

Wolf-Skilpad- Grassridge 132kV power line

Avifaunal Impact Assessment

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Executive summary

Red Rocket South Africa (Pty) Ltd is required to construct the new Wolf-Skilpad- Grassridge 132kV monopole transmission line in order to strengthen the network for the Wolf Wind Farm. There is an existing 132kV line and the new line is proposed to be constructed in a new servitude directly adjacent to the existing line ($\pm 31\text{m}$ from the existing centreline). The old line will be decommissioned.

In terms of the EIA Regulations, 2014 (as amended), various aspects of the proposed development may have an impact on the environment and are considered to be listed activities. These activities require authorisation from the National Competent Authority (CA), namely the Department of Forestry, Fisheries and the Environment (DFFE), prior to the commencement thereof.

Red Rocket has appointed Zutari to conduct the necessary Basic Assessment (BA) Process. The project has the potential to impact on avifauna and so WildSkies Ecological Services Pty Ltd ("WildSkies") was appointed by Zutari to conduct an avifaunal impact assessment.

Up to approximately 340 bird species occur in the broader area within which the proposed project is located. Included amongst these species are a number of regionally and globally Red Listed bird species and a number of endemics.

Based on the formal criteria supplied by Zutari, we have rated the potential impacts on avifauna as follows:

- » Destruction of bird habitat during the construction phase will be of Moderate negative significance both pre and post mitigation.
- » Disturbance of birds during the construction phase will be of Minor negative significance pre and post mitigation.
- » Collision of birds with overhead cables on the power line will be of Major negative significance pre mitigation and Minor negative significance post mitigation.
- » Electrocutation of birds on the pylons of the power line will be of Major negative significance pre mitigation and Negligible negative significance post mitigation.

The following mitigation measures are to be implemented:

- » All construction activities should be strictly managed according to generally accepted environmental best practice standards, so as to avoid any unnecessary impact on the receiving environment.

- » All temporary disturbed areas should be rehabilitated according to the site's rehabilitation plan, following construction.
- » The overhead cables (specifically the earth wires) on the power line should be fitted with an approved anti bird collision line marking device to make cables more visible to birds in flight and reduce the likelihood of collisions. This should be done according to the Eskom Distribution standards in terms of device spacing and other factors. Literature around the world points towards a 50-60% reduction in bird collision risk if the line is marked (Jenkins, Smallie & Diamond, 2010; Shaw et al, 2021). The line marking device should be a dynamic (moving – bird flapper type) device.
- » The new power line should be patrolled during operation by Eskom annually to measure any impacts on birds (through detecting collision fatalities) and to monitor the durability of the line marking devices.
- » Where multiple devices on a span have failed (broken off or become stuck and non-dynamic due to wind) they should be replaced immediately.
- » Any recorded bird fatality data should be submitted to the Eskom –EWT Strategic Partnership where it will be curated and publicly accessible.
- » The pylon structure to be used provides sufficient clearance between phase and phase and phase and earth to mitigate against the risk of bird electrocution. It is recommended as a precautionary measure that the standard Eskom Bird Perch be fitted to all pole tops to further provide safe perching substrate well above dangerous hardware.
- » It is also essential that if any of the pylon structures are changed, we are given opportunity to assess the electrocution risk of the new structure and design mitigation.

If these mitigation measures are implemented correctly, we believe that the impacts of the proposed project will be at an acceptable level and we recommend the proposed project be authorised to proceed. It is noted that the old existing power line will be decommissioned and removed once the new line is operational. This means that there will be no nett increase in length of power line in the area.

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1. Introduction

Red Rocket South Africa (Pty) Ltd is required to construct the new Wolf-Skilpad- Grassridge 132kV monopole transmission line in order to strengthen the network for the Wolf Wind Farm. There is an existing 132kV line and the new line is proposed to be constructed in a new servitude directly adjacent to the existing line ($\pm 31\text{m}$ from the existing centreline). The old line will be decommissioned.

In terms of the EIA Regulations, 2014 (as amended), various aspects of the proposed development may have an impact on the environment and are considered to be listed activities. These activities require authorisation from the National Competent Authority (CA), namely the Department of Forestry, Fisheries and the Environment (DFFE), prior to the commencement thereof.

Red Rocket has appointed Zutari to conduct the necessary Basic Assessment (BA) Process. The project has the potential to impact on avifauna and so WildSkies Ecological Services Pty Ltd (“WildSkies”) was appointed by Zutari to conduct an avifaunal impact assessment.

Figure 1 shows the layout of the proposed activities. The power line runs from the existing Wolf Substation near Kleinpoort in the west, past Glenconnor, to the existing Skilpad Substation near Kirkwood, and onwards to the existing Grassridge Substation in the east.

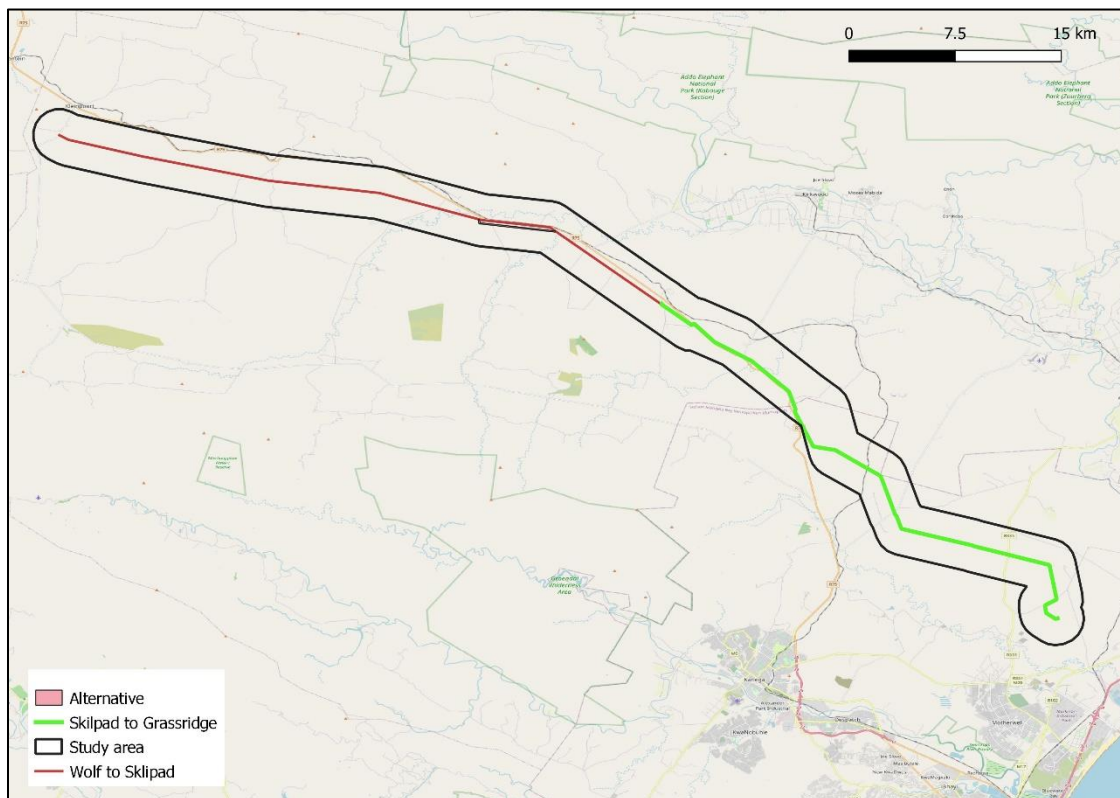


Figure 1. The locality map.

2. Document Structure

This report has been compiled in accordance with the EIA Regulations, 2014 (Government Notice (GN) R982). A summary of the report structure, and the specific sections that correspond to the applicable regulations, is provided in Table 1 below.

Table 1. Summary of report structure in compliance with above legislation.

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	Section of Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Section 3, Appendix 2
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix 1
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 4
(cA) an indication of the quality and age of base data used for the specialist report;	Section 7 & 8
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 10
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 7
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 7
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 7
g) an identification of any areas to be avoided, including buffers;	Section 9
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 9
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 13
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, (including identified alternatives on the environment) or activities;	Section 12
k) any mitigation measures for inclusion in the EMPr;	Section 11
l) any conditions for inclusion in the environmental authorisation;	Section 11
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 11
n) a reasoned opinion-	Section 12

<p>i. (as to) whether the proposed activity, activities or portions thereof should be authorised;</p> <p>(iA) regarding the acceptability of the proposed activity or activities; and</p> <p>ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMP, and where applicable, the closure plan;</p>	
<p>o) a description of any consultation process that was undertaken during the course of preparing the specialist report;</p>	Section 7
<p>p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and</p>	7
<p>q) any other information requested by the competent authority.</p>	n/a
<p>2) Where a government notice <i>gazetted</i> by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.</p>	n/a

3. Specialist details

The avifaunal specialist, Jon Smallie completed a BSC WILDLIFE SCIENCE (Hons) at the University of KwaZulu-Natal-Pietermaritzburg in 1998, and an MSC ENVIRONMENTAL SCIENCE at University of Witwatersrand in 2011. He has 20 years of experience working on bird conservation and impact assessment, in particular the interaction between birds and power lines. This includes 4 years managing the Eskom-Endangered Wildlife Trust Strategic Partnership. He is SACNASP registered (# 400020/06).

A full *curriculum vitae* can be seen in Appendix 2.

4. Terms of reference

The appointed specialist is required to conduct an Avifauna (bird) Impact Assessment on the proposed project, as set out below:

- » Avifaunal Impact Assessment (including marking and recording of affected protected and other avifaunal features);
- » Input into the Site Sensitivity Verification Process;
- » Impact rating (as per supplied methodology);

- » Recommended Mitigation measures and rehabilitation measures where required for inclusion in the Environmental Management Programme;
- » Provision of GIS information for the features identified, clearly indicating feature sensitivity.

5. Project description

The proposed project consists of the following components, described in Table 2:

Table 2. Summary of project components.

Component	Description
Overhead Powerline	132kV single-circuit Wolf substation to Skilpad substation - ± 46km Skilpad substation to Grassridge substation - ± 44km Total length ± 90km The transmission line will be located within a new 31m wide servitude except where the existing servitude could be re-used
Access	The line is accessed via existing access/farm roads and an Eskom service track (approximately 3.5m wide) running underneath the new 132kV line.
Pylon structures	Monopole structures will be up to 40m for the structure, but this excludes the conductors which can vary up to additional 30m. Monopoles (stayed) is proposed to be used Self-supporting monopole structures will be used where required Special structures with horizontal configuration will be used for line crossings Number of monopoles: In process of design Disturbance footprint per pylon of approximately: 15m radius
Conductor type	Tern
Transmission Line footprint	<i>xxm² total footprint (permanent)</i> Eskom requires the whole servitude area as footprint of disturbance
Laydown area and contractors' yard	Due to the line length, we would require 3 laydown areas, one at Wolf, One at Grassridge and another in the middle at Skilpad, all about 1000m ² each

The pylon structure to be used is the 'guyed intermediate suspension pole – TAP/T2008/1, pictured in Figure 2.

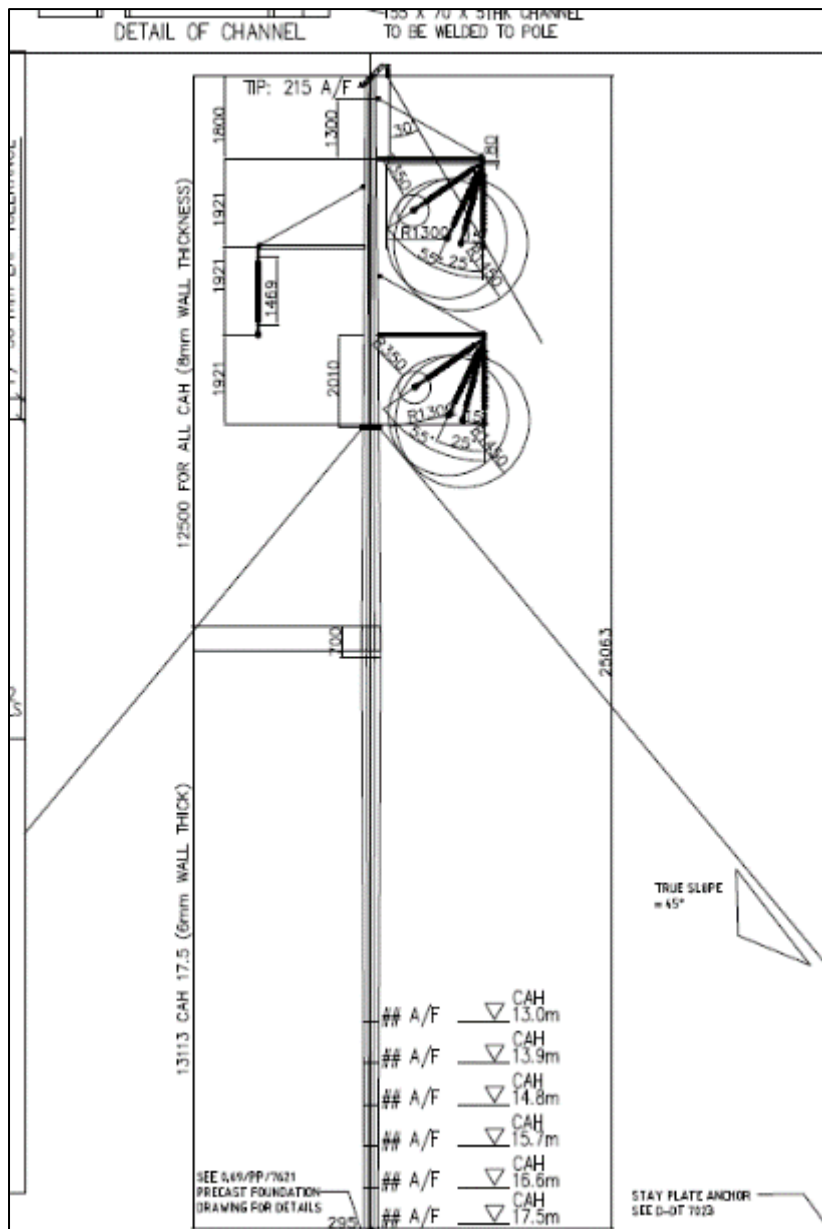


Figure 2. Pylon structures.

6. Legislative & Policy Framework

The legislation and guidelines relevant to this specialist field and development include the following:

The Convention on Biological Diversity (CBD): dedicated to promoting sustainable development. The Convention recognizes that biological diversity is about more than plants, animals and micro-

organisms and their ecosystems – it is about people and our need for food security, medicines, fresh air and water, shelter, and a clean and healthy environment in which to live. It is an international convention signed by 150 leaders at the Rio 1992 Earth Summit. South Africa is a signatory to this convention and should therefore abide by its' principles.

An important principle encompassed by the CBD is the precautionary principle which essentially states that where serious threats to the environment exist, lack of full scientific certainty should not be used a reason for delaying management of these risks. The burden of proof that the impact will not occur lies with the proponent of the activity posing the threat.

The Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or Bonn Convention): aims to conserve terrestrial, aquatic and avian migratory species throughout their range. It is an intergovernmental treaty, concluded under the aegis of the United Nations Environment Programme, concerned with the conservation of wildlife and habitats on a global scale. Since the Convention's entry into force, its membership has grown steadily to include 117 (as of 1 June 2012) Parties from Africa, Central and South America, Asia, Europe and Oceania. South Africa is a signatory to this convention.

The Agreement on the Conservation of African-Eurasian Migratory Water birds (AEWA): is the largest of its kind developed so far under the CMS. The AEWA covers 255 species of birds ecologically dependent on wetlands for at least part of their annual cycle, including many species of divers, grebes, pelicans, cormorants, herons, storks, rails, ibises, spoonbills, flamingos, ducks, swans, geese, cranes, waders, gulls, terns, tropic birds, auks, frigate birds and even the South African penguin. The agreement covers 119 countries and the European Union (EU) from Europe, parts of Asia and Canada, the Middle East and Africa.

The National Environmental Management – Biodiversity Act - Threatened or Protected Species list (TOPS).

The Species Environmental Assessment Guideline (SANBI, 2020) is applicable, this report adheres to the guideline.

The Provincial Nature Conservation Ordinance (Nature Conservation Ordinance 19 of 1974) identifies very few bird species as endangered, none of which are relevant to this study. Protected status is accorded to all wild bird species, except for a list of approximately 12 small passerine species, all corvids (crows and ravens) and all Mousebirds.

The National Environmental Management Act, No. 107 of 1998 (NEMA as amended): An Environmental Authorisation is required for Listed Activities in Regulations pursuant to NEMA The

avifaunal assessment feeds into the Scoping and EIA process to inform whether the project can proceed or not.

7. Methodology

7.1. General approach

In predicting the interactions between the proposed development and birds, a combination of science, field experience and common sense is required. More specifically the methodology used to predict impacts in the current study was as follows:

- » The various avifaunal data sets listed below and the micro habitats within the study area were examined to determine the likelihood of these relevant species occurring on or near the site, and the importance of the study area for these species.
- » The grid connection site was surveyed by driving and walking as much as possible of the route. During this field work the following was conducted:
 - Identification of micro habitats/land use on site
 - Representative photographs were taken of available micro habitats (e.g. dams, wetlands, crops, etc.);
 - Identification of any sensitive receptors e.g. wetlands, roosts, raptor nests etc.; and
 - Identification of any constraints to power line routing. For example wetlands and dams that could be avoided with slight route amendment.
- » Field survey work was done in February 2022. This qualifies as peak summer, which is a good time to sample this type of avifaunal community. Extensive rain had also fallen in the area prior to field work, meaning that food availability and avifaunal abundance was at a peak. The timing of the field survey is therefore acceptable.
- » A list of priority bird species was determined for this assessment.
- » The potential impacts of the proposed project on these above species and habitats were described and evaluated.
- » Recommendations were made for the management and mitigation of impacts.

In simple terms, this study assesses which bird species could occur on site, how important they are, how important the site is for them, how the project will affect them, and how to mitigate these effects.

7.2. Information sources

The study made use of the following data sources:

- Bird distribution data of the Southern African Bird Atlas Project (SABAP1 – Harrison, Allan, Underhill, Herremans, Tree, Parker & Brown, 1997 & SABAP2 - <http://sabap2.adu.org.za>) was consulted in order to ascertain which species occur in the study area.
- The regional conservation status of all bird species occurring in the aforementioned degree squares was then determined with the use of The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor *et al*, 2015). The global conservation status was obtained from the IUCN Red List (2022).
- The Important Bird and Biodiversity Areas of South Africa data (Marnewick *et al*. 2015) was consulted. The nearest IBA is too far (12km – Swartkops IBA) and in a totally different habitat, and so not relevant to this project and is not discussed further.
- The Co-ordinated Avifaunal Roadcount (CAR) data from South Africa (www.car.birdmap.africa) was consulted to determine its relevance. One route is close to site and is described in Section 8.2.
- The Co-ordinated Waterbird Count (CWAC) data was consulted (www.cwac.birdmap.africa) to determine whether any data is available for the site. There are no CWAC sites close enough to the proposed project to be useful.
- Information on the micro-habitat level was obtained through visiting the area and obtaining a first-hand perspective.
- Satellite Imagery of the area was studied using Google Earth ©2022.

7.3. Potential interaction between birds & proposed project

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, Hobbs & Smith, 1992; Verdoorn 1996; Kruger & Van Rooyen 1998; Van Rooyen 1998; Kruger 1999; Van Rooyen 1999; Van Rooyen 2000). Other problems are electrical faults caused by bird excreta when roosting or breeding on electricity infrastructure, (Van Rooyen & Taylor 1999) and disturbance and habitat destruction during construction and maintenance activities.

Habitat destruction during construction

During the construction phase of almost any development, some habitat destruction and alteration inevitably takes place. This happens with the construction of the development itself, access roads,

and associated infrastructure. This is true of power lines such as that proposed. Birds rely on habitat to meet their needs for foraging, drinking, resting, commuting and breeding. Of these it is probably breeding habitat which is most important to protect, although this varies between bird species. The significance of habitat destruction is influenced by a number of factors, including: size of area to be affected; sensitivity of receiving habitat; uniqueness of the habitat; degree of habitat specialisation of the bird species utilising the habitat; and the conservation status and sensitivity of the species using the habitat.

Disturbance of birds during construction of the proposed development

The construction and operational activities can impact on birds through disturbance, particularly during bird breeding activities. Particular project activities of concern include blasting, drilling, heavy earth moving general vehicular movement and any other activities which result in noise or increased human activity in an area. Disturbance of non-breeding birds may simply require them to move further away or adjust their activities during the disturbance. This may be either temporary or permanent. Disturbance of breeding birds may result in lower breeding productivity, failed breeding in the relevant season, and temporary or permanent abandonment of a breeding site. All of these reduce the recruitment of young birds to the population and can have significant implications for Red Listed species in particular, many of which are slow to reach breeding age and breed in small numbers.

Electrocution of birds whilst perched on pylons

This is caused when a bird bridges the gap between either: a live and an earthed component (phase-earth electrocution); or two live phases (phase-phase electrocutions). This type of impact is a function of line design and the dimensions of the birds' extremities. Larger bird species have a greater chance of bridging the critical clearances, causing a short circuit and being electrocuted. This risk is fairly easily managed by designing the pylons in a bird friendly manner from the outset.

Collision of birds with overhead cables

Collisions are the biggest single threat posed by the larger overhead lines to birds in southern Africa (van Rooyen 2004). 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).

The Red List bird species vulnerable to power line collisions are generally long living, slow reproducing species under natural conditions. Some require very 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, with the result that consistent high adult mortality over an extensive period could have a serious effect on a population's ability to sustain itself in the long or even medium term. Many of the anthropogenic

threats to these species are non-discriminatory as far as age is concerned (e.g. habitat destruction, disturbance and power lines) and therefore contribute to adult mortality, and it is not known what the cumulative effect of these impacts could be over the long term.

8. Receiving environment

8.1. Vegetation type & micro habitat

The power line alignment passes through a number of vegetation types. The most prevalent is “Sundays Thicket”. Patches of “Albany Alluvial Vegetation”, “Sundays Noorsveld” and “Coega Bontveld” are also traversed (Figure 3) (Mucina & Rutherford, 2018). The Albany Alluvial Vegetation is the most sensitive of these vegetation types, being classified as Endangered. Coega Bontveld occurs on the far east of the site.

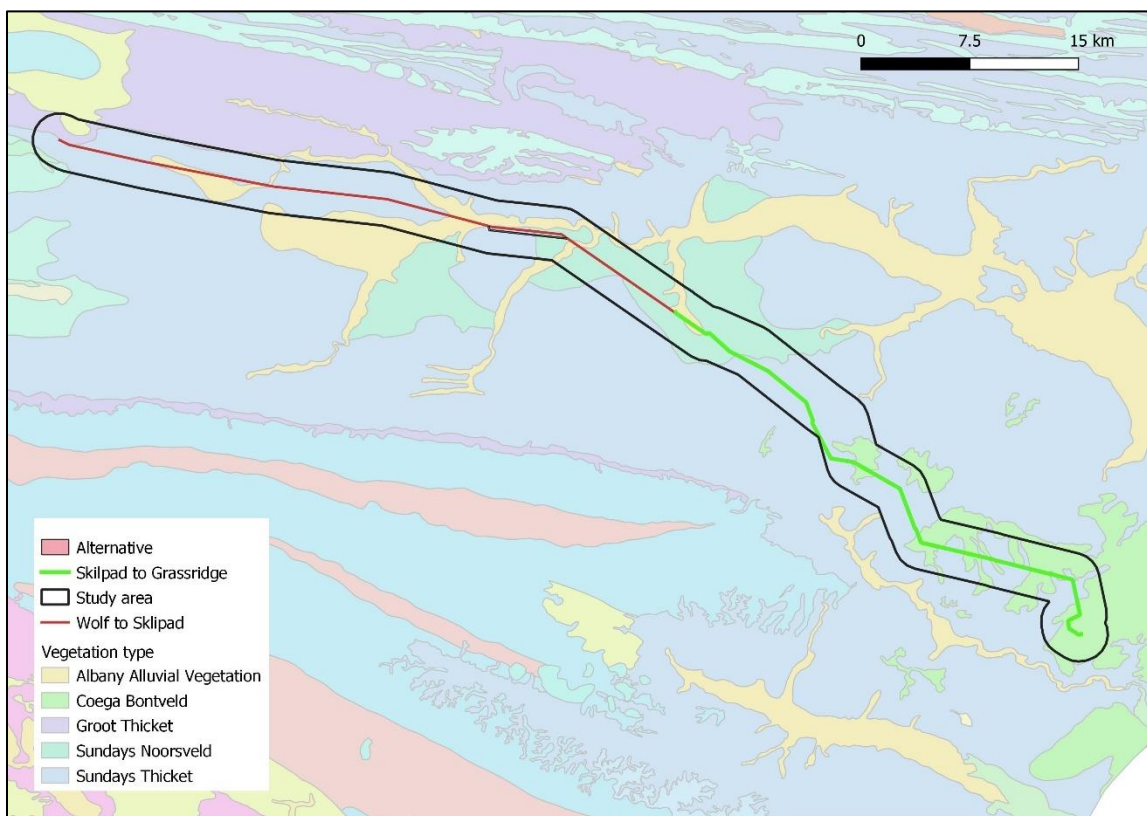


Figure 3. Vegetation types on site (Mucina & Rutherford, 2018).

For avifaunal purposes, with exception of sections of dense thicket in some of the eastern parts, the site is predominantly an open vegetation type conducive to large terrestrial bird species and raptors. The micro habitats available to birds on the site are: grassland, thicket, bontveld, dams, and drainage lines. Examples of these are shown Appendix 4.

8.2. Avifaunal community

The second Southern African Bird Atlas Project (www.sabap2.adu.org.za) recorded a total of approximately 340 bird species in the fifteen pentads (a pentad is approximately 9 x 9km) within which the proposed project is located. These are the species which could occur on the proposed site if conditions are right, but they have not all necessarily been confirmed on the site. Included amongst these 340 species are a number of regionally and globally Red Listed bird species. Five Endangered species are included: Black Harrier *Circus maurus*; African Marsh-Harrier *Circus ranivorus*; Ludwig's Bustard *Neotis ludwigii*; Martial Eagle *Polemaetus bellicosus*; and Yellow-billed Stork *Mycteria ibis*. Eight Vulnerable and twelve Near-threatened species are also amongst the 340 species. These regionally Red Listed species are the priority bird species for this assessment and are presented in Table 3. Our own brief field survey recorded 63 bird species (Appendix 3), including one regionally Red Listed species – the Blue Crane *Grus paradisea*.

One Coordinated Avifaunal Roadcount route is situated close to the site, passing the Wolf Substation (route EB04). Relevant species typically recorded on this route include: Blue Crane, Denham's Bustard, Secretarybird *Sagittarius serpentarius* and White Stork *Ciconia ciconia* (summer).

Appendix 3 presents the bird atlas data for the site and includes the species we recorded on the site. Table 3 summarises the priority bird species for the site and their likelihood of occurrence on site and possible impacts.

Table 3. Priority bird species for the site.

Common name	Taxonomic name	Status (Regional, Global, Endemic)	SABAP2 Report rate	Specialist survey	Likelihood of occurring on site	Relative importance of site for species	Potential impacts
Harrier, Black	<i>Circus maurus</i>	EN, EN, NE	3.5235		Possible	Low	-
Bustard, Ludwig's	<i>Neotis ludwigii</i>	EN, EN	6.5436		Probable	Medium	Collision with earth wire
Harrier, African Marsh	<i>Circus ranivorus</i>	EN, LC	5.0336		Unlikely	Low	-
Stork, Yellow-billed	<i>Mycteria ibis</i>	EN, LC	0.1678		Unlikely	Low	-
Eagle, Martial	<i>Polemaetus bellicosus</i>	EN, VU	2.5168		Probable	Medium	Electrocution on pylons
Tern, Caspian	<i>Hydropogone caspia</i>	VU, LC	8.3893		Probable	Low	-
Eagle, Verreaux's	<i>Aquila verreauxii</i>	VU, LC	5.8725		Probable	Medium	Electrocution on pylons
Falcon, Lanner	<i>Falco biarmicus</i>	VU, LC	5.5369		Probable	Medium	Collision with earth wire
Stork, Black	<i>Ciconia nigra</i>	VU, LC	0.6711		Possible	Low	-
Pelican, Great White	<i>Pelecanus onocrotalus</i>	VU, LC	0.1678		Unlikely	Low	-
Bustard, Denham's	<i>Neotis denhami</i>	VU, NT	2.1812		Probable	Medium	Collision with earth wire
Eagle, Crowned	<i>Stephanoaetus coronatus</i>	VU, NT	0.6711		Possible	Low	-
Korhaan, Southern Black	<i>Afrotis afra</i>	VU, VU, E	3.0201		Possible	Low	-
Pipit, African Rock	<i>Anthus crenatus</i>	NT, LC, SLS	0.8389		Possible	Low	-
Korhaan, Karoo	<i>Eupodotis vigorsii</i>	NT, LC	9.0604		Probable	Low	-
Flamingo, Greater	<i>Phoenicopterus roseus</i>	NT, LC	8.557		Unlikely	Low	-
Roller, European	<i>Coracias garrulus</i>	NT, LC	0.1678		Probable	Low	-
Woodpecker, Knysna	<i>Campethera notata</i>	NT, NT, E	11.9128		Probable	Low	-
Lark, Sclater's	<i>Spizocorys sclateri</i>	NT, NT, NE	0.1678		Unlikely	Low	-
Bustard, Kori	<i>Ardeotis kori</i>	NT, NT	2.8523		Probable	Low	-
Flamingo, Lesser	<i>Phoeniconaias minor</i>	NT, NT	2.6846		Unlikely	Low	-
Plover, Chestnut-banded	<i>Charadrius pallidus</i>	NT, NT	2.349		Possible	Low	-
Harrier, Pallid	<i>Circus macrourus</i>	NT, NT	0.1678		Possible	Low	-
Crane, Blue	<i>Grus paradisea</i>	NT, VU	11.5772	1	Confirmed	Medium	Collision with earth wire
Duck, Maccoa	<i>Oxyura maccoa</i>	NT, VU	1.1745		Possible	Low	-

Buzzard, Forest	<i>Buteo trizonatus</i>	LC, NT, SLS	0.8389		Unlikely	Low	-
Sandpiper, Curlew	<i>Calidris ferruginea</i>	LC, NT	3.3557		Possible	Low	-

Regional: Red Data regional (Taylor et al, 2015). CR- Critically Endangered; EN-Endangered; VU-Vulnerable; NT-Near-threatened; LC-Least concern

Global: IUCN, 2022

Endemic: E-Endemic; NE-Near-endemic; SLS-Endemic to South Africa, Lesotho, Swaziland; BSLS=Endemic to Botswana, SA, Lesotho, Swaziland

SABAP 2 = Southern African Bird Atlas Project 2. '1' denotes presence, not abundance

Three main ecological groups of bird species are relevant to this assessment:

Raptors – including Martial and Verreaux’s Eagles, and Lanner Falcon. These species will occur throughout the site and will be at risk of electrocution on the power line, and to a lesser extent collision (particularly in the case of Lanner Falcon).

