other international treaties and declarations is reflected in the 1992 Rio Declaration on Environment and Development. Principle 15 of the Rio Declaration 1992 states that: “in order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall be not used as a reason for postponing cost-effective measures to prevent environmental degradation.”

• There are currently no peer-reviewed scientific papers available yet on the impacts wind farms have on birds in South Africa. Even in the international arena, many studies lack before and after comparisons, or wind farm area and reference area comparisons, or do not offer any assessment whatsoever of relevant factors such as collision risk and differences in bird behaviour between night and day, or are of inadequate duration to provide conclusive results (Langston & Pullen 2003). It is therefore inevitable that given the inconclusive and sometimes contradictory scientific evidence on the nature and extent of the impacts caused by wind farms, and the lack of any research on this topic in South Africa, an element of speculation will enter the conclusions in this report. It is therefore imperative that a dedicated pre- and post-construction monitoring programme is implemented to measure collision and displacement risk.
2 DESCRIPTION OF AFFECTED ENVIRONMENT

2.1 General Study Area

2.1.1 Bird habitat in the study area

The study area is located near the town of Bot River in the Theewaterskloof Municipality in the Western Cape. It overlaps with two QDGCs (i.e. 1:50 000 maps), namely 3419AA and 3419AB.

The study site is primarily located in the Overberg wheatbelt, and borders on the Eastern False Bay Mountains Important Bird Area (IBA) (Barnes 1998). The mosaic of wheat, barley and canola fields interspersed with pastures that comprises the area known as the Overberg wheatbelt, is classified as an IBA (Barnes 1998) – the study area falls marginally outside the formal IBA borders, but in similar habitat (see Figure 2.1). This large agricultural district stretches from Caledon to Riversdale and encompasses the area south of these two towns, running between the coastal towns of Hermanus and Stilbaai. The topography consists of low-lying coastal plains and consists primarily of cereal croplands. The extreme western section of the study area displays characteristics of the Eastern False Bay Mountains i.e. typical fynbos on steep slopes with rocky ledges.

Figure 2.1: Location of the study area relative to the Eastern False Bay Mountains and Overberg wheatbelt IBAs.

It is widely accepted that vegetation structure is more critical in determining bird habitat, than the actual plant species composition (Harrison et al 1997). The description of vegetation presented in this report therefore concentrates on factors relevant to the bird species present, and is not an exhaustive list of plant species present. The description of the vegetation types occurring in the study area copies that of the Atlas of Southern African Birds 1 (SABAP1) (Harrison et al 1997). The criteria used by the SABAP1 authors to amalgamate botanically
defined vegetation units, or to keep them separate were (1) the existence of clear differences in vegetation structure, likely to be relevant to birds, and (2) the results of published community studies on bird/vegetation associations. The natural vegetation in the QDGCs where the proposed wind facility is located is classified as fynbos vegetation (Harrison et al 1997).

Fynbos is dominated by low shrubs and can be divided into two categories, fynbos proper and renosterveld. Despite having a high diversity of plant species, fynbos and renosterveld has a relatively low diversity of bird species. The priority species that are closely associated with natural vegetation in this study area are Black Harrier Circus maurus (Hockey et al 2005; Harrison et al 1997) Denham’s Bustard Neotis denhami, (Hockey et al 2005; Harrison et al 1997, H. Lötter pers.com) and Cape Rockjumper Cheatops frenatus (Hockey et al 2005). Other priority species that sometimes use this habitat are Secretarybirds Sagittarius serpentarius which are sometimes found in fynbos and renosterveld (pers. obs.), and a Martial Eagle Polemaetus bellicosus was recorded in this habitat during the field trip. The proposed Langhoogte Wind Farm is primarily situated in an area of agricultural activity, but there are large areas of natural vegetation remaining, particularly against steeper slopes, ridges and in drainage lines. The largest unfragmented area of natural vegetation is in the western section of the study area, bordering the Eastern False Bay Mountains IBA.

The majority of the fynbos and renosterveld in the Overberg wheatbelt have been transformed for agriculture. Whilst this obviously resulted in substantial natural habitat being destroyed, several species have in fact adapted well to this transformation. One such species, which is highly relevant to this study, is the Blue Crane Anthropoides paradiseus. This species has thrived on the grain lands and pastures in the southern and western Cape. This will be further discussed when the micro-habitats are discussed below.

In addition to natural vegetation, other bird micro-habitats are present in the study area and these are discussed below. Appendix A provides a photographic record of the bird habitat in the study area.

### 2.1.2 Cereal crops and pastures

The natural vegetation at the study area at Langhoogte Wind Farm is surrounded by a typical mosaic of grain fields interspersed with pastures. It is of specific importance to the endemic, Blue Crane and Denham’s Bustard.

The Overberg holds the largest population of Blue Cranes in the world. At times the Overberg can hold nearly 20% of this species’ global population, as well as containing large numbers of Denham’s Bustard and White Stork Ciconia ciconia during the summer (Barnes 1998). The Blue Crane has relatively recently expanded its range into the Overberg, where it feeds on inter alia fallen grain and recently germinated crops (Young 1998). They also feed on supplementary food put out for small stock, and can congregate in huge numbers around these feed lots. The Blue Cranes favour agricultural areas above natural vegetation (Young 2008; 2009a; 2009b; 2010). During the reconnaissance site visit at Langhoogte Wind Farm, a flock of approximately 100 Blue Cranes were recorded in cereal crops and pastures in the study area. Secretary birds are also present as well as (possibly) some karroid birds such as the endemic Karoo Korhaan Eupodotis vigorsii (Barnes 1998, Young 2003). The endemic Agulhas Long-billed Lark Certhilauda brevirostris is abundant in places; its preferred habitat is ploughed fields (Hockey et al 2007).
2.1.3 **Drainage lines and wetlands**

The Overberg wheatbelt contains many drainage lines and associated wetlands, some of which are sometimes used as roosting areas for Blue Cranes (and White Storks *Ciconia ciconia*), as well as for foraging and breeding African Marsh-Harrier *Circus ranivorus*. Wetlands are also important for many non-priority water bird species. The Black Stork *Ciconia nigra* could also visit some wetlands, although the species is becoming very rare in the Overberg (SABAP2). The proposed development site contains several drainage lines but no significant wetlands were identified during the short site visit. In the Overberg, the short trees that line some of the drainage lines are also important for Secretarybird *Sagittarius serpentarius*, which may use these trees for roosting and breeding purposes (pers. obs.).

2.1.4 **Dams**

The study area contains many dams, some of which could be roosting areas for Blue Cranes. Blue Cranes tend to roost in dams at night, probably as a protective measure against predators. Cranes also require water for drinking and typically take nestlings to water within 24 hours of hatching (Bidwell 2004), and prefer nest sites close to dams. Apart from cranes, agricultural dams are also important for White Stork and African Fish-Eagle *Haliaeetus vocifer*. The Black Stork could also visit dams in the study area.

2.1.5 **Other habitats**

Other micro-habitats within and immediately adjacent to the proposed site, which are important for a number of priority raptor species, are stands of Eucalyptus. Stands of exotic Eucalyptus create attractive habitat for priority species such as Black Sparrowhawk *Accipiter melanooleucus*, Rufous-chested Sparrowhawk *Accipiter rufiventris* and Jackal Buzzard *Buteo rufofuscus*. African Fish-Eagle often uses a large Eucalyptus to breed in (pers. obs).

