BIRD IMPACT ASSESSMENT STUDY:

Basic Assessment for the proposed new infrastructure to support the authorised wind energy facilities, near Noupoort, in the Northern Cape Province

Report prepared for:

ARCUS

Report prepared by:

AFRIMAGE Photography (Pty) Ltd t/a:
Chris van Rooyen Consulting
VAT#: 4580238113
email: vanrooyen.chris@gmail.com
Tel: +27 (0)82 4549570 cell

July 2019

Specialist Expertise

Curriculum vitae: Chris van Rooyen

Profession/Specialisation	:	Avifaunal Specialist
Highest Qualification	:	LLB
Nationality	:	South African
Years of experience	:	22 years

Key Experience

Chris van Rooyen has twenty two years' experience in the assessment of avifaunal interactions with industrial infrastructure. He was employed by the Endangered Wildlife Trust as head of the Eskom-EWT Strategic Partnership from 1996 to 2007, which has received international acclaim as a model of co-operative management between industry and natural resource conservation. He is an acknowledged global expert in this field and has consulted in South Africa, Namibia, Botswana, Lesotho, New Zealand, Texas, New Mexico and Florida. He also has extensive project management experience and he has received several management awards from Eskom for his work in the Eskom-EWT Strategic Partnership. He is the author and/or co-author of 17 conference papers, co-author of two book chapters, several research reports and the current best practice guidelines for avifaunal monitoring at wind farm sites. He has completed around 130 power line assessments; and has to date been employed as specialist avifaunal consultant on more than 50 renewable energy generation projects. He has also conducted numerous risk assessments on existing power lines infrastructure. He also works outside the electricity industry and he has done a wide range of bird impact assessment studies associated with various residential and industrial developments. He serves on the Birds and Wind Energy Specialist Group which was formed in 2011 to serve as a liaison body between the ornithological community and the wind industry.

Professional affiliations

I work under the supervision of and in association with Albert Froneman (MSc Conservation Biology) (SACNASP Zoological Science Registration number 400177/09) as stipulated by the Natural Scientific Professions Act 27 of 2003.

Curriculum vitae: Albert Froneman

Profession/Specialisation	:	Avifaunal Specialist
Highest Qualification	:	MSc (Conservation Biology)
Nationality	:	South African
Years of experience	:	20 years

Key Qualifications

Albert Froneman (Pr.Sci.Nat) has more than 20 years' experience in the management of avifaunal interactions with industrial infrastructure. He holds a M.Sc. degree in Conservation Biology from the University of Cape Town. He managed the Airports Company South Africa (ACSA) – Endangered Wildlife Trust Strategic Partnership from 1999 to 2008 which has been internationally recognised for its achievements in addressing airport wildlife hazards in an environmentally sensitive manner at ACSA's airports across South Africa. Albert is recognised worldwide as an expert in the field of bird hazard management on airports and has worked in South Africa, Swaziland, Botswana, Namibia, Kenya, Israel, and the USA. He has served as the vice chairman of the International Bird Strike Committee and has presented various papers at international conferences and workshops. At present, he is consulting to ACSA with wildlife hazard management on all their airports. He also an accomplished specialist ornithological consultant outside the aviation industry and has completed a wide range of bird impact assessment studies. He has co-authored many avifaunal specialist studies and pre-construction

monitoring reports for proposed renewable energy developments across South Africa. He also has vast experience in using Geographic Information Systems to analyse and interpret avifaunal data spatially and derive meaningful conclusions. Since 2009 Albert has been a registered Professional Natural Scientist (Registration Number 400177/09) with The South African Council for Natural Scientific Professions, specialising in Zoological Science.

Specialist Declaration

I, Chris van Rooyen, as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- I act as the independent specialist in this application;
- I 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;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- 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 not, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- 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;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study 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.

Name of Specialist: Chris van Rooyen

Signature of the specialist: _____

Date: 9 July 2019

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

Basic Assessment Process for Grid Connection and Associated Infrastructure, Northern and Eastern Cape Provinces

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

1. SPECIALIST INFORMATION

Specialist Company Name:	Afrimage Photography (Pty) Ltd t/a Chris van Rooyen Consulting			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	Contribution level (indicate 1 to 8 or non-compliant)	Contribution level (indicate 1 to 8 or non-compliant)	Contribution level (indicate 1 to 8 or non-compliant)
Specialist name:	Chris van Rooyen			
Specialist Qualifications:	BA LLB			
Professional affiliation/registration:	I work under the supervision of and in association with Albert Froneman (MSc Conservation Biology) (SACNASP Zoological Science Registration number 400177/09) as stipulated by the Natural Scientific Professions Act 27 of 2003.			
Physical address:	30 Roosevelt Street, Robindale, Randburg			
Postal address:	30 Roosevelt Street, Robindale, Randburg			
Postal code:	2194	2194	2194	
Telephone:	0824549570	0824549570	0824549570	
E-mail:	Vanrooyen.chris@gmail.com	Vanrooyen.chris@gmail.com	Vanrooyen.chris@gmail.com	

2. DECLARATION BY THE SPECIALIST

I, Chris van Rooyen, 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

Afrimage Photography (Pty) Ltd t/a Chris van Rooyen Consulting

Name of Company:

8 August 2019

Date:

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Chris van Rooyen swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

Afrimage Photography (Pty) Ltd t/a Chris van Rooyen Consulting

Name of Company

8 August 2019

Date

Signature of the Commissioner of Oaths

Date 2019-08-08

SOUTH AFRICAN POLICE SERVICE
COMMUNITY SERVICE CENTRE
2019 -08- 08
C.S.C
LINDEN
SUID-AFRIKAANSE POLISIEDIENS

Executive Summary

EDF Renewables wishes to apply for authorisation for a number of additional infrastructure components for the proposed San Kraal Split 1, Phezukomoya Split 1, Hartebeesthoek East and Hartebeesthoek West Wind Energy Facilities (WEFs) through a Basic Assessment process. The components which could potentially impact on avifauna are the following:

- SKPH-Collector Substation 5km away from Hydra D
- Expanded San Kraal substation
- Hartebeesthoek (HBH) East on-site substation
- San Kraal Split 1 132 kV step-up substation
- Phezukomoya Split 1 batching plant
- Phezukomoya Split 1 substation
- Relocated Hartebeesthoek (HBH) West switching station
- Additional proposed 132kV overhead lines
- 400kV turn-in

The proposed project will have the following potential impacts on avifauna:

- Displacement due to habitat transformation in the footprint of the proposed substation and batching plant;
- Displacement due to disturbance associated with the construction of the proposed substations powerlines and batching plant;
- Electrocution in the substation yards; and
- Mortality due to collision with the earth wire of the proposed powerlines.

1.1 Displacement due to habitat transformation

Habitat transformation has an impact on birds breeding, foraging and roosting in or in close proximity to the proposed substations and batching plant, which could result in temporary or permanent displacement. Unfortunately, very little mitigation can be applied to reduce this impact as the total permanent transformation of the natural habitat within the construction footprint of the proposed infrastructure is unavoidable. However, due to the nature of the vegetation, and judged by the existing transmission lines, very little if any vegetation clearing will be required in the powerline servitudes. The habitat in the area where the substations and batching plant are planned is very uniform from a bird impact perspective. Therefore the loss of habitat for priority species due to direct habitat transformation associated with the construction of the proposed substations is likely to be fairly minimal. **The impact significance is assessed to be Low, both before and after mitigation**. The species most likely to be directly affected by this impact would be small, non-Red Data species. Suggested mitigation measures are restricting the footprint to the absolute minimum, no off-road driving, maximum use of existing roads, measures to control dust, restrict access to the rest of the property, and rehabilitation of all areas disturbed.

1.2 Displacement due to disturbance

Construction activities in close proximity to breeding locations could be a source of disturbance and could lead to temporary breeding failure or even permanent abandonment of nests. A potential mitigation measure is the timeous identification of nests and the timing of the construction activities to avoid disturbance during a critical phase of the breeding cycle, although in practice that can admittedly be very challenging to implement. Terrestrial priority species namely Ludwig's Bustard, Karoo Korhaan, Southern Black Korhaan, Blue Crane, Grey-winged Francolin, Melodious Lark and African Rock Pipit

are most likely to be affected by displacement due to disturbance. The ground-nesting Black Harrier and cliff-nesters such as Jackal Buzzard and Cape Eagle Owl could also potentially be vulnerable to this impact, but the habitat in the study area is not ideal for Black Harrier from a breeding perspective. The cliff-nesting Verreaux's Eagle should not be affected as no known nests are within the impact zone of the proposed developments. **The impact is assessed to be Moderate before mitigation, and Low after mitigation**. Suggested mitigation measures are restricting the footprint to the absolute minimum, no off-road driving, maximum use of existing roads, measures to control noise, restrict access to the rest of the property, training the ECO to identify Red Data species nests during construction, and a pre-construction walk-through by the avifaunal specialist to identify Red Data nests coupled with the timing of the construction if need be.