Large terrestrial species – including Ludwig’s Bustard, Denham’s Bustard *Neotis denhamii*, Kori Bustard *Ardeotis kori* Blue Crane and Karoo Korhaan *Eupodotis vigorsii*. These species will occur mostly in the more open areas and will be at high risk of collision with overhead cables.

Small terrestrial species – including larks, pipits and others. These species will occur on the site and be at risk of habitat destruction and disturbance.

Overall the topmost priority bird species for this assessment are: Ludwig’s Bustard; Martial Eagle; Verreaux’s Eagle; Lanner Falcon; Denham’s Bustard and Blue Crane.

9. Spatial sensitivity mapping

9.1. Site sensitivity verification report

In accordance with GN 320 and GN 1150 (20 March 2020) of the NEMA EIA Regulations of 2014 (as amended), prior to commencing with a specialist assessment, a site sensitivity verification must be undertaken to confirm the current land use and environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tool (i.e., Screening Tool).

We examined the Screening Tool output (provided by Zutari, dated November 2021) and found the following:

- Animal Theme is classed as High sensitivity (Figure 4), with Black Harrier, African Marsh-Harrier, Denham’s Bustard and Knysna Warbler *Brachypterus sylvaticus* highlighted.
- Avian theme is not rated.
- Terrestrial Biodiversity Theme is classified as Very High sensitivity (Figure 5)

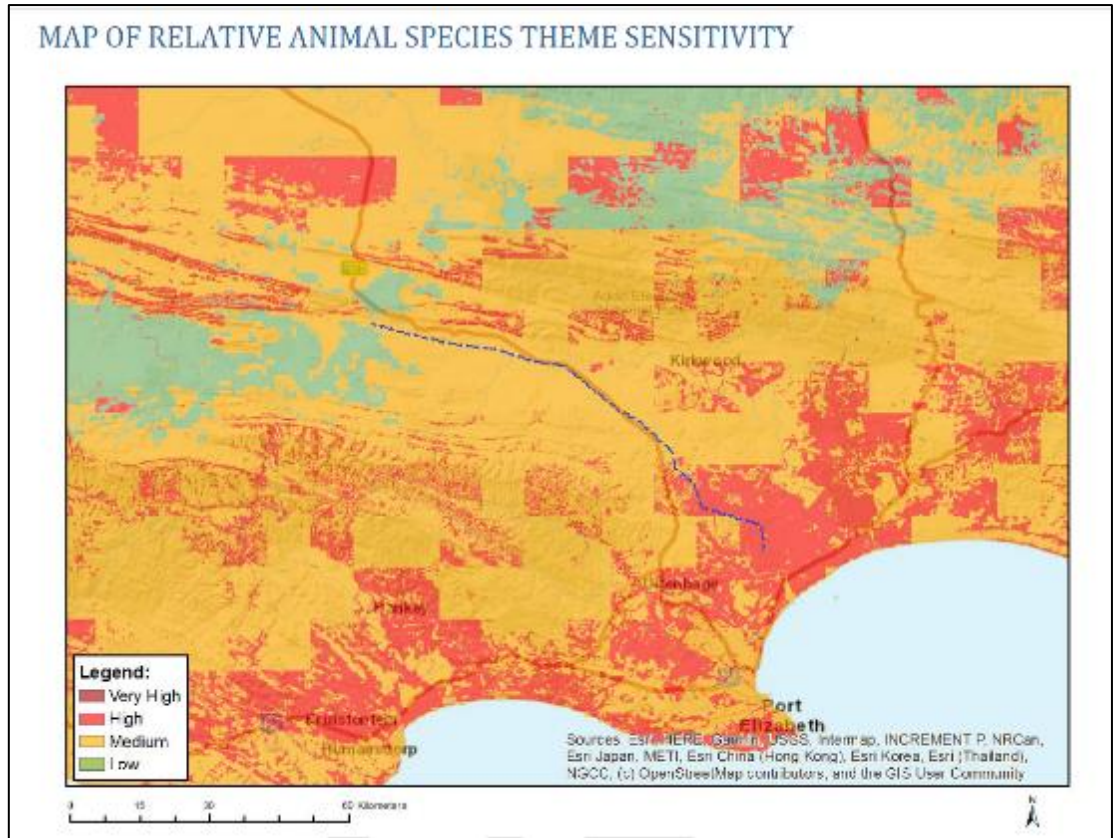


Figure 4. DFFE Screening Tool output for Animal Theme.

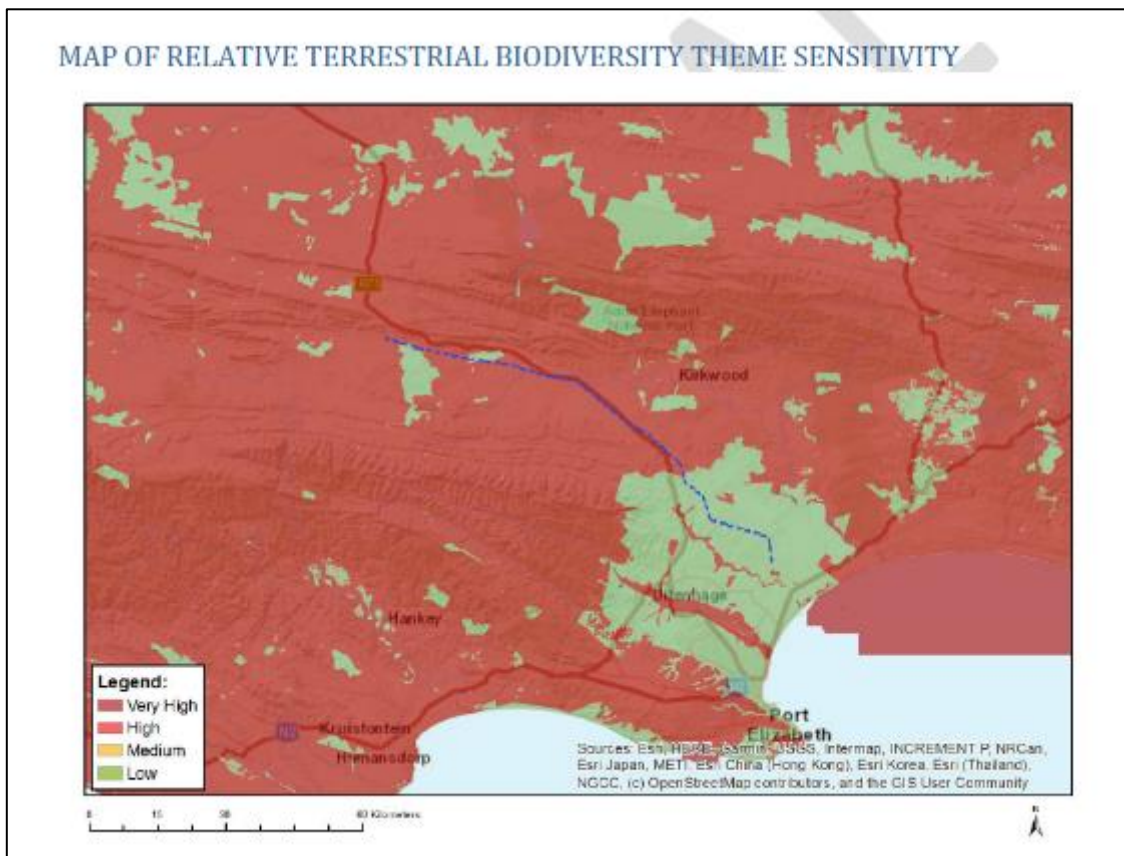


Figure 5. DFFE Screening Tool output for Terrestrial Biodiversity Theme.

The environmental sensitivity of the proposed development area for the “Avian Theme” (although not rated by the tool) was established by our own work as follows:

- » desk top analysis, using all available data sources (specified in Section 7 & 8); and
- » field survey on site as described in Section 7 & 8

Based on our work we confirm that the site is of Medium sensitivity for avifauna – predominantly on the basis of collision of large terrestrial bird species with the overhead cables.

9.2. Site sensitivity mapping

The full site is considered to be High risk for collision of regionally Red Listed bird species with the overhead cables, specifically the earth wire. The full length of the power line should therefore be installed with bird diverters as explained in Sections 10 and 11.

There are no further constraints within the proposed alignment.

10. Impact assessment

The identified impacts have been assessed according to the methodology supplied by Zutari (see Appendix 6).

The DFFE Online screening tool identified three authorised solar PV facilities within 30km of the proposed site. These have relevance to the cumulative impact assessments below.

10.1. Construction Phase Impacts

10.1.1. Destruction of bird habitat during construction of power line

The impact of habitat destruction will be of Moderate negative significance. The amount of habitat to be transformed for the power line is relatively small in this landscape and the habitat is not particularly unique or limited in availability. However destruction of habitat cannot be reversed and there is a cumulative impact in the broader area, particularly in the eastern part of the site. We recommend several mitigation measures which will slightly reduce the impact significance, but these will not entirely reduce the significance since a certain amount of habitat destruction is inevitable.

Mitigation measures

- All construction activities should be strictly managed according to generally accepted environmental best practice standards, so as to avoid any unnecessary impact on the receiving environment.
- All temporary disturbed areas should be rehabilitated according to the site's rehabilitation plan, following construction.

Table 4. Assessment of destruction of habitat.

Project phase	Construction			
Impact	Destruction of bird habitat during construction			
Description of impact	Habitat is altered or destroyed on the project footprint, including pylon positions, and access and servitude road			
Mitigatability	Low	Mitigation does not exist; or mitigation will slightly reduce the significance of impacts		
Potential mitigation	Avoid any particularly sensitive areas. Maintain strict control of staff, machinery, vehicles, so as to minimise the footprint			
Assessment	Without mitigation		With mitigation	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	Permanent	Impact may be permanent, or in excess of 20 years
Extent	Limited	Limited to the site and its immediate surroundings	Limited	Limited to the site and its immediate surroundings
Intensity	Very low	Natural and/ or social functions and/ or processes are slightly altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Certain / definite	There are sound scientific reasons to expect that the impact will definitely occur	Certain / definite	There are sound scientific reasons to expect that the impact will definitely occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	Moderate - negative		Moderate - negative	
Comment on significance	The assessed significance is appropriate			
Cumulative impacts	The cumulative impacts on habitat in the area are quite low			

10.1.2. Disturbance of birds during construction of the power line

We judge the significance of this impact to be Minor negative significance. Disturbance of birds typically reaches significant levels when the receptor is a breeding site for a sensitive species, or some other important feature, such as a roost. We have identified no such features on or near site.

Mitigation measures

- All construction activities should be strictly managed according to generally accepted environmental best practice standards, so as to avoid any unnecessary impact on the receiving environment.
- All temporary disturbed areas should be rehabilitated according to the site's rehabilitation plan, following construction.

Table 5. Assessment of disturbance of birds.

Project phase	Construction			
Impact	Disturbance of birds during construction activities			
Description of impact	Birds are disturbed by construction activities, particularly during breeding			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	Where breeding sites of sensitive species are identified these can be avoided. No such sites were identified on this site			
Assessment	Without mitigation		With mitigation	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Short term	impact will last between 1 and 5 years
Extent	Limited	Limited to the site and its immediate surroundings	Limited	Limited to the site and its immediate surroundings
Intensity	Very low	Natural and/ or social functions and/ or processes are slightly altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	Minor - negative		Minor - negative	
Comment on significance	The assessed significance is appropriate			
Cumulative impacts	The cumulative impact on birds through disturbance in the area is low			

10.2. Operations Phase Impacts

10.2.1. Collision of birds with overhead cables during operations of the power line

Using the formal methodology supplied by Zutari we judge the significance of this impact to be Major negative significance pre-mitigation. Mitigation will reduce this to Minor negative significance. Several regionally Red Listed bird species which are known to be susceptible to collision with overhead power lines occur in the study area, including Ludwig's Bustard, Kori Bustard, Denham's Bustard, Blue Crane and Karoo Korhaan. The cumulative impact of power lines on birds through collision is Medium in the eastern parts of the study area.

Mitigation measures

- The overhead cables (specifically the earth wires) should be fitted with an approved anti bird collision line marking device to make cables more visible to birds in flight and reduce the likelihood of collisions. This should be done according to the Eskom Distribution standards in terms of device spacing and other factors. Literature around the world points towards a 50-60% reduction in bird collision risk if the line is marked (Jenkins, Smallie & Diamond, 2010;

Shaw et al, 2021). The line marking device should be a dynamic (moving – bird flapper type) device.

- The new power line should be patrolled during operation by Eskom annually to measure any impacts on birds (through detecting collision fatalities) and to monitor the durability of the line marking devices.
- Where multiple devices on a span have failed (broken off or become stuck and non-dynamic due to wind) they should be replaced immediately.
- Any recorded bird fatality data should be submitted to the Eskom –EWT Strategic Partnership where it will be curated and publicly accessible.

Table 6. Assessment of collision of birds with cables.

Project phase	Operation			
Impact	Collision of birds with overhead cables			
Description of impact	Birds in flight collide with overhead cables, particularly earth wire			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	Line marking devices should be installed on the earth wire of the power line to increase its visibility to birds in flight			
Assessment	Without mitigation		With mitigation	
Nature	Negative		Negative	
Duration	On-going	Impact will last between 15 and 20 years	On-going	Impact will last between 15 and 20 years
Extent	Regional	Impacts felt at a regional / provincial level	Regional	Impacts felt at a regional / provincial level
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Certain / definite	There are sound scientific reasons to expect that the impact will definitely occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	Low	The affected environment will not be able to recover from the impact - permanently modified
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	Major - negative		Minor - negative	
Comment on significance	The assessed significance is appropriate			
Cumulative impacts	The cumulative impact of collision of birds with power lines in the study area is Medium			

10.2.2. Electrocutation of birds on pylons during operations of the power line

The significance of bird electrocution on the proposed power lines will be of Major negative significance pre-mitigation. Mitigation can reduce this to Negligible negative significance. Large eagles occur in the area, and with the absence of suitable large trees to perch on, these birds will certainly perch on the new pylons. The cumulative impact of power lines on birds through electrocution is Medium in the eastern parts of the study area.