2.1.6 **Avifauna in the study area**

The BLSA List of Priority Species for Wind Farms (Birdlife SA 2012) was used as primary reference for the identification of priority species potentially occurring in the study area. Table 2.1 below shows the list of priority species that have been recorded in the QDGCs overlapping with the study area, namely 3419AA and 3419AB. **Only priority species that are likely to occur on site (to be confirmed by pre-construction monitoring) based on the identification of habitat during the reconnaissance site visit have been included.**

The following abbreviations and acronyms are used:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>VU</td>
<td>Nationally vulnerable (Barnes 2000)</td>
</tr>
<tr>
<td>NT</td>
<td>Nationally near threatened (Barnes 2000)</td>
</tr>
<tr>
<td>AEWA</td>
<td>Listed in Annexure 2 of the African-Eurasian Waterbird Agreement</td>
</tr>
<tr>
<td>Ra</td>
<td>Raptor</td>
</tr>
<tr>
<td>SS</td>
<td>Special regional significance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Status</th>
<th>Likelihood of occurrence in the study area</th>
<th>Habitat requirements (Barnes 1998; Barnes 2000; Hockey <em>et al</em> 2005; Young <em>et al</em> 2003; Young 2008; 2009a; 2009b; 2010; Harrison <em>et al</em> 1997; personal observations)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secretarybird</td>
<td><em>Sagittarius serpentarius</em></td>
<td>NT, Ra</td>
<td>High</td>
<td>Grassland, old lands, open woodland. Most likely to be encountered in fynbos and pastures.</td>
</tr>
<tr>
<td>African Marsh-Harrier</td>
<td><em>Circus ranivorus</em></td>
<td>VU, Ra</td>
<td>Low</td>
<td>Large permanent wetlands with dense reed beds. Sometimes forages over smaller wetlands, grassland and (rarely) fynbos.</td>
</tr>
<tr>
<td>Black Harrier</td>
<td><em>Circus maurus</em></td>
<td>NT, Ra</td>
<td>High</td>
<td>Highest expected densities in remnant patches of fynbos.</td>
</tr>
<tr>
<td>Peregrine Falcon</td>
<td><em>Falco peregrinus</em></td>
<td>NT, Ra</td>
<td>Medium</td>
<td>A wide range of habitats, but cliffs (or tall buildings) are a prerequisite for breeding. Immature birds are most likely to be encountered foraging over farm land. More likely to be encountered in the western part of the study area adjoining the Eastern False Bay Mountains IBA.</td>
</tr>
<tr>
<td>Lanner Falcon</td>
<td><em>Falco biarmicus</em></td>
<td>NT, Ra</td>
<td>Medium</td>
<td>Generally prefers open habitat, but exploits a wide range of habitats.</td>
</tr>
<tr>
<td>Blue Crane</td>
<td><em>Anthropoides paradiseus</em></td>
<td>VU</td>
<td>High</td>
<td>Cereal crops, old lands, pastures, wetlands, dams for roosting. Recorded in pastures and wheat fields in the</td>
</tr>
<tr>
<td>Species</td>
<td>Scientific Name</td>
<td>IBA Category</td>
<td>Habitat Description</td>
<td></td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------------------</td>
<td>--------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Denham’s Bustard</td>
<td>Neotis denhami</td>
<td>VU High</td>
<td>Cereal crops, fynbos and pastures. Recorded during site visit.</td>
<td></td>
</tr>
<tr>
<td>Agulhas Long-billed Lark</td>
<td>Certhiola brevirostris</td>
<td>NT, SS High</td>
<td>Fallow and recently ploughed fields, sparse shrubland dominated by renosterveld.</td>
<td></td>
</tr>
<tr>
<td>White Stork</td>
<td>Ciconia ciconia</td>
<td>AEWA High</td>
<td>Agricultural lands and dams.</td>
<td></td>
</tr>
<tr>
<td>Booted Eagle</td>
<td>Aquila pennatus</td>
<td>Ra Medium</td>
<td>Wide variety of habitats. Ridges important for slope soaring. More likely to be encountered in the western part of the study area adjoining the Eastern False Bay Mountains.</td>
<td></td>
</tr>
<tr>
<td>African Fish-Eagle</td>
<td>Haliaeetus vocifer</td>
<td>Ra Medium</td>
<td>Mostly farm dams.</td>
<td></td>
</tr>
<tr>
<td>Steppe Buzzard</td>
<td>Buteo vulpinus</td>
<td>Ra High</td>
<td>Agricultural areas and fynbos. Ridges important for slope soaring/kiting.</td>
<td></td>
</tr>
<tr>
<td>Jackal Buzzard</td>
<td>Buteo rufofuscus</td>
<td>Ra High</td>
<td>Wide variety of habitats. Ridges important for slope soaring/kiting.</td>
<td></td>
</tr>
<tr>
<td>Black Sparrowhawk</td>
<td>Accipiter melanoleucus</td>
<td>Ra Medium</td>
<td>Clumps of alien trees.</td>
<td></td>
</tr>
<tr>
<td>African Harrier-Hawk</td>
<td>Polyboroides typus</td>
<td>Ra Low</td>
<td>Alien plantations and in natural vegetation along drainage lines.</td>
<td></td>
</tr>
<tr>
<td>Rufous-chested Sparrowhawk</td>
<td>Accipiter rufiventris</td>
<td>Ra Low</td>
<td>Clumps of alien trees.</td>
<td></td>
</tr>
<tr>
<td>Spotted Eagle-Owl</td>
<td>Bubo africanus</td>
<td>Ra High</td>
<td>Wide range of habitats, but mostly in fynbos and in alien stands of trees.</td>
<td></td>
</tr>
<tr>
<td>Species</td>
<td>Scientific Name</td>
<td>Status</td>
<td>Risk</td>
<td>Location and Habitat</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------------------</td>
<td>--------</td>
<td>------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Cape Eagle-Owl</td>
<td><em>Bubo capensis</em></td>
<td>Ra</td>
<td>Low</td>
<td>More likely to be encountered in the western part of the study area adjoining the Eastern False Bay Mountains, in steep, rocky areas.</td>
</tr>
<tr>
<td>Cape Rockjumper</td>
<td><em>Chaetops frenatus</em></td>
<td>SS</td>
<td>Low</td>
<td>More likely to be encountered in the western part of the study area adjoining the Eastern False Bay Mountains, in steep, rocky areas.</td>
</tr>
<tr>
<td>Forest Buzzard</td>
<td><em>Buteo trizonatus</em></td>
<td>Ra</td>
<td>Low</td>
<td>More likely to be encountered in the western part of the study area adjoining the Eastern False Bay Mountains, in dense stands of alien trees.</td>
</tr>
<tr>
<td>Martial Eagle</td>
<td><em>Polemaetus bellicosus</em></td>
<td>VU Ra</td>
<td>High</td>
<td>More likely to be encountered in the western part of the study area adjoining the Eastern False Bay Mountains, also in natural vegetation in the rest of the study area. Recorded during the site visit.</td>
</tr>
<tr>
<td>Verreaux's Eagle</td>
<td><em>Aquila verreauxii</em></td>
<td>Ra</td>
<td>Low</td>
<td>More likely to be encountered in the western part of the study area adjoining the Eastern False Bay Mountains, in steep, rocky areas.</td>
</tr>
</tbody>
</table>
3 IMPACTS AND ISSUES IDENTIFICATION

The effects of a wind farm on birds are highly variable and depend on a wide range of factors including the specification of the development, the topography of the surrounding land, the habitats affected and the number and species of birds present. With so many variables involved, the impacts of each wind farm must be assessed individually. The principal areas of concern with regard to effects on birds are listed below. Each of these potential effects can interact with each other, either increasing the overall impact on birds or, in some cases, reducing a particular impact (for example where habitat loss or displacement causes a reduction in birds using an area which might then reduce the risk of collision).