1.3 Electrocution

In the case of the proposed powerlines, no electrocution risk is envisaged because the proposed design of the 132kV powerlines and 400kV turn-in will not pose an electrocution threat to any of the priority species which are likely to occur at the site. Electrocutions within the proposed substation yards are possible but should not affect the more sensitive Red Data bird species, as these species are unlikely to use the infrastructure within the substation yards for perching or roosting. Suggested mitigation measures are reactive mitigation in the substation if electrocutions are recorded. **The risk is assessed to be Medium, and Low after mitigation.**

1.4 Collisions

The most likely priority species candidates for collision mortality on the proposed powerline are Ludwig's Bustard, Karoo Korhaan, Blue Crane, Secretary Bird, White Stork and Northern Black Korhaan in natural habitat, Greater Flamingo and Blue Crane near dams. Non-Red Data water birds could also be at risk near dams and where the line crosses drainage lines. Large raptors, e.g. Martial, Tawny and Verreaux's Eagle might also be at risk, especially at dams when they descend to bath and drink. Suggested mitigation measures are a walk-through by the avifaunal specialist of the final alignment to identify sections that require mitigation, the fitting of BFDs on those pre-identified sections and quarterly line inspections by the avifaunal specialist to record collision-related mortality. **The risk is assessed to be High, but it can be reduced to Medium through the application of mitigation measures.**

1.5 Cumulative impacts

The concern from a powerline interaction perspective within the 35km radius is mostly for large terrestrial priority species, particularly Ludwig's Bustard, Secretary bird, White Stork and Blue Crane, which are highly susceptible to powerline collisions. The proposed development will add an additional 30-40km of HV line to the existing HV network in the area. Several hundred kilometres of HV line already exists within this area, and several more are planned should the renewable energy projects all be built. **The overall cumulative impact of the proposed project, when viewed with the potential impact of similar and planned projects, is assessed to be of high significance. It could be reduced to some extent with mitigation but will remain at a medium level after mitigation.**

Final Specialist Statement and Authorisation Recommendation

The table below provides a summary of the respective significance ratings and an average overall rating before and after mitigation.

Impact	Rating pre-mitigation	Rating post-mitigation
Displacement due to habitat transformation	Low	Low
Displacement due to disturbance	Medium	Low
Electrocution	Medium	Low
Collisions	High	Medium
Cumulative impacts	High	Medium

It is recommended that the activity is authorised, on condition that the proposed mitigation measures as detailed in the EMPr (APPENDIX 6) are strictly implemented.

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List of Abbreviations

EIA	Environmental Impact Assessment
BA	Basic Assessment
WEF	Wind Energy Facility
IBA	Important Bird Area
BLSA	BirdLife South Africa
EWT	Endangered Wildlife Trust
SABAP 2	Southern African Bird Atlas Project 2
BFD	Bird Flight Diverters
OHL	Overhead line

Glossary

Definitions	
Study area	The area comprising a 2km radius around the proposed powerline alignments, substations and batching plant.
Priority species	Priority species in the updated list (2014) of priority species for wind farms compiled for the Avian Wind Farm Sensitivity Map (Retief *et al*. 2012).
Pentad Grid	A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude

COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS (AS AMENDED)

Requirements of Appendix 6 – GN R326 (7 April 2017)	**Addressed in the Specialist 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;	Preliminary Section of this report
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Preliminary Section of this report
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1
(cA) an indication of the quality and age of base data used for the specialist report;	Section 1.3 and Section 2.1
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Sections 4, 5 and 6 and Appendix 2
d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 1 and Section 2
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 2
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 alternatives;	Section 4
g) an identification of any areas to be avoided, including buffers;	Section 4
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 4
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2
j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 9
k) any mitigation measures for inclusion in the EMPr;	Section 8
l) any conditions for inclusion in the environmental authorisation;	Appendix 6
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Appendix 6
n) a reasoned opinion- i. whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity and activities; and 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 EMPr, and where applicable, the closure plan;	Section 10
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Section 2
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	No comments received so far

q) any other information requested by the competent authority.	Not applicable
2. Where a government notice gazetted by the Minister provides for any protocol of minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply	Not Applicable

2. Introduction and Methodology

EDF Renewables wishes to apply for authorisation for a number of additional infrastructure components for the proposed San Kraal Split 1, Phezukomoya Split 1, Hartebeesthoek East and Hartebeesthoek West Wind Energy Facilities (WEFs) through a Basic Assessment process. These components are as follows:

1. Additional access points
   - Of the three additional access points, A and B are to properties for the WEF and the "future access point on both sides of the road" will be specifically for the grid access when the line is built.

2. A new proposed SK-PH collector substation
   - Located within an approved corridor
   - If approved, for Option A of the 4 WEFS, all approved grid corridors will be transferred to this SK-PH collector substation and electricity will be transferred via 1 132 kV line to the Eskom Hydra D substation.

3. A proposed expansion to the approved San Kraal substation

4. 400 kV turn in options
   - Approval is required for the step up at the Eskom Hydra D substation from 132 kV to 400 kV via turn in Options A and / or B.
   - Note: Option C must not be assessed.

5. The proposed establishment of a 132 kV overhead power line (OHL) (HBH Corridor)
   - Which will transfer electricity from the San Kraal substation to the SK-PH collector substation or to the Eskom Hydra D substation

San Kraal Split 1 WEF approval required:

6. San Kraal Split 1 132 kV step-up substation
   - Located approximately 2.0 km NE of the approved San Kraal substation

7. The proposed establishment of a 132 kV overhead power line (OHL) (located within the approved site) which will transfer electricity from the SK Split 1 132 kV step-up substation to the approved San Kraal substation.

8. The proposed establishment of a 132 kV overhead power line (OHL) (located within the approved site) which will transfer electricity from the San Kraal substation to the approved Phezukomoya substation.

   San Kraal Split 1 OHL Options A – C:
   Option A: Electricity is transferred from the approved San Kraal switching station to the San Kraal substation via an approved OHL or electricity is transferred from the proposed 132 kV step-up substation to the San Kraal substation via a proposed OHL. From the San Kraal substation, the electricity is transferred by the approved 132 kV OHL to the SK-PH collector substation or via the proposed southerly 132 kV OHL (HBH Corridor) to the SK-PH collector substation. From the

SK-PH collector substation, electricity will be transferred to the Eskom Hydra D substation via a 132 kV OHL.

Option B: Electricity is transferred from the proposed 132 kV step-up substation to the San Kraal substation via a proposed OHL. From the San Kraal substation, the electricity is transferred via a proposed westerly 132 kV OHL to the approved Phezukomoya substation.
From the approved Phezukomoya substation the electricity is transferred by the approved 132 kV OHL to the Eskom Hydra D substation.

Option C: Electricity is transferred from the proposed 132 kV step-up substation to the San Kraal substation via a proposed OHL. From the San Kraal substation, the electricity is transferred by the approved 132 kV OHL to the Eskom Hydra D substation or via the proposed southerly 132 kV OHL (HBH Corridor) to the Eskom Hydra D substation.

Hartebeesthoek (HBH) East WEF approval required:

9. Hartebeesthoek (HBH) East on-site substation
    - Located approximately 2.3 km SW of the San Kraal substation expansion

10. The proposed establishment of a 132 kV overhead power line (OHL) (located within the approved site) which will transfer electricity from the proposed HBH East on-site substation to the San Kraal substation.

11. The proposed establishment of a 132 kV overhead power line (OHL) (located within the approved site) which will transfer electricity from the proposed HBH East on-site substation to the approved Phezukomoya substation.

    HBH East OHL Options A – C:
    Option A: Electricity is transferred from the proposed HBH East on-site substation to the San Kraal substation via a proposed OHL. From the San Kraal substation, the electricity is transferred by the approved 132 kV OHL to the SK-PH collector substation or via the proposed southerly 132 kV OHL (HBH Corridor) to the SK-PH collector substation. From the SK-PH collector substation, electricity will be transferred to the Eskom Hydra D substation via a 132 kV OHL.

    Option B: Electricity is transferred from the proposed HBH East on-site substation to the approved Phezukomoya substation via a proposed OHL. From the approved Phezukomoya substation the electricity is transferred by the approved 132 kV OHL to the Eskom Hydra D substation.

    Option C: Electricity is transferred from the proposed HBH East on-site substation to the San Kraal substation via a proposed OHL. From the San Kraal substation, the electricity is transferred by the approved 132 kV OHL to the Eskom Hydra D substation or via the proposed southerly 132 kV OHL (HBH Corridor) to the Eskom Hydra D substation.

Phezukomoya Split 1 WEF approval required:

12. Phezukomoya Split 1 batching plant
    - Temporary batching plant 2 approval required

13. Phezukomoya Split 1 substation
    - Located to the east of the approved Phezukomoya substation

14. The proposed establishment of a 132 kV overhead power line (OHL) (located within the approved site) which will transfer electricity from the proposed Phezukomoya split 1 substation to the approved Phezukomoya substation.

15. The proposed establishment of a 132 kV overhead power line (OHL) (located within the approved site) which will transfer electricity from the approved Phezukomoya substation to the San Kraal substation.
    Phezukomoya OHL Options A – C:
    Option A: Electricity is transferred from the approved Phezukomoya switching station (west of the approved Phezukomoya substation) and from the proposed Phezukomoya split 1 substation (east of the approved Phezukomoya substation) to the approved Phezukomoya substation. From the approved Phezukomoya substation the electricity is transferred by the approved 132 kV OHL to the SK-PH collector substation. From the SK-PH collector substation, electricity will be transferred to the Eskom Hydra D substation via a 132 kV OHL.

    Option B: Electricity is transferred from the approved Phezukomoya switching station (west of the approved Phezukomoya substation) and from the proposed Phezukomoya split 1 substation (east of the approved Phezukomoya substation) to the approved Phezukomoya substation. From the approved Phezukomoya substation the electricity is transferred by the approved 132 kV OHL Eskom Hydra D substation.

    Option C: Electricity is transferred from the approved Phezukomoya switching station (west of the approved Phezukomoya substation) and from the proposed Phezukomoya split 1 substation (east of the approved Phezukomoya substation) to the approved Phezukomoya substation. From the approved Phezukomoya substation electricity is transferred to the San Kraal substation. From the San Kraal substation, the electricity is transferred by the approved 132 kV OHL to the Eskom Hydra D substation or via the proposed southerly 132 kV OHL (HBH Corridor) to the Eskom Hydra D substation.

Hartebeesthoek (HBH) West WEF approval required:

16. Hartebeesthoek (HBH) West switching station
    - This switching station is not new. However, it has moved slightly from the approved location as part of the original EA for Phezukomoya WEF. It is now located approximately 2.5 km SE of the San Kraal substation

17. The proposed establishment of a 132 kV overhead power line (OHL) (located within the approved site) which will transfer electricity from the proposed HBH West switching substation to the San Kraal substation.