Mitigation measures

- The pylon structure to be used provides sufficient clearance between phase and phase and phase and earth to mitigate against the risk of bird electrocution. It is recommended as a precautionary measure that the standard Eskom Bird Perch be fitted to all pole tops to further provide safe perching substrate well above dangerous hardware.
- It is recommended as a precautionary measure that the standard Eskom Bird Perch be fitted to all pole tops to further provide safe perching substrate well above dangerous hardware.
- It is also essential that if any of the pylon structures are changed, we are given opportunity to assess the electrocution risk of the new structure and design mitigation.

Table 7. Assessment of electrocution of birds on pylons.

Project phase	Operation			
Impact	Electrocution of birds perched on pylons			
Description of impact	Large birds such as eagles perch on pylons and are electrocuted when they bridge the gap between phases and/or phase and earth			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	Use a bird friendly pylon design			
Assessment	Without mitigation		With mitigation	
Nature	Negative		Negative	
Duration	On-going	Impact will last between 15 and 20 years	On-going	Impact will last between 15 and 20 years
Extent	Regional	Impacts felt at a regional / provincial level	Regional	Impacts felt at a regional / provincial level
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
Probability	Certain / definite	There are sound scientific reasons to expect that the impact will	Highly unlikely / none	Expected never to happen
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	Low	The affected environment will not be able to recover from the impact - permanently modified
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	Major - negative		Negligible - negative	
Comment on significance	The assessed significance is appropriate			
Cumulative impacts	The cumulative impact of electrocution of birds with power lines in the study area is Medium			

10.3. Decommissioning Phase Impacts

The only impact that could possibly occur during this phase is disturbance of birds, which would be similar to that assessed for the construction phase.

Table 8. Assessment of disturbance of birds during decommissioning.

Project phase	Decommissioning			
Impact	Disturbance of birds during decommissioning activities			
Description of impact	Birds are disturbed by construction activities, particularly during breeding			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	Where breeding sites of sensitive species are identified these can be avoided. No such sites were identified on this site			
Assessment	Without mitigation		With mitigation	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Short term	impact will last between 1 and 5 years
Extent	Limited	Limited to the site and its immediate surroundings	Limited	Limited to the site and its immediate surroundings
Intensity	Very low	Natural and/ or social functions and/ or processes are slightly altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	Minor - negative		Minor - negative	
Comment on significance	The assessed significance is appropriate			
Cumulative impacts	The cumulative impact on birds through disturbance in the area is low			

10.4. Overall Preferred Alternative

A minor alternative alignment for the power line was presented for assessment in the mid-section of the power line route (Figure 6). Both routes are acceptable and there is no difference between them from an avifaunal perspective.

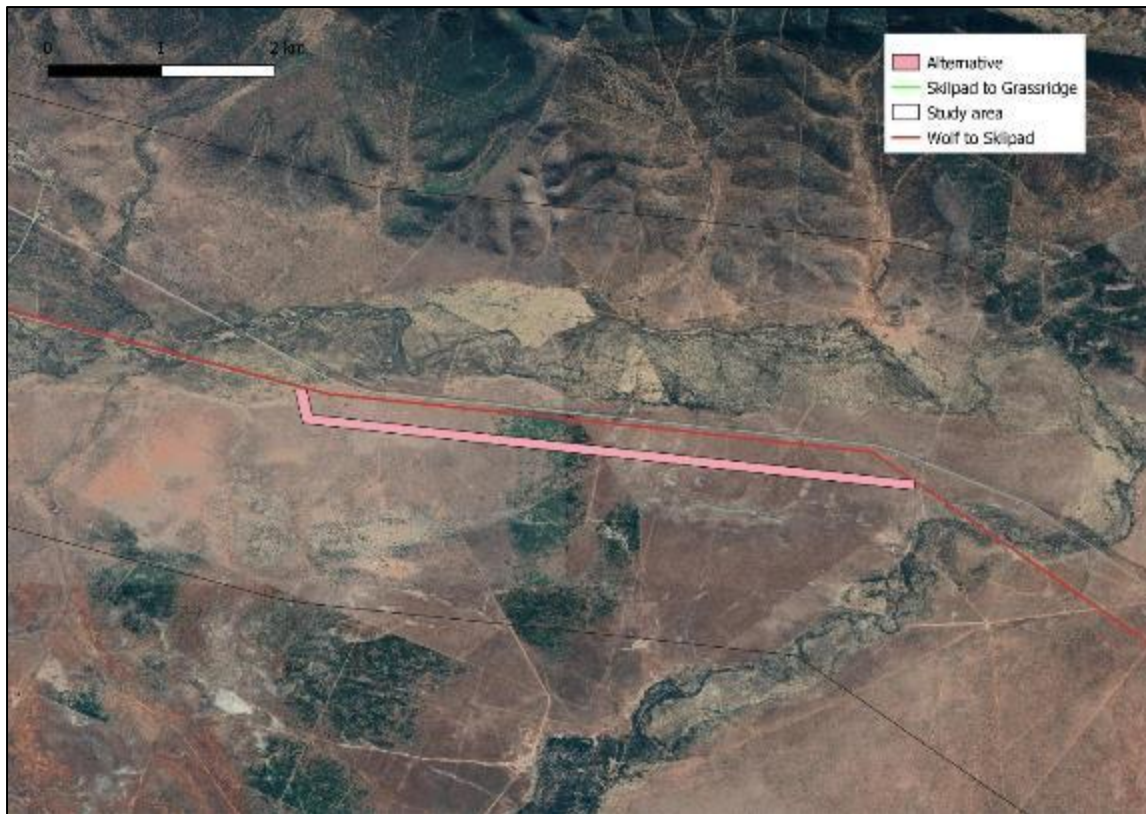


Figure 6. Alternative alignment.

11. Summary of required mitigation measures

To summarise, the following mitigation measures are necessary:

- » All construction activities should be strictly managed according to generally accepted environmental best practice standards, so as to avoid any unnecessary impact on the receiving environment.
- » All temporary disturbed areas should be rehabilitated according to the site's rehabilitation plan, following construction.
- » The overhead cables (specifically the earth wires) on the power line should be fitted with an approved anti bird collision line marking device to make cables more visible to birds in flight and reduce the likelihood of collisions. This should be done according to the Eskom Distribution standards in terms of device spacing and other factors. Literature around the world points towards a 50-60% reduction in bird collision risk if the line is marked (Jenkins, Smallie & Diamond, 2010; Shaw et al, 2021). The line marking device should be a dynamic (moving – bird flapper type) device.

- » The new power line should be patrolled during operation by Eskom annually to measure any impacts on birds (through detecting collision fatalities) and to monitor the durability of the line marking devices.
- » Where multiple devices on a span have failed (broken off or become stuck and non-dynamic due to wind) they should be replaced immediately.
- » Any recorded bird fatality data should be submitted to the Eskom –EWT Strategic Partnership where it will be curated and publicly accessible.
- » The pylon structure to be used provides sufficient clearance between phase and phase and phase and earth to mitigate against the risk of bird electrocution. It is recommended as a precautionary measure that the standard Eskom Bird Perch be fitted to all pole tops to further provide safe perching substrate well above dangerous hardware.
- » It is also essential that if any of the pylon structures are changed, we are given opportunity to assess the electrocution risk of the new structure and design mitigation.

12. Conclusions

Up to approximately 340 bird species occur in the broader area within which the proposed project is located. Included amongst these species are a number of regionally and globally Red Listed bird species and a number of endemics. Overall the topmost priority bird species for this assessment are: Ludwig’s Bustard; Martial Eagle; Verreaux’s Eagle; Lanner Falcon; Denham’s Bustard and Blue Crane.

Based on the formal criteria supplied by Zutari, we have rated the potential impacts on avifauna as follows:

- » Destruction of bird habitat during the construction phase will be of Moderate negative significance both pre and post mitigation.
- » Disturbance of birds during the construction phase will be of Minor negative significance pre and post mitigation.
- » Collision of birds with overhead cables on the power line will be of Major negative significance pre mitigation and Minor negative significance post mitigation.
- » Electrocution of birds on the pylons of the power line will be of Major negative significance pre mitigation and Negligible negative significance post mitigation.

The following mitigation measures are to be implemented:

- » All construction activities should be strictly managed according to generally accepted environmental best practice standards, so as to avoid any unnecessary impact on the receiving environment.
- » All temporary disturbed areas should be rehabilitated according to the site's rehabilitation plan, following construction.
- » The overhead cables (specifically the earth wires) on the power line should be fitted with an approved anti bird collision line marking device to make cables more visible to birds in flight and reduce the likelihood of collisions. This should be done according to the Eskom Distribution standards in terms of device spacing and other factors. Literature around the world points towards a 50-60% reduction in bird collision risk if the line is marked (Jenkins, Smallie & Diamond, 2010; Shaw et al, 2021). The line marking device should be a dynamic (moving – bird flapper type) device.
- » The new power line should be patrolled during operation by Eskom annually to measure any impacts on birds (through detecting collision fatalities) and to monitor the durability of the line marking devices.
- » Where multiple devices on a span have failed (broken off or become stuck and non-dynamic due to wind) they should be replaced immediately.
- » Any recorded bird fatality data should be submitted to the Eskom –EWT Strategic Partnership where it will be curated and publicly accessible.
- » The pylon structure to be used provides sufficient clearance between phase and phase and phase and earth to mitigate against the risk of bird electrocution. It is recommended as a precautionary measure that the standard Eskom Bird Perch be fitted to all pole tops to further provide safe perching substrate well above dangerous hardware.
- » It is also essential that if any of the pylon structures are changed, we are given opportunity to assess the electrocution risk of the new structure and design mitigation.

If these mitigation measures are implemented correctly, we believe that the impacts of the proposed project will be at an acceptable level and we recommend the proposed project be authorised to proceed. It is noted that the old existing power line will be decommissioned and removed once the new line is operational. This means that there will be no nett increase in length of power line in the area.

13. Assumptions, uncertainties & gaps in knowledge

This study made the assumption that the sources of information described throughout the report are reliable. The following factors may potentially detract from the accuracy of the predicted results:

This report is the result of a short term study, no long term studies were conducted on site. This study therefore depends heavily upon secondary or existing data sources such as those listed above. This study assumes a reasonable degree of accuracy of these data.

Predictions in this study are based on experience of these and similar species in different parts of southern Africa, through the authors' experience working in the field of wildlife – energy interaction since 2000. However bird behaviour can't be reduced to formulas that will hold true under all circumstances.

14. References

Avian Power Line Interaction Committee (APLIC). 2012. Reducing Avian Collisions with Power Lines: The State of the Art in 2012. Edison Electric Institute and APLIC. Washington, D.C.

Anderson, M.D. 2001. The effectiveness of two different marking devices to reduce large terrestrial bird collisions with overhead electricity cables in the eastern Karoo, South Africa. Draft report to Eskom Resources and Strategy Division. Johannesburg. South Africa.

Harrison, J.A., Allan, D.G., Underhill, L.G., Herremans, M., Tree, A.J., Parker, V & Brown, C.J. (eds). 1997. The atlas of southern African birds. Vol. 1&2. BirdLife South Africa: Johannesburg.

Hobbs, J.C.A. & Ledger J.A. 1986a. The Environmental Impact of Linear Developments; Power lines and Avifauna. (Third International Conference on Environmental Quality and Ecosystem Stability. Israel, June 1986).

Hobbs, J.C.A. & Ledger J.A. 1986b. "Power lines, Birdlife and the Golden Mean." *Fauna and Flora*, 44, pp 23-27.

Hockey, P.A.R., Dean, W.R.J., Ryan, P.G. (Eds) 2005. Roberts – Birds of Southern Africa, VIIIth ed. The Trustees of the John Voelcker Bird Book Fund, Cape Town.

Jenkins, A.R., Smallie, J.J., & Diamond, M. 2010. Avian collisions with power lines: a global review of causes and mitigation with a South African perspective. *Bird Conservation International* (2010) 20:263–278. ³ BirdLife International, 2010 doi:10.1017/S0959270910000122

Kruger, R. & Van Rooyen, C.S. 1998. Evaluating the risk that existing power lines pose to large raptors by using risk assessment methodology: the Molopo Case Study. (5th World Conference on Birds of Prey and Owls: 4 - 8 August 1998. Midrand, South Africa.)

Kruger, R. 1999. Towards solving raptor electrocutions on Eskom Distribution Structures in South Africa. M. Phil. Mini-thesis. University of the Orange Free State. Bloemfontein. South Africa.

Ledger, J. 1983. Guidelines for Dealing with Bird Problems of Transmission Lines and Towers. Eskom Test and Research Division Technical Note TRR/N83/005.

Ledger, J.A. & Annegarn H.J. 1981. "Electrocution Hazards to the Cape Vulture (*Gyps coprotheres*) in South Africa". *Biological Conservation*, 20, pp15-24.

Ledger, J.A. 1984. "Engineering Solutions to the problem of Vulture Electrocutions on Electricity Towers." *The Certificated Engineer*, 57, pp 92-95.

Ledger, J.A., J.C.A. Hobbs & Smith T.V. 1992. Avian Interactions with Utility Structures: Southern African Experiences. (Proceedings of the International Workshop on Avian Interactions with Utility Structures, Miami, Florida, 13-15 September 1992. Electric Power Research Institute.)

Mucina, L, Rutherford, C. 2018. *The Vegetation of South Africa, Lesotho and Swaziland*, South African National Biodiversity Institute, Pretoria.

Taylor, M. R, Peacock, F., & Wanless, R. 2015. *The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho & Swaziland*.

Van Rooyen, C.S. 1998. Raptor mortality on power lines in South Africa. (5th World Conference on Birds of Prey and Owls: 4 - 8 August 1998. Midrand, South Africa.)

Van Rooyen, C.S. 1999. An overview of the Eskom - WILDSKIES ECOLOGICAL SERVICES Strategic Partnership in South Africa. (EPRI Workshop on Avian Interactions with Utility Structures 2-3 December 1999, Charleston, South Carolina.)

Van Rooyen, C.S. 2000. "An overview of Vulture Electrocutions in South Africa." *Vulture News*, 43, pp 5-22. Vulture Study Group: Johannesburg, South Africa.

Van Rooyen, C.S. 2004a. The Management of Wildlife Interactions with overhead lines. In *The fundamentals and practice of Overhead Line Maintenance (132kV and above)*, pp217-245. Eskom Technology, Services International, Johannesburg.

Van Rooyen, C.S. 2004b. Investigations into vulture electrocutions on the Edwardsdam-Mareetsane 88kV feeder, Unpublished report, Endangered Wildlife Trust, Johannesburg.