3.1 Potential Impacts

The following potential impacts have been identified:

- Collision mortality on the wind turbines
- Collision with the proposed power line
- Displacement due to disturbance
- Displacement caused by habitat transformation.

It is important to note that the assessment is made on the status quo as it is currently on site. The possible change in land use in the area where the wind farm is situated is not taken into account because the extent and nature of future developments are unknown at this stage. It is however highly unlikely that the land use will change in the foreseeable future.

3.2 50 MW Wind facility

3.2.1 Collision mortality on wind turbines

Internationally, it is widely accepted that bird mortalities from collisions with wind turbines contribute a relatively small proportion of the total mortality from all causes. The US National Wind Coordinating Committee (NWCC) conducted a comparison of wind farm bird mortality with that caused by other man-made structures in the USA (Anon. (b) 2000). The NWCC did not conduct its own study, but analyzed all of the research done to date on various causes of avian mortality, including commercial wind farm turbines. It reports that "data collected outside California indicate an average of 1.83 avian fatalities per turbine (for all species combined), and 0.006 raptor fatalities per turbine per year. Based on current projections of 3,500 operational wind turbines in the US by the end of 2001, excluding California, the total annual mortality was estimated at approximately 6,400 bird fatalities per year for all species combined". The NWCC report states that its intent is to "put avian mortality associated with windpower development into perspective with other significant sources of avian collision mortality across the United States". It further reports that: "Based on current estimates, windplant related avian collision fatalities probably represent from 0.01% to 0.02% (i.e. 1 out of every 5,000 to 10,000) of the annual avian collision fatalities in the United States". That is, commercial wind turbines cause
the direct deaths of only 0.01% to 0.02% of all of the birds killed by collisions with man-made structures and activities in the USA.

Also in the USA, a Western EcoSystems Technology Inc. study found a range of between 100 million to 1 billion bird fatalities due to collisions with artificial structures such as vehicles, buildings and windows, power lines and communication towers, in comparison to 33,000 fatalities attributed to wind turbines. The study (see Anon. (a) 2003) reports that “windplant-related avian collision fatalities probably represent from 0.01% to 0.02% (i.e. one out of every 5,000 to 10,000 avian fatalities) of the annual avian collision fatalities in the United States, while some may perceive this level of mortality as small, all efforts to reduce avian mortality are important”. A Finnish study reported 10 bird fatalities from turbines, and 820,000 birds killed annually from colliding with other structures such as buildings, electricity pylons and lines, telephone and television masts, lighthouses and floodlights (Anon. (a) 2003).

The majority of studies on collisions caused by wind turbines have recorded relatively low mortality levels (Madders & Whitfield 2006). This is perhaps largely a reflection of the fact that many of the studied wind farms are located away from large concentrations of birds. It is also important to note that many records are based only on finding corpses, with no correction for corpses that are overlooked or removed by scavengers (Drewitt & Langston in Ibis 2006).

Relatively high collision mortality rates have been recorded at several large, poorly sited wind farms in areas where large concentrations of birds are present (including Important Bird Areas (IBAs)), especially among migrating birds, large raptors or other large soaring species, e.g. in the Altamont Pass in California, USA, and in Tarifa and Navarra in Spain. In these cases actual deaths resulting from collision are high, notably of Golden Eagle Aquila chrysaetos and Eurasian Griffon Gyps fulvus, respectively.

In a study in Spain, it was found that the distribution of collisions with wind turbines was clearly associated with the frequencies at which soaring birds flew close to rotating blades (Barrios & Rodriguez 2004). Patterns of risky flights and mortality included a temporal component (deaths concentrated in some seasons), a spatial component (deaths aggregated in space), a taxonomic component (a few species suffered most losses), and a migration component (resident populations were more vulnerable). Clearly, the risk is likely to be greater on or near areas regularly used by large numbers of feeding or roosting birds, or on migratory flyways or local flight paths, especially where these are intercepted by the turbines. Risk also changes with weather conditions, with evidence from some studies showing that more birds collide with structures when visibility is poor due to fog or rain, although this effect may to some extent be offset by lower levels of flight activity in such conditions (Madders & Whitfield 2005). Strong headwinds also affect collision rates and migrating birds in particular tend to fly lower when flying into the wind (Drewitt & Langston 2006). The same applies for Blue Cranes flying between roosting and foraging areas (pers. obs.).

Accepting that many wind farms may only cause low levels of mortality, even these levels of additional mortality may be significant for long-lived species with low productivity and slow maturation rates (e.g. Blue Crane, Denham’s Bustard, Martial Eagle and Secretarybird), especially when rarer species of conservation concern are affected. In such cases there could be significant effects at the population level (locally, regionally or, in the case of rare and restricted species, nationally), particularly in situations where cumulative mortality takes place as a result of multiple installations (Carette et. al. 2009).
Large birds with poor manoeuvrability (such as cranes, bustards and secretarybirds) are
generally at greater risk of collision with structures, and species that habitually fly at dawn and
dusk or at night are perhaps less likely to detect and avoid turbines (e.g. cranes arriving at a
roost site after sunset, or flamingos flying at night). Collision risk may also vary for a particular
species, depending on age, behaviour and stage of annual cycle (Drewitt & Langston 2006).
While the flight characteristics of cranes, flamingos and bustards make them obvious
candidates for collisions with power lines, it is noted that these classes of birds (unlike raptors)
do not feature prominently in literature as wind turbine collision victims. It may be that they avoid
wind farms entirely, resulting in lower collision risks (see the discussion on Displacement in
section 3.2.2 below). However, this can only be verified through on-site post-construction
monitoring.

The precise location of a wind farm site can be critical. Soaring species may use particular
topographic features for lift (Barrios & Rodriguez 2004; De Lucas et. al. 2008) or such features
can result in large numbers of birds being funnelled through an area of turbines (Drewitt &
Langston 2006). For example, absence of thermals on cold, overcast days may force larger,
soaring species (e.g. Martial Eagle and Secretarybird) to use slopes for lift, which may increase
their exposure to turbines. Birds also lower their flight height in some locations, for example
when following the coastline or crossing a ridge, which might place them at greater risk of
collision with rotors.

The size and alignment of turbines and rotor speed are likely to influence collision risk; however,
physical structure is probably only significant in combination with other factors, especially wind
speed, with gentle winds resulting in the highest risk (Barrios & Rodriguez 2004; Stewart et. al.
2007). Lattice towers are generally regarded as more dangerous than tubular towers because
many raptors use them for perching and occasionally for nesting; however Barrios & Rodriguez
(2004) found tower structure to have no effect on mortality, and that mortality may be directly
related to abundance for certain species (e.g. Common Kestrel Falco tinnunculus). De Lucas
et. al. (2008) found that turbine height and higher elevations may heighten the risk (taller/higher
= higher risk), but that abundance was not directly related to collision risk, at least for Eurasian
Griffon Vulture Gyps fulvus.

A review of the available literature indicates that, where collisions have been recorded, the rates
per turbine are highly variable with averages ranging from 0.01 to 23 bird collisions annually
(the highest figure is the value, following correction for scavenger removal, for a coastal site in
Belgium and relates to gulls, terns and ducks among other species) (Drewitt & Langston 2006).
Although providing a helpful and standardised indication of collision rates, average rates per
turbine must be viewed with some caution as they are often cited without variance and can
mask significantly higher rates for individual turbines or groups of turbines (Everaert et. al. 2001
as cited by Drewitt & Langston 2006).