18. The proposed establishment of a 132 kV overhead power line (OHL) (located within the approved site) which will transfer electricity from the San Kraal substation to the approved Phezukomoya substation.

    HBH East OHL Options A – C:
    Option A: Electricity is transferred from the proposed HBH West switching station to the San Kraal substation via a proposed OHL. From the San Kraal substation, the electricity is transferred by the approved 132 kV OHL to the SK-PH collector substation or via the proposed southerly 132 kV OHL (HBH Corridor) to the SK-PH collector substation. From the SK-PH collector substation, electricity will be transferred to the Eskom Hydra D substation via a 132 kV OHL.

Option B: Electricity is transferred from the proposed HBH West switching station to the San Kraal substation via a proposed OHL. From the San Kraal substation, the electricity is transferred to the Phezukomoya substation via a proposed OHL. From the Phezukomoya substation, the electricity is transferred by the approved 132 kV OHL to the Eskom Hydra D substation.

Option C: Electricity is transferred from the proposed HBH West switching station to the San Kraal substation via a proposed OHL. From the San Kraal substation, the electricity is transferred by the approved 132 kV OHL to the Eskom Hydra D substation or via the proposed southerly 132 kV OHL (HBH Corridor) to the Eskom Hydra D substation.

1.1. Scope, Purpose and Objectives of this Specialist Report

The objectives of the report are to investigate the potential impacts of the proposed new infrastructure on avifauna in order to assess whether the project is fatally flawed from an avifaunal impact perspective and, if not, what mitigation measures should be implemented to reduce the potential impacts.

1.2. Terms of Reference

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

- Describe the affected environment from an avifaunal perspective;
- Discuss gaps in baseline data and other limitations;
- List and describe the expected impacts;
- Assess and evaluate the potential impacts;
- Recommend mitigation measures to reduce the impact of the expected impacts; and
- Provide a reasoned opinion as to whether the proposed development should proceed or not.

1.3. Assessment Details

Type of Specialist Investigation	Bird Impact Assessment Study: Wind energy facilities
Date of Specialist Site Investigation	12-months pre-construction monitoring programme conducted over four seasons in 2015/2016 for the proposed San Kraal and Phezukomoya WEFs.
Season	All four seasons
Relevance of Season	All four seasons are important from an avifaunal perspective

Type of Specialist Investigation	Field investigation
Date of Specialist Site Investigation	19 - 21 July 2019
Season	Winter
Relevance of Season	The investigation was conducted during the breeding season of large raptors.

3. Approach and Methodology

2.1. Information Sources

The following information sources were used in compiling the report:

- Bird distribution data of the South African Bird Atlas 2 (SABAP 2) was obtained from the Animal Demography Unit of the University of Cape Town (ADU 2019), as a means to ascertain which species occurs within the greater area i.e. within a block consisting of nine pentad grid cells within which the proposed wind facilities are situated. The nine pentad grid cells are the following: 3110_2450, 3110_2455, 3110_2500, 3115_2450, 3115_2455, 3115_2500, 3120_2450,

3120_2455 and 3120_2500. A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8 × 7.6 km. From 2011 to date, a total of 74 full protocol cards (i.e. surveys lasting a minimum of two hours or more each) have been completed for this area. In addition, 61 ad hoc protocol cards have been completed (i.e. surveys lasting less than two hours, but still yielding useful data) and 385 incidental records.

- The national threatened status of all priority species was determined with the use of the most recent edition of the Red Data Book of Birds of South Africa (Taylor *et al*. 2015), and the latest authoritative summary of southern African bird biology (Hockey *et al*. 2005).
- The global threatened status of all priority species was determined by consulting the 2019.1 IUCN Red List of Threatened Species (IUCN 2019).
- A classification of the vegetation types in the study area was obtained from the Atlas of Southern African Birds 1 (SABAP1) and the National Vegetation Map compiled by the South African National Biodiversity Institute (Mucina & Rutherford 2006, 2012 and 2018).
- The Important Bird and Biodiversity Areas of South Africa (Marnewick *et al*. 2015) was consulted for information on Important Bird Areas (IBAs).
- Satellite imagery from Google Earth was used in order to view the broader development area on a landscape level and to help identify sensitive bird habitat.
- Priority species were taken from the updated list (2014) of priority species for wind farms compiled for the Avian Wind Farm Sensitivity Map (Retief *et al*. 2012).
- A site visit was conducted from 7 – 9 April 2015 to record bird habitat at the site and to confirm the pre-selected transects, vantage points and potential focal points for the 12-months pre-construction monitoring of the WEF site/s.
- The main source of information on avifaunal abundance and species diversity was the 12-months pre-construction monitoring, which was conducted from March 2015 to February 2016.
- All the available published count data of the Coordinated Avifaunal Roadcount project (CAR) (2003 to 2014) was consulted to get an overview of the densities of large terrestrial species in the Eastern Karoo (ADU 2019) (Appendix 3).
- The avifaunal specialist study and pre-construction monitoring report of the Mainstream Noupoort WEF (Van Rooyen 2012, Van Rooyen *et al.* 2013), the avifaunal specialist study for the Umsobomvu WEF (Smallie 2015), and the bird specialist study for the Noupoort CSP project (Van Niekerk 2016) were consulted for further background information on the avifaunal diversity and abundance in the greater area.
- A site visit to the greater area, including the proposed new power line alignments, was conducted from 19 - 21 June 2019. During the site visit, nest searches were also conducted in suitable habitat for potential cliff-nesting raptors.

2.2. Assumptions, Knowledge Gaps and Limitations

The following assumptions and limitations apply:

- Conclusions in this study are based on experience of these and similar species in different parts of South Africa. Bird behaviour can never be entirely reduced to formulas that will be valid under all circumstances. However, power line and substation impacts can be predicted with a fair amount of certainty, based on a robust body of research stretching back over thirty years (see References in Section 11).
- The precautionary principle was applied throughout. The World Charter for Nature, which was adopted by the United Nations (UN) General Assembly in 1982, was the first international endorsement of the precautionary principle (http://www.unep.org). The principle was implemented in an international treaty as early as the 1987 Montreal Protocol and, among other international treaties and declarations, is reflected in the 1992 Rio Declaration on Environment and Development. Principle 15 of the 1992 Rio Declaration states that: “in order to protect the environment, the precautionary approach shall be widely applied by States according to their

capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall be not used as a reason for postponing cost-effective measures to prevent environmental degradation."

- The core study area was defined as a 2km buffer zone around the proposed new infrastructure.
- Cumulative impacts were assessed by assessing expected impacts from this proposed development and existing and proposed developments with similar impacts in a 35km radius around the proposed development.

2.3. Consultation Processes Undertaken

Various landowners were interviewed to obtain information on potential eagle nests in the greater area.

4. Description of Project Aspects relevant to Avifaunal Impacts

The following proposed new components are relevant from a bird impact assessment perspective:

- SKPH-Collector Substation 5km away from Hydra D
- Expanded San Kraal substation
- Hartebeesthoek (HBH) East on-site substation
- San Kraal Split 1 132 kV step-up substation
- Phezukomoya Split 1 batching plant
- Phezukomoya Split 1 substation
- Relocated Hartebeesthoek (HBH) West switching station
- Additional proposed 132kV overhead lines
- 400kV turn-in

The new access points are not regarded as being relevant to bird impacts.

See Figure 1 below for a map indicating the location and layout of the additional proposed infrastructure.