Van Rooyen, C.S. & Taylor, P.V. 1999. Bird Streamers as probable cause of electrocutions in South Africa. (EPRI Workshop on Avian Interactions with Utility Structures 2-3 December 1999. Charleston, South Carolina)

Verdoorn, G.H. 1996. Mortality of Cape Griffons *Gyps coprotheres* and African White-backed Vultures *Gyps africanus* on 88kV and 132kV power lines in Western Transvaal, South Africa, and mitigation measures to prevent future problems. (2nd International Conference on Raptors: 2-5 October 1996. Urbino, Italy.)

Websites:

www.sabap2.adu.org.za Southern African Bird Atlas Project 2

www.iucnredlist.org. Accessed January 2022

Appendix 1. Specialist declaration form



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

PROPOSED CONSTRUCTION AND OPERATION OF THE WOLF-SKILPAD-GRASSRIDGE 132KV POWER LINE IN THE EASTERN CAPE PROVINCE

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at <https://www.environment.gov.za/documents/forms>.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:

Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:

Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
 Email: EIAAdmin@environment.gov.za

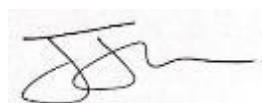
SPECIALIST INFORMATION

Specialist Company Name:	WILDSKIES ECOLOGICAL SERVICES PTY LTD		
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition
			100%
Specialist name:	J. SMALLIE		
Specialist Qualifications:	BSC MSC		
Professional affiliation/registration:	SACNASP 400020/06		
Physical address:	36 UTRECHT AVENUE, EAST LONDON, 5241		
Postal address:			
Postal code:	5241	Cell:	0824448919
Telephone:		Fax:	
E-mail:	JON@WILDSKIES.CO.ZA		

DECLARATION BY THE SPECIALIST

I, J. SMALLIE, declare that –

- I act as the independent specialist in this application;
- 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 have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, 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; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.



Signature of the Specialist
 WILDSKIES ECOLOGICAL SERVICES PTY LTD

Name of Company:
 25 February 2022

Date:

Appendix 2. Specialist CV

JONATHAN JAMES SMALLIE

WildSkies Ecological Services (2011/131435/07)

Curriculum Vitae

Background

Date of birth: 20 October 1975

Qualifications: BSC – Agriculture (Hons) (completed 1998)

University of Natal – Pietermaritzburg

MSC – Environmental Science (completed 2011)

University of Witwaterstrand

Occupation: Specialist avifaunal consultant

Profession registration: South African Council for Natural Scientific Professions

Contact details

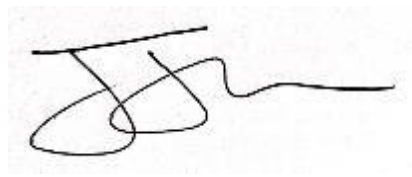
Cell number: 082 444 8919

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Postal: 36 Utrecht Avenue, Bonnie Doon, East London, 5210

ID #: 7510205119085



Professional experience

World Bank Group – International Finance Corporation:

Short term consultant role as avifaunal specialist advisor

Renewable energy:

Post construction bird monitoring for wind energy facilities:

Dassieklip (Caledon) –initiated in April 2014 (2yrs); Dorper Wind Farm (Molteno) – initiated in July 2014 (5yrs); Jeffreys Bay Wind Farm – initiated in August 2014 (4yrs); Kouga Wind Farm – started Feb 2015 (2yrs); Cookhouse Wind Farm – started March 2015 (1yr); Grassridge Wind Farm – initiated in April 2015 (2yrs); Chaba Wind Farm – initiated December 2015 (1yr); Amakhala Emoyeni 01 Wind Farm initiated August 2016 (5yrs) – IFC funded project; Gibson Bay Wind Farm – initiated March 2017 (4yrs); Nojoli Wind Farm initiated March 2017 (4yrs); Sere Wind Farm (2yrs); Golden Valley Wind Farm (started Sep 2021 – 1 yr).

Pre-construction bird monitoring & EIA for wind energy facilities:

Golden Valley 1; Middleton; Dorper; Qumbu; Ncora; Nqamakhwe; Ndakana; Thomas River; Peddie; Mossel Bay; Hluhluwe; Richards Bay; Garob; Outeniqua; Castle; Wolf; Inyanda-Roodeplaat; Dassiesridge; Great Kei; Bayview; Grahamstown; Bakenskop; Umsobomvu; Stormberg; Zingesele; Oasis; Gunstfontein; Naumanii; Golden Valley Phase 2; Ngxwabangu; Hlobo; Woodstock; Scarlet Ibis; Albany; Golden Valley 1 2nd monitoring; Umtathi Emoyeni; Serenje Zambia; Unika 1 Zambia; Impofu East, West, and North; Nuweveld East, West and North; Elands Wind Farm; Ingwe Wind Farm; Hoogland Wind Farm; Cradock Wind Farm Cluster; Canyon Springs Wind Farm; Loxton Wind Farm; Taibos Wind Farm; Aberdeen Wind Farm.

Screening studies for wind energy facilities:

Tarkastad Wind Farm; Quanti Wind Farm; Ruitjies Wind Farm; Beaufort West Wind Farm; Success Wind Farm; Cradock Wind Farm; Britstown Wind Farm; Clanwilliam Wind Farm; Ebenhezer Wind Farm.

Avifaunal walk through for wind energy facilities:

Garob Wind Farm; Golden Valley 1 wind farm; Nxuba Wind Farm.

Pre-construction bird monitoring and EIA for Solar energy facilities:

Bonnievale Solar Energy Facility; Dealesville Solar Energy Facility; Rooipunt Solar Energy Facility; De Aar Solar Energy Facility; Noupoot Solar Energy Facility, Aggeneys Solar Energy Facility; Eskom Concentrated Solar Power Plant; Bronkhorstspruit Solar Photovoltaic Plant; De Aar Solar Energy Facility; Paulputs Solar Energy Facility; Kenhardt Solar Energy Facility; Wheatlands Solar Energy Facility; Nampower CSP project; Dwaalboom PV; Slurry PV; De Hoek PV; Suikerbekkie PV; Springhaas PV.

Other Electricity Generation:

Port of Ngura Power Barge EIA; Tugela Hydro-Electric Scheme; Mmamabula West Coal Power Station (Botswana).

Electricity transmission & distribution:

Overhead transmission power lines (>132 000 kilovolts):

Oranjemund Gromis 220kv; Perseus Gamma 765kv; Aries Kronos 765kv; Aries Helios 765kv; Perseus Kronos 765kv; Helios Juno 765kv; Borutho Nzelele 400kv; Foskor Merensky 275kv; Kimberley Strengthening; Mercury Perseus 400kv; Eros Neptune Grassridge 400kv; Kudu Juno 400kv; Garona Aries 400kv; Perseus Hydra 765kv; Tabor Witkop 275kv; Tabor Spencer 400kv; Moropule Orapa 220kv (Botswana); Coega Electrification; Majuba Venus 765kv; Gamma Grassridge 765kv; Gourikwa Proteus 400kv; Koeberg Strengthening 400kv; Ariadne Eros 400kv; Hydra Gamma 765kv; Zizabona transmission – Botswana; Maphutha Witkop 400kv; Makala B 400kv; Aggeneys Paulputs 400kv; Northern Alignment 765kv; Kappa Omega 765kv; Isundu 400kv and Substation; Senakangwedi B Integration; Oranjemund Gromis;

Overhead distribution power lines (<132 000 kilovolts):

Kanoneiland 22kV; Hydra Gamma 765kV; Komani Manzana 132kV; Rockdale Middelburg 132kV; Irenedale 132 kV; Zandfontein 132kV; Venulu Makonde 132 kV; Spencer Makonde 132 kV; Dalkeith Jackal Creek 132kV; Glen Austin 88kV; Bulgerivier 132kV; Ottawa Tongaat 132kV; Disselfontein 132kV; Voorspoed Mine 132kV; Wonderfontein 132kV; Kabokweni Hlau Hlau 132kV; Hazyview Kiepersol 132kV; Mayfern Delta 132kV; VAAL Vresap 88kV; Arthursview Modderkuil 88kV; Orapa, AK6, Lethakane substations and 66kV lines (Botswana); Dagbreek Hermon 66kV; Uitkoms Majuba 88kV; Pilanesberg Spitskop 132kV; Qumbu PG Bison 132kV; Louis Trichardt Venetia 132kV; Rockdale Middelburg Ferrochrome 132kV; New Continental Cement 132kV; Hillside 88kV; Marathon Delta 132kV; Malelane Boulder 132kV; Nondela Strengthening 132kV; Spitskop Northern Plats 132kV; West Acres Mataffin 132kV; Westgate Tarlton Kromdraai 132kV; Sappi Elliot Ugie 132kV; Melkhout Thyspunt 132kV; St Francis Bay 66kV; Etna Ennerdale 88kV; Kroonstad 66kV; Firham Platrand; Paradise Fondwe 132kV; Kraal Mafube 132kV; Loeriesfontein 132kV; Albany Mimosa 66kV; Zimanga 132kV; Grootpan Brakfontein; Mandini Mangethe; Valkfontein Substation; Sishen Saldanha; Corinth Mzongwana 132kV; Franklin Vlei 22kV; Simmerpan Strengthening; Ilanga Lethemba 132kV; Cuprum Burchell Mooidraai 132; Oliphantskop Grassridge 132;

Risk Assessments on existing power lines:

Hydra-Droerivier 1,2 & 3 400kV; Hydra-Poseidon 1,2 400kV; Butterworth Ncora 66kV; Nieu-Bethesda 22kV; Maclear 22kV (Joelshoek Valley Project); Wodehouse 22kV (Dordrecht district); Burgersdorp

Aliwal North Jamestown 22kV; Cradock 22kV; Colesberg area 22kV; Loxton self build 11kV; Kanoneiland 22kV; Stutterheim Municipality 22kV; Majuba-Venus 400kV; Chivelston-Mersey 400kV; Marathon-Prairie 275kV; Delphi-Neptune 400kV; Ingagane – Bloukrans 275kV; Ingagane – Danskraal 275kV; Danskraal – Bloukrans 275kV

Avifaunal “walk through” (EMP’s):

Kappa Omega 765kV; Rockdale Marble Hall 400kV; Beta Delphi 400kV; Mercury Perseus 765kV; Perseus 765kV Substation; Beta Turn 765kV in lines; Spencer Tabor 400kV line; Kabokweni Hlau Hlau 132kV; Mayfern Delta 132kV; Eros Mtata 400kV; Cennergi Grid connect 132kV; Melkhout Thyspunt 132kV; Imvubu Theta 400kV; Outeniqua Oudshoorn 132kV; Clocolan Ficksburg 88kV.

Strategic Environmental Assessments for Master Electrification Plans:

Northern Johannesburg area; Southern KZN and Northern Eastern Cape; Northern Pretoria; Western Cape Peninsula

Other electrical infrastructure work

Investigation into rotating Bird Flapper saga – Aberdeen 22kV; Special investigation into faulting on Ariadne-Eros 132kV; Special investigation into Bald Ibis faulting on Tutuka Pegasus 275kV; Special investigation into bird related faulting on 22kV Geluk Hendrina line; Special investigation into bird related faulting on Camden Chivelston 400kV line

Water sector:

Umkhombazi Dam and associated tunnel and pipelines; Rosedale Waste Water Treatment Works; Lanseria Outfall Sewer; Lanseria Wastewater Treatment Works;

Wildlife airport hazards:

Kigali International Airport – Rwanda; Port Elizabeth Airport – specialist study as part of the EIA for the proposed Madiba Bay Leisure Park; Manzini International Airport (Swaziland); Polokwane International Airport; Mafekeng International Airport; Lanseria Airport. Namibia Airports Company – wildlife hazard management plans for three airports.

Conservation planning:

East Cape Biodiversity Strategy & Action Plan – avifaunal input; City of Ekurhuleni Biodiversity Plan – avifaunal input.

Other sectors:

Submarine telecommunications cables project; Lizzard Point Golf Estate – Vaaldam; Lever Creek Estates housing development; East Cape Biodiversity Strategy and Action Plan 2017; Cathedral Peak Road diversion; Dube Tradeport; East London Transnet Ports Authority Biodiversity Management Plan; Leazonia Feedlot; Carisbrooke Quarry; Senekal Sugar Development; Frankfort Paper Mill;

Employment positions held to date:

- August 1999 to May 2004: Eastern Cape field officer for the South African Crane Working Group of the Endangered Wildlife Trust
- May 2004 to November 2007: National Field officer for Eskom-EWT Strategic Partnership and Airports Company SA – EWT Strategic Partnership (both programmes of Endangered Wildlife Trust)
- November 2007 to August 2011: Programme Manager – Wildlife & Energy Programme – Endangered Wildlife Trust
- August 2011 to present: Independent avifaunal specialist – Director at WildSkies Ecological Services (Pty) Ltd

Relevant achievements:

- Recipient of BirdLife South Africa's Giant Eagle Owl in 2011 for outstanding contribution to bird conservation in SA
- Founded and chaired for first two years – the Birds and Wind Energy Specialist Group (BAWESG) of the Endangered Wildlife Trust & BirdLife South Africa.

Conferences attended & presented at:

- 2021. African Conference on Linear Infrastructure and Environment
- 2018. Raptor Research Foundation conference, Kruger National Park.
- 2019. Conference on Wind Energy and Wildlife, Stirling, Scotland.
- 2017. Conference on Wind Energy and Wildlife, Estoril, Portugal.
- 2012-2020. Windaba Conference. Various attendance.
- May 2011. Conference of Wind Energy and Wildlife, Trondheim, Norway.
- March 2011. Chair and facilitator at Endangered Wildlife Trust – Wildlife & Energy Programme – “2011 Wildlife & Energy Symposium”, Howick, SA
- September 2010 – Raptor Research Foundation conference, Fort Collins, Colorado. Presented on the use of camera traps to investigate Cape Vulture roosting behaviour on transmission lines
- May 2010 - Wind Power Africa 2010. Presented on wind energy and birds
- October 2008. Session chair at Pan-African Ornithological Conference, Cape Town, South Africa
- March 27 – 30 2006: International Conference on Overhead Lines, Design, Construction, Inspection & Maintenance, Fort Collins Colorado USA. Presented a paper entitled “Assessing the power line network in the Kwa-Zulu Natal Province of South Africa from a vulture interaction perspective”.
- June 2005: IASTED Conference at Benalmadena, Spain – presented a paper entitled “Impact of bird streamers on quality of supply on transmission lines: a case study”
- May 2005: International Bird Strike Committee 27th meeting – Athens, Greece. Presented a paper entitled Bird Strike Data analysis at SA airports 1999 to 2004.
- 2003: Presented a talk on “Birds & Power lines” at the 2003 AGM of the Amalgamated Municipal Electrical Unions – in Stutterheim - Eastern Cape
- September 2000: 5th World Conference on Birds of Prey in Seville, Spain.

