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AVIFAUNAL SITE WALK DOWN REPORT

PROPOSED JUNO-GROMIS 400KV POWER LINE PROJECT, WESTERN AND NORTHERN CAPE PROVINCES.

MAY 2016

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Declaration

I, **Paige Potter,** declare that -

- I act as the independent specialist in this application;
- I do not have and will not have any vested interest (either business, financial, personal or other) in the undertaking of the proposed activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I will comply with the National Environmental Act (NEMA), regulations and all other applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority; all the particulars furnished by me in this form are true and correct.

Signature of the specialist:

Date: 25/04/2016

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Declaration

I, **Craig Widdows,** declare that -

- I act as the independent specialist in this application;
- I do not have and will not have any vested interest (either business, financial, personal or other) in the undertaking of the proposed activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
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Signature of the specialist:

Date: 25/04/2016

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Reviewed by:

Declaration

I, **Robyn Phillips,** declare that -

- I act as the independent specialist in this application;
- I do not have and will not have any vested interest (either business, financial, personal or other) in the undertaking of the proposed activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I will comply with the National Environmental Act (NEMA), regulations and all other applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- As a registered member of the South African Council for natural Scientific Professions, undertake my profession in accordance with the Code of Conduct of the Council, as well as any other societies to which I am a member;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority; all the particulars furnished by me in this form are true and correct.

Signature of the specialist:

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Executive Summary

Afzelia Environmental Consultants (Pty) Ltd were appointed by Nsovo Environmental Consulting (Pty) Ltd to undertake an avifaunal site walk over for the proposed construction of the Juno-Gromis 400kV transmission power line project, traversing through portions of the Western and Northern Cape provinces. The power line will traverse in a southerly direction, exiting the Gromis Substation, near Kleinsee, and will enter the Juno Substation just outside Vredendal. It will be approximately 230km long. The proposed project forms part of Eskom's capacity installation programme and is implemented to provide additional electricity capacity for future growth in the Greater Cape region.

A total of 188 bird species are predicted to occur within the fourteen quarter degree grid squares through which the proposed power line will traverse (South African Bird Atlas Project 2), five of which are currently considered "Endangered", four are currently considered "Vulnerable" and six are currently considered "Near Threatened" (Taylor *et al*. 2015). Avian species likely to be impacted by the proposed power line development include locally resident or transient raptors (Martial Eagle) and large terrestrial birds (Secretarybird, Blue Crane, Ludwig's Bustard and Kori Bustard). During the site visit, 54 bird species were recorded within the proposed study site including the Near Threatened Blue Crane (*Anthropoides paradiseus*), the Endangered Ludwig's Bustard (*Neotis ludwigii*) and Vulnerable Martial Eagle (*Polemaetus bellicosus*). The avian species composition was dominated by small passerine species such as Karoo Long-billed Lark (*Certhilauda subcoronata*), Rufous-eared Warbler (*Malcorus pectoralis*), Karoo Scrub Robin (*Cercotrichas coryphoeus*), Long-billed pipit (*Anthus similis*) and Karoo Prinia (*Prinia maculosa*).

Avifaunal activity within arid areas, in which the power line corridor is located, is driven by rainfall events as this influences the growth of vegetation, presence of prey items and most notably the presence of water. As a result, avian populations tend to follow these rainfall events. This makes it very difficult to predict the abundance of avian species within this biome without extensive sampling over a number of seasons.

The major impacts associated with the proposed 400kV power line project include:

- Destruction and alteration of avian habitats;
- Disturbance and displacement of birds; and
- Collision with overhead power lines.

Due to the design of the proposed tower structures electrocution is considered unlikely and thus not considered a significant impact to avian species.

Collision by birds with the earth wire is the main impact associated with the project. In order to mitigate this impact, it is imperative that earth wires crossing important avian habitats (agricultural lands, rivers, drainage lines and avian flyways) are fitted with anti-collision marking devices to increase the visibility of the power line and reduce likelihood of collisions. These must be Eskom and EWT approved anti-collision devices that are durable as the area is prone to strong winds.

It is strongly recommended that Best Practices be implemented and all power lines that run parallel to the proposed Juno-Gromis power line be fitted with bird anti-collision devices at the same time as the construction of the Juno-Gromis power line, in order to mitigate cumulative impacts of power lines.

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1. INTRODUCTION

1.1 BACKGROUND AND LOCALITY OF THE ASSESSMENT

Afzelia Environmental Consultants (Pty) Ltd were appointed by Nsovo Environmental Consulting (Pty) Ltd to undertake an avifaunal site walk over for the proposed construction of the Juno-Gromis 400kV transmission power line project, traversing through portions of the Western and Northern Cape provinces **(Figure 1**). The power line will traverse in a southerly direction, exiting the Gromis Substation, near Kleinsee, and will enter the Juno Substation just outside Vredendal, for approximately 230km.

An avifaunal impact assessment was conducted in November 2006 by the Endangered Wildlife Trust (EWT) in accordance with the Environmental Impact Assessment (EIA). One of the conditions of the Environmental Authorisation (obtained in 2006) is that a pre-construction avifaunal walk-through study be undertaken. Further to this, the environmental authorisation specified, "*Sections of the power line crossing or traversing areas adjacent to dams, open water courses, the Orange River, as well as drainage lines and other bird sensitive areas as determined by the Endangered Wildlife Trust, must be fitted with bird flappers on the earth wires"*

The proposed project will form part of Eskom's capacity installation programme and is implemented to provide additional electricity capacity for future growth in the Greater Cape region.

Overhead power line infrastructure is known to impact various avian species negatively through direct mortality (collision or electrocution) of birds and indirectly through the removal of natural habitats and disturbance.

1.2 SCOPE OF WORK

- Field visit and power line corridor walk-down to identify important avian habitats associated with the proposed project as well as avian micro-habitats and species that will potentially use these niches;
- Description of the avifaunal assemblages currently occurring along the power line corridor and the identification of Red Data species potentially affected by the proposed overhead power lines;
- Integration of the site data collected from avian atlases and counts within the area to develop a comprehensive avifaunal database of species likely to be present within the development footprint;
- Identification of sensitive avifaunal habitats through which the power line corridor will cross; and
- To integrate the mitigation measures specified by the Endangered Wildlife Trust (EWT) in the original avifaunal impact assessment conducted in November 2006 in order to avert or lower the significance of the negative impacts on avifauna.

1.3 SOURCES OF INFORMATION

The avifaunal walk down study made use of the following data sources:

- The original avifaunal impact assessment conducted by EWT in November 2006;
- Bird distribution data of the Southern African Bird Atlas Project (SABAP2) obtained from the Animal Demography Unit of the University of Cape Town, in order to ascertain species occurrence within the study area (Harrison *et al*. 1997);
- The conservation and endemic status of all bird species occurring within the quarter degree squares determined with the use of The Eskom Red Data book of birds of South Africa, Lesotho and Swaziland (Taylor *et al*. 2015) and BirdLife SA checklist of endemics and near-endemics;
- The Important Bird Areas (IBA) programme according to BirdLife South Africa was consulted;
- Coordinated Waterbird Count (CWAC) data was consulted and analysed;
- A classification of the vegetation types in the study area was obtained from Mucina and Rutherford (2012; and
- Information on the avian micro-habitat level was obtained during two site visits, conducted on the 29th Feb – 16th March 2016 and again on the 11th – 15th April, through a combination of avian and ecological experience. The first survey was conducted on foot and the second survey via helicopter.

1.4 ASSUMPTIONS AND LIMITATIONS

It is difficult to apply pure scientific methods within a natural environment without limitations, consequently assumptions need to be made. The following constraints may have affected this assessment:

- Avifaunal activity within arid areas, in which the power line corridor is located, is driven by rainfall events as the influences the growth of vegetation, presence of prey items and of water. As a result, avian populations tend to follow these rainfall events. This makes it very difficult to predict the abundance of avian species within this biome without extensive sampling over a number of seasons.
- Avian behaviour is relatively unpredictable and cannot be reduced to formulas that will hold a true reflection under all circumstances. However, power line impacts can be predicted with a fair amount of certainty due to the vast amount of data available in this regard.
- It is important to note that, although the predicted impacts are mostly concerned with Red Data species, the non-Red Data species will also benefit from the proposed mitigation measures as they share the same habitat and face the same potential impacts.

2. STUDY APPROACH

The methodology used to predict avifaunal impacts of the proposed project was as follows:

- The various data sets discussed above under “sources of information” were collated and examined with the aim of determining the focal species for this study.
- The data was examined to determine the location and abundance of species which may be susceptible to impacts from the proposed project including both Red Data and non-Red Data species.
- A desk top examination of the site, using Google Earth imagery was done to identify avian micro-habitats and sensitive habitats for avifaunal communities. This was confirmed during the site visit.
- The broader study area was visited during a 17-day (29th Feb – 16th March) site visit and power line corridor walk-down. The corridor was traversed thoroughly to obtain a first-hand perspective of the avian abundance and species diversity, and to identify sensitive bird micro-habitats present along the corridor, which will require the implementation of mitigation measures. This involved driving around in the broader study area, taking photographs, and walking the route. Due to the limited access roads within the area, sections of the power line route were re-visited using a helicopter in April 2016. During the walk-over special attention was placed on sensitive avifaunal habitats including rivers, wetlands systems, drainage lines and important flight paths.
- The impacts of the proposed project on the avifaunal populations were predicted by reviewing the literature and analysing previous data on wildlife impacts with power lines throughout southern Africa.