Some of the highest mortality levels have been for raptors in the Altamont Pass in California
(Howell & DiDonato 1991, Orloff & Flannery 1992 as cited by Drewitt & Langston 2006) and at
Tarifa and Navarre in Spain (Barrios & Rodriguez unpublished data as cited by Drewitt &
Langston 2006). These cases are of particular concern because they affect relatively rare and
long-lived species such as Griffon Vulture Gyps fulvus and Golden Eagle Aquila chrysaetos that
have low reproductive rates and are vulnerable to additive mortality. Golden Eagles congregate
in Altamont Pass to feed on super-abundant prey which supports very high densities of
breeding birds. In the Spanish cases, extensive wind farms were built in topographical
bottlenecks where large numbers of migrating and local birds fly through a relatively confined
area due to the nature of the surrounding landscape, for example through mountain passes, or
use rising winds to gain lift over ridges (Barrios & Rodriguez 2004). Although the average
numbers of annual fatalities per turbine (ranging from 0.02 to 0.15 collisions/turbine) were
generally low in the Altamont Pass and at Tarifa, overall collision rates were high because of the
large numbers of turbines involved (over 7 000 in the case of Altamont). At Navarre, corrected
annual estimates ranging from 3.6 to 64.3 mortalities/turbine were obtained for birds and bats
(unpublished data). Thus, a minimum of 75 Golden Eagles are killed annually in Altamont and
over 400 Griffon Vultures are estimated (following the application of correction factors) to have
collided with turbines at Navarre. Work on Golden Eagles in the Altamont Pass indicated that
the population was declining in this area thought to be due, at least in part, to collision mortality

Of the 22 priority species that could potentially occur at the Langhoogte Wind Farm site, 4 (18%)
are associated with aquatic habitats to some extent. Dams and wetlands therefore constitute
high risk habitat as far as potential collisions are concerned. Determination of the actual use
of these dams and wetlands will require further surveys during the pre-construction period. In this respect nocturnal flight movement by Blue Cranes in and out of roost sites is of specific importance.

Soaring species, which constitute 17 (77%) out of the 22 priority species, is also a group of
species that could be potentially vulnerable to collisions. The biggest collision risk for soaring
species would be where turbines are situated against slopes perpendicular to dominant wind
directions. Several of the priority species identified as potentially occurring at the sites fall in this
category, especially raptors, but also storks and occasionally Blue Cranes. These species could
use wind currents on slopes for lift. The dominant wind directions in the Overberg is east-
southeast through to west-southwest (http://www.windfinder.com/windstats). It follows therefore
that turbines situated against on slopes facing east-southeast through to west-southwest are
likely to hold the biggest risk of collision for soaring species, as the majority of slope associated
wind currents would be on these slopes. At this stage of the investigation, final turbine positions
have not yet been determined. Determination of the actual use of these slopes by soaring
species will require further surveys during the pre-construction period and may influence
the final lay-out of the turbines.

It is important to note that all the agricultural lands in the study area may be used for foraging
purposes by Blue Cranes and Denham’s Bustards. Short flights between foraging areas or
foraging areas and roost sites will happen continuously, and specific flight paths cannot be
predicted without on site surveys. Due to the high priority ranking of these species, on site,
pre-construction surveys are required from strategically placed observation points.

3.2.2 Displacement due to disturbance

The displacement of birds from areas within and surrounding wind farms due to visual intrusion
and disturbance effectively can amount to habitat loss. Displacement may occur during both the
construction and operational phases of wind farms, and may be caused by the presence of the
turbines themselves through visual, noise and vibration impacts, or as a result of vehicle and
personnel movements related to site maintenance. The scale and degree of disturbance will vary
according to site- and species-specific factors and must be assessed on a site-by-site basis
(Drewitt & Langston 2006).
Unfortunately, few studies of displacement due to disturbance are conclusive, often because of the lack of before-and-after and control-impact (BACI) assessments. Onshore, disturbance distances (in other words the distance from wind farms up to which birds are absent or less abundant than expected) up to 800 m (including zero) have been recorded for wintering waterfowl (Pedersen & Poulsen 1991 as cited by Drewitt & Langston 2006), though 600 m is widely accepted as the maximum reliably recorded distance (Drewitt & Langston 2006). The variability of displacement distances is illustrated by one study which found lower post-construction densities of feeding European White-fronted Geese *Anser albifrons* within 600 m of the turbines at a wind farm in Rheiderland, Germany (Kruckenberg & Jaene 1999 as cited by Drewitt & Langston 2006), while another showed displacement of Pink-footed Geese *Anser brachyrhynchus* up to only 100–200 m from turbines at a wind farm in Denmark (Larsen & Madsen 2000 as cited by Drewitt & Langston 2006). Indications are that Great Bustard *Otis tarda* (a species related to the Denham’s Bustard) are displaced by wind farms within one kilometre of the facility (Langgemach 2008).

Studies of breeding birds are also largely inconclusive or suggest lower disturbance distances, though this apparent lack of effect may be due to the high site fidelity and long life-span of the breeding species studied. This might mean that the true impacts of disturbance on breeding birds will only be evident in the longer term, when new recruits replace existing breeding birds. Few studies have considered the possibility of displacement for short-lived passerines (such as larks), although Leddy et al (1999) found increased densities of breeding grassland passerines with increased distance from wind turbines, and higher densities in the reference area than within 80 m of the turbines, indicating that displacement did occur at least in this case. The consequences of displacement for breeding productivity and survival are crucial to whether or not there is likely to be a significant impact on population size. A recent comparative study of nine wind farms in Scotland (Pearce-Higgens et al 2009) found unequivocal evidence of displacement: Seven of the 12 species studied exhibited significantly lower frequencies of occurrence close to the turbines, after accounting for habitat variation, with equivocal evidence of turbine avoidance in a further two. No species were more likely to occur close to the turbines. Levels of turbine avoidance suggest breeding bird densities may be reduced within a 500-m buffer of the turbines by 15–53%, with Common Buzzard *Buteo buteo*, Hen Harrier *Circus cyaneus*, Golden Plover *Pluvialis apricaria*, Snipe *Gallinago gallinago*, Curlew *Numenius arquata* and Wheatear *Oenanthe oenanthe* most affected.

Studies show that the scale of disturbance caused by wind farms varies greatly. This variation is likely to depend on a wide range of factors including seasonal and diurnal patterns of use by birds, location with respect to important habitats, availability of alternative habitats and perhaps also turbine and wind farm specifications. Behavioural responses vary not only between different species, but between individuals of the same species, depending on such factors as stage of life cycle (wintering, moulting, breeding), flock size and degree of habituation. The possibility that wintering birds in particular might habituate to the presence of turbines has been raised (Langston & Pullin 2003), though it is acknowledged that there is little evidence and few studies of long enough duration to show this, and at least one study has found that habituation may not happen (Altamont Pass Avian Monitoring Team 2008). A systematic review of the effects of wind turbines on bird abundance has shown that increasing time since operation resulted in greater declines in bird abundance (Stewart et al. 2004 as cited by Drewitt & Langston 2006). This evidence that impacts are likely to persist or worsen with time suggests that habituation is unlikely, at least in some cases (Drewitt & Langston 2006, Altamont Pass Avian Monitoring Team 2008).
The effect of birds altering their migration flyways or local flight paths to avoid a wind farm is also a form of displacement. This effect is of concern because of the possibility of increased energy expenditure when birds have to fly further, as a result of avoiding a large array of turbines, and the potential disruption of linkages between distant feeding, roosting, moulting and breeding areas otherwise unaffected by the wind farm. The effect depends on species, type of bird movement, flight height, distance to turbines, the layout and operational status of turbines, time of day and wind force and direction, and can be highly variable, ranging from a slight ‘check’ in flight direction, height or speed, through to significant diversions which may reduce the numbers of birds using areas beyond the wind farm (Drewitt & Langston 2006).