Papers & publications:

- Jenkins, A.R., Van Rooyen, C.S., Smallie, J., Harrison, J.A., Diamond, M., Smit-Robbinson, H.A. & Ralston, S. 2015. “Best practice guidelines for assessing and monitoring the impact of wind energy facilities on birds in southern Africa” Unpublished guidelines
- Ralston-Paton, S., Smallie, J., Pearson, A., & Ramalho, R. 2017. Wind energy's impacts on birds in South Africa: a preliminary review of the results of operational monitoring at the first wind farms of the Renewable Energy Independent Power Producer Procurement Programme Wind Farms in South Africa. BirdLife South Africa Occasional Report Series No. 2. BirdLife South Africa, Johannesburg, South Africa.
- Prinsen, H.A.M., J.J. Smallie, G.C. Boere, & N. Pires. (compilers), 2011. Guidelines on how to avoid or mitigate impacts of electricity power grids on migratory birds in the African-Eurasian Region. CMS Technical Series Number XX. Bonn, Germany.
- Prinsen, H.A.M., J.J. Smallie, G.C. Boere, & N. Pires. (compilers), 2011. Review of the conflict between migratory birds and electricity power grids in the African-Eurasian region. CMS Technical Series Number XX, Bonn, Germany.

- Jenkins, A.R., van Rooyen, C.S, Smallie, J.J, Harrison, J.A., Diamond, M.D., Smit-Robinson, H.A & Ralston, S. 2014. Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa
- Jenkins, A.R., Shaw, J.M., Smallie, J.J., Gibbons, B., Visagie, R. & Ryan, P.G. 2011. Estimating the impacts of power line collisions on Ludwig's Bustards *Neotis ludwigii*. Bird Conservation International.
- Jordan, M., & Smallie, J. 2010. A briefing document on best practice for pre-construction assessment of the impacts of onshore wind farms on birds. Endangered Wildlife Trust , Unpublished report
- Smallie, J., & Virani, M.Z. 2010. A preliminary assessment of the potential risks from electrical infrastructure to large birds in Kenya. Scopus 30: p32-39
- Shaw, J.M., Jenkins, A.R., Ryan, P.G., & Smallie, J.J. 2010. A preliminary survey of avian mortality on power lines in the Overberg, South Africa. Ostrich 2010. 81 (2) p109-113
- Jenkins, A.R., Smallie, J.J., & Diamond, M. 2010. Avian collisions with power lines: a global review of causes and mitigation with a South African perspective. Bird Conservation International 2010. 20: 263-278.
- Shaw, J.M., Jenkins, A.R., Ryan, P.G., & Smallie, J.J. 2010. Modelling power line collision risk for the Blue Crane *Anthropoides paradiseus* in South Africa. Ibis 2010 (152) p590-599.
- Jenkins, A.R., Allan, D.G., & Smallie, J.J. 2009. Does electrification of the Lesotho Highlands pose a threat to that countries unique montane raptor fauna? Dubious evidence from surveys of three existing power lines. Gabar 20 (2).
- Smallie, J.J., Diamond, M., & Jenkins, A.R. 2008. Lighting up the African continent – what does this mean for our birds? Pp 38-43. In Harebottle, D.M., Craig, A.J.F.K., Anderson, M.D., Rakotomanana, H., & Muchai. (eds). Proceedings of the 12th Pan-african Ornithological Congress. 2008. Cape Town. Animal Demography Unit. ISBN (978-0-7992-2361-3)
- Van Rooyen, C., & Smallie, J.J. 2006. The Eskom –EWT Strategic Partnership in South Africa: a brief summary. Nature & Faunae Vol 21: Issue 2, p25
- Smallie, J. & Froneman, A. 2005. Bird Strike data analysis at South African Airports 1999 to 2004. Proceedings of the 27th Conference of the International Bird Strike Committee, Athens Greece.
- Smallie, J. & Van Rooyen, C. 2005. Impact of bird streamers on quality of supply on transmission lines: a case study. Proceedings of the Fifth IASTED International Conference on Power and Energy Systems, Benalmadena, Spain.
- Smallie, J. & Van Rooyen, C. 2003. Risk assessment of bird interaction on the Hydra-Droërvier 1 and 2 400kV. Unpublished report to Eskom Transmission Group. Endangered Wildlife Trust. Johannesburg. South Africa
- Van Rooyen, C. Jenkins, A. De Goede, J. & Smallie J. 2003. Environmentally acceptable ways to minimise the incidence of power outages associated with large raptor nests on Eskom pylons in the Karoo: Lessons learnt to date. Project number 9RE-00005 / R1127 Technology Services International. Johannesburg. South Africa
- Smallie, J. J. & O'Connor, T. G. (2000) Elephant utilization of *Colophospermum mopane*: possible benefits of hedging. African Journal of Ecology 38 (4), 352-359.

Courses & training:

- Successfully completed a 5 day course in High Voltage Regulations (modules 1 to 10) conducted by Eskom – Southern Region
- Successfully completed training on, and obtained authorization for, live line installation of Bird Flappers

Appendix 3. Bird data for the site

Regional: Red Data regional (Taylor et al, 2015). CR- Critically Endangered; EN-Endangered; VU-Vulnerable; NT-Near-threatened; LC-Least concern

Global: IUCN, 2021

Endemic: E-Endemic; NE-Near-endemic; SLS-Endemic to South Africa, Lesotho, Swaziland; BSLS=Endemic to Botswana, SA, Lesotho, Swaziland

SABAP 2 = Southern African Bird Atlas Project 2. '1' denotes presence, not abundance

Specialist site visit = recorded on the specialists site visit in January 2022

Common name	Taxonomic name	Status (Regional, Global, Endemic)	SABAP2 Report rate	Specialist survey
Harrier, Black	<i>Circus maurus</i>	EN, EN, NE	3.5235	
Bustard, Ludwig's	<i>Neotis ludwigii</i>	EN, EN	6.5436	
Harrier, African Marsh	<i>Circus ranivorus</i>	EN, LC	5.0336	
Stork, Yellow-billed	<i>Mycteria ibis</i>	EN, LC	0.1678	
Eagle, Martial	<i>Polemaetus bellicosus</i>	EN, VU	2.5168	
Buzzard, Forest	<i>Buteo trizonatus</i>	LC, NT, SLS	0.8389	
Sandpiper, Curlew	<i>Calidris ferruginea</i>	LC, NT	3.3557	
Pipit, African Rock	<i>Anthus crenatus</i>	NT, LC, SLS	0.8389	
Korhaan, Karoo	<i>Eupodotis vigorsii</i>	NT, LC	9.0604	
Flamingo, Greater	<i>Phoenicopterus roseus</i>	NT, LC	8.557	
Roller, European	<i>Coracias garrulus</i>	NT, LC	0.1678	
Woodpecker, Knysna	<i>Campethera notata</i>	NT, NT, E	11.9128	
Lark, Sclater's	<i>Spizocorys sclateri</i>	NT, NT, NE	0.1678	
Bustard, Kori	<i>Ardeotis kori</i>	NT, NT	2.8523	
Flamingo, Lesser	<i>Phoeniconaias minor</i>	NT, NT	2.6846	
Plover, Chestnut-banded	<i>Charadrius pallidus</i>	NT, NT	2.349	
Harrier, Pallid	<i>Circus macrourus</i>	NT, NT	0.1678	
Crane, Blue	<i>Grus paradisea</i>	NT, VU	11.5772	1
Duck, Maccoa	<i>Oxyura maccoa</i>	NT, VU	1.1745	
Tern, Caspian	<i>Hydropogone caspia</i>	VU, LC	8.3893	
Eagle, Verreaux's	<i>Aquila verreauxii</i>	VU, LC	5.8725	
Falcon, Lanner	<i>Falco biarmicus</i>	VU, LC	5.5369	
Stork, Black	<i>Ciconia nigra</i>	VU, LC	0.6711	
Pelican, Great White	<i>Pelecanus onocrotalus</i>	VU, LC	0.1678	
Bustard, Denham's	<i>Neotis denhami</i>	VU, NT	2.1812	
Eagle, Crowned	<i>Stephanoaetus coronatus</i>	VU, NT	0.6711	
Korhaan, Southern Black	<i>Afrotis afra</i>	VU, VU, E	3.0201	
Swallow, South African Cliff	<i>Petrochelidon spilodera</i>	BSLS	0.1678	
Sugarbird, Cape	<i>Promerops cafer</i>	E	0.5034	
Warbler, Victorin's	<i>Cryptillas victorini</i>	E	0.5034	
Siskin, Cape	<i>Crithagra totta</i>	E	0.3356	

Bulbul, Cape	<i>Pycnonotus capensis</i>	E	55.3691	
Flycatcher, Fiscal	<i>Melaenornis silens</i>	NE	62.0805	
Prinia, Karoo	<i>Prinia maculosa</i>	NE	57.8859	
White-eye, Cape	<i>Zosterops virens</i>	NE	36.4094	
Weaver, Cape	<i>Ploceus capensis</i>	NE	34.8993	
Sunbird, Southern Double-collared	<i>Cinnyris chalybeus</i>	NE	31.2081	
Tchagra, Southern	<i>Tchagra tchagra</i>	NE	26.6779	
Buzzard, Jackal	<i>Buteo rufofuscus</i>	NE	26.0067	1
Lark, Large-billed	<i>Galerida magnirostris</i>	NE	8.557	1
Canary, Black-headed	<i>Serinus alario</i>	NE	7.3826	
Chat, Sickle-winged	<i>Emarginata sinuata</i>	NE	6.0403	
Lark, Cape Clapper	<i>Mirafra apiata</i>	NE	5.5369	
Thrush, Karoo	<i>Turdus smithi</i>	NE	5.3691	
Tit, Grey	<i>Melaniparus afer</i>	NE	4.8658	
Flycatcher, Fairy	<i>Stenostira scita</i>	NE	3.6913	
Lark, Black-eared Sparrow-	<i>Eremopterix australis</i>	NE	2.8523	
Tit-Babbler (Warbler), Layard's	<i>Sylvia layardi</i>	NE	2.1812	
Waxbill, Swee	<i>Coccyzygia melanotis</i>	NE	2.0134	
Grassbird, Cape	<i>Sphenoeacus afer</i>	NE	1.6779	
Lark, Karoo	<i>Calendulauda albescens</i>	NE	0.8389	
Eremomela, Karoo	<i>Eremomela gregalis</i>	NE	0.6711	
Cisticola, Cloud	<i>Cisticola textrix</i>	NE	0.1678	
Robin, Brown Scrub	<i>Cercotrichas signata</i>	NE	0.1678	
Spurfowl, Cape	<i>Pternistis capensis</i>	NE	0.1678	
Warbler, Namaqua	<i>Phragmacia substriata</i>	NE	0.1678	
Starling, Pied	<i>Lamprotornis bicolor</i>	SLS	40.1007	1
Sunbird, Greater Double-collared	<i>Cinnyris afer</i>	SLS	36.745	
Thrush, Cape Rock	<i>Monticola rupestris</i>	SLS	4.1946	
Francolin, Grey-winged	<i>Scleroptila afra</i>	SLS	3.0201	
Turaco, Knysna	<i>Tauraco corythaix</i>	SLS	1.3423	
Canary, Forest	<i>Crithagra scotops</i>	SLS	0.5034	
Fiscal, Southern (Common)	<i>Lanius collaris</i>		80.2013	1
Sparrow, Cape	<i>Passer melanurus</i>		76.5101	1
Dove, Cape Turtle (Ring-necked)	<i>Streptopelia capicola</i>		68.9597	1
Weaver, Southern Brown-throated	<i>Ploceus xanthopterus</i>		61.745	
Greenbul, Sombre	<i>Andropadus importunus</i>		61.5772	1
Wagtail, Cape	<i>Motacilla capensis</i>		59.8993	
Crow, Pied	<i>Corvus albus</i>		58.7248	1
Mousebird, Speckled	<i>Colius striatus</i>		57.2148	1
Mousebird, Red-faced	<i>Urocolius indicus</i>		56.5436	1
Barbet, Acacia Pied	<i>Tricholaema leucomelas</i>		56.0403	
Ibis, Hadedda (Hadada)	<i>Bostrychia hagedash</i>		55.8725	1
Robin, Karoo Scrub	<i>Cercotrichas coryphoeus</i>		54.3624	1
Dove, Laughing	<i>Spilopelia senegalensis</i>		53.8591	
Drongo, Fork-tailed	<i>Dicrurus adsimilis</i>		53.3557	
Robin-chat, Cape	<i>Cossypha caffra</i>		52.6846	1

Goose, Egyptian	<i>Alopochen aegyptiaca</i>		50.8389	1
Tit-Babbler, Chestnut-vented	<i>Sylvia subcoerulea</i>		50.3356	1
Boubou, Southern	<i>Laniarius ferrugineus</i>		48.8255	1
Pigeon, Speckled	<i>Columba guinea</i>		44.4631	1
Raven, White-necked	<i>Corvus albicollis</i>		43.1208	
Dove, Red-eyed	<i>Streptopelia semitorquata</i>		41.443	1
Crow, Cape	<i>Corvus capensis</i>		40.9396	1
Lapwing, Blacksmith	<i>Vanellus armatus</i>		40.7718	1
Sunbird, Malachite	<i>Nectarinia famosa</i>		38.5906	
Hoopoe, African	<i>Upupa africana</i>		38.4228	
Seedeater, Streaky-headed	<i>Crithagra gularis</i>		38.4228	
Cisticola, Grey-backed	<i>Cisticola subruficapilla</i>		37.5839	1
Swallow, Barn	<i>Hirundo rustica</i>		36.0738	1
Starling, Common	<i>Sturnus vulgaris</i>		35.7383	1
Chat, Familiar	<i>Oenathe familiaris</i>		34.8993	
Lapwing, Crowned	<i>Vanellus coronatus</i>		34.8993	
Duck, Yellow-billed	<i>Anas undulata</i>		34.7315	1
Martin, Rock	<i>Ptyonoprogne fuligula</i>		33.3893	1
Egret, Western Cattle	<i>Bubulcus ibis</i>		32.8859	
Sunbird, Amethyst	<i>Chalcomitra amethystina</i>		32.8859	
Plover, Three-banded	<i>Charadrius tricollaris</i>		32.7181	1
Shelduck, South African	<i>Tadorna cana</i>		32.5503	1
Swallow, Greater Striped	<i>Cecropis cucullata</i>		32.5503	1
Ibis, African Sacred	<i>Threskiornis aethiopicus</i>		31.8792	
Pipit, African	<i>Anthus cinnamomeus</i>		31.0403	
Coot, Red-knobbed	<i>Fulica cristata</i>		30.5369	
Cormorant, Reed	<i>Microcarbo africanus</i>		30.2013	1
Starling, Cape Glossy (Cape)	<i>Lamprotornis nitens</i>		30.0336	
Sparrow, Southern Grey-headed	<i>Passer diffusus</i>		29.698	1
Guineafowl, Helmeted	<i>Numida meleagris</i>		29.1946	
Kingfisher, Brown-hooded	<i>Halcyon albiventris</i>		29.0268	1
Swift, White-rumped	<i>Apus caffer</i>		28.8591	
Grebe, Little	<i>Tachybaptus ruficollis</i>		28.5235	1
Heron, Black-headed	<i>Ardea melanocephala</i>		28.1879	1
Weaver, Spectacled	<i>Ploceus ocularis</i>		28.1879	
Sparrow, House	<i>Passer domesticus</i>		28.0201	1
Bishop, Southern Red	<i>Euplectes orix</i>		27.5168	
Moorhen, Common	<i>Gallinula chloropus</i>		27.0134	
Waxbill, Common	<i>Estrilda astrild</i>		26.5101	
Goshawk, Pale Chanting	<i>Melierax canorus</i>		26.3423	1
Heron, Grey	<i>Ardea cinerea</i>		25.5034	
Martin, Brown-throated	<i>Riparia paludicola</i>		25.1678	1
Barbet, Black-collared	<i>Lybius torquatus</i>		25.1678	
Robin, White-browed Scrub	<i>Cercotrichas leucophrys</i>		24.8322	
Warbler, Lesser Swamp	<i>Acrocephalus gracilirostris</i>		24.8322	
Canary, White-throated	<i>Crithagra albogularis</i>		23.9933	