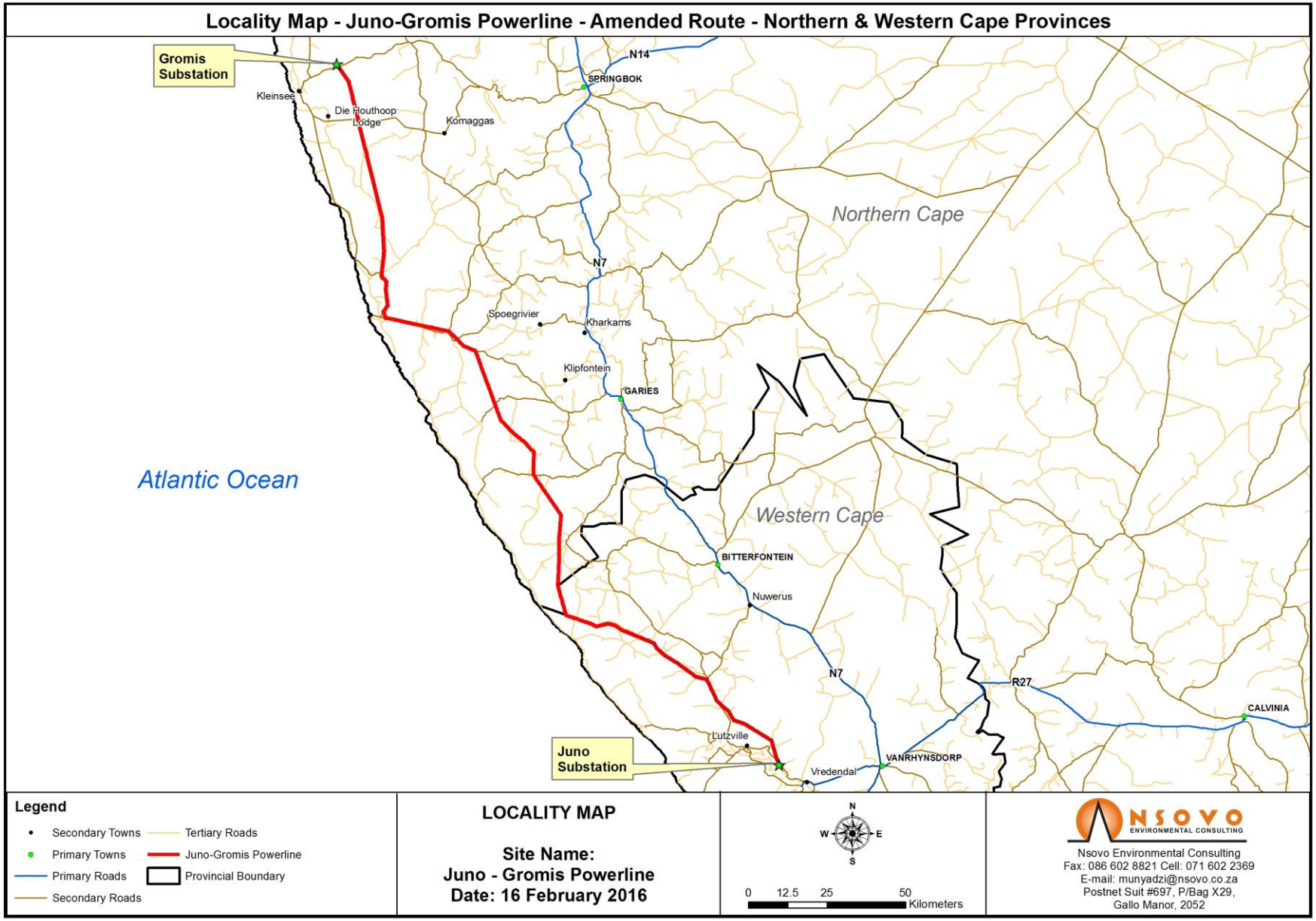


Figure 1: Locality of study area for the proposed power line infrastructure.

3. DESCRIPTION OF GREATER STUDY AREA

3.1 GENERAL INFORMATION

The West Coast of South Africa is characterised by a low winter rainfall pattern with extreme summer aridity. The mean annual precipitation ranges between 20 mm and 290 mm per year. The area receives the lowest rainfall in February (0 mm) and the highest in June (49 mm). The average daily maximum temperatures range from 16.4°C in July to 30.1°C in February. The region is the coldest in June with minimum temperatures of 8.0°C (Mucina and Rutherford 2006). The power line corridor traverses through the Succulent Karoo and Fynbos biomes (**Figure 3**). The vegetation is dominated by succulent shrubs including Mesembryanthemaceae and Crassulaceae with very few large trees present. Less than 0.5% of the Succulent Karoo Biome has been formally conserved (Mucina and Rutherford, 2012).

According to the national vegetation map (Mucina and Rutherford 2012 ten vegetation types occur along the power line corridor (**Figure 4**). Namaqualand Strandveld is the dominant vegetation type located along the corridor while the Namaqualand Sand Fynbos occupies the large portions of area within the southern section of the corridor.

The Namaqualand Strandveld consists of high diversity of low shrublands (*Eriocephalus* and *Lebeckia sp.*) with an open succulent layer forming in the undergrowth. Namaqualand Sand Fynbos vegetation type consists of both isolated streets and dune fields of Aeolian sand. This vegetation is dominated by Restioid and Asteraceous fynbos with localised pockets of Proteoid fynbos. Both vegetation types are considered Least Threatened with at least 10% and 2% transformed mostly by cultivation and mining for heavy metals respectively (Mucina and Rutherford, 2012).

Several outcrops of Namaqualand Inland Duneveld are located along the central section of the corridor and Namaqua Heuweltjieveld vegetation traverses the eastern boundary. Both vegetation types are considered Least Threatened with various areas transformed by cultivation and intensive grazing land respectively (Mucina and Rutherford, 2012).

Along the power line corridor these different vegetation types are structurally very similar and all consist of low shrubland and fynbos with varying amounts of grass, succulents, forbs and geophytes depending on the aspect and landscape position (**Photograph 1**).

A series of power lines exit the Juno substation traverse throughout the landscape in northerly and easterly directions. There is also other existing power line infrastructure throughout the study site. The study area has also been transformed by agricultural development and industrial development (Tronox Mine – Namakwa Sands). Large ornamental trees located around farmsteads contrast with the karroid shrubland vegetation occupying the surrounding areas.

The main topographical character of the proposed study area consists of flat undulating plains and ridgelines that are characteristic of the West Coast Succulent Karoo. The main water courses located along the corridor include

the Hol River, Groen River, Spoeg River and Swartlintjies River. These rivers drain northwards to the east of the proposed power line.

In examining the region as a whole in terms of avifauna, it is important to relate the avifauna to the biomes and vegetation types present in the area. Harrison *et al.* (1997) in "The Atlas of Southern African Birds" provide a description of the various vegetation types represented in the region and the associated bird species. Vegetation structure is more important in determining avian species abundance and distribution than vegetation species composition (Harrison *et al*., 1997). Therefore, the vegetation description within this report does not focus on lists of plant species, but rather on vegetation structural units such as woodlands, riverine habitats or pans and wetlands.

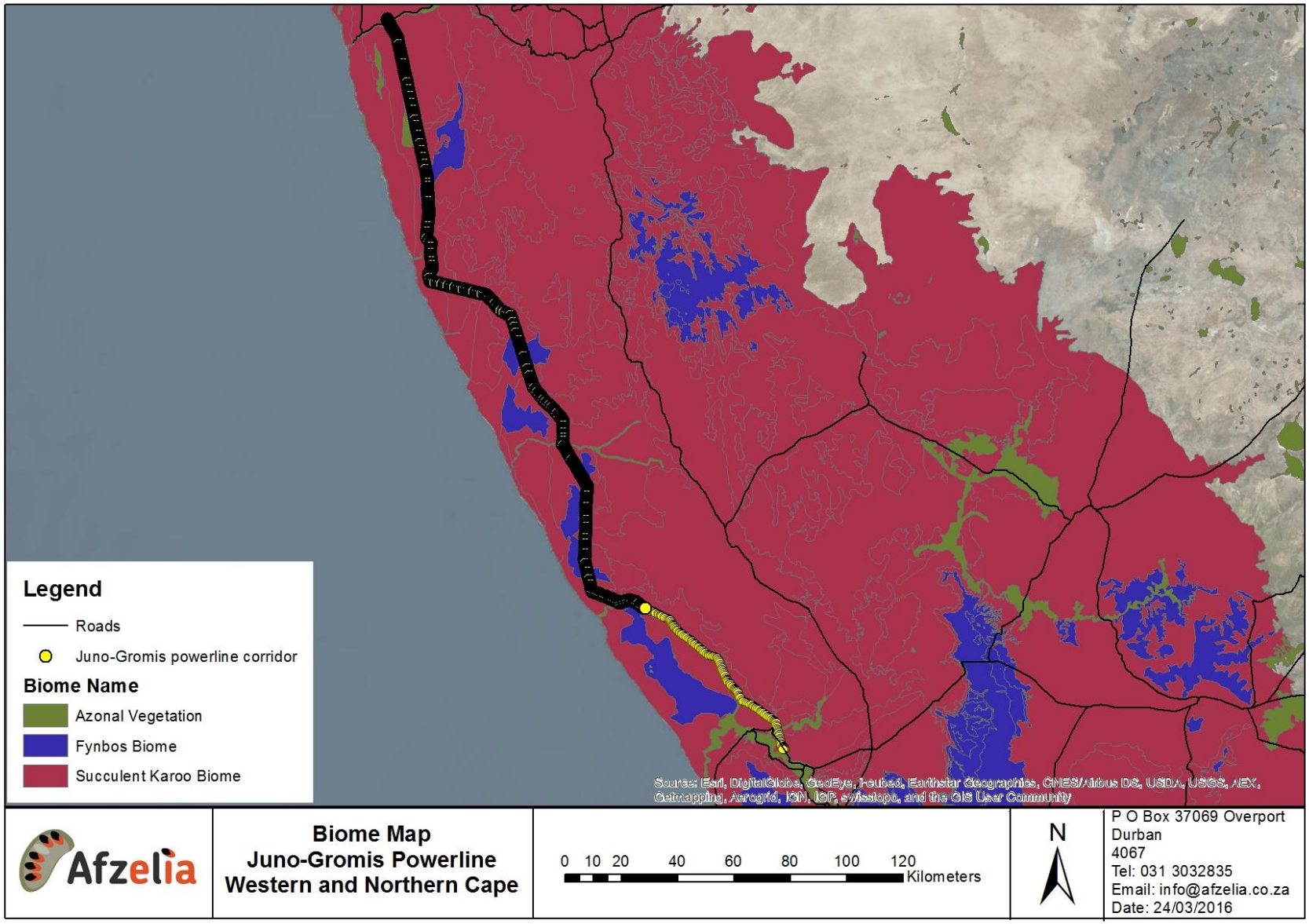


Figure 2. Biomes located within the proposed study area and surrounds.

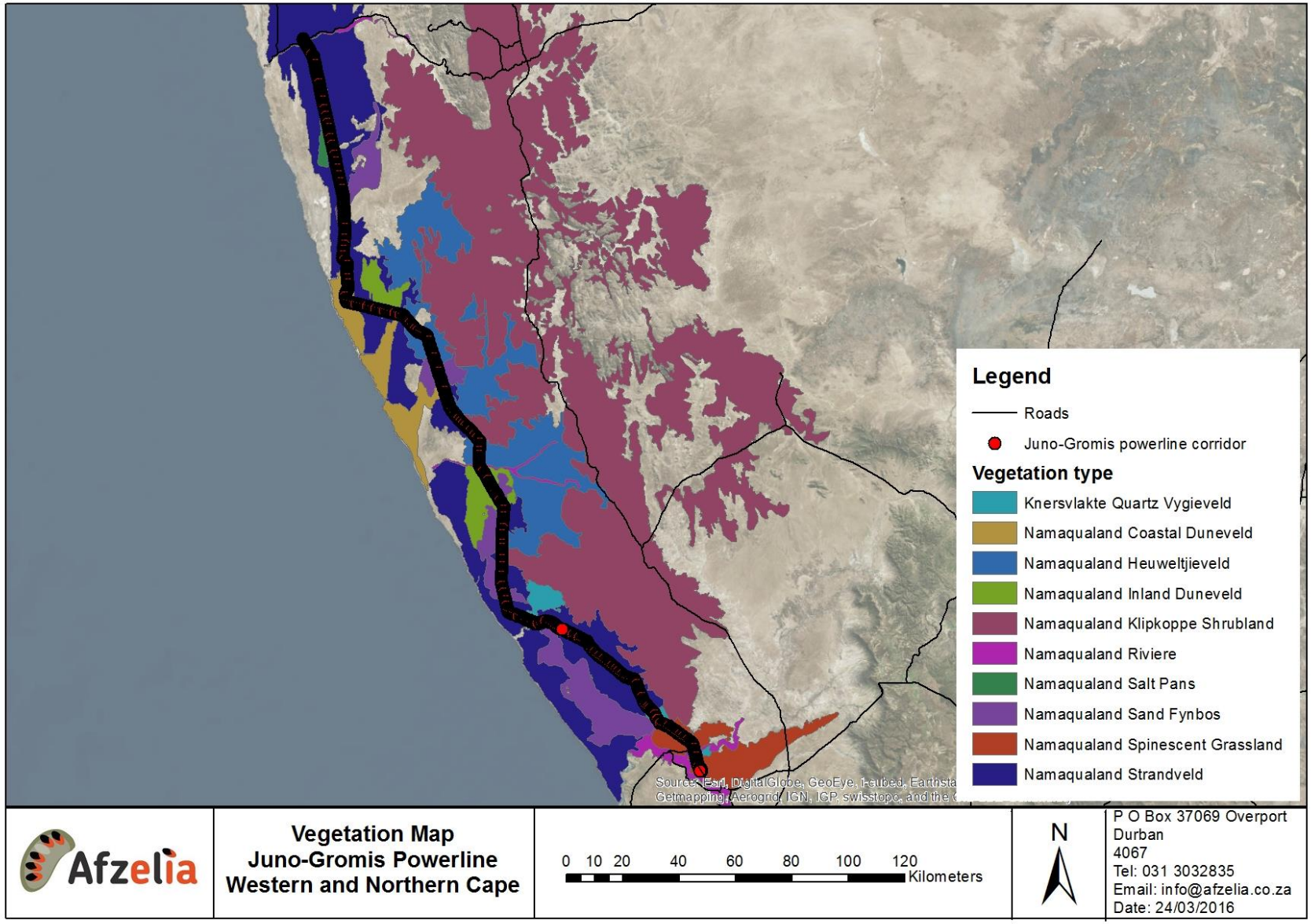


Figure 3. Vegetation types located within the proposed study area and surrounds.