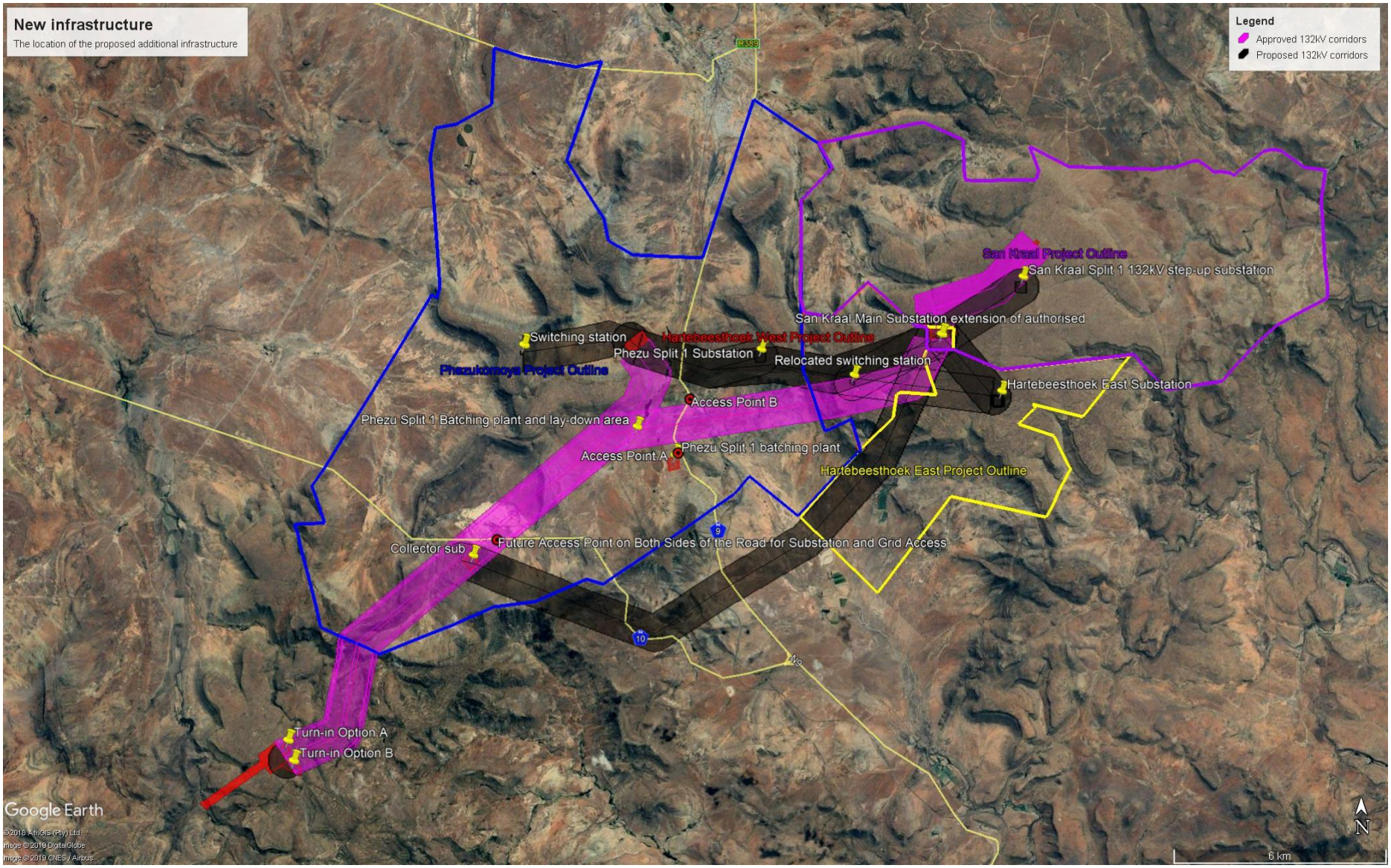

Figure 1: Layout of the proposed infrastructure

5. Description of the Receiving Environment

5.1 Important Bird Areas

At its closest point, the main San Kraal substation is situated approximately 9km south of the town of Noupoort, in the Northern Cape Province. The study area is not located in an Important Bird Area. The border of the closest Important Bird Area (IBA), the Platberg Karoo Conservancy IBA SA037, is located approximately 19km away from the proposed collector substation (Marnewick *et al.* 2015) (see Figure 2 below).

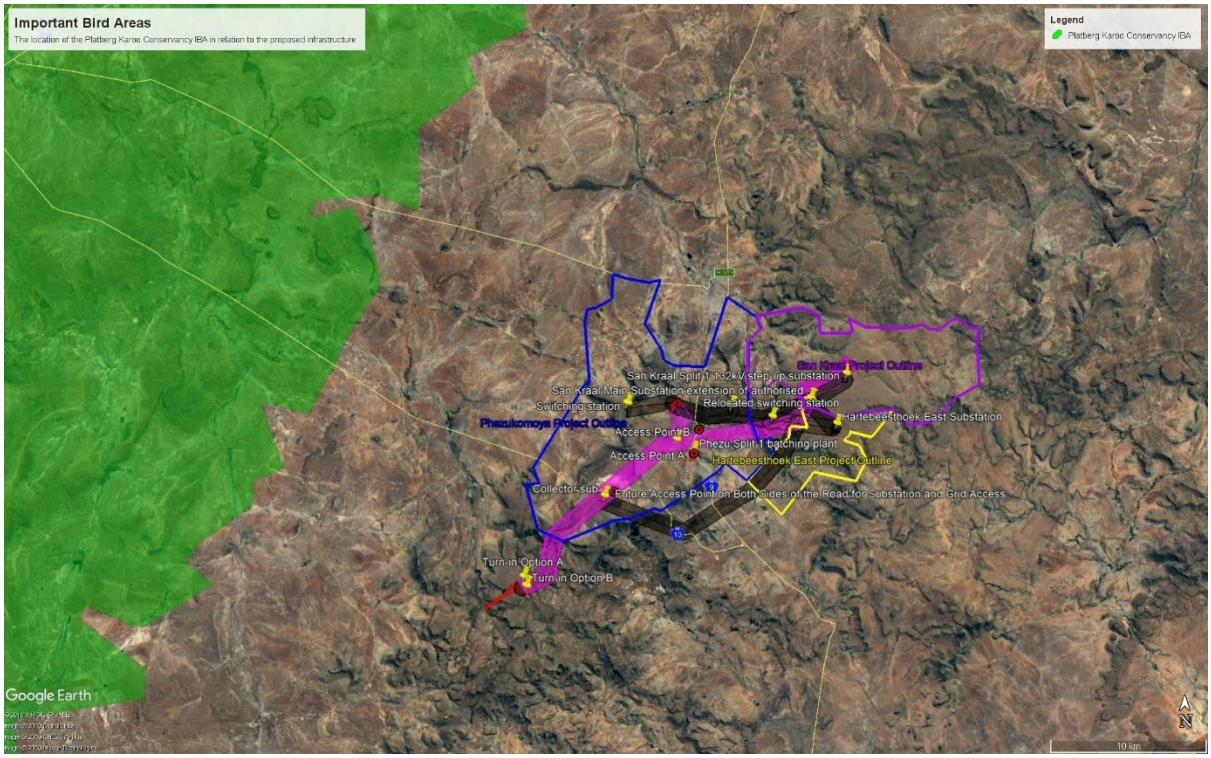

Figure 2: The study area in relation to the Platberg Karoo Conservancy IBA SA037.

5.2 Biomes and vegetation types

The San Kraal main substation, where the proposed new HBH Corridor starts, is located on a grassy plateau with scattered rocks. From there the route drops away westwards down an escarpment consisting of steep, boulder-strewn slopes and exposed rocky ridges. From the bottom of the escarpment, it extends westwards across a grassy plain with scattered shrubs for about 6km, before it moves into broken, hilly terrain again for about 7km where it terminates at the proposed new SKPH collector substation 5km away from the Eskom Hydra D substation. The other proposed 132 kV lines are situated on top of the plateau, with some extending westwards down the escarpment into broken, hilly terrain in the west of the study area.

Four vegetation types are found in the study area, namely Karoo Escarpment Grassland on the plateau, Tarkastad Montane Shrubland on the slopes, Eastern Upper Karoo on the grassy plain, and Besemkaree Koppie Shrubland on the hilly terrain in the west (Mucina & Rutherford 2006, 2012, 2018). Karoo Escarpment Grassland is characterised by wiry, tussock grass and low shrubs. Tarkastad Montane Grassland occurs on hills, ridges and isolated mountain slopes and is characterised by high surface rock cover, this often consisting of large, round boulders. The vegetation is low, semi-open mixed shrubland with “white” grasses and dwarf shrubs forming a prominent component of the vegetation. Eastern Upper Karoo, which is dominated by dwarf *mycrophyllus* shrubs, with white grasses

of the genera *Aristida* and *Eragrostis*., Besemkaree Koppies Shrubland is found on steep slopes, mountain ridges and koppies which is characterised by both tall and dwarf small-leaved shrubs and abundant grasses, especially in precipitation-rich years (Mucina & Rutherford 2006).

Rainfall in Noupoort happens mostly between November and April and averages about 400mm per year[1], which makes for a fairly arid climate. Winters are very dry.

5.3 Habitat classes

SABAP1 recognises six primary vegetation divisions within South Africa, namely (1) Fynbos (2) Succulent Karoo (3) Nama Karoo (4) Grassland (5) Savanna and (6) Forest (Harrison *et al.* 1997). The criteria used by the authors to amalgamate botanically defined vegetation units, or to keep them separate were (1) the existence of clear differences in vegetation structure, likely to be relevant to birds, and (2) the results of published community studies on bird/vegetation associations. It is important to note that no new vegetation unit boundaries were created, with use being made only of previously published data. All the natural vegetation types in the study area can be collectively classified as Grassy Karoo, which is described is an ecological transition zone between the Grassland and Nama Karoo biomes (Harrison *et al*. 1997).

Whilst much of the distribution and abundance of the bird species in the study area can be explained by the description of the biomes and vegetation types above, it is as important to examine the modifications which have changed the natural landscape, and which may have an effect on the distribution of avifauna. These are sometimes evident at a much smaller spatial scale than the biome or vegetation types and are determined by a host of factors such as topography, land use and man-made infrastructure.

The bird habitat classes that were identified in the study area are discussed below. See also Appendix 4 for a photographic record of the habitat in the study area.

- *Grassy Karoo*

This habitat class is described above under 4.2. The Karoo vegetation types support a particularly high diversity of bird species endemic to Southern Africa, particularly in the family *Alaudidae* (Larks) (Harrison *et al.* 1997). Its avifauna typically comprises ground-dwelling species of open habitats. Many typical karroid species are nomads, able to use resources that are patchy in time and space, especially enhanced conditions associated with rainfall (Barnes 1998).

Priority species associated with Grassy Karoo which could potentially occur in the study area are the nomadic Ludwig's Bustard, which may occur in flocks following rainfall events, Karoo Korhaan, Blue Korhaan, Blue Crane, Booted Eagle, Martial Eagle, Common Buzzard, Southern Pale Chanting Goshawk, Northern Black Korhaan, Grey-winged Francolin, Greater Kestrel, Lesser Kestrel, Amur Falcon, Spotted Eagle-Owl, Melodious Lark, Black Harrier, Black-shouldered Kite, White Stork and Lanner Falcon. Secretary Bird, Jackal Buzzard, Black Harrier and Verreaux's Eagle could occur irregularly in this habitat class (see Table 7-1 below for a complete list of priority species which potentially occur at the site). CAR counts between 2003 and 2004 indicate particular high densities of Blue Crane, Northern Black Korhaan and White Stork in this habitat in the eastern Karoo (see Appendix 3).

- *Waterbodies*

[1] http://www.worldweatheronline.com/noupoort-weather-averages/northern-cape/za.aspx

Surface water is of specific importance to avifauna in this semi-arid study area. The study area contains at least six large farm dams. These dams, when filled with water, serve as focal points for water birds and can act as roosting areas for Blue Cranes and possibly Greater Flamingo.

- *Slopes and cliffs*

Priority species that could potentially be attracted to slopes and cliffs habitat in the study area are Verreaux's Eagle, Booted Eagle, Jackal Buzzard, Cape Eagle-Owl, Lanner Falcon and African Rock-Pipit.