A review of the literature suggests that none of the barrier effects identified so far have significant impacts on populations (Drewitt & Langston 2006). However, there are circumstances where the barrier effect might lead indirectly to population level impacts; for example where a wind farm effectively blocks a regularly used flight line between nesting and foraging areas, or where several wind farms interact cumulatively to create an extensive barrier which could lead to diversions of many tens of kilometres, thereby incurring increased energy costs.

There is a dearth of literature on the displacement effect of wind farm developments on key species assemblages in the study area, particularly cranes and bustards. As mentioned above, indications are that Great Bustard *Otis tarda* is displaced by wind farms within one kilometre of the facility (Langgemach 2008). If this happens with Denham’s Bustard (and Blue Cranes) in the current study area, it may have longer term habitat fragmentation impacts if the number of wind farms in the Overberg increases significantly. The **only reliable way of establishing whether the wind farm will lead to the displacement of priority species will be through the implementation of a monitoring programme, by comparing pre- and post construction densities of key species in the wind farm area.**

3.2.3 **Habitat change and loss**

The scale of permanent habitat loss resulting from the construction of a wind farm and associated infrastructure depends on the size of the project but, generally speaking, is likely to be small per turbine base. Typically, actual habitat loss amounts to 2–5% of the total development area (Fox *et al.* 2006 as cited by Drewitt & Langston 2006), though effects could be more widespread where developments interfere with hydrological patterns or flows on wetland or peatland sites (unpublished data). Some changes could also be beneficial. For example, habitat changes following the development of the Altamont Pass wind farm in California led to increased mammal prey availability for some species of raptor (for example through greater availability of burrows for Pocket Gophers *Thomomys bottae* around turbine bases), though this may also have increased collision risk (Thelander *et al.* 2003 as cited by Drewitt & Langston 2006).
3.3 Associated Infrastructure for the wind facility

3.3.1 Turbine lighting

The effects of night-time illumination has not been adequately tested, and the results of studies are contradictory (Gregory et al 2007).

Studies involving lighted objects or towers indicate that lights may attract birds, rather than disorient or repel them, resulting in collision mortality (Johnson et al 2007). This is mostly a problem for nocturnal migrants (primarily passerines) during poor visibility conditions. Different colour lights vary in their attractiveness to birds and their effect on orientation. Several studies have shown that intermittent lights have less of an effect on birds than constant lights, with reduced rates of mortality. In addition, some studies suggest that replacing white lights with red coloured lights may reduce mortality by up to 80%. This may be due to the change in light intensity rather than the change in wavelength (Johnson et al 2007). However, Ugoretz (2001) suggest that birds are more sensitive to red lights and may be attracted to them. Quickly flashing white strobe lights appear to be less attractive. The issue is however far from settled - a study at Buffalo Ridge, Minnesota, where most of the collision fatalities were classified as nocturnal migrants, found little difference between lighted and unlighted turbines (Johnson et al 2000).

The consensus among researchers is to avoid lighting the turbines if possible, but that is against civil aviation regulations (Civil Aviation Regulations 1997). Furthermore, the potential for collisions with the wind turbines due to presence of lights is not envisaged to be significant, primarily because the phenomenon of mass nocturnal passerine migrations is not a feature of the study area. Post – construction monitoring (carcass searches) will be required to assess the extent (if any) of nocturnal fatalities that may be linked to the lighting on the turbines.

3.3.2 Electricity distribution lines

A proposed 132kV power line that will link the wind facility to the grid could pose a collision risk, irrespective of which alignment is used (see Figure 1.1). In addition, the turbines will be linked to each other with reticulation cables.

Because of their size and prominence, electrical infrastructures constitute an important interface between wildlife and man. Negative interactions between wildlife and electricity structures take many forms, but two common problems in southern Africa are electrocution of birds (and other animals) and birds colliding with power lines (Ledger & Annegarn 1981; Ledger 1983; Ledger 1984; Hobbs & Ledger 1986a; Hobbs & Ledger 1986b; Ledger et.al. 1992; Verdoorn 1996; Kruger & Van Rooyen 1998; Van Rooyen 1998; Kruger 1999; Van Rooyen 1999; Van Rooyen 2000). Electrocutions are not envisaged to be a problem on the proposed electricity network. Collisions, on the other hand, could be a major potential problem.

Collisions kill far more birds annually in southern Africa than electrocutions (Van Rooyen 2007). Most heavily impacted upon are bustards, storks, cranes and various species of water birds. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes
it difficult for them to take the necessary evasive action to avoid colliding with power lines (van Rooyen 2004, Anderson 2001). Unfortunately, many of the collision sensitive species are considered threatened in southern Africa - of the 2369 avian mortalities on distribution lines recorded by the EWT since August 1996 and October 2007, 1512 (63.8%) were Red Data species (Van Rooyen 2007).

In the Overberg, power line collisions have long been recorded as a major source of avian mortality (Van Rooyen 2007). Most numerous amongst power line collision victims are Blue Crane and Ludwig’s Bustard (Shaw 2009). It has been estimated that as many as 10% of the Blue Crane population in the Overberg are killed annually on power lines, and the figure for Denham’s Bustard might be as high as 30% of the Overberg population (Shaw 2009). These figures are extremely concerning, as it represents a possible unsustainable source of unnatural mortality. The study area supports a very high density of Blue Cranes (Young 2008, 2009a, 2009b, 2010).

Unfortunately, the dynamics of the collision problem is poorly understood. In the most recent study on this problem in the Overberg, Shaw (2009) identified cultivated land and region as the significant factors influencing power line collision risk. Lines that cross cultivated land pose a higher risk, as expected, as this is the preferred habitat of Blue Cranes in the Overberg. Interestingly, she also found that collision rates in the Bredasdorp region are much higher than those around Caledon, which might be a function of the higher proportion of flocks, and a greater number of large flocks (50+ birds) in Bredasdorp, as opposed to Caledon in the winter. Collision rates are higher for birds in flocks, as they may panic, or lack visibility and room for manoeuvre because of the close proximity of other birds (APLIC, 1994). Other factors, such as proximity to dams, wind direction and proximity to roads and dwellings did not emerge as significant factors, but she readily admits that her broad-scale analysis may have been too crude to demonstrate their effects. It is for example a well known fact that cranes are particularly vulnerable to power lines skirting water bodies used as roosts, as they often arrive there or leave again in low light conditions (pers. obs.).

3.4 Provisional impact assessment for the wind facility

The impact assessment methodology for the avifaunal impacts that has been adopted for the Scoping phase of the project is detailed below (see Table 3.1). No assessment of impacts is provided for the No-Go alternative as that would preserve the status quo as it currently exists. For a description of the status quo, see Section 2: Description of the Affected Environment.