Photograph 1. Overview of vegetation types and habitat structure located within the proposed study area and surrounds.

3.2 AVIAN MICRO-HABITATS

Most of the abundance and distribution of avian species within the study area could be attributed to the vegetation types and bioregions. In determining the suitability of the study area for avian species, it is necessary to look at the habitats available to determine where the relevant species will most likely occur. These "micro habitats" do not always correspond to vegetation types and are determined by a combination of vegetation type, topography, land use, food sources and other various intrinsic factors.

Investigation of the study area revealed the following important avian micro-habitats in addition to the habitats identified by EWT (2006). In each case, some of the species likely to make use of the various micro-habitats have been described.

Succulent Karoo Shrublands

Karoo shrublands are the dominant land cover along the power line corridor and is the most common micro-habitat within the study site (**Figure 4**). This micro-habitat is characterised by sparsely vegetated rocky to sandy soils with patches of grasslands dominated by *Stipagrostis* species. The avifauna associated with this open micro-habitat is dominated by ground-dwelling species with many species displaying nomadic life histories. This allows these species to utilise this micro-habitat periodically when resources such as water and food are available, particularly after rainfall events. Relevant bird species that will be attracted to these areas include most importantly Ludwig's Bustard (*Neotis ludwigi*), on occasions Kori Bustard (*Ardeotis kori*) and Southern Black Korhaan (*Afrotis afra*). The Karoo-like vegetation supports a high diversity of endemic avian species most notable the Lark family *Alaudidae.*

The impacts associated with the development within this micro-habitat are displacement due to habitat loss and disturbance, as well as collision with the power line (Ludwig's Bustard, Kori Bustard and Southern Black Korhaan).

Photograph 2. The Karoo shrubland habitat present along the power line corridor.

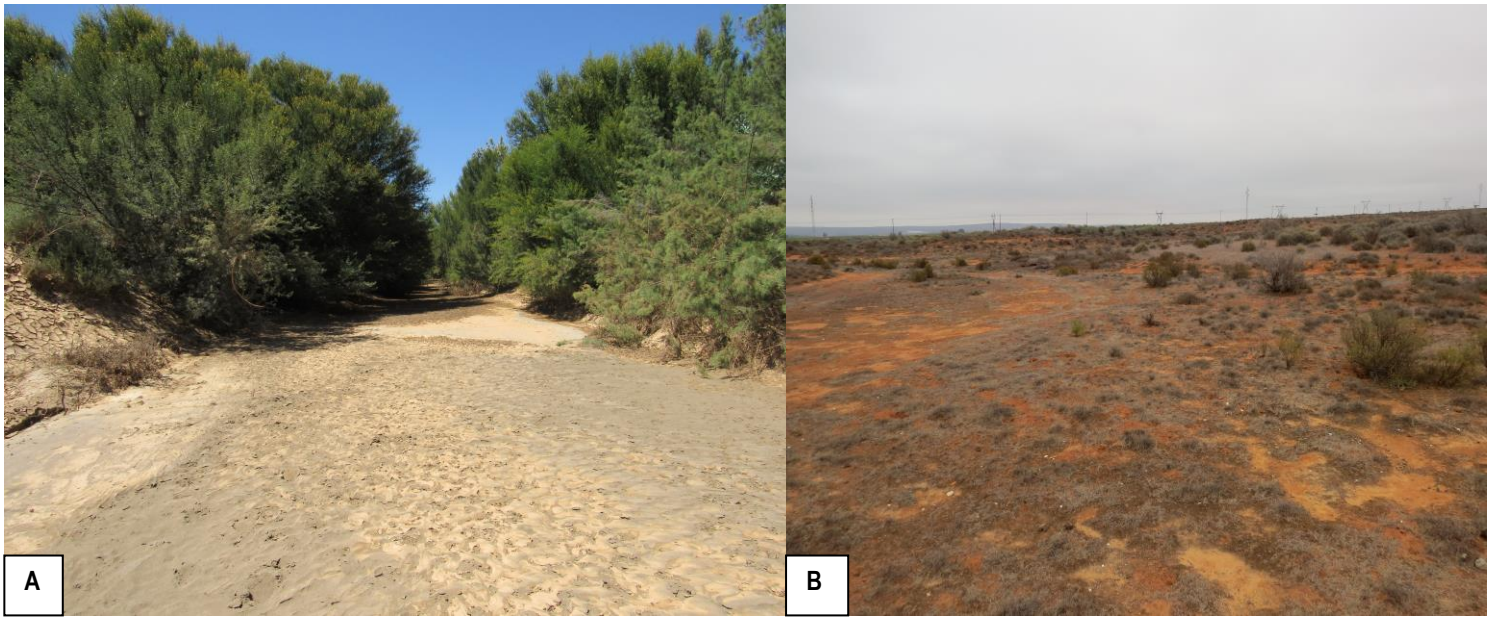
Photograph 3. Southern Black Korhaan (Vulnerable) recorded within the Karoo shrubland micro-habitat.

Rivers, wetland systems and drainage lines

Due to the aridity of the project area, very few rivers and wetland systems are present and as a result, those that are present attract avian species. Furthermore, vegetation structure surrounding these systems (large stands of *Acacia* and other trees species) differs from the karroid shrublands that dominate the area and in turn influences avian species distribution.

These factors provide suitable breeding and foraging opportunities and attract various waterbirds. The occasional presence of water in the pans in this study area could be used by White Storks (*Ciconia ciconia*), Yellow-billed Duck (*Anas undulata*), Blacksmith Lapwing (*Vanellus armatus*) and a number of resident and migratory wader species. Furthermore, these water sources are often used by large flocks of granivorous bird species such as Cape Sparrow (*Passer melanurus*), Cape Weaver (*Ploceus capensis*) and Canary Species (*Crithagra* spp).

The Hol River, Groen River, Spoeg River and Swartlintjies River are all watercourses through which the proposed power line crosses.



Photograph 4. A river over which the proposed power line will cross (A) and an ephemeral pan in close proximity to the proposed power line (B).

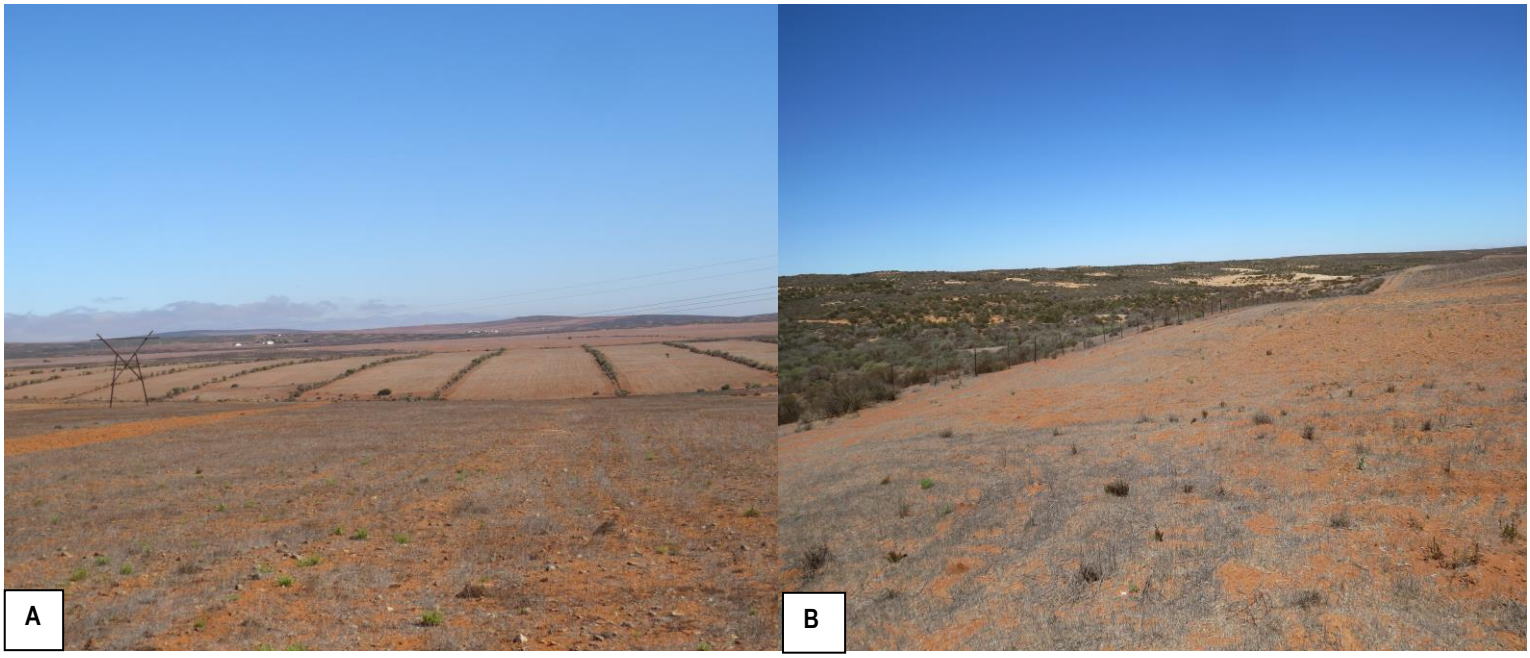
Farmland or cultivated landscape

Agricultural lands are found within the study area and are a common micro-habitat in the landscape (**Photograph 4**). Relevant bird species that will be attracted to these areas include Western Cattle Egret (*Bubulcus ibis*), Hammerkop (*Scopus umbretta*), Black-headed Heron (*Ardea melanocephala),* African Sacred Ibis *(Threskiornis aethiopicus*), Blue Crane (*Anthropoides paradiseus*) and small granivorus species (such as Southern Red Bishop). In particular, the White Stork and Blue Cranes have a high affinity for arable land, with 80% of sightings in South Africa recorded within this habitat (Dean and Ryan, 2005).