Dove, Emerald-spotted Wood	<i>Turtur chalcospilos</i>		23.8255	
Kestrel, Rock	<i>Falco rupicolus</i>		23.8255	
Swift, Little	<i>Apus affinis</i>		22.1477	1
Cormorant, White-breasted	<i>Phalacrocorax lucidus</i>		22.1477	
Eagle, African Fish	<i>Haliaeetus vocifer</i>		21.9799	
Warbler, Rufous-eared	<i>Malcorus pectoralis</i>		21.6443	
Stilt, Black-winged	<i>Himantopus himantopus</i>		21.1409	1
Chat, Ant-eating	<i>Myrmecocichla formicivora</i>		21.1409	
Canary, Yellow-fronted	<i>Crithagra mozambica</i>		20.302	
Spoonbill, African	<i>Platalea alba</i>		19.6309	1
Darter, African	<i>Anhinga rufa</i>		19.6309	
Woodpecker, Cardinal	<i>Dendropicos fuscescens</i>		19.6309	
Shoveler, Cape	<i>Spatula smithii</i>		19.2953	
Swallow, Lesser Striped	<i>Cecropis abyssinica</i>		19.1275	1
Oriole, Black-headed	<i>Oriolus larvatus</i>		19.1275	
Bunting, Lark-like	<i>Emberiza impetuani</i>		18.4564	
Canary, Brimstone	<i>Crithagra sulphurata</i>		18.4564	
Egret, Little	<i>Egretta garzetta</i>		18.4564	
Thick-knee, Spotted	<i>Burhinus capensis</i>		18.1208	
Bunting, Cape	<i>Emberiza capensis</i>		17.953	1
Kingfisher, Pied	<i>Ceryle rudis</i>		17.4497	
Warbler, Little Rush	<i>Bradypterus baboecala</i>		17.1141	
Swallow, Pearl-breasted	<i>Hirundo dimidiata</i>		16.9463	1
Teal, Cape	<i>Anas capensis</i>		16.9463	
Lark, Sabota	<i>Calendulauda sabota</i>		16.2752	
Cisticola, Levallant's	<i>Cisticola tinniens</i>		15.9396	
Teal, Red-billed	<i>Anas erythrorhyncha</i>		15.9396	
Starling, Red-winged	<i>Onychognathus morio</i>		15.7718	
Batis, Cape	<i>Batis capensis</i>		15.604	
Crombec, Long-billed	<i>Sylvietta rufescens</i>		15.2685	
Honeyguide, Lesser	<i>Indicator minor</i>		14.9329	
Lark, Spike-heeled	<i>Chersomanes albofasciata</i>		14.4295	1
Crake, Black	<i>Amaurornis flavirostra</i>		14.4295	
Kite, Yellow-billed	<i>Milvus aegyptius</i>		14.094	1
Bush-shrike, Olive	<i>Chlorophoneus olivaceus</i>		13.5906	
Spurfowl, Red-necked	<i>Pternistis afer</i>		13.5906	
Thrush, Olive	<i>Turdus olivaceus</i>		13.4228	
Coucal, Burchell's	<i>Centropus burchellii</i>		13.0872	
Wood-hoopoe, Green	<i>Phoeniculus purpureus</i>		13.0872	
Swallow, White-throated	<i>Hirundo albigularis</i>		12.9195	
Swift, African Palm	<i>Cypsiurus parvus</i>		12.9195	
Cuckoo, Diederik	<i>Chrysococcyx caprius</i>		12.5839	
Plover, Kittlitz's	<i>Charadrius pecuarius</i>		12.5839	
Dove, Namaqua	<i>Oena capensis</i>		12.2483	1
Tinkerbird, Red-fronted	<i>Pogoniulus pusillus</i>		12.2483	1
Quelea, Red-billed	<i>Quelea quelea</i>		12.2483	

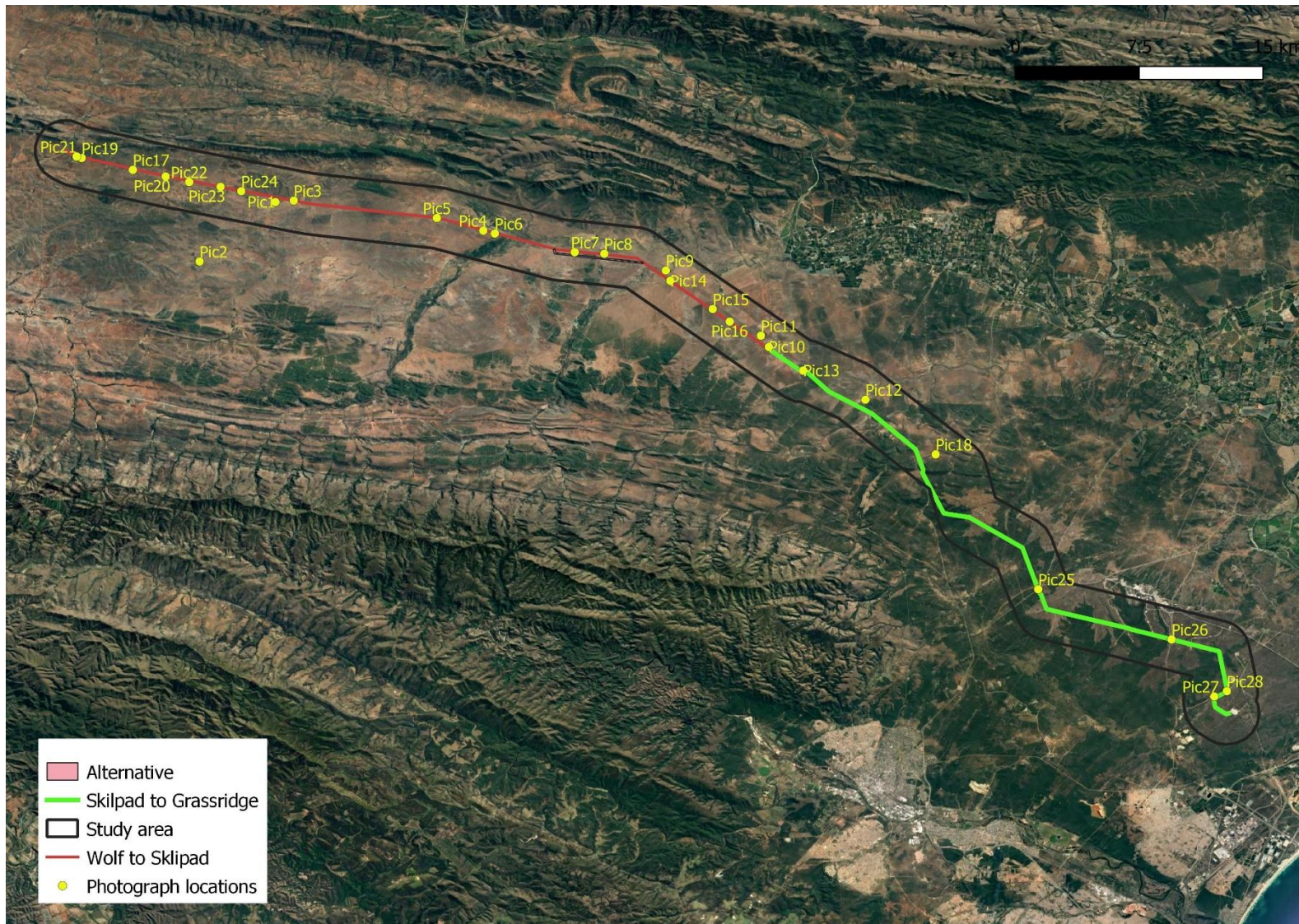
Thick-knee, Water	<i>Burhinus vermiculatus</i>		12.2483	
Buzzard, Common (Steppe)	<i>Buteo buteo</i>		11.9128	1
Saw-wing, Black	<i>Psalidoprocne pristoptera</i>		11.9128	
Lark, Karoo Long-billed	<i>Certhilauda subcoronata</i>		11.4094	
Kingfisher, Malachite	<i>Corythornis cristatus</i>		11.0738	
Bulbul, African Red-eyed	<i>Pycnonotus nigricans</i>		10.906	
Dove, Rock	<i>Columba livia</i>		10.7383	
Stint, Little	<i>Calidris minuta</i>		10.4027	
Greenshank, Common	<i>Tringa nebularia</i>		10.2349	
Heron, Goliath	<i>Ardea goliath</i>		10.2349	
Whydah, Pin-tailed	<i>Vidua macroura</i>		10.0671	1
Flycatcher, African Dusky	<i>Muscicapa adusta</i>		9.8993	
Cuckoo, Klaas's	<i>Chrysococcyx klaas</i>		9.7315	
Eremomela, Yellow-bellied	<i>Eremomela icteropygialis</i>		9.7315	
Jacana, African	<i>Actophilornis africanus</i>		9.7315	
Kite, Black-winged	<i>Elanus caeruleus</i>		9.396	
Goose, Spur-winged	<i>Plectropterus gambensis</i>		9.2282	1
Firefinch, African	<i>Lagonosticta rubricata</i>		9.2282	
Mousebird, White-backed	<i>Colius colius</i>		9.2282	
Brownbul, Terrestrial	<i>Phyllastrephus terrestris</i>		9.0604	
Wryneck, Red-throated	<i>Jynx ruficollis</i>		8.7248	1
Batis, Pirit	<i>Batis pririt</i>		8.3893	
Lark, Red-capped	<i>Calandrella cinerea</i>		8.3893	
Swamphen, African (Purple)	<i>Porphyrio madagascariensis</i>		8.3893	
Bee-eater, White-fronted	<i>Merops bullockoides</i>		8.2215	
Longclaw, Cape	<i>Macronyx capensis</i>		8.2215	
Chat, Karoo	<i>Emarginata schlegelii</i>		8.0537	
Wheatear, Mountain	<i>Myrmecocichla monticola</i>		8.0537	
Flycatcher, Chat	<i>Melaenornis infuscatus</i>		7.8859	
Sandgrouse, Namaqua	<i>Pterocles namaqua</i>		7.7181	
Korhaan, Northern Black	<i>Afrotis afroides</i>		7.5503	
Stonechat, African	<i>Saxicola torquatus</i>		7.5503	
Camaroptera, Green-backed	<i>Camaroptera brachyura</i>		7.3826	1
Flycatcher, African Paradise	<i>Terpsiphone viridis</i>		7.3826	
Sunbird, Grey	<i>Cyanomitra veroxii</i>		7.3826	
Sandpiper, Wood	<i>Tringa glareola</i>		7.2148	
Sunbird, Dusky	<i>Cinnyris fuscus</i>		7.047	
Ostrich, Common	<i>Struthio camelus</i>		6.7114	1
Lark, Eastern Clapper	<i>Mirafraga fasciolata</i>		6.7114	
Stork, White	<i>Ciconia ciconia</i>		6.3758	
Bunting, Golden-breasted	<i>Emberiza flaviventris</i>		6.2081	
Eagle, Booted	<i>Hieraaetus pennatus</i>		6.0403	1
Kingfisher, Giant	<i>Megaceryle maxima</i>		5.7047	
Cuckoo, Jacobin	<i>Clamator jacobinus</i>		5.3691	
Canary, Black-throated	<i>Crithagra atrogularis</i>		5.2013	
Sunbird, Collared	<i>Hedydipna collaris</i>		5.2013	

Canary, Cape	<i>Serinus canicollis</i>		4.8658	
Cisticola, Lazy	<i>Cisticola aberrans</i>		4.8658	
Duck, White-backed	<i>Thalassornis leuconotus</i>		4.8658	
Heron, Purple	<i>Ardea purpurea</i>		4.8658	
Tern, Whiskered	<i>Chlidonias hybrida</i>		4.8658	
Starling, Wattled	<i>Creatophora cinerea</i>		4.3624	
Warbler, Willow	<i>Phylloscopus trochilus</i>		4.3624	
Woodpecker, Olive	<i>Dendropicos griseocephalus</i>		4.3624	
Honeyguide, Greater	<i>Indicator indicator</i>		4.1946	
Penduline-tit, Cape	<i>Anthoscopus minutus</i>		4.1946	
Weaver, Yellow (Eastern Golden)	<i>Ploceus subaureus</i>		4.1946	
Wheatear, Capped	<i>Oenanthe pileata</i>		4.0268	1
Bee-eater, European	<i>Merops apiaster</i>		4.0268	
Duck, White-faced Whistling	<i>Dendrocygna viduata</i>		4.0268	
Cuckoo, African	<i>Cuculus gularis</i>		3.6913	
Dove, Tambourine	<i>Turtur tympanistria</i>		3.6913	
Egret, Yellow-billed (Intermediate)	<i>Ardea intermedia</i>		3.6913	
Pipit, Nicholson's	<i>Anthus similis</i>		3.6913	
Pochard, Southern	<i>Netta erythrophthalma</i>		3.6913	
Warbler, African Reed	<i>Acrocephalus baeticatus</i>		3.5235	
Hawk, African Harrier-	<i>Polyboroides typus</i>		3.3557	
Lark, Grey-backed Sparrow	<i>Eremopterix verticalis</i>		3.3557	
Sparrowhawk, Black	<i>Accipiter melanoleucus</i>		3.3557	
Cisticola, Zitting	<i>Cisticola juncidis</i>		3.0201	
Mannikin, Bronze	<i>Lonchura cucullata</i>		3.0201	
Osprey, Western	<i>Pandion haliaetus</i>		3.0201	
Tit, Southern Black	<i>Melaniparus niger</i>		3.0201	
Puffback, Black-backed	<i>Dryoscopus cubla</i>		2.8523	
Canary, Yellow	<i>Crithagra flaviventris</i>		2.6846	1
Finch, Red-headed	<i>Amadina erythrocephala</i>		2.6846	
Nightjar, Fiery-necked	<i>Caprimulgus pectoralis</i>		2.6846	
Bunting, Cinnamon-breasted	<i>Emberiza tahapisi</i>		2.5168	
Heron, Black-crowned Night	<i>Nycticorax nycticorax</i>		2.5168	
Owl, Spotted Eagle-	<i>Bubo africanus</i>		2.5168	
Prinia, Black-chested	<i>Prinia flavicans</i>		2.5168	
Rail, African	<i>Rallus caerulescens</i>		2.5168	
Swift, Alpine	<i>Tachymarptis melba</i>		2.5168	
Chat, Tractrac	<i>Emarginata tractrac</i>		2.349	
Cuckooshrike, Black	<i>Campephaga flava</i>		2.349	
Quail, Common	<i>Coturnix coturnix</i>		2.1812	1
Finch (Weaver), Scaly-feathered	<i>Sporopipes squamifrons</i>		2.1812	
Flycatcher, Spotted	<i>Muscicapa striata</i>		2.1812	
Weaver, Village	<i>Ploceus cucullatus</i>		2.1812	
Whimbrel, (Common)	<i>Numenius phaeopus</i>		2.1812	
Cisticola, Wailing	<i>Cisticola lais</i>		2.0134	
Flycatcher, Blue-mantled Crested	<i>Trochocercus cyanomelas</i>		2.0134	