- *Trees*

In the study area, isolated stands of alien trees are found at farmyards, along agricultural fields and at some dams, consisting mostly of *Eucalyptus*, *Salix* and *Salicaceae* species. Priority species that could potentially use the trees for nesting and/or roosting are Black Sparrowhawk, Rufous-chested Sparrowhawk, Lesser Kestrel (there is a confirmed roost in the town of Noupoort), Black-shouldered Kite, Jackal Buzzard, Common Buzzard, Martial Eagle, Verreaux's Eagle, Amur Falcon, Spotted Eagle-Owl and White Stork.

- *High voltage lines and telephone lines*

High voltage lines are an important potential roosting and breeding substrate for large raptors in the greater study area (Jenkins *et al.* 2006). There are two high voltage lines running through the centre of the study area along the N9, namely the Noupoort-Middelburg 66kV and the Newgate-Ludlow 132kV. There is also a multitude of smaller reticulation lines and telephone lines which are used as perches by priority species such as Lesser Kestrel, Amur Falcon, Jackal Buzzard, Common Buzzard and Southern Pale Chanting Goshawks in the largely treeless environment.

- *Agriculture*

There are a few agricultural lands in the study area where lucerne is cultivated as fodder for livestock. Priority species which could be attracted to these fields are White Stork, Ludwig's Bustard, Blue Crane, Amur Falcon, Common Buzzard and Lesser Kestrel.

5.4 Avifauna

A total of 190 bird species could potentially occur in the study area. Of these, 32 are classified as priority species. Of these, 12 are classified as locally threatened (Taylor *et al*. 2015). A total of 15 priority species were recorded during the pre-construction monitoring, including 6 locally threatened species. Table 1 below lists the priority species that could potentially occur in the study area, as well as the potential impact on the species in the study area.

Table 1: Priority species potentially occurring in the study area. VU = Vulnerable, EN = Endangered, NT = Near-threatened, LC = Least Concern.

Refer to APPENDIX 1 for a list of all species that could potentially occur in the study area.

Family name	Taxonomic name	Priority species	Global status	Regional status	Endemic status South Africa	Endemic status Southern Africa	SABAP2 reporting rate	Recorded during pre-construction monitoring	Potential impacts			
									Collisions with power line	Electrocutions in the substations	Temporary Displacement through disturbance	Displacement through habitat transformation
Bustard, Ludwig's	*Neotis ludwigii*	*x*	EN	EN		Near-endemic	4.05	x	x			
Buzzard, Jackal	*Buteo rufofuscus*	*x*	-	-	Near endemic	Endemic	35.14	x				
Crane, Blue	*Anthropoides paradiseus*	*x*	VU	NT		Endemic	40.54	x	x		x	
Eagle, Booted	*Hieraaetus pennatus*	*x*	-	-			20.27	x				
Eagle, Martial	*Polemaetus bellicosus*	*x*	VU	EN			2.70	x				
Eagle, Verreaux's	*Aquila verreauxii*	*x*	LC	VU			16.22	x				
Francolin, Grey-winged	*Scleroptila afra*	*x*	-	-	Endemic (SA, Lesotho, Swaziland)	Endemic	28.38	x			x	x
Goshawk, Southern Pale Chanting	*Melierax canorus*	*x*	-	-		Near-endemic	27.03					

Family name	Taxonomic name	Priority species	Global status	Regional status	Endemic status South Africa	Endemic status Southern Africa	SABAP2 reporting rate	Recorded during pre-construction monitoring	Potential impacts			
									Collisions with power line	Electrocutions in the substations	Displacement through disturbance	Displacement through habitat transformation
Kestrel, Greater	*Falco rupicoloides*	*x*	-	-			2.70			x		
Kestrel, Lesser	*Falco naumanni*	*x*	-	-			32.43	x		x		
Kestrel, Rock	*Falco rupicolus*	*x*	-	-			37.84	x		x		
Lark, Melodious	*Mirafra cheniana*	*x*	NT	-	Near endemic	Endemic	2.70				x	x
Pipit, African Rock	*Anthus crenatus*	*x*	LC	NT	Endemic (SA, Lesotho, Swaziland)	Endemic	39.19	x			x	x
Sparrowhawk, Rufous-chested	*Accipiter rufiventris*	*x*	-	-			2.70					
Buzzard, Common	*Buteo buteo*	*x*	-	-			13.51			x		
Eagle, Tawny	*Aquila rapax*	*x*	LC	EN			1.35					
Eagle, African Fish	*Haliaeetus vocifer*	*x*	-	-			0	x	x			
Eagle-owl, Cape	*Bubo capensis*	*x*	-	-			1.35	x		x	X	
Eagle-owl, Spotted	*Bubo africanus*	*x*	-	-			5.41			x	X	
Falcon, Amur	*Falco amurensis*	*x*	-	-			6.76			x		
Falcon, Lanner	*Falco biarmicus*	*x*	LC	VU			2.70					

Family name	Taxonomic name	Priority species	Global status	Regional status	Endemic status South Africa	Endemic status Southern Africa	SABAP2 reporting rate	Recorded during pre-construction monitoring	Potential impacts			
									Collisions with power line	Electrocutions in the substations	Displacement through disturbance	Displacement through habitat transformation
Flamingo, Greater	*Phoenicopterus roseus*	*x*	LC	NT			1.35		x			
Harrier, Black	*Circus maurus*	*x*	VU	EN	Near endemic	Endemic	0					
Hawk, African Harrier-	*Polyboroides typus*	*x*	-	-			1.35	x				
Kite, Black-shouldered	*Elanus caeruleus*	*x*	-	-			12.16			x		
Korhaan, Blue	*Eupodotis caerulescens*	*x*	NT	-	Endemic (SA, Lesotho, Swaziland)	Endemic	9.46	x	x		x	x
Korhaan, Karoo	*Eupodotis vigorsii*	*x*	LC	NT		Endemic	1.35		x		x	x
Korhaan, Northern Black	*Afrotis afraoides*	*x*	-	-		Endemic	33.78	x	x		x	x
Secretarybird	*Sagittarius serpentarius*	*x*	VU	VU			0		x		x	
Sparrowhawk, Black	*Accipiter melanoleucus*	*x*	-	-			1.35					
Stork, Black	*Ciconia nigra*	*x*	LC	VU			2.70		x			
Stork, White	*Ciconia ciconia*	*x*	-	-			5.41		x			

5.5 Environmental sensitivities

The following environmental sensitivities have been identified in the study area from an avifaunal perspective (see Figure 3 below):

- High sensitivity: Included are areas within 500m of dams and agricultural areas, and across slopes, where the proposed powerline will constitute a collision risk. Although these areas should ideally be avoided, this is not practically possible. Therefore there should be adequate mitigation implemented to reduce the risks materially (see Section 6 for a discussion of proposed mitigation measures).
    - Dams: Red Data species that could be impacted through collisions with the proposed powerline due to being attracted to dams include Greater Flamingo, Blue Crane, White Stork, Black Stork, and raptors such as Martial Eagle, Tawny Eagle, African Fish-Eagle and Verreaux's Eagle. Many non-Red Data powerline sensitive species could also be attracted to dams and be at risk of collisions, e.g. various species of raptors, ducks, herons, grebes and waders.
    - Slopes: Slope soaring species could be at risk of collisions where the line runs down the escarpment and across slopes. These include Verreaux's Eagle, Jackal Buzzard, Common Buzzard, Booted Eagle, Rock Kestrel and Lanner Falcon.
    - Agricultural areas: Agricultural areas attract Ludwig's Bustard, Blue Crane, White Stork and Common Buzzard, where they could be at risk of collisions with the proposed powerline.
- Medium sensitivity: The entire study area can be classified as medium-sensitive. The area is largely untransformed, and the natural habitat supports a number of Red Data powerline sensitive species, notably Ludwig's Bustard, Karoo Korhaan, Blue Korhaan and Secretarybird. Ludwig's Bustard, in particular, is known to be highly susceptible to powerline collisions (Shaw 2013).