Farmland or cultivated land provides foraging opportunities for many bird species for the following reasons:

- Through the process of land preparation many insects, seeds, bulbs and other food sources become readily accessible to bird species;
- The agricultural plants that are cultivated are often consumed by birds, or attract insects which are in turn consumed by birds; and
- The use of agricultural lands as foraging sites is likely to fluctuate throughout the year. It is predicted that greater concentrations of birds will increase during spring when the fields are ploughed, and in late summer / autumn when the crops are harvested and the birds are attracted to feed on the residual grains.

However, these benefits do not apply to all species and active agricultural lands are not a preferred environment for certain avian species due to the lack of vegetation cover and the regular disturbance experienced during the harvesting period.

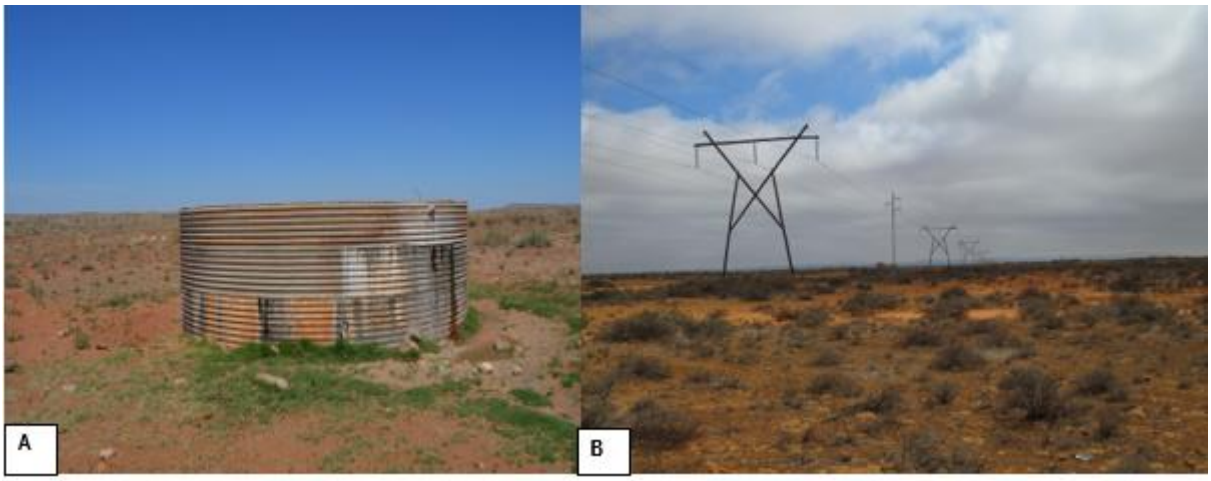


Photograph 5. Agricultural land located within the study area (A) and the agricultural- shrubland mosaic habitat located on the fringe of agricultural areas (B).

Areas where agricultural lands meet with natural shrublands create a mosaic habitat merging the foraging advantages of the agricultural habitats and the protection of shrubland habitats (**Photograph 5**). This has provided a novel habitat and in the area of study, Ludwig's Bustard were observed within this habitat.

Artificial habitats

Artificial habitats are provided by the existing overhead power lines that traverse through the study area (**Photograph 6**). The pylons are used by various species including raptors (Jackal Buzzard, Pale-chanting Goshawk and Martial Eagles) from which to hunt and to nest. A series of reservoirs are located along the power line corridor. These contain water all year round and are used by a variety of avifaunal species as a predictable water source. As a result, these water sources act as a beacon attracting faunal species into the area, particularly during dry periods.



Photograph 6. A water reservoir located in close proximity to the power line corridor (A) and an existing power line traversing through southern and central section of the study area (B**).**

3.3 IMPORTANT BIRD AREAS (IBA)

Important Bird Areas (IBAs) are identified as areas that are important for the long-term survival of threatened and/or range restricted avian species (BirdLife South Africa).

The proposed power line development does not fall within any IBA. The closest IBA is located at the Olifants River Estuary (SA099), approximately 15 km south-west of the proposed development site (**Figure 5**). The extent of this IBA is 6330 ha and forms part of the Fynbos Biome.

This IBA supports 127 bird species and hosts over 60 waterbirds. The area includes the Olifants River estuary which is one of only four perennial estuaries on South Africa's West Coast and extensive salt marshes within the estuary habitat. This area is a vital wetland for South African wader species and supports 15 000 waterbirds. The vegetation surrounding the estuary supports a variety of Karoo Biome restricted species including Karoo Korhaan (*Eupodotis vigorsii*), Cape Spurfowl (*Pternistis capensis)* Sickle-winged Chat (*Cercomela sinuata*), Grey Tit (*Parus afer*) and Karoo Lark (*Calendulauda albescens*) (BLSA 2016).

IBA trigger species for this area include Lesser Flamingo (*Phoenicopterus minor*), Southern Black Korhaan (*Afrotis afra*), Marsh Harrier (*Circus ranivorus*), Ludwig's Bustard (*Neotis ludwigi)* and Black Harrier (*Circus maurus*). Regionally threatened species include Caspian Tern (*Hydroprogne caspia*), Great White Pelican (*Pelecanus onocrotalus*) and Greater Flamingo (*Phoenicopterus roseus*) (BLSA 2016).

The Cedarberg - Koue Bokkeveld Complex (SA101) is another IBA located 35km south-east of the power line corridor (**Figure 5**). It is 754 290 ha in extent and encompasses the Cederberg Mountain Catchment Area and the Winterhoek Mountain Catchment Area. Important avian micro-habitats include mountain fynbos, karroid vegetation as well as ephemeral and perennial river systems. This IBA supports 235 bird species attributed to the diversity of avifaunal habitats within this IBA (BLSA 2016).

The Bitterputs Conservation Area (SA036) and the Haramoep & Black Mountain Mine (SA035) IBAs are located 135km and 139km from the power line corridor respectively.

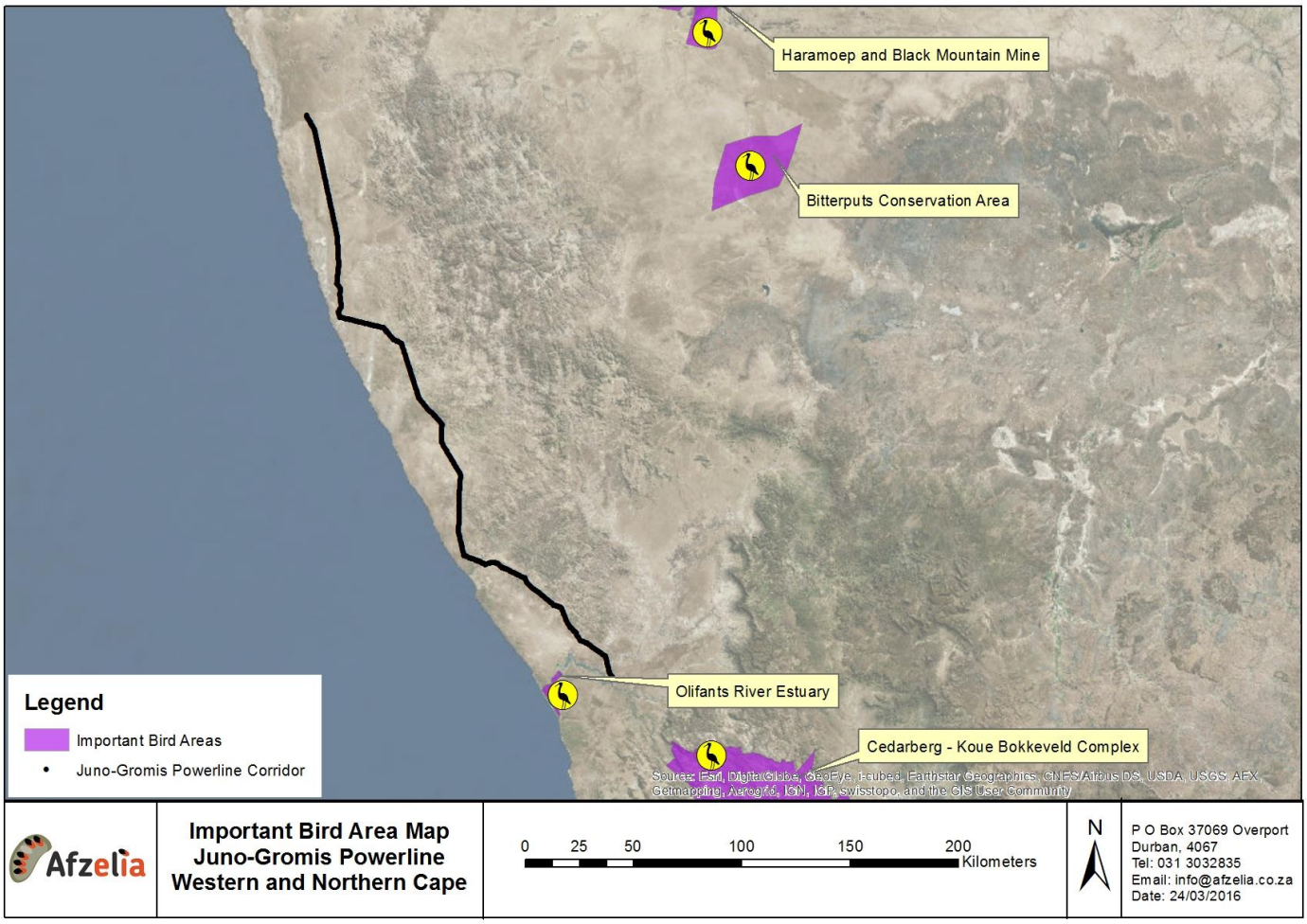


Figure 4. The Olifants River Estuary, Cedeberg-Koue Bokkeveld Complex, Bitterputs Conservation Area and Haramoep and Black Mountain Mine IBAs located outside the study area.

According to BirdLife South Africa, one-third of the 112 IBAs located within South Africa are under threat by alien invasive vegetation, habitat modification and agricultural expansion (Marnewick *et al*. 2015). It is therefore important to include mitigation measures to ensure that the development does not have a significant negative effect on protected avian species and source populations occurring within the IBA. This will be particularly important as the development site is located between two important bird areas both of which support a high population of avifaunal species.

4. AVIFAUNA SPECIES COMPOSITION

A total of 193 species are predicted to occur along the power line corridor (SABAP2), with 23 species (11.9%) classified as Red Data species (Taylor *et al.* 2015). Furthermore, fourteen species are southern African endemics (7.8%).

According to SABAP2, reporting rates are an indication of the relative density of a species on the ground in that it reflects the number of times that a species was recorded relative to the total amount of cards that were completed for the pentad[1].

During the site visit a total of 54 bird species were recorded within the study area (**Appendix 1**).