Table 3.1: Assessment criteria for rating the envisaged impacts of the wind farm and associated infrastructure on birds.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating Scales</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature</td>
<td>Positive</td>
<td>This is an evaluation of the type of effect the construction, operation and management of the proposed development would have on the affected environment.</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Neutral</td>
<td></td>
</tr>
<tr>
<td>Extent</td>
<td>Low</td>
<td>Site-specific, affects only the development footprint</td>
</tr>
<tr>
<td>Criteria</td>
<td>Rating Scales</td>
<td>Notes</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>---------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>Low</td>
<td>0-3 years</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>4-8 years (i.e. full duration of construction phase)</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>More than 9 years to permanent</td>
</tr>
<tr>
<td><strong>Intensity</strong></td>
<td>Low</td>
<td>Where the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>Where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>Where natural, cultural or social functions and processes are altered to the extent that the impact will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.</td>
</tr>
<tr>
<td><strong>Non-reversibility</strong></td>
<td>Low</td>
<td>Impacted natural, cultural or social functions and processes will return to their pre-impacted state within the short-term.</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>Impacted natural, cultural or social functions and processes will return to their pre-impacted state within the medium to long term.</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>Impacted natural, cultural or social functions and processes will never return to their pre-impacted state.</td>
</tr>
<tr>
<td><strong>Potential for impact on irreplaceable resources</strong></td>
<td>Low</td>
<td>No irreplaceable resources will be impacted.</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>Resources that will be impacted can be replaced, with effort.</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>There is no potential for replacing a particular vulnerable resource that will be impacted.</td>
</tr>
<tr>
<td><strong>Consequence</strong></td>
<td>Low</td>
<td>A combination of any of the following</td>
</tr>
<tr>
<td>(a combination of extent, duration, intensity and the potential for impact on irrereplaceable)</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Intensity, duration, extent and impact on irreplaceable resources are all rated low</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Intensity, duration and extent are rated low but impact on irreplaceable resources is rated medium to high</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Intensity is low and up to two of the other criteria are rated medium</td>
</tr>
</tbody>
</table>
An explanation of the above-mentioned impact criteria is provided below.

- **Nature**

This is an evaluation of the type of effect the construction, operation and management of the development would have on the affected environment. Would it be positive, negative or neutral?

- **Extent or scale**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating Scales</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>resources).</td>
<td>• Intensity is medium and all three other criteria are rated low</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>• Intensity is medium and one other criteria is rated high, with the remainder being rated low</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Intensity is low and at least two other criteria are rated medium or higher</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Intensity is rated medium and at least two of the other criteria are rated medium or higher</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Intensity is high and at least two other criteria are medium or higher</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Intensity is rated low, but irreplaceability and duration are rated high</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>• Intensity and impact on irreplaceable resources are rated high, with any combination of extent and duration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Intensity is rated high, with all of the other criteria being rated medium or higher</td>
<td></td>
</tr>
<tr>
<td>Probability (the likelihood of the impact occurring)</td>
<td>Low</td>
<td>It is highly unlikely or less than 50 % likely that an impact will occur.</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>It is between 50 and 70 % certain that the impact will occur.</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>It is more than 75 % certain that the impact will occur or it is definite that the impact will occur.</td>
</tr>
<tr>
<td>Significance (all impacts including potential cumulative impacts)</td>
<td>Low</td>
<td>• Low consequence and low probability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Low consequence and medium probability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Low consequence and high probability</td>
</tr>
<tr>
<td>Low to medium</td>
<td>• Low consequence and high probability</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Medium consequence and low probability</td>
</tr>
<tr>
<td>Medium</td>
<td>• Medium consequence and low probability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Medium consequence and medium probability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Medium consequence and high probability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• High consequence and low probability</td>
<td></td>
</tr>
<tr>
<td>Medium to high</td>
<td>• High consequence and medium probability</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>• High consequence and high probability</td>
<td></td>
</tr>
</tbody>
</table>
This refers to the spatial scale at which the impact will occur. Extent of the impact is described as: low (site-specific - affecting only the footprint of the development), medium (limited to the site and its immediate surroundings and closest towns) and high (regional and national).

- **Duration**

The lifespan of the impact is indicated as low (short-term: 0-5 years, typically impacts that are quickly reversible within the construction phase of the project), medium (medium-term, 6-10 years, reversible over time) and high (long-term, 10-60 years, and continue for the operational life span of the development).

- **Intensity or severity**

This is a relative evaluation within the context of all the activities and the other impacts within the framework of the project. Does the activity destroy the impacted environment, alter its functioning, or render it slightly altered?

- **Non-reversibility**

This considers the ability of the impacted environment to return to its pre-impacted state once the cause of the impact has been removed.

- **Impact on irreplaceable resources**

This refers to the potential for an environmental resource to be replaced, should it be impacted. A resource could possibly be replaced by natural processes (e.g. by natural colonisation from surrounding areas), through artificial means (e.g. by reseeding disturbed areas or replanting rescued species) or by providing a substitute resource, in certain cases. In natural systems, providing substitute resources is usually not possible, but in social systems substitutes are often possible (e.g. by constructing new social facilities for those that are lost). Should it not be possible to replace a resource, the resource is essentially irreplaceable e.g. Red Data species that are restricted to a particular site or habitat of very limited extent.

- **Consequence**

The consequence of the potential impacts is a summation of above criteria, namely the extent, duration, intensity and impact on irreplaceable resources.

- **Probability of occurrence**

The probability of the impact actually occurring, based on professional experience of the specialist with environments of a similar nature to the site and/or with similar projects. Probability is described as low (improbable), medium (distinct possibility), and high (most likely). It is important to distinguish between probability of the impact occurring and probability that the activity causing a potential impact will occur. Probability is defined as the probability of the impact occurring, not as the probability of the activities that may result in the impact. The fact that an activity will occur does not necessarily imply that an impact will occur. For instance, the fact that a road will be built does not necessarily imply that it will impact on a wetland. If the road is properly routed to avoid the wetland, the impact may not occur at all, or the probability of the impact will be low, even though it is certain that the activity will occur.
• **Significance**

Impact significance is defined to be a combination of the consequence (as described below) and probability of the impact occurring. The relationship between consequence and probability highlights that the risk (or impact significance) must be evaluated in terms of the **seriousness (consequence)** of the impact, weighted by the probability of the impact actually occurring. The following analogy provides an illustration of the relationship between consequence and probability. The use of a vehicle may result in an accident (an impact) with multiple fatalities, not only for the driver of the vehicle, but also for passengers and other road users. There are certain mitigation measures (e.g. the use of seatbelts, adhering to speed limits, airbags, anti-lock braking, etc.) that may reduce the consequence or probability or both. The probability of the impact is low enough that millions of vehicle users are prepared to accept the risk of driving a vehicle on a daily basis. Similarly, the consequence of an aircraft crashing is very high, but the risk is low enough that thousands of passengers happily accept this risk to travel by air on a daily basis.

In simple terms, if the consequence and probability of an impact is high, then the impact will have a high significance. The significance defines the level to which the impact will influence the proposed development and/or environment. It determines whether mitigation measures need to be identified and implemented and whether the impact is important for decision-making.

• **Degree of confidence in predictions**

Specialists are required to provide an indication of the degree of confidence (low, medium or high) that there is in the predictions made for each impact, based on the available information and their level of knowledge and expertise. Degree of confidence is not taken into account in the determination of consequence or probability.