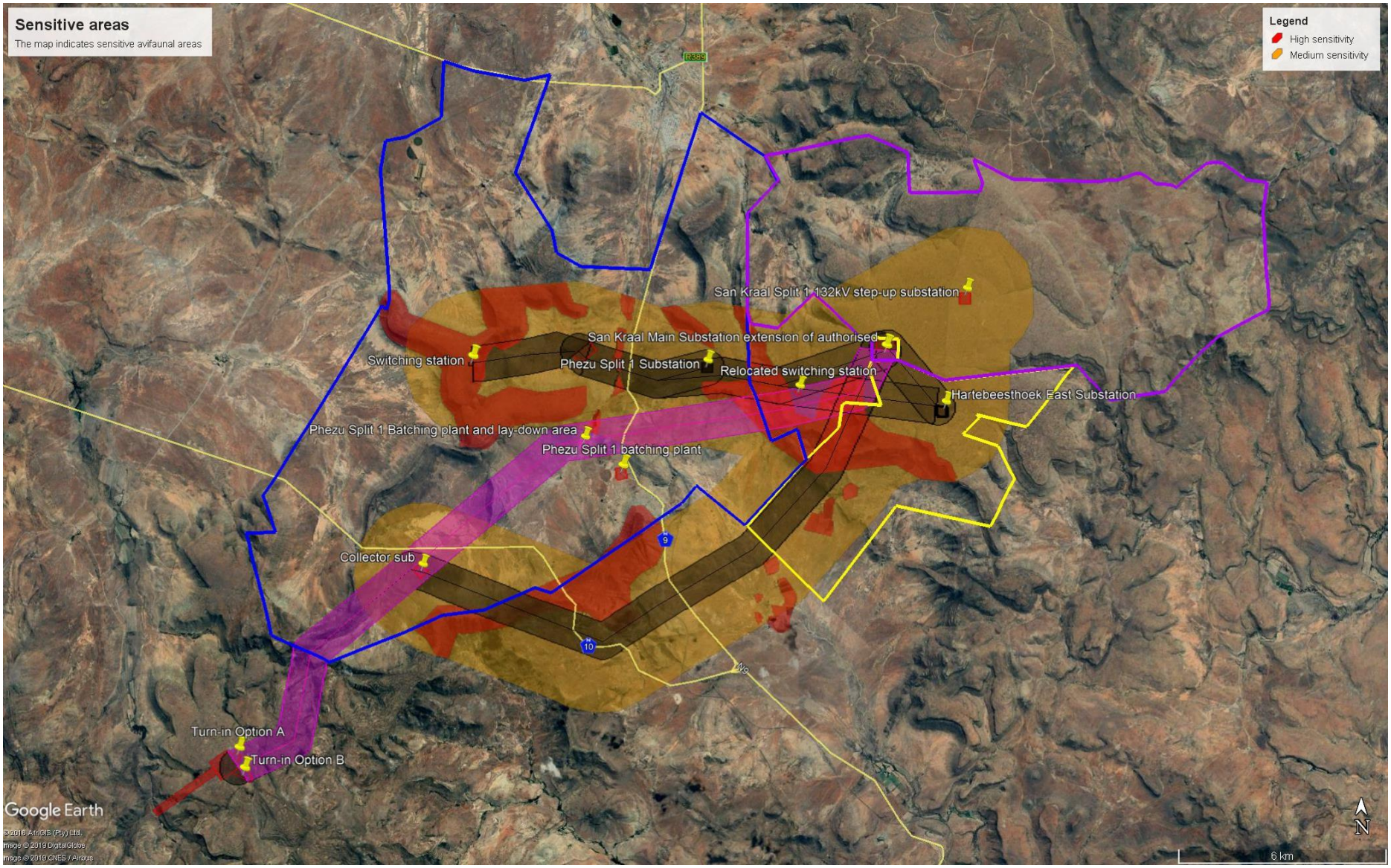

Figure 3: Sensitive areas from an avifaunal impact perspective.

6. Issues, Risks and Impacts

The potential impacts identified are as follows:

5.1 Construction Phase

- Potential impact 1: Displacement of priority avifauna due to disturbance associated with the construction of the proposed powerlines, substations and batching plant.
- Potential impact 2: Displacement of priority avifauna due to habitat transformation associated with the construction of the substations and batching plant.

5.2 Operational Phase

- Potential impact 3: Mortality of priority avifauna due to collisions with the earth wire of the proposed 132kV powerlines and 400kV turn-ins.
- Potential impact 4: Electrocution of priority avifauna in the substation yards.

5.3 Decommissioning Phase

- Potential impact 5: Displacement of priority avifauna due to disturbance associated with the decommissioning of the proposed powerlines, substations and batching plant.

5.4 Cumulative Impacts

- Cumulative impact 1: Displacement of priority avifauna due to disturbance associated with the construction of the proposed powerlines, substations and batching plant in conjunction with existing and future similar projects.
- Cumulative impact 2: Displacement of priority avifauna due to habitat transformation associated with the construction of the substations and batching plant in conjunction with existing and future similar projects.
- Cumulative impact 3: Mortality of priority avifauna due to collisions with the earth wire of the proposed 132kV and 400kV powerlines in conjunction with existing and future similar projects.
- Cumulative impact 4: Electrocutions in the substation yards in conjunction with existing and future similar projects.

7. Impact Assessment

The criteria for the assessment of the potential impacts on avifauna is attached as Appendix 5. Below follows a discussion of the potential impacts, followed by a summary of each impact in table format.

7.1 General

Negative impacts on avifauna by electricity infrastructure generally take two main forms namely electrocution and collisions (Ledger & Annegarn 1981; Ledger 1983; Ledger 1984; Hobbs and 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; Van Rooyen 2004; Jenkins *et al*. 2010). Displacement due to habitat destruction and disturbance associated with the construction of the electricity infrastructure is another impact that could potentially impact on avifauna.

7.2 Electrocutions

Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (Van Rooyen 2004). The electrocution risk is largely determined by the pole/tower design. In the case of the proposed powerlines, no electrocution risk is envisaged because the large clearances on the proposed 132kV lines and 400kV turn-ins should practically eliminate this risk to any of the priority species which are likely to occur at the site. Electrocutions within the proposed transmission substation yards are possible but should not affect the more sensitive Red Data bird species, as these species are unlikely to use the infrastructure within the substation yards for perching or roosting.

7.3 Collisions

Collisions are the biggest threat posed by transmission lines to birds in Southern Africa (Van Rooyen 2004). Most heavily impacted upon are bustards, storks, cranes and various species of waterbirds, and to a lesser extent, vultures. 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 transmission lines (Van Rooyen 2004, Anderson 2001). In a PhD study, Shaw (2013) provides a concise summary of the phenomenon of avian collisions with transmission lines:

"The collision risk posed by power lines is complex, and problems are often localised. While any bird flying near a power line is at risk of collision, this risk varies greatly between different groups of birds and depends on the interplay of a wide range of factors (APLIC 1994). Bevanger (1994) described these factors in four main groups – biological, topographical, meteorological and technical. Birds at highest risk are those that are both susceptible to collisions and frequently exposed to power lines, with waterbirds, gamebirds, rails, cranes and bustards usually the most numerous reported victims (Bevanger 1998, Rubolini et al. 2005, Jenkins et al. 2010).

The proliferation of man-made structures in the landscape is relatively recent, and birds are not evolved to avoid them. Body size and morphology are key predictive factors of collision risk, with large-bodied birds with high wing loadings (the ratio of body weight to wing area) most at risk (Bevanger 1998, Janss 2000). These birds must fly fast to remain airborne and do not have sufficient manoeuvrability to avoid unexpected obstacles. Vision is another key biological factor, with many collision-prone birds principally using lateral vision to navigate in flight, when it is the lower-resolution, and often restricted, forward vision that is useful to detect obstacles (Martin & Shaw 2010, Martin 2011, Martin et al. 2012). Behaviour is important, with birds flying in flocks, at low levels and in crepuscular or nocturnal conditions at higher risk of collision (Bevanger 1994). Experience affects risk, with migratory and nomadic species that spend much of their time in unfamiliar locations also expected to collide more often (Anderson 1978, Anderson 2002). Juvenile birds have often been reported as being more collision-prone than adults (e.g. Brown et al. 1987, Henderson et al. 1996).

Topography and weather conditions affect how birds use the landscape. Power lines in sensitive bird areas (e.g. those that separate feeding and roosting areas, or cross flyways) can be very dangerous (APLIC 1994, Bevanger 1994). Lines crossing the prevailing wind conditions can pose a problem for large birds that use the wind to aid take-off and landing (Bevanger 1994). Inclement weather can disorient birds and reduce their flight altitude, and strong winds can result in birds colliding with power lines that they can see but do not have enough flight control to avoid (Brown et al. 1987, APLIC 2012).

The technical aspects of power line design and siting also play a big part in collision risk. Grouping similar power lines on a common servitude or locating them along other features such as tree lines are both approaches thought to reduce risk (Bevanger 1994). In general, low lines with short span lengths (i.e. the distance between two adjacent pylons) and flat conductor configurations are thought to be the least dangerous (Bevanger 1994, Jenkins et al. 2010). On many higher voltage lines, there is a thin

earth (or ground) wire above the conductors, protecting the system from lightning strikes. Earth wires are widely accepted to cause the majority of collisions on power lines with this configuration because they are difficult to see, and birds flaring to avoid hitting the conductors often put themselves directly in the path of these wires (Brown et al. 1987, Faanes 1987, Alonso et al. 1994a, Bevanger 1994)."
From incidental record-keeping by the Endangered Wildlife Trust, it is possible to give a measure of what species are generally susceptible to power line collisions in South Africa (see Figure 8 below).

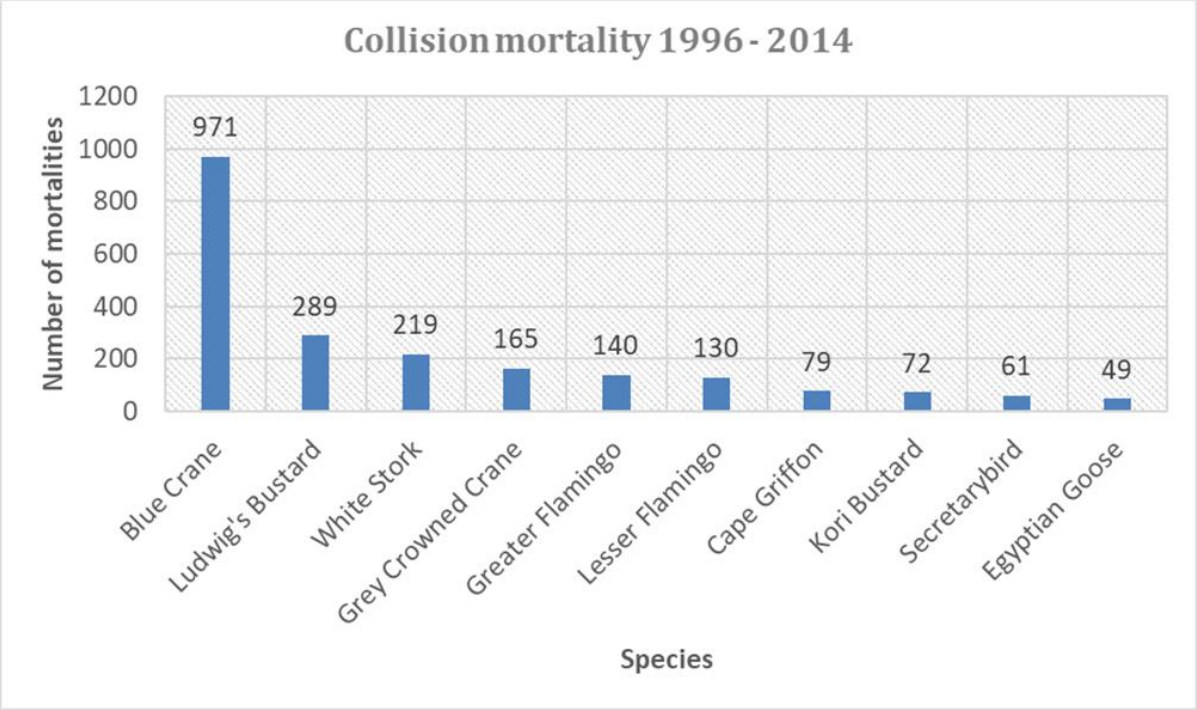

Figure 4: The top 10 collision prone bird species in South Africa, in terms of reported incidents contained in the Eskom/Endangered Wildlife Trust Strategic Partnership central incident register 1996 - 2014 (EWT unpublished data)