The most commonly recorded species were passerine species such as Karoo Prinia (*Prinia maculosa*), Karoo Long-billed Lark (*Certhilauda subcoronata*), Bokmakierie (*Telophorus zeylonus*), Cape Weaver (*Ploceus capensis*) and Grey-backed Sparrow-lark (*Eremopterix verticalis*). Various species often associated with anthropogenically modified landscapes were also recorded in close proximity to agricultural land including Red-eyed Dove (*Streptopelia semitorquata*), Cape Sparrow (*Passer melanurus*) and Pied Crow (*Corvus albus*). The drainage lines and ephemeral rivers were observed to have the highest avian species richness and activity as opposed to the open Karroid landscape. The open karroid shrublands habitat located throughout the study area was dominated by Bokmakierie (*Telophorus zeylonus*), Grey-winged Francolin (*Scleroptila africanus*), Crowned Lapwing (*Vanellus coronatus*) and two canary species. The agricultural landscape within the central section of the study area was relatively unproductive with a low avian species presence and activity at the time of the survey. However, Blue Crane (*Anthropoides paradiseus*) and Ludwig's Bustard (*Neotis ludwigii*) were observed within this habitat.

Endemic and Near Endemic species recorded during the site visit included Bokmakierie (*Telophorus zeylonus*), Cape Siskin (*Crithagra totta*), Pied Starling (*Spreo bicolor*), Jackal Buzzard (*Buteo rufofuscus*), Cape Spurfowl (*Pternistis capensis*), Karoo Prinia (*Prinia maculosa*), Cape Weaver (*Ploceus capensis*) and Southern Double-collared Sunbird (*Cinnyris chalybeus*).

The Martial Eagle (*Polemaetus bellicosus*), Rock Kestrel (*Falco rupicolus*) and Greater Kestrel (*Falco rupicoloides*) were the only medium-large raptor species recorded during the site visit and walk-through.

4.1 AVIFAUNAL SPECIES OF CONSERVATION PRIORITY

Table 1 provides a list of the Red Data species that could potentially be encountered anywhere within the study areaad, where suitable habitat is available; it should not be used as a measure of actual densities within the study area. Report rates are the likelihood of a particular species occurring along any of the alignments/ substation sites represented as a percentage. Furthermore, it is also important to note that these species were recorded within the entire quarter degree grid cell (QDGC) and may not have actually been recorded on the proposed site/routes for the study.

[1] A 5 minute X 5 minute coordinate grid super-imposed over the continent for spatial reference. One QDGC comprises of 9 pentads.

Table 1. Red Listed bird species recorded within fourteen QDGCs within which the proposed power line infrastructure is located.

NAME	CONSERVATION STATUS (2014)	HABITAT	LIKELIHOOD OF OCCURRENCE	HABITAT DESTRUCTION	DISTURBANCE	COLLISIONS WITH POWER LINE
SECRETARY BIRD *Sagittarius serpentarius*	VU	Grassland	High		X	X
MARTIAL EAGLE *Polemaetus bellicosus*	VU	Woodland/Savanna h	High		X	X
LUDWIG'S BUSTARD *Neotis ludwigii*	EN	Savannah	High	X	X	X
KORRI BUSTARD *Ardeotis kori*	NT	Grassland/Thornveld	High	X	X	X
LANNER FALCON *Falco biarmicus*	VU	Woodland/Savanna h	Medium		X	
GREAT WHITE PELICAN *Pelecanus onocrotalus*	VU	Wetlands, Estuaries and Coastal bays	Low	X		X
GREATER FLAMINGO *Phoenicopterus ruber*	NT	Wetlands, lagoons and estuaries	Low			X
LESSER FLAMINGO *Phoenicopterus minor*	NT	Wetlands, lagoons and estuaries	Low			X
BLACK HARRIER *Circus maurus*	EN	Fynbos shrubland and agricultural land	Moderate	X	X	
BLUE CRANE *Anthropoides paradiseus*	NT	Croplands and pastures	High		X	X
SOUTHERN BLACK KORHAAN *Afrotis afra*	VU	Coastal Fynbos/Karoo scrub	High	X	X	X

*NT= Near Threatened; VU=Vulnerable; EN= Endangered

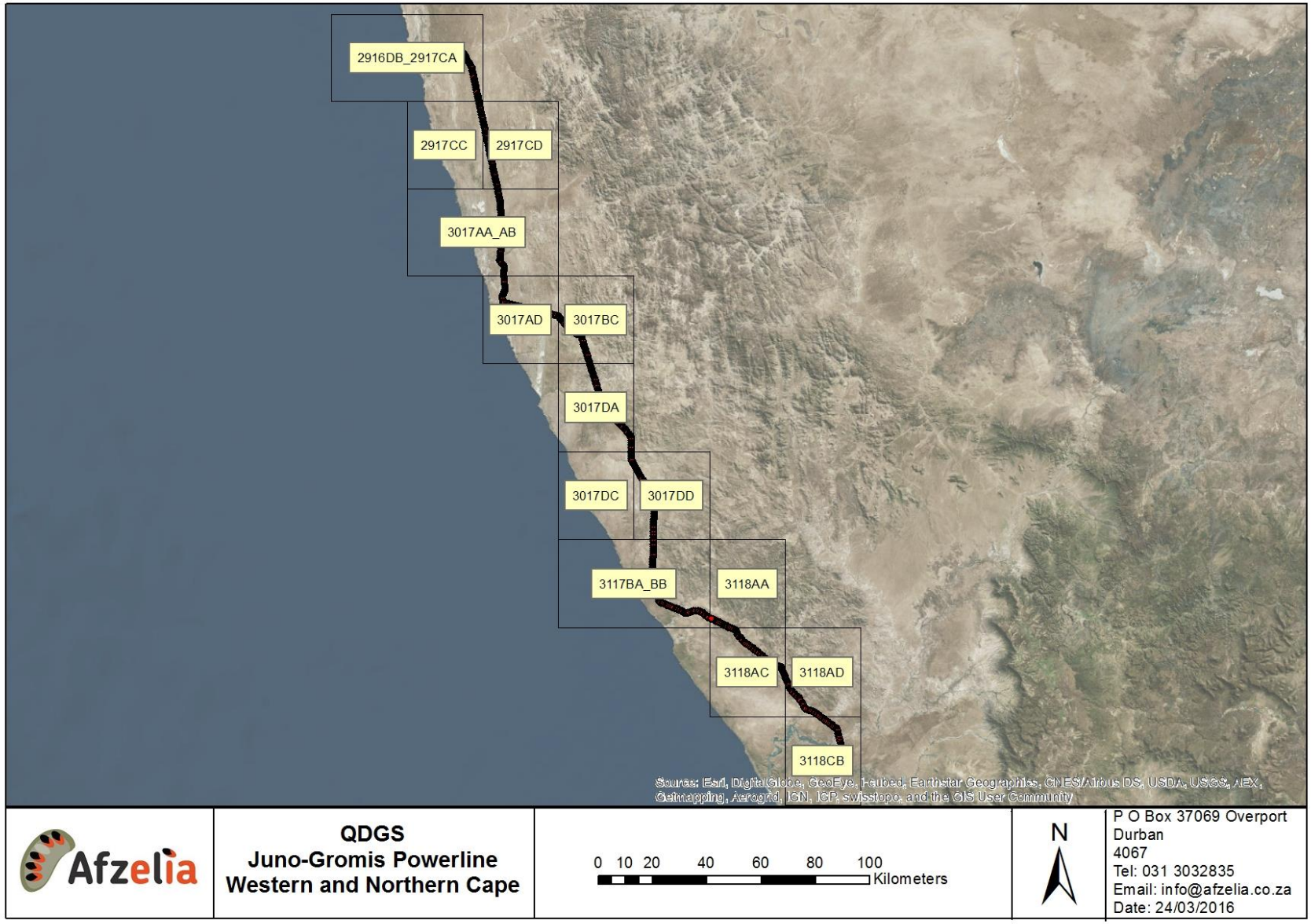


Figure 5. The Quarter Degree Grid Cells (QDGC) within which the proposed power line corridor traverses.

5. POWER LINE TOWER DESIGN

The proposed structure design for the proposed Juno-Gromis power line is a cross rope suspension tower (**Figure 7**). This structure does not provide a suitable nesting and perching substrate (above the conductors) for large raptors such as Martial Eagles. As a result, faults caused by bird streamers[2] or bird mortalities are highly unlikely.

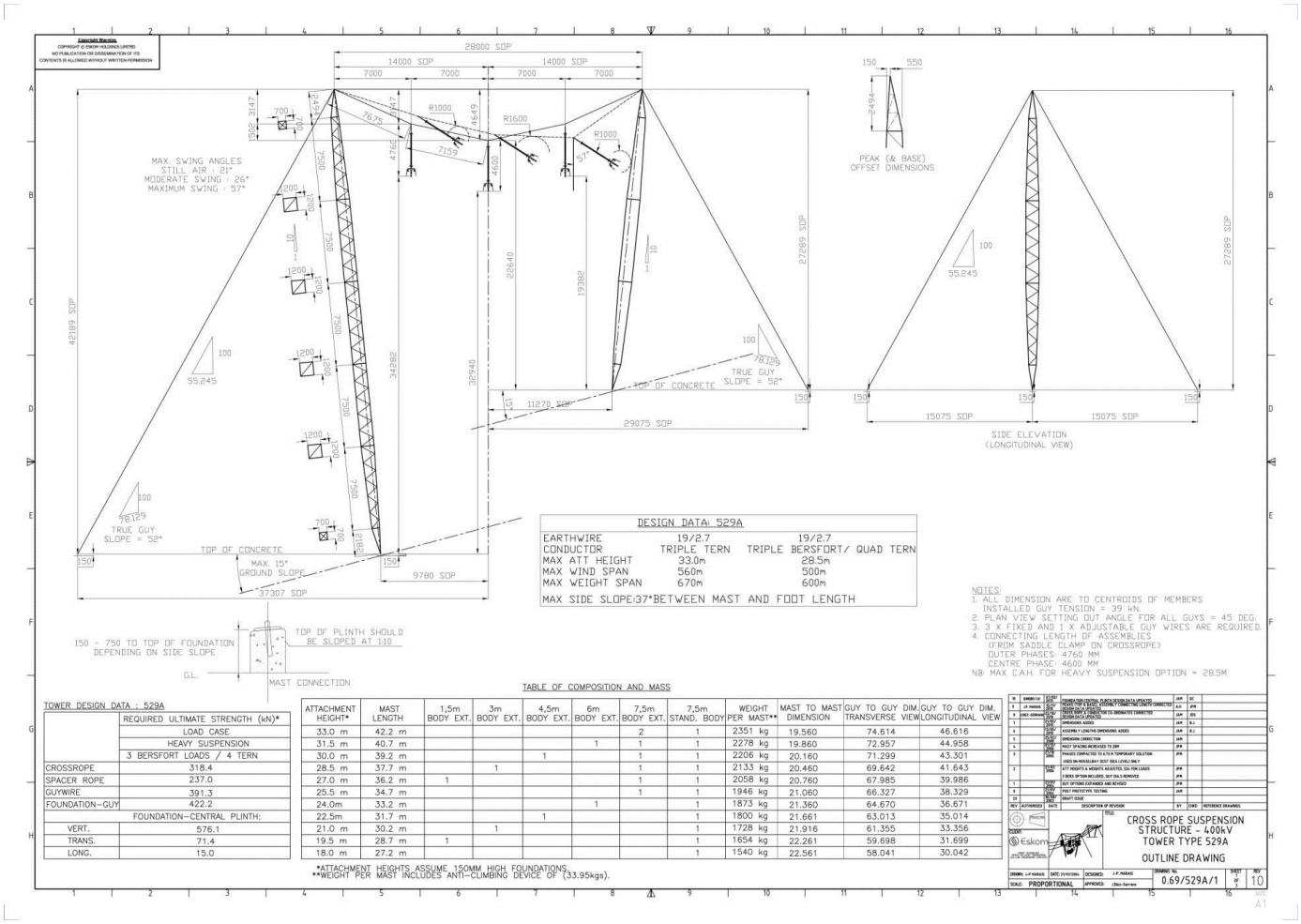


Figure 6. Cross rope suspension structure design used for the 400kV power line project.