Starling, Pale-winged	<i>Onychognathus nabouroup</i>		2.0134	
Weaver, Sociable	<i>Philetairus socius</i>		2.0134	
Bush-shrike, Grey-headed	<i>Malaconotus blanchoti</i>		1.8456	
Duck, African Black	<i>Anas sparsa</i>		1.8456	
Goshawk, African	<i>Accipiter tachiro</i>		1.8456	
Martin, Common House	<i>Delichon urbicum</i>		1.8456	
Batis, Chinspot	<i>Batis molitor</i>		1.6779	1
Courser, Double-banded	<i>Rhinoptilus africanus</i>		1.6779	
Eagle, Long-crested	<i>Lophaetus occipitalis</i>		1.6779	
Swift, African Black	<i>Apus barbatus</i>		1.6779	
Tern, Common	<i>Sterna hirundo</i>		1.6779	
Bulbul, Dark-capped	<i>Pycnonotus tricolor</i>		1.5101	1
Bittern, Little	<i>Ixobrychus minutus</i>		1.5101	
Firefinch, Red-billed	<i>Lagonosticta senegala</i>		1.5101	
Lark, Rufous-naped	<i>Mirafrja africana</i>		1.5101	
Pipit, Plain-backed	<i>Anthus leucophrys</i>		1.5101	
Sandpiper, Marsh	<i>Tringa stagnatilis</i>		1.5101	
Shrike, Red-backed	<i>Lanius collurio</i>		1.5101	
Weaver, Dark-backed	<i>Ploceus bicolor</i>		1.5101	
Grebe, Black-necked	<i>Podiceps nigricollis</i>		1.3423	
Owl, Western Barn	<i>Tyto alba</i>		1.3423	
Swift, Common	<i>Apus apus</i>		1.3423	
Cuckooshrike, Grey	<i>Cebalpyris caesius</i>		1.1745	
Falcon, Peregrine	<i>Falco peregrinus</i>		1.1745	
Sparrow-weaver, White-browed	<i>Plocepasser mahali</i>		1.1745	
Sparrowhawk, Little	<i>Accipiter minullus</i>		1.1745	
Indigobird, Dusky	<i>Vidua funerea</i>		1.0067	
Petronia, Yellow-throated	<i>Gymnoris superciliaris</i>		1.0067	
Starling, Black-bellied	<i>Notopholia corusca</i>		1.0067	
Weaver, Thick-billed	<i>Amblyospiza albifrons</i>		1.0067	
Flycatcher, Southern Black	<i>Melaenornis pammelaina</i>		0.8389	
Honeyguide, Scaly-throated	<i>Indicator variegatus</i>		0.8389	
Tern, Little	<i>Sternula albifrons</i>		0.8389	
Egret, Great	<i>Ardea alba</i>		0.6711	
Ibis, Glossy	<i>Plegadis falcinellus</i>		0.6711	
Kestrel, Greater	<i>Falco rupicoloides</i>		0.6711	
Oriole, Eurasian Golden	<i>Oriolus oriolus</i>		0.6711	
Pigeon, African Olive	<i>Columba arquatrix</i>		0.6711	
Plover, Grey	<i>Pluvialis squatarola</i>		0.6711	
Plover, White-fronted	<i>Charadrius marginatus</i>		0.6711	
Snipe, African	<i>Gallinago nigripennis</i>		0.6711	
Starling, Violet-backed	<i>Cinnyricinclus leucogaster</i>		0.6711	
Teal, Hottentot	<i>Spatula hottentota</i>		0.6711	
Cisticola, Desert	<i>Cisticola aridulus</i>		0.5034	
Heron, Squacco	<i>Ardeola ralloides</i>		0.5034	
Hornbill, Crowned	<i>Lophocerus alboterminatus</i>		0.5034	

Kestrel, Lesser	<i>Falco naumanni</i>		0.5034	
Warbler, Yellow-throated Woodland	<i>Phylloscopus ruficapilla</i>		0.5034	
Bush-shrike, Orange-breasted	<i>Chlorophoneus sulfureopectus</i>		0.3356	
Chat, Mocking Cliff	<i>Thamnolaea cinnamomeiventris</i>		0.3356	
Cuckoo, Red-chested	<i>Cuculus solitarius</i>		0.3356	
Eagle, Black-chested Snake	<i>Circaetus pectoralis</i>		0.3356	
Heron, Black	<i>Egretta ardesiaca</i>		0.3356	
Honeybird, Brown-backed	<i>Prodotiscus regulus</i>		0.3356	
Myna, Common	<i>Acridotheres tristis</i>		0.3356	
Nightjar, Freckled	<i>Caprimulgus tristigma</i>		0.3356	
Prinia, Tawny-flanked	<i>Prinia subflava</i>		0.3356	
Sparrowhawk, Rufous-breasted	<i>Accipiter rufiventris</i>		0.3356	
Wagtail, African Pied	<i>Motacilla aguimp</i>		0.3356	
Warbler, Great Reed	<i>Acrocephalus arundinaceus</i>		0.3356	
Warbler, Marsh	<i>Acrocephalus palustris</i>		0.3356	
Cisticola, Wing-snapping	<i>Cisticola ayresii</i>		0.1678	
Cuckoo, Great Spotted	<i>Clamator glandarius</i>		0.1678	
Goshawk, Gabar	<i>Micronisus gabar</i>		0.1678	
Kingfisher, African Pygmy	<i>Ispidina picta</i>		0.1678	
Martin, Sand	<i>Riparia riparia</i>		0.1678	
Nightjar, European	<i>Caprimulgus europaeus</i>		0.1678	
Owl, African Scops	<i>Otus senegalensis</i>		0.1678	
Owl, Cape Eagle-	<i>Bubo capensis</i>		0.1678	
Pigeon, African Green	<i>Treron calvus</i>		0.1678	
Robin, Kalahari Scrub	<i>Cercotrichas paena</i>		0.1678	
Scimitarbill, Common	<i>Rhinopomastus cyanomelas</i>		0.1678	
Swift, Horus	<i>Apus horus</i>		0.1678	
Tern, White-winged	<i>Chlidonias leucopterus</i>		0.1678	
Thrush, Short-toed Rock	<i>Monticola brevipes</i>		0.1678	
Apalis, Bar-throated	<i>Apalis thoracica</i>			1
Bokmakierie	<i>Telophorus zeylonus</i>			1
Neddicky	<i>Cisticola fulvicapilla</i>			1
Weaver, Southern Masked	<i>Ploceus velatus</i>			1

Appendix 4. Photographs of the site.





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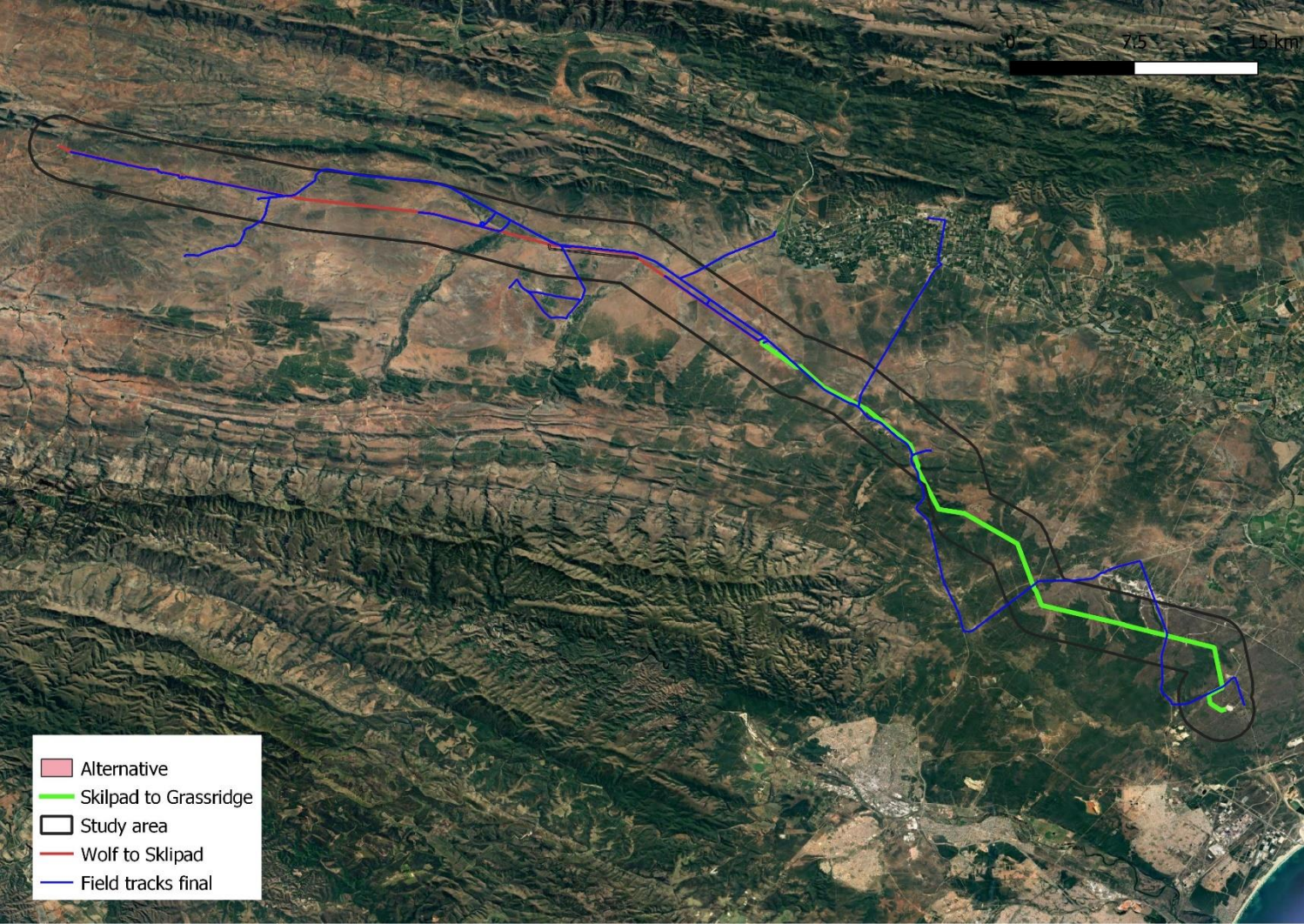


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Appendix 5. GPS tracks from field survey of the site.



Appendix 6. Impact assessment methodology (from Zutari).

Methodology

This section outlines the proposed method for assessing the significance of the potential environmental impacts. For each predicted impact, criteria are ascribed, and these include the intensity (size or degree scale), which also includes the type of impact, being either a positive or negative impact; the duration (temporal scale); and the extent (spatial scale), as well as the probability (likelihood). The methodology is quantitative, whereby professional judgement is used to identify a rating for each criteria based on a seven-point scale (refer to the below tables); and the significance is auto-generated using a spreadsheet through application of the calculations in the below figure. Specialists can comment where they disagree with the auto-calculated impact significance rating.

Calculations

For each predicted impact, certain criteria are applied to establish the likely **significance** of the impact, firstly in the case of no mitigation being applied and then with the most effective mitigation measure(s) in place.

These criteria include the **intensity** (size or degree scale), which also includes the **type** of impact, being either a positive or negative impact; the **duration** (temporal scale); and the **extent** (spatial scale). These numerical ratings are used in an equation whereby the **consequence** of the impact can be calculated. Consequence is calculated as follows:

$$\text{Consequence} = \text{type} \times (\text{intensity} + \text{duration} + \text{extent})$$

To calculate the significance of an impact, the **probability** (or likelihood) of that impact occurring is applied to

Calculation of significance

Assessment criteria for the evaluation of impacts

Criteria	Numerical Rating	Category	Description
Duration	1	Immediate	Impact will self-remedy immediately
	2	Brief	Impact will not last longer than 1 year
	3	Short term	Impact will last between 1 and 5 years
	4	Medium term	Impact will last between 5 and 10 years
	5	Long term	Impact will last between 10 and 15 years
	6	On-going	Impact will last between 15 and 20 years
	7	Permanent	Impact may be permanent, or in excess of 20 years
Extent	1	Very limited	Limited to specific isolated parts of the site
	2	Limited	Limited to the site and its immediate surroundings
	3	Local	Extending across the site and to nearby settlements
	4	Municipal area	Impacts felt at a municipal level
	5	Regional	Impacts felt at a regional level
	6	National	Impacts felt at a national level
	7	International	Impacts felt at an international level
Intensity	1	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
	2	Very low	Natural and/ or social functions and/ or processes are slightly altered

Criteria	Numerical Rating	Category	Description
	3	Low	Natural and/ or social functions and/ or processes are somewhat altered
	4	Moderate	Natural and/ or social functions and/ or processes are moderately altered
	5	High	Natural and/ or social functions and/ or processes are notably altered
	6	Very high	Natural and/ or social functions and/ or processes are majorly altered
	7	Extremely high	Natural and/ or social functions and/ or processes are severely altered
Probability	1	Highly unlikely / None	Expected never to happen
	2	Rare / improbable	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere
	3	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
	4	Probable	Has occurred here or elsewhere and could therefore occur
	5	Likely	The impact may occur
	6	Almost certain / Highly probable	It is most likely that the impact will occur
	7	Certain / Definite	There are sound scientific reasons to expect that the impact will definitely occur

When assessing impacts, broader considerations are also taken into account. These include the level of confidence in the assessment rating; the reversibility of the impact; and the irreplaceability of the resource as set out in the below tables.

Definition of confidence ratings

Category	Description
Low	Judgement is based on intuition
Medium	Determination is based on common sense and general knowledge
High	Substantive supportive data exists to verify the assessment

Definition of reversibility ratings

Category	Description
Low	The affected environment will not be able to recover from the impact - permanently modified
Medium	The affected environment will only recover from the impact with significant intervention
High	The affected environmental will be able to recover from the impact

Definition of irreplaceability ratings

Category	Description
Low	The resource is not damaged irreparably or is not scarce
Medium	The resource is damaged irreparably but is represented elsewhere
High	The resource is irreparably damaged and is not represented elsewhere