Power line collisions are generally accepted as a key threat to bustards (Raab *et al*. 2009; Raab *et al*. 2010; Jenkins & Smallie 2009; Barrientos *et al*. 2012, Shaw 2013). In a recent study, carcass surveys were performed under high voltage transmission lines in the Karoo for two years, and low voltage distribution lines for one year (Shaw 2013). Ludwig's Bustard was the most common collision victim (69% of carcasses), with bustards generally comprising 87% of mortalities recovered. Total annual mortality was estimated at 41% of the Ludwig's Bustard population, with Kori Bustards also dying in large numbers (at least 14% of the South African population killed in the Karoo alone). Karoo Korhaan was also recorded, but to a much lesser extent than Ludwig's Bustard. The reasons for the relatively low collision risk of this species probably include their smaller size (and hence greater agility in flight) as well as their more sedentary lifestyles, as local birds are familiar with their territory and are less likely to collide with power lines (Shaw 2013).

Several factors are thought to influence avian collisions, including the manoeuvrability of the bird, topography, weather conditions and power line configuration. An important additional factor that previously has received little attention is the visual capacity of birds; i.e. whether they are able to see obstacles such as power lines, and whether they are looking ahead to see obstacles with enough time to avoid a collision. In addition to helping explain the susceptibility of some species to collision, this factor is key to planning effective mitigation measures. Recent research provides the first evidence that birds can render themselves blind in the direction of travel during flight through voluntary head movements (Martin & Shaw 2010). Visual fields were determined in three bird species representative of families known to be subject to high levels of mortality associated with power lines, i.e. Kori Bustard *Ardeotis kori*, Blue Crane and White Stork. In all species, the frontal visual fields showed narrow and

vertically long binocular fields typical of birds that take food items directly in the bill under visual guidance. However, these species differed markedly in the vertical extent of their binocular fields and in the extent of the blind areas which project above and below the binocular fields in the forward-facing hemisphere. The importance of these blind areas is that when in flight, head movements in the vertical plane (pitching the head to look downwards) will render the bird blind in the direction of travel. Such movements may frequently occur when birds are scanning below them (for foraging or roost sites, or for conspecifics). In bustards and cranes pitch movements of only 25° and 35°, respectively, are sufficient to render the birds blind in the direction of travel; in storks, head movements of 55° are necessary. That flying birds can render themselves blind in the direction of travel has not been previously recognised and has important implications for the effective mitigation of collisions with human artefacts, including wind turbines and power lines. These findings have applicability to species outside of these families especially raptors (A*ccipitridae*) which are known to have small binocular fields and large blind areas similar to those of bustards and cranes and are also known to be vulnerable to power line collisions.

Despite doubts about the efficacy of line marking to reduce the collision risk for bustards (Jenkins *et al*. 2010; Martin *et al.* 2010), there are numerous studies which prove that marking a line with PVC spiral type Bird Flight Diverters (BFDs) generally reduce mortality rates (e.g. Bernardino *et al.* 2018; Sporer *et al.* 2013, Barrientos *et al*. 2011; Jenkins *et al*. 2010; Alonso & Alonso 1999; Koops & De Jong 1982), including to some extent for bustards (Barrientos *et al*. 2012; Hoogstad 2015 pers.comm). Beaulaurier (1981) summarised the results of 17 studies that involved the marking of earth wires and found an average reduction in mortality of 45%. Barrientos *et al.* (2011) reviewed the results of 15 wire marking experiments in which transmission or distribution wires were marked to examine the effectiveness of flight diverters in reducing bird mortality. The presence of flight diverters was associated with a decrease of 55–94% in bird mortalities. Koops and De Jong (1982) found that the spacing of the BFDs was critical in reducing the mortality rates - mortality rates are reduced up to 86% with a spacing of 5m, whereas using the same devices at 10m intervals only reduces the mortality by 57%. Barrientos *et al*. (2012) found that larger BFDs were more effective in reducing Great Bustard collisions than smaller ones. Line markers should be as large as possible and highly contrasting with the background. Colour is probably less important as during the day the background will be brighter than the obstacle with the reverse true at lower light levels (e.g. at twilight, or during overcast conditions). Black and white interspersed patterns are likely to maximise the probability of detection (Martin *et al*. 2010).

The most likely priority species candidates for collision mortality on the proposed powerlines are Ludwig's Bustard, Karoo Korhaan, Blue Crane, Secretarybird, White Stork and Northern Black Korhaan in natural habitat, and Greater Flamingo and Blue Crane near dams. Non-Red Data waterbirds could also be at risk near dams and where the line crosses drainage lines (see Table 1 for a list of species that could be at risk). Large raptors, e.g. Martial, Tawny and Verreaux's Eagle might also be at risk, especially at dams when they descend to bath and drink.

7.4 Displacement due to habitat destruction and disturbance

During the construction of power lines, roads, substations and batching plants, habitat destruction/transformation inevitably takes place. The construction activities will constitute the following:

- Site clearance and preparation:
- Construction of the infrastructure;
- Transportation of personnel, construction material and equipment to the site, and personnel away from the site;
- Removal of vegetation, stockpiling of topsoil and cleared vegetation;
- Excavations for infrastructure;

These activities could impact on birds breeding, foraging and roosting in or in close proximity of the proposed infrastructure through **transformation of habitat**, which could result in temporary or permanent displacement. Unfortunately, very little mitigation can be applied to reduce the significance of this impact as the total permanent transformation of the natural habitat within the construction footprint of the substation yard is unavoidable. Fortunately, due to the nature of the vegetation, and judged by the existing powerlines, very little if any vegetation clearing will be required in the powerline servitudes. The vegetation in the study area where the substations and batching plant are planned is fairly uniform from a bird impact perspective; therefore, the loss of habitat for priority species due to direct habitat transformation associated with the construction of this infrastructure is likely to be fairly minimal. The species most likely to be directly affected by this impact would be small, non-Red Data species.

Apart from direct habitat destruction, the above-mentioned activities also impact on birds through **disturbance**; this could lead to breeding failure if the disturbance happens during a critical part of the breeding cycle. Construction activities in close proximity to breeding locations could be a source of disturbance and could lead to temporary breeding failure or even permanent abandonment of nests. A potential mitigation measure is the timeous identification of nests and the timing of the construction activities to avoid disturbance during a critical phase of the breeding cycle, although in practice that can admittedly be very challenging to implement. Terrestrial priority species, namely Ludwig's Bustard, Karoo Korhaan, Northern Black Korhaan, Blue Crane, Grey-winged Francolin, Melodious Lark and African Rock Pipit are most likely to be affected by displacement due to disturbance. The ground-nesting Black Harrier and cliff-nesters such as Jackal Buzzard and Cape Eagle Owl could also potentially be vulnerable to this impact, but the habitat in the study area is not ideal for Black Harrier from a breeding perspective. The cliff-nesting Verreaux's Eagle should not be affected as no known nests are within the impact zone of the proposed developments.

7.5 Cumulative impacts (all phases)

The cluster of renewable energy project applications currently registered with the Department of Environmental Affairs (DEA) within a 35km radius around the proposed development is listed in APPENDIX 2 of this report, together with a map indicating their locality relative to the proposed development. Possible impacts by the associated infrastructure of renewable energy projects on birds within this area are temporary displacement due to disturbance, permanent displacement due to habitat transformation, mortality due to collisions with the power lines, and electrocutions in substation yards.

The concern from a powerline interaction perspective within the 35km radius is mostly for large terrestrial priority species, particularly Ludwig's Bustard, Secretarybird, White Stork and Blue Crane, which are highly susceptible to powerline collisions. The proposed development will add an additional 30 - 40km of HV line to the existing HV network in the area. Several hundred kilometres of HV line already exists within this area, and several more are planned should the renewable energy projects all be built. The overall cumulative impact of the proposed development, when viewed with the potential impact of similar and planned projects, is assessed to be of high significance. It could be reduced to some extent with mitigation but will remain at a medium level after mitigation.

7.6 Potential Impacts during the Construction Phase

6.6.1. Displacement of priority avifauna due to habitat transformation

Impact Phase (Construction)

Potential Impact: Displacement of priority species due to permanent habitat transformation in the substations and batching plant							
ANTICIPATED IMPACTS							
	Severity	**Extent**	**Duration**	**Consequence**	**Probability**	**Confidence**	**Significance**
Without Mitigation	Low	Low	High	Medium	Low	High	Low
With Mitigation	Low	Low	High	Medium	Low	High	Low
Can the impact be reversed?			NO: The habitat transformation is long term, possibly permanent.				
Will impact cause irreplaceable loss of resources?			NO: The species most likely to be directly affected by this impact would be small, non-Red Data species.				
Can impact be avoided, managed or mitigated?					YES: To some extent, but very limited mitigation can be applied to reduce the significance of this impact as the total permanent transformation of the natural habitat within the construction footprint of the substation yard is unavoidable		
Mitigation: A site-specific Construction Environmental Management Programme (CEMPr) must be implemented, which gives appropriate and detailed description of how construction activities must be conducted to reduce unnecessary destruction and degradation of habitat. All contractors are to adhere to the CEMPr and should apply good environmental practice during construction. The CEMPr should specifically include the following: • The minimum footprint areas for infrastructure should be used wherever possible, including road widths and lengths; • No off-road driving; • Maximum use of existing roads; • Measures to control dust; • Restricted access to the rest of the property; and • Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks) must be undertaken, and to this end, a habitat restoration plan is to be developed by a rehabilitation specialist and implemented accordingly.							