[2] Streamers are long "streams" of excrement expelled from large raptors, which are often expelled as a bird takes off from a perch.

6. IMPACTS ASSOCIATED WITH THE POWER LINE PROJECT

The implications of the proposed power line to avifauna are as follows:

- A width of approximately 55 m of land along the length of the power line will be altered during the creation and use of the power line servitude.
- During the construction phase, disturbance levels will be significantly higher in the immediate vicinity than previously. This disturbance will consist of machinery and vehicle disturbance as well as other construction activities.
- During the operational phase, there will be some vehicle activity resulting in disturbance, particularly within the road access corridor.
- Due to the length of the overhead power lines (230km), there will be a collision risk to avifauna, particularly heavier birds with low manoeuvrability (Ludwig's Bustard and Kori Bustard).

6.1 HABITAT DESTRUCTION

During the construction phase as well as maintenance of the power line during operation, some habitat destruction and alteration will occur due to the clearing of servitudes along the power line route. These activities will have an impact on foraging, breeding and roosting ecology of avian species within the area through modification of habitat. The continual clearing of servitudes will have the effect of altering bird community structure along the length of the power line (Kind and Byers 2002).

It is not envisaged that any Red Data species will be displaced by the habitat transformation that will take place as a result of the construction of the power line. The impact on smaller, non-Red Data species that are potentially breeding in the area will be local in extent, in that it will not have a significant effect on regional or national populations.

Various sections of the habitat are already largely transformed and fragmented by agricultural land. Furthermore, this is not a unique habitat within the landscape. The construction of the proposed power line should therefore have a low displacement impact from an avifaunal perspective.

6.2 DISTURBANCE AND DISPLACEMENT

The disturbance of avifauna during the construction and operation of the power line infrastructure will occur. This is an indirect impact that will affect the movement and distribution of avian species surrounding the power line corridor, particularly during the construction of the proposed project. The avoidance of these areas by avian species will impact the breeding and foraging characteristics of affected bird species. Species sensitive to disturbance are ground-nesting species resident within the development footprint. Disturbance can also influence the community structure of avifauna within close proximity to the development as certain species will be displaced and forced to find alternative territories. Avian species with small territories are particularly susceptible.

Disturbance could have a negative impact on the breeding activities of various species, particularly if this occurs during a sensitive period in the breeding cycle.

Species of concern include Southern Black Korhaan (*Afrotis afra*), African Marsh Harrier (*Circus ranivorus*), Black Harrier (*Circus maurus*) and Blue Crane (*Anthropoides paradiseus*). Both Harrier species often breed in damp areas in vegetation associated with wetlands or pans and Blue Cranes often breed on open ground near a water source (Hockey *et al*. 2006). These species will be sensitive to disturbance and habitat loss due to the construction of the proposed overhead power lines.

The study area is already subject to varying degrees of disturbance due to agriculture, industrial infrastructure and mining as well as existing power line infrastructure. Therefore, species within this landscape already experience disturbance. As a result, disturbance of birds by the proposed power lines is anticipated to be of low significance, as birds will move away from the area temporarily. However, species are particularly sensitive to disturbance during the breeding season and this must be borne in mind during both the construction and operational (maintenance) phases.

6.3 ELECTROCUTION OF BIRDS ON OVERHEAD POWER LINE

Electrocution[3] of birds on associated overhead power lines is a primary cause of mortality for a variety of bird species particularly storks, cranes and raptors in South Africa (Van Rooyen & Ledger 1999). Electrocution risk is influenced by the voltage of the power line coupled with the pole structure. Due to the design of the proposed tower structures electrocution is considered unlikely and thus not considered a significant impact to avian species.

6.4 COLLISIONS WITH THE POWER LINE

Collisions are the biggest single threat posed by overhead power lines to birds in southern Africa (van Rooyen 2004). Larger bird species such as bustards, storks, flamingos, cranes and raptors are highly susceptible to power line collisions (**Appendix 2**). These species often collide with the earth wire, as it is not highly visible. These species are mostly heavy-bodied species with limited manoeuvrability and are not sufficiently mobile to take the necessary evasive action to avoid colliding with power lines (Anderson 2001; Van Rooyen 2004, Jenkins and Smallie 2009). This impact is further exacerbated as they tend to fly between foraging bouts and roosting sites within the elevation ranges of both high and low voltage power lines. Many of the collision sensitive species are considered threatened in southern Africa.

The Red Data species that are vulnerable to power line collisions are generally long living, slow reproducing species. Furthermore, various species require specific conditions for breeding, resulting in very few successful breeding attempts, or breeding might be restricted to very small areas. These species have not evolved to cope with high adult mortality. Therefore, consistent high adult mortality over an extensive period could have a serious effect on a population's ability to sustain itself in the medium to long term.

[3] Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (van Rooyen 2004).

Photograph 7. The remains of one of several Ludwig's Bustard recovered below the existing JUKO 134 power line, which runs parallel to the proposed 400kV transmission power line.

The potential collision of avian species with the power line earth wire is considered the most significant impact pertaining to avifauna within the project area. It is predicted that this impact will have a moderate negative impact prior to the implementation of mitigation measures. This is due to the presence of collision prone species including Ludwig's Bustard (*Neotis ludwigi*), Kori Bustard (*Ardeotis kor*), Secretarybird (*Sagittarius serpentarius*), Blue Crane (*Anthropoides paradiseus*), and to a lesser extent Southern Black Korhaan (*Afrotis afra*). Furthermore, the power line corridor traverses sensitive avian habitats such as streams, pan systems and rivers.

7. MITIGATION OF IDENTIFIED IMPACTS

Habitat destruction

- All construction and maintenance activities must be carried out according to the generally accepted environmental best practice, and the temporal and spatial footprint of the development must be kept to a minimum. In particular, care must be taken in the vicinity of the drainage lines and existing roads must be used as much as possible for access during construction.
- The boundaries of the project footprint areas are to be clearly demarcated and all activities must remain within the demarcated footprint area.
- Any bird nests that are found during the construction period must be reported to the Environmental Control Officer (ECO).
- The movement of vehicles and heavy machinery around sensitive avian habitats (river crossings, pan systems and thickets) must be controlled.
- The above measures must be covered in a site specific EMPr and controlled by an ECO.

Disturbance and displacement

- Strict control must be maintained over all activities during construction, in line with an approved construction EMPr.
- During construction, if any of the Red Data species identified in this report are observed to be roosting and/or breeding in the vicinity, the ECO must be notified.
- The construction camps must be located within the construction corridor if possible, or as close to the corridor as possible.
- Contractors and working staff must stay within the development footprint and movement outside these areas especially into avian micro-habitats must be restricted.
- Driving must take place on existing roads and servitudes and a speed limit of 30km/h must be implemented on all roads running through the study area during the construction phase.
- Hunting or interfering with fauna is strictly prohibited.
- No pets or domestic animals may be brought to site.

Collisions with the power line

In order to mitigate for collision prone species, it is imperative that earth wires crossing important avian habitats (**Table 2**) are fitted with anti-collision marking devices to increase the visibility of the power line and reduce likelihood of collisions. These must be Eskom and EWT approved anti-collision devices that are durable as the area is prone to strong winds. Anti-collision devices must be installed as soon as the wires are strung.

EBM Flapper and the Tyco Flight Diverter are approved bird flight diverters which are currently used by Eskom (Transmission Bird Collision Guideline 2014; Distribution Technical Bulletin 2009).

The devices must be installed 5m apart and alternate between a light and dark colour in order to increase the visibility of the earth wires. Furthermore 100% of the identified spans must be marked with devices, as collision probability is equally possible along the entire identified span (Shaw 2013). According to Shaw (2013), marking of only 60% of the line may divert collision prone species to the unmarked portions of the line.

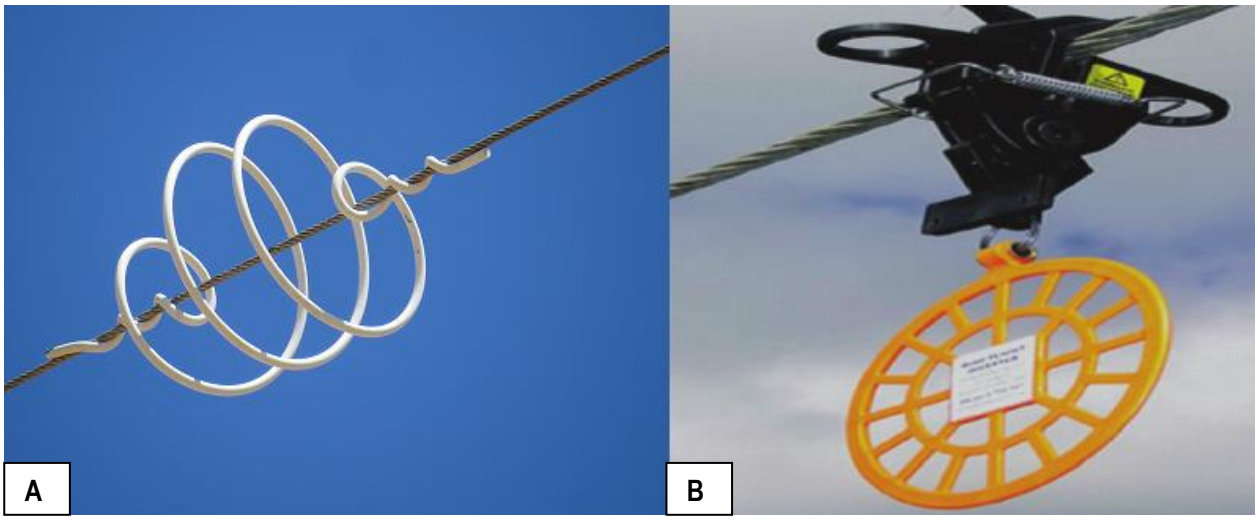


Figure 7. Static Helical bird flight diverter and a mobile bird flapper device.