**It important to stress that the impact assessment in this scoping report is a preliminary assessment. Potential impacts, and especially the extent and probability of potential impacts may only come to light once the results of the pre-construction monitoring become available.**
Table 3.2: Impact assessment table for the construction phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Nature</th>
<th>Extent</th>
<th>Duration</th>
<th>Intensity</th>
<th>Non-reversibility</th>
<th>Impact on irreplaceable resource</th>
<th>Consequence</th>
<th>Probability</th>
<th>Significance</th>
<th>Confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement due to disturbance during construction activities</td>
<td>Negative</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>With mitigation</td>
<td>Negative</td>
<td>Local</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
<td>Low</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>Impact</td>
<td>Nature</td>
<td>Extent</td>
<td>Duration</td>
<td>Intensity</td>
<td>Non-reversibility</td>
<td>Impact on irreplaceable resource</td>
<td>Consequence</td>
<td>Probability</td>
<td>Significance</td>
<td>Confidence</td>
</tr>
<tr>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>----------</td>
<td>-----------</td>
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<td>----------------------------------</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>Bird collisions, of priority species, with the wind turbines.</td>
<td>Negative</td>
<td>Medium</td>
<td>High</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>With mitigation</td>
<td>Negative</td>
<td>Medium</td>
<td>High</td>
<td>Low</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Impact</td>
<td>Nature</td>
<td>Extent</td>
<td>Duration</td>
<td>Intensity</td>
<td>Non-reversibility</td>
<td>Impact on irreplaceable resource</td>
<td>Consequence</td>
<td>Probability</td>
<td>Significance</td>
<td>Confidence</td>
</tr>
<tr>
<td>Bird collisions, of priority species, with the power lines.</td>
<td>Negative</td>
<td>Medium</td>
<td>High</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>With mitigation</td>
<td>Negative</td>
<td>Medium</td>
<td>High</td>
<td>Low</td>
<td>Medium</td>
<td>Low</td>
<td>Medium</td>
<td>Medium (for the 132kV line)</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Impact</td>
<td>Nature</td>
<td>Extent</td>
<td>Duration</td>
<td>Intensity</td>
<td>Non-reversibility</td>
<td>Impact on irreplaceable resource</td>
<td>Consequence</td>
<td>Probability</td>
<td>Significance</td>
<td>Confidence</td>
</tr>
<tr>
<td>Displacement due to disturbance because of movement and activity associated with the wind turbines.</td>
<td>Negative</td>
<td>Low</td>
<td>High</td>
<td>Medium – the cumulative impact of several wind farms may affect the capacity of the environmental resources within the geographic area to respond to change and withstand further stress</td>
<td>Medium</td>
<td>High (for certain species)</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>Low due to lack of South African precedents.</td>
</tr>
<tr>
<td>Impact</td>
<td>Nature</td>
<td>Extent</td>
<td>Duration</td>
<td>Intensity</td>
<td>Non-reversibility</td>
<td>Impact on irreplaceable resource</td>
<td>Consequence</td>
<td>Probability</td>
<td>Significance</td>
<td>Confidence</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------</td>
<td>----------</td>
<td>--------</td>
<td>----------</td>
<td>-----------</td>
<td>-------------------</td>
<td>----------------------------------</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>Habitat change and loss due to the footprint of the infrastructure</td>
<td>Negative</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
<td>Low</td>
<td>Medium/low due to lack of South African precedents.</td>
</tr>
<tr>
<td>With mitigation: Very little practical mitigation is possible</td>
<td>Negative</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
<td>Low</td>
<td>Medium/low due to lack of South African precedents.</td>
</tr>
</tbody>
</table>

Very little practical mitigation is possible

Negative Low High

Medium Medium Medium Medium

Low due to lack of South African precedents.
3.5 Potential Mitigation Measures

Despite the fact that wind power has been a feature of the energy industry in the developed world for more than a decade, best practices with regard to bird mitigation are still far from clear and universally accepted. In the USA, for example, best practices are sorely lacking (Smallwood 2008). Mitigation measures would be more effective if based on scientifically founded conclusions of factors affecting bird collisions with wind turbines. It is essential to perform scientifically rigorous pre- and post-construction monitoring of bird fatalities and flight behaviours in wind farms, as well as ecological investigations. These types of investigations have not been performed at most wind farms in the USA so the scientific basis for mitigation measures remains weak (Smallwood 2008). Avoidance and minimisation measures will be the most effective mitigation at wind farms, but these have yet to be implemented at USA wind farms. Adaptive management is often promised in environmental review documents, but in practice it seldom happens. Off-site compensation may be the only substantial means of mitigating impacts following wind farm development. A scientifically defensible nexus between project impacts and mitigation benefits still needs to be established for compensation ratios directed toward wind farms (Smallwood 2008).

It must be accepted that appropriate best practices and mitigation measures with regard to impacts on birds in a South African context will take a number of years to crystallise, and a measure of trial and error will inevitably be part of the process.

3.6 50 MW Wind facility

Mitigation measures fall into two broad categories: best-practice measures which could be adopted by any wind farm development and should be adopted as an industry standard, and additional measures which are aimed at reducing an impact specific to a particular development (Drewitt & Langston 2006).

3.6.1 Generic best practice measures

Examples of generic best practice measures are listed below (Drewitt & Langston 2006). Some of these measures may have significant economic implications, and will need to be discussed on a per project basis with the developer:

- Ensuring that key areas of conservation importance and sensitivity are avoided;
- Implementing appropriate working practices to protect sensitive habitats;
- Providing adequate briefing for site personnel and, in particularly sensitive locations, employing an on-site ecologist during construction;
- Implementing an agreed post-development monitoring programme;
- Siting turbines close together to minimise the development footprint (subject to technical constraints such as the need for greater separation between larger turbines);
- Grouping turbines to avoid alignment perpendicular to main flight paths and to provide corridors between clusters, aligned with main flight trajectories, within large wind farms;
Where possible, installing transmission cables underground (subject to habitat sensitivities and in accordance with existing best practice guidelines for underground cable installation);

- Marking overhead cables using Bird Flight Diverters and avoiding use over areas of high bird concentrations, especially for species vulnerable to collision;
- Timing construction to avoid sensitive periods e.g. during the breeding season if there is the chance of disturbing a priority species;
- Increasing the visibility of rotor blades. Research indicates that high contrast patterns might help reduce collision risk, although this may not always be acceptable on landscape grounds. Another suggested, but untested possibility is to paint blades with UV paint, which may enhance their visibility to birds. However, the painting of the blades will have to conform to South African aviation regulations (Civil Aviation Regulations 1997).
- Relocation of proposed or actual turbines responsible for particular collision mortality.
- Halting operation during peak flight periods, or reducing rotor speed, to reduce the risk of collision mortality.
- Post-construction monitoring in order to test the effectiveness of mitigation measures.
- Timing construction to avoid sensitive periods.
- Implementing habitat enhancement for species using the site.

3.6.2 Site specific mitigation measures or the Langhoogte Wind Facility

The following site-specific mitigation measures are proposed for the turbines at the proposed Langhoogte Wind Facility, subject to further investigations and actual monitoring of bird movement and densities:

- Ensuring that key areas of conservation importance and sensitivity are avoided: See Figure 3.1 for a map of the area, indicating preliminary sensitive areas from a priority species perspective.
- Implementing appropriate working practices to protect sensitive habitats: Habitat destruction should be limited to what is absolutely necessary for the construction of the infrastructure, including the construction of new roads. In this respect, the recommendations from the Ecological Specialist Study should be applied strictly.
- Providing adequate briefing for site personnel and in particularly sensitive locations. Personnel should be adequately briefed on the need to restrict habitat destruction, and must be restricted to the actual building sites.
- Sensitive sections of the proposed power line need to be identified and marked with Bird Flight Diverters (BFDs) to lower the risk of collisions with the power line.
- Implementing a pre-construction monitoring programme to establish a baseline to measure potential collision and displacement impacts on priority species. The monitoring programme should be designed and implemented under the guidance of a suitably qualified and experienced ornithological consultant, starting at least one year prior to the construction of the infrastructure. Once the turbines have been constructed, post-construction monitoring should be implemented to assess actual collision rates. If actual collision rates indicate high mortality levels, the following mitigation measures will have to be considered:
  - Negotiating appropriate off-set compensation for turbine related collision mortality;
  - As a last resort, halting operation of specific turbines during peak flight periods, or reducing rotor speed, to reduce the risk of collision mortality.
Figure 3.1: Preliminary identification of bird sensitive habitat in the Langhoogte study area, subject to further investigation.
3.7 Associated infrastructure

3.7.1 Turbine lighting

- It is recommended that red intermittent lights are used for the lighting of the turbines.
- Any perimeter lighting should use motion sensitive sensors to prevent insects being attracted to the lights, which in turn will attract nocturnal species e.g. Spotted Eagle Owl.