Rationale: The habitat transformation associated with the construction of the substations and the batching plant could result in the long-term displacement of priority species from the footprint. The vegetation in the study area where the substations and batching plant are planned is fairly uniform from a bird impact perspective; therefore, the loss of habitat for priority species due to direct habitat transformation associated with the construction of the proposed substation is likely to be fairly minimal, due to the small footprint. The species most likely to be directly affected by this impact would be small, non-Red Data species.

6.6.2. Displacement due to Disturbance

Impact Phase (Construction)							
Potential Impact: Displacement of priority species, particularly Red Data species, due to disturbance associated with the construction of the powerlines and substations.							
ANTICIPATED IMPACTS							
	Severity	**Extent**	**Duration**	**Consequence**	**Probability**	**Confidence**	**Significance**
Without Mitigation	Medium	Low	Low	Low	High	Medium	Medium
With Mitigation	Low	Low	Low	Low	Low	Medium	Low
Can the impact be reversed?					YES: The impact is likely to be mitigated through the passage of time once the construction activities are completed.		

Will impact cause irreplaceable loss of resources?	NO: Priority species should recolonise the area again after the construction activities have ceased.	
Can impact be avoided, managed or mitigated?		YES: To some extent.

Mitigation: A site-specific CEMPr must be implemented, which gives an appropriate and detailed description of how construction activities must be conducted. All contractors are to adhere to the CEMPr and should apply good environmental practice during construction. The CEMPr must specifically include the following:

- No off-road driving;
- Maximum use of existing roads;
- Measures to control noise;
- Restricted access to the rest of the property;
- The appointed Environmental Control Officer (ECO) must be trained by an avifaunal specialist to identify the potential priority species as well as the signs that indicate possible breeding by these species. The ECO must then, during audits/site visits, make a concerted effort to look out for such breeding activities of especially Red Data species, and such efforts may include the training of construction staff to identify Red Data species, followed by regular questioning of staff as to the regular whereabouts on site of these species. If any of the Red Data species are confirmed to be breeding (e.g. if a nest site is found), construction activities within 500m of the breeding site must cease, and an avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed; and
- Prior to construction, an avifaunal specialist should conduct a site walkthrough, covering the final power line route, to identify any nests/breeding/roosting activity of priority species, the results of which may inform the final construction schedule in close proximity to that specific area, including abbreviating construction time, scheduling activities around avian breeding and/or movement schedules, and lowering levels of associated noise.

Rationale: The disturbance caused by the construction activities associated with the 132kV powerlines, substations and batching plant could result in the short-term displacement of priority species from the site.

7.7 Potential Impacts during the Operational Phase

- Electrocution of priority avifauna in the substations

Impact Phase (Operational)							
Potential Impact: Electrocution of priority species in the substations							
ANTICIPATED IMPACTS							
	Severity	**Extent**	**Duration**	**Consequence**	**Probability**	**Confidence**	**Significance**
Without Mitigation	High	Medium	High	High	Low	High	Medium
With Mitigation	Low	Medium	High	Medium	Low	High	Low

Can the impact be reversed?		YES: Partly reversible. Mitigation measures could reduce the risk of electrocutions.
Will impact cause irreplaceable loss of resources?	NO: It is not expected that the mortality will lead to the complete eradication of a priority species from the study area.	
Can impact be avoided, managed or mitigated?		YES: Future electrocutions can be avoided through the application of suitable mitigation measures.

Mitigation: The hardware within the proposed transmission substation yard is too complex to warrant any pro-active mitigation for electrocution at this stage. It is recommended that if on-going impacts are recorded once operational, site-specific mitigation be applied reactively. This is an acceptable approach because priority avifauna, especially Red Data species, is unlikely to frequent the substation and be electrocuted.

Rationale: The electrocution risk will potentially persist for the operational lifetime of the wind farm, but it can be largely eliminated through the reactive application of mitigation, should the impact occur at all.

- Mortality of priority avifauna due to collisions

Impact Phase (Operational)							
Potential Impact: Mortality of priority avifauna due to collisions with the earth wire of the proposed powerlines.							
ANTICIPATED IMPACTS							
	Severity	**Extent**	**Duration**	**Consequence**	**Probability**	**Confidence**	**Significance**
Without Mitigation	High	Medium	High	High	High	High	High
With Mitigation	High	Medium	High	High	Low	Medium	Medium

Can the impact be reversed?		YES: Partly reversible. Mitigation measures could reduce the risk of collisions.
Will impact cause irreplaceable loss of resources?	NO: It is not expected that the mortality will lead to the complete eradication of a priority species from the study area.	
Can impact be avoided, managed or mitigated?		YES: Partially through the application of anti-collision devices.

Mitigation:

- An avifaunal specialist must conduct a site walkthrough of final pylon positions prior to construction to determine if, and where, BFDs are required.
- Install BFDs as per the instructions of the specialist following the site walkthrough, which may include the need for modified BFDs fitted with solar-powered LED lights on certain spans.
- The operational monitoring programme must include regular monitoring (i.e. quarterly) of the powerlines for collision mortalities.

Rationale: The application of BFDs should reduce the probability and severity of the collision impact to a lower level, but it is likely to remain at the medium level, as the application of BFD's will reduce, but not eliminate the risk.

7.8 Potential Impacts during the Decommissioning Phase

- Displacement of priority avifauna due to disturbance

Impact Phase (Construction)							
Potential Impact: Displacement of priority species, particularly Red Data species, due to disturbance associated with the decommissioning of the powerlines, substations and batching plant.							
ANTICIPATED IMPACTS							
	Severity	**Extent**	**Duration**	**Consequence**	**Probability**	**Confidence**	**Significance**
Without Mitigation	Medium	Low	Low	Low	High	Medium	Medium
With Mitigation	Medium	Low	Low	Low	Medium	Medium	Medium

Can the impact be reversed?		YES: The impact is likely to be mitigated through the passage of time once the construction activities are completed.
Will impact cause irreplaceable loss of resources?	NO: Priority species should recolonise the area again after the construction activities have ceased.	
Can impact be avoided, managed or mitigated?		YES: To some extent.

Mitigation: A site-specific Decommissioning Environmental Management Programme (DEMPr) must be implemented, which gives an appropriate and detailed description of how de-commission activities must be conducted. All contractors are to adhere to the DEMPr and should apply good environmental practice. The DEMPr must specifically include the following:

- No off-road driving;
- Maximum use of existing roads;
- Measures to control noise;
- Restricted access to the rest of the property;
- The appointed Environmental Control Officer (ECO) must be trained by an avifaunal specialist to identify the potential priority species as well as the signs that indicate possible breeding by these species. The ECO must then, during audits/site visits, make a concerted effort to look out for such breeding activities

of especially Red Data species, and such efforts may include the training of construction staff to identify Red Data species, followed by regular questioning of staff as to the regular whereabouts on site of these species. If any of the Red Data species are confirmed to be breeding (e.g. if a nest site is found), activities within 500m of the breeding site must cease, and an avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed; and

- Prior to de-commissioning, an avifaunal specialist should conduct a site walkthrough, to identify any nests/breeding/roosting activity of priority species, the results of which may inform the final schedule in close proximity to that specific area, including abbreviating construction time, scheduling activities around avian breeding and/or movement schedules, and lowering levels of associated noise.

Rationale: It is highly likely that most priority species will be temporarily displaced in the development area during the dismantling operations, due to the noise and activity. The significance will, therefore, remain at a medium level in the dismantling phase after mitigation. However, once the dismantling has been completed, the impact will be negated naturally.

7.9 Cumulative Impacts

Cumulative impacts							
Potential Impact: Cumulative impact of electrocution, collision and displacement.							
ANTICIPATED IMPACTS							
	Severity	**Extent**	**Duration**	**Consequence**	**Probability**	**Confidence**	**Significance**
Without Mitigation	Medium	Medium	High	High	Medium	Medium	High
With Mitigation	Medium	Medium	High	High	Low	Medium	Medium

Can the impact be reversed?		YES: With the application of mitigation measures as detailed in the previous impact tables
Will impact cause irreplaceable loss of resources?	NO: Not with the application of mitigation measures as detailed in the previous impact tables	
Can impact be avoided, managed or mitigated?		YES: With the application of mitigation measures as detailed in the previous impact tables

- See 6.2 – 6.8 for proposed mitigation measures.
- All the proposed mitigation measures proposed for the other renewable energy facilities within a 35km radius should be implemented.

7.10 No-go option

The no-go option will result in no additional impacts on avifauna apart from what is envisaged for the original authorised infrastructure (as described in the original Bird Specialist Study compiled in September 2017 as part of the original Environmental Impact Assessment process).

8. Legislative and Permit Requirements

8.1 Legislative framework

There is no legislation pertaining specifically to the impact of wind facilities and associated electrical infrastructure on avifauna. There are best practice guidelines available which were compiled under the auspices of Birdlife South Africa (BLSA) and the Endangered Wildlife Trust (EWT), i.e. *Jenkins A R; Van Rooyen C S; Smallie J J; Anderson M D & Smit H A. 2011. Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa. Endangered Wildlife Trust and Birdlife South Africa.* These guidelines have been updated on several occasions, with the latest version released in 2015.

7.1.1 Agreements and conventions

The table below lists international agreements and conventions which South Africa is party to and which is relevant to the conservation of avifauna[2].

Table 2: Agreements and conventions which South Africa is party to and which is relevant to the conservation of avifauna.

Convention name	Description	Geographic scope
African-Eurasian Waterbird