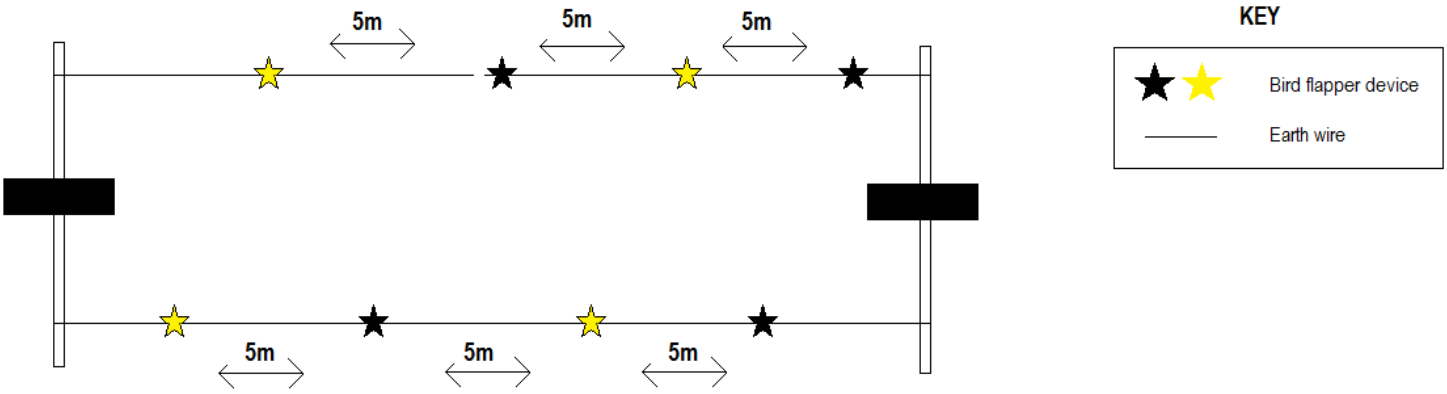


Figure 8. Technique and guideline for marking of the earth wire with bird flapper devices (*Adapted from Vosloo et al. 2014*).

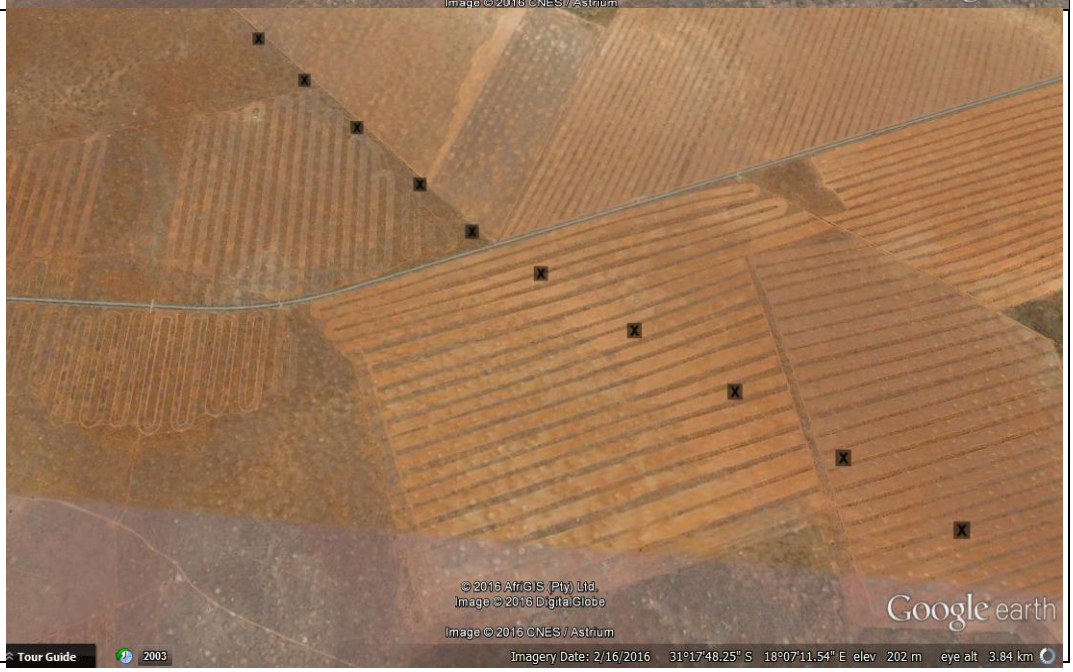
8. TOWER POSITIONS IDENTIFIED FOR MARKING

Based on the information obtained during the power line walk-down and avifaunal impact assessment, the following tower positions and power line spans were identified for marking. These areas will be marked with anti-collision devices.

Table 2. Areas identified along the power line corridor for marking with anti-collision devices.

TOWER POSITION	AVIAN HABITAT DESCRIPTION	AERIAL IMAGERY OF THE TOWER POSITIONS
570-569 *Start:* *31°33'24.89"S* *18°25'40.39"E* *End:* *31°33'8.26"S* *18°25'35.45"E*	River crossing (Hol River) • *Avian flight path and a collision prone area*	
563-564 *Start:* *31°31'58.84"S* *18°25'9.29"E* *End:* *31°31'49.81"S* *18°24'54.48"E*	River crossing (Moedverloor River) • *Avian flight path and a collision prone area*	

TOWER POSITION	AVIAN HABITAT DESCRIPTION	AERIAL IMAGERY OF THE TOWER POSITIONS
531-530 *Start:* *31°26'33.80"S* *18°17'20.78"E* *End:* *31°26'19.03"S* *18°17'3.00"E*	Drainage line • *Higher collision risk associated with the presence of water*	
542-539 *Start:* *31°28'45.05"S* *18°19'9.92"E* *End:* *31°28'8.76"S* *18°18'35.09"E*	River crossing (Droekraal se River) • *Higher collision risk associated with the presence of water*	
525-524 *Start:* *31°25'22.82"S* *18°16'4.88"E* *End:* *31°25'13.11"S* *18°15'56.05"E*	Drainage line • *Avian flight path and a collision prone area*	

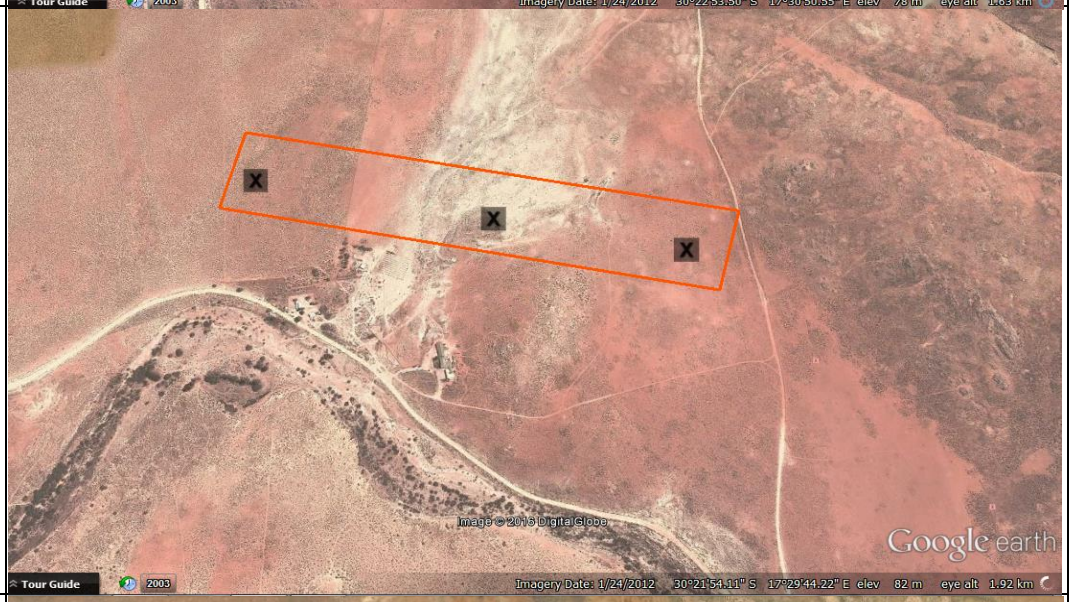
TOWER POSITION	AVIAN HABITAT DESCRIPTION	AERIAL IMAGERY OF THE TOWER POSITIONS
509-499 *Start:* *31°21'35.43"S* *18°13'58.93"E* *End:* *31°20'16.44"S* *18°11'9.10"E*	Open agricultural land • *Collision risk for large avian species associated with the agricultural landscape*	
498-488 *Start:* *31°20'5.53"S* *18°10'54.31"E* *End:* *31°18'29.53"S* *18° 8'36.99"E*	Open agricultural land • *Collision risk for large avian species associated with the agricultural landscape*	
487-477 *Start:* *31°18'19.35"S* *18° 8'20.46"E* *End:* *31°16'48.27"S* *18° 6'14.41"E*	Open agricultural land • *Collision risk for large avian species associated with the agricultural landscape*	

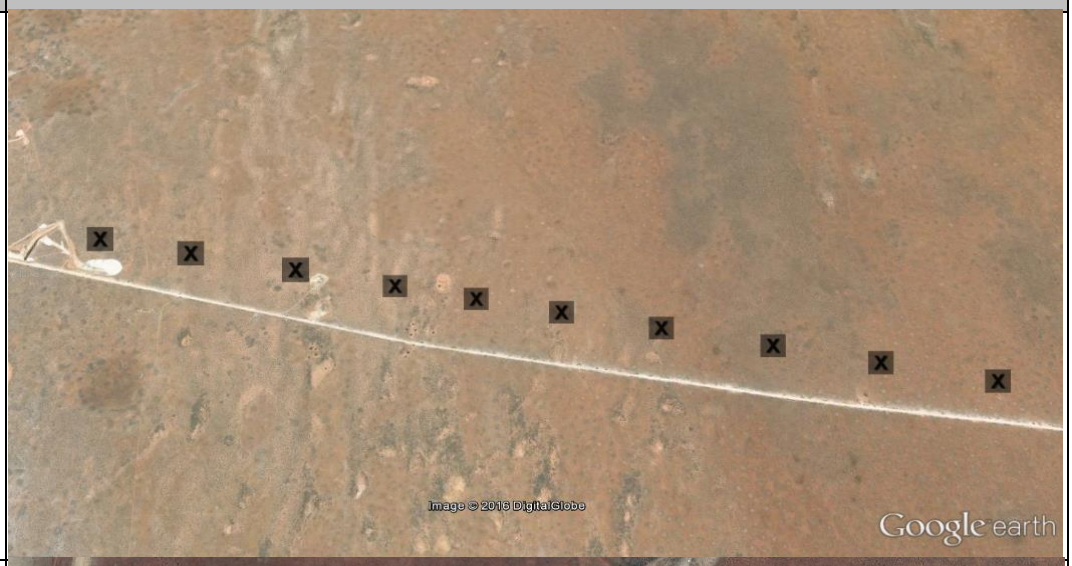
TOWER POSITION	AVIAN HABITAT DESCRIPTION	AERIAL IMAGERY OF THE TOWER POSITIONS
471-468 *Start:* *31°15'37.98"S* *18° 5'17.82"E* *End:* *31°15'15.20"S* *18° 4'45.50"E*	Drainage line and water course • *Higher collision risk associated with the presence of water*	
464-460 *Start:* *31°14'45.77"S* *18° 3'34.66"E* *End:* *31°14'16.68"S* *18° 2'24.68"E*	River crossing (Groot Goerap) • *Avian flight path and a collision prone area*	
425-424 *Start:* *31°11'57.57"S* *17°54'3.10"E* *End:* *31°11'51.47"S* *17°53'45.10"E*	River crossing (Sout River) • *Avian flight path and a collision prone area*	

TOWER POSITION	AVIAN HABITAT DESCRIPTION	AERIAL IMAGERY OF THE TOWER POSITIONS
381-380 *Start:* *31° 2'50.26"S* *17°48'49.33"E* *End:* *31° 2'31.30"S* *17°48'50.45"E*	Drainage line • *Higher collision risk associated with the presence of water*	
373-372 *Start:* *31° 0'40.96"S* *17°48'51.29"E* *End:* *31° 0'22.72"S* *17°48'51.43"E*	Drainage line • *Higher collision risk associated with the presence of water*	
368-367 *Start:* *30°59'14.34"S* *17°48'51.95"E* *End:* *30°58'56.97"S* *17°48'52.08"E*	Drainage line and water course • *Higher collision risk associated with the presence of water*	