3.8 Electricity transmission lines

The following mitigation measures are proposed as far as the electricity transmission line are concerned:

- Electricity cables between turbines should be placed underground.
- The 132kV transmission line should be marked with Bird Flight Diverters on the earthwire in areas where there is a high risk of collision can be expected. There are many studies that prove that marking a line with PVC spiral type Bird Flight Diverters (BFD’s) can reduce the mortality rates by at least 60% (Alonso & Alonso 1999; Koops & De Jong 1982). Beaulaurier (1981) summarised the results of 17 studies that involved the marking of earth wires and found an average reduction in mortality of 45%. Koops and De Jong (1982) found that the spacing of the spirals were critical in reducing the mortality rates - mortality rates are reduced up to 86% with a spacing of 5 metres, whereas using the same devices at 10 metre intervals only reduces the mortality by 57%.
4 TERMS OF REFERENCE FOR THE IMPACT ASSESSMENT PHASE

The approach to the EIA Phase is centred on a pre-construction monitoring programme with the aim of providing the necessary information on bird occurrence and flight patterns to inform the final layout of the turbines.

4.1 Objectives of the monitoring programme

The objectives of the monitoring programme are to gather baseline data over a period of 12 months on the following aspects pertaining to avifauna:

- The abundance and diversity of birds at the wind farm site and a suitable control site (to be determined).
- Flight patterns of priority species at the wind farm site.

The required 12 month period of monitoring will not have been completed by the time that the EIA report is submitted. It is therefore envisaged that the results of the monitoring that has been completed by the time that the EIA report is due, will be used, subject to the monitoring being completed in due course.

4.1.1 Proposed monitoring protocols

The methodology for gathering of data, including the manner and frequency of sampling, is guided by the “Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa” Version (Jenkins et al 2011), which is the current protocol endorsed by the Endangered Wildlife Trust (EWT) and Birdlife South Africa (BLSA) (See Appendix A). The methodology will be discussed on an ongoing basis with relevant NGO stakeholders as the project progresses, specifically the EWT and BirdLife SA, at the regular meetings of the Birds and Wind Energy Specialist Group (BAWESG). The priority species will be identified through the use of the following data sources:

- The latest version of the BLSA list of priority species for wind farms (Birdlife SA 2012).
- Existing avifaunal data sources, e.g. the South African Bird Atlas 2 (SABAP2) and the Co-ordinated Avifaunal Road Count (CAR).
- The results of monitoring at several wind farm sites in the Overberg Bay area which commenced in 2011 and is currently ongoing (use of this data would have to be discussed with the relevant developers).

4.1.2 Deliverables

A report will be produced at the end of the pre-construction programme which will contain an analysis of the results of the pre-construction monitoring. These outcomes will inform the bird impact specialist study for the EIA process, in that it will assist in the evaluation of the potential impacts as well as the formulation of appropriate mitigation measures.

4.1.3 Other infrastructure

The proposed 132kV power line alignments will be assessed in terms of potential collision risks to priority species, taking into account factors such as proximity to wetlands and dams,
feeding congregations, other power lines, roads, towns, topography and preferred habitat. Both alternatives will be evaluated to establish a preferred alternative. Sections requiring mitigation with Bird Flight Diverters will be delineated.
5 CONCLUSIONS

The investigation of potential impacts on birds caused by wind farms is a new field of study in South Africa, and has only been the focus of much attention since the middle of 2010. The concept of wind energy suddenly and rapidly gained momentum in South Africa in the latter part of 2010, resulting in a plethora of proposed wind farm applications which caught the ornithological community completely by surprise. The pace of proposed new developments is such that both developers and specialist ornithological consultants struggled (and are still struggling) to come to grips with the enormity of the task ahead, namely to ensure that scientifically robust studies are implemented at all proposed development sites to assess the potential impact on avifauna. As the results of pre-and post-construction monitoring programmes which currently are being implemented become available, those results will be applied to future developments in order to predict with increasing confidence what the likely impact of a particular wind farm development will be on avifauna. At present it has to be acknowledged that there is much to be learnt and this situation is likely to continue for some time. The monitoring at the proposed wind facility site has not yet commenced, therefore all conclusions in this scoping report should be viewed as preliminary and subject to change as the results of the recommended site specific monitoring becomes available.

Of the 22 priority species that could potentially occur at the Langhoogte Wind Farm site, 4 (18%) are associated with aquatic habitats to some extent. Dams and wetlands therefore constitute high risk habitat as far as potential collisions are concerned. Soaring species, which constitute 17 (77%) out of the 22 priority species, is also a group of species that could be potentially vulnerable to collisions. The biggest collision risk for soaring species would be where turbines are situated against slopes perpendicular to dominant wind directions. Several of the priority species identified as potentially occurring at the sites fall in this category, especially raptors, but also storks and occasionally Blue Cranes. These species could use wind currents on slopes for lift. It is important to note that all the agricultural lands in the study area may be used for foraging purposes by Blue Cranes and Denham’s Bustards. Short flights between foraging areas or roost sites will happen continuously, and specific flight paths cannot be predicted without on site surveys. There is a dearth of literature on the displacement effect of wind farm developments on key species assemblages in the study area, particularly cranes and bustards. Indications are that Great Bustard *Otis tarda* is displaced by wind farms within one kilometre of the facility (Langgemach 2008). If this happens with Denham’s Bustard (and Blue Cranes) in the current study area, it may have longer term habitat fragmentation impacts if the number of wind farms in the Overberg increases significantly. **Ultimately, the only reliable way of establishing whether the wind farm will pose a collision risk and/or lead to the displacement of priority species will be through the implementation of a monitoring programme, by comparing pre- and post construction densities of key species in the wind farm area.**

The scale of direct habitat loss resulting from the construction of a wind farm and associated infrastructure depends on the size of the project but, generally speaking, is likely to be small per turbine base. This is therefore not regarded as a major impact from an avifaunal perspective, relative to other impacts.

The proposed 132kV power line that will link the wind facility to the grid could pose a collision risk, irrespective of which alignments is used. The proposed alignments will have to be investigated and sensitive sections will have to be marked with Bird Flight Diverters (BFDs).
REFERENCES


http://www.unep-aewa.org

http://www.cbd.int/doc/lega
APPENDIX A: BIRD HABITAT

Figure 1: Fynbos on the slopes in western part of the study area

Figure 2: Alien trees with steep fynbos covered slopes in the west of the study area
Figure 3: Drainage line in the western part of the study area

Figure 4: Steep fynbos covered slopes in the western part of the study area
Figure 5: Typical scene in the study area: A mosaic of indigenous fynbos, pastures and cereal crops

Figure 6: Steep kloof with indigenous fynbos in the south of the study area
Figure 7: Pastures in the central part of the study area

Figure 8: A typical scene with cereal crops and a farm dam
Figure 9: A clump of eucalyptus

Figure 10: A flock of Blue Cranes at a feedlot