TOWER POSITION	AVIAN HABITAT DESCRIPTION	AERIAL IMAGERY OF THE TOWER POSITIONS
365-364 *Start:* *30°58'27.95"S* *17°48'52.30"E* *End:* *30°58'7.89"S* *17°48'52.45"E*	River crossing (Brak River) • *Higher collision risk associated with the presence of water*	
319-316 *Start:* *30°47'8.69"S* *17°44'55.78"E* *End:* *30°46'28.34"S* *17°44'28.16"E*	River crossing (Groen River) • *Avian flight path and a collision prone area*	
306-305 *Start:* *30°43'44.57"S* *17°44'32.16"E* *End:* *30°43'26.04"S* *17°44'32.61"E*	Drainage line • *Higher collision risk associated with the presence of water*	

TOWER POSITION	AVIAN HABITAT DESCRIPTION	AERIAL IMAGERY OF THE TOWER POSITIONS
295-293 *Start:* *30°41'17.75"S* *17°43'17.69"E* *End:* *30°40'51.98"S* *17°42'52.56"E*	Drainage line • *Higher collision risk associated with the presence of water*	
264-261 *Start:* *30°34'52.81"S* *17°38'3.34"E* *End:* *30°34'2.18"S* *17°37'44.67"E*	River crossing (Outeep and Bitter River) • *Avian flight path and a collision prone area*	
227-225 *Start:* *30°25'31.26"S* *17°34'36.64"E* *End:* *30°25'9.56"S* *17°34'21.12"E*	River crossing (Spoeg River) • *Avian flight path and a collision prone area*	

TOWER POSITION	AVIAN HABITAT DESCRIPTION	AERIAL IMAGERY OF THE TOWER POSITIONS
211-210 *Start:* *30°22'58.42"S* *17°31'5.83"E* *End:* *30°22'47.92"S* *17°30'55.19"E*	River crossing (Horees River) • *Avian flight path and a collision prone area*	
205-203 *Start:* *30°21'51.10"S* *17°29'57.67"E* *End:* *30°21'43.26"S* *17°29'20.22"E*	Water course (Horees River) • *Avian flight path and a collision prone area*	
192-185 *Start:* *30°21'1.22"S* *17°25'59.76"E* *End:* *30°20'32.96"S* *17°23'45.27"E*	Namaqua National Park • *Area falls within a National Park and a potential collision risk*	

TOWER POSITION	AVIAN HABITAT DESCRIPTION	AERIAL IMAGERY OF THE TOWER POSITIONS
184-175 *Start:* *30°20'28.91"S* *17°23'26.02"E* *End:* *30°19'53.39"S* *17°20'37.31"E*	Namaqua National Park • *Area falls within a National Park and a potential collision risk*	
143-142 *Start:* *30°12'56.79"S* *17°18'55.32"E* *End:* *30°12'40.66"S* *17°18'40.81"E*	River crossing (Swartlintjies Rivier) • *Avian flight path and a collision prone area*	
007-009A *Start:* *29°37'58.72"S* *17°12'4.04"E* *End:* *29°37'21.99"S* *17°11'38.74"E*	Drainage lines • *Avian flight path and a collision prone area*	

006-004 *Start:* *29°37'9.42"S* *17°11'30.08"E* *End:* *29°36'45.86"S* *17°11'13.86"E*	River crossing (Buffels River) • *Avian flight path and a collision prone area*	

9. CONCLUSION

Collisions with the power lines pose the single biggest threat to large, low manoeuvrability bird species. Species of particular concern for collisions with the power line are Secretary Bird, Martial Eagle, Ludwig's Bustard and Kori Bustard. High collisions rates were observed under existing power lines in the agricultural areas. Ludwig's Bustard and Blue crane were observed in these agricultural areas, indicating the need for mitigation in this micro-habitat.

The avifaunal walk down study has identified sensitive avifaunal habitats within close proximity of the power line. These areas were deemed to have an increased probability of collisions and will subsequently require marking with anti-collision bird mitigation devices (**Table 2**).

Due to the current number of remains of Ludwig's Bustard found below the existing JUKO 134 power line, which runs parallel to the proposed Juno-Gromis 400kV transmission power line, it is strongly recommended that Best Practises be implemented on all powerlines that run parallel to the proposed Juno-Gromis power line in the agricultural fields. These power lines must be fitted with anti-collision bird mitigation devices at the same time as the construction of the Juno-Gromis power line to mitigate the observed impacts.

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Appendix 1. List of bird species identified within the study area during the site visit.

COMMON NAME	SCIENTIFIC NAME	STATUS AND BIOLOGY	HABITAT
Karoo Prinia	*Prinia maculosa*	Near-Endemic	Fynbos, thickets, Karoo scrub
Pied Starling	*Spreo bicolor*	ESLS	Grassland and Karroo scrub
Steppe Buzzard	*Buteo vulpinus*	Palearctic migrant	Open habitat
Greater Kestrel	*Falco rupicoloides*	Locally common resident	Semi-arid to arid areas
Southern Pale Chanting Goshawk	*Melierax canorus*	Common resident	Arid savannah, semi desert, Karoo scrub
Black Harrier	*Circus maurus*	Vulnerable	Fynbos, Karoo scrub and agricultural land
African Sacred Ibis	*Threskiornis aethiopicus*	Common resident	Wetlands, fields and grasslands
Rufous-eared Warbler	*Malcorus pectoralis*	Common resident and local nomad	Arid scrub
Crowned Lapwing	*Vanellus coronatus*	Common resident and local nomad	Short grasslands and fields
Spotted Thick-Knee	*Burhinus capensis*	Common resident and local nomad	Rivers and lake shores
African Pipit	*Anthus cinnamomeus*	Common resident and local nomad	Open grasslands and fields
Rock Kestrel	*Falco rupicolus*	Common resident and local nomad	Grassland, scrub and open woodland
Black-shouldered Kite	*Elanus caeruleus*	Common resident and local nomad	Savannah, grassland and agricultural areas
Cape Bulbul	*Pycnonotus capensis*	Endemic	Fynbos and coastal scrub
Jackal Buzzard	*Buteo rufofuscus*	Near-Endemic	Karoo scrub, grassland and agricultural land
Familiar Chat	*Cercomela familiaris*	Common resident and local nomad	Mountainous terrain and farmlands
Capped Wheatear	*Oenanthe pileata*	Common resident and local nomad	Grassland and croplands
Cape Spurfowl	*Pternistis capensis*	Near-Endemic	Lowland Fynbos, fields, riparian thickets
Helmeted Guineafowl	*Numida meleagris*	Common resident	Grassland, savannah and fields
Cape Grassbird	*Sphenoeacus afer*	Near-Endemic	Fynbos and rank grass (near water)
Blue Crane	*Anthropoides paradiseus*	Resident and local nomad	Agricultural lands
Lanner Falcon	*Falco biarmicus*	Common resident and local nomad	Wide range of habitats
Common Fiscal	*Lanius collaris*	Common resident	Open habitats

COMMON NAME	SCIENTIFIC NAME	STATUS AND BIOLOGY	HABITAT
Bokmakierie	*Telophorus zeylonus*	Common resident, shrublands and Strandveld	Shrublands, Strandveld and scrublands
Blacksmith Lapwing	*Vanellus armatus*	Common resident and nomad	Wetland margins, grasslands and fields
Speckled Pigeon	*Columba guinea*	Common resident	Rocky areas, fields and grasslands
Cape Turtle-dove	*Streptopelia capicola*	Abundant resident and nomad	Wide range of habitats, avoids forests
Laughing Dove	*Streptopelia senegalensis*	Abundant resident and nomad	Wide range of habitats, avoids forests
Cape Weaver	*Ploceus capensis*	Near-Endemic	Grassland and scrub
White-backed Mousebird	*Colius colius*	Common resident	Strandveld, coastal Fynbos and scrub
Red-capped Lark	*Calandrella cinerea*	Common resident, intra-African migrant	Grass areas and croplands
Brown-throated Martin	*Riparia paludicola*	Common resident and Local migrant	Range of habitats, roosts in reeds
Pied Crow	*Corvus albus*	Common	Virtually all habitats
Cape Crow	*Corvus capensis*	Common	Cultivated fields and dry, desert regions
Namaqua Sandgrouse	*Oena capensis*	Common nomad and partial migrant	Semi-desert, arid savannah and grasslands
Grey-backed Sparrow-lark	*Eremopterix verticalis*	Common nomad and local migrant	Karoo shrubland, semi-desert, arid savannah
Streaky-headed Seedeater	*Crithagra gularis*	Common resident	Woodlands, thickets and dense scrub
Southern Double-collared Sunbird	*Cinnyris chalybeus*	Near-Endemic	Coastal scrub, Fynbos and forests
Southern Boubou	*Laniarius ferrugineus*	Common resident	Forest edge, thickets and coastal scrub
Neddicky	*Cisticola fulvicapilla*	Common resident	Savannah and mountain Fynbos
Grey-backed Cisticola	*Cisticola subruficapilla*	Common resident	Lowland Fynbos and Karoo scrub
Cape Robin-Chat	*Cossypha caffra*	Common resident and altitudinal migrant	Thickets, scrub, gardens and forest edge
Ant-eating Chat	*Myrmecocichla formicivora*	Endemic	Open flat landscapes and short scrub
Karoo Scrub-Robin	*Cercotrichas paena*	Common resident in Karoo scrub and Strandveld	Karoo scrub and Strandveld
Grey Tit	*Parus afer*	Near-Endemic	Fynbos and Karoo scrub
Cape Eagle-Owl	*Bubo capensis*	Uncommon resident	Rocky and mountainous terrain
Namaqua Dove	*Oena capensis*	Common resident and nomad	Arid and semi-arid Savannah

COMMON NAME	SCIENTIFIC NAME	STATUS AND BIOLOGY	HABITAT
Southern Black Korhaan	*Afrotis afra*	Endemic	Coastal Fynbos and Karoo scrub
House Sparrow	*Passer domesticus*	Locally common resident	Urban areas, Farmlands
Cape Sparrow	*Passer melanurus*	Common resident in grasslands, fields and gardens	Grassland, fields and gardens
Cape Canary	*Serinus canicollis*	Common resident in Fynbos, grassland and coastal dunes	Fynbos, grassland and coastal dunes
Yellow canary	*Crithagra flaviventris*	Near-endemic	Karoo, coastal scrublands
Karoo Lark	*Calendulauda albescens*	Near-endemic	Karoo and coastal shrublands
Ludwig's Bustard	*Neotis ludwigii*	Endangered	Karoo scrub and arid savannah
Secretary Bird	*Sagittarius serpentarius*	Vulnerable	Savanna and open grassland
Martial Eagle	*Polemaetus bellicosus*	Vulnerable	Savannah, grassland, Karoo
Karoo Long-billed Lark	*Certhilauda subcoronata*	Common resident	Karoo scrub and grasslands
Long-billed Pipit	*Anthus similis*	Locally common resident	Grassland, savannah, pastures and rocky hillsides

*ESLS- Endemic to South Africa, Lesotho and Swaziland

Appendix 2. Collision prone species in South Africa (Extracted from Jenkins *et al*. 2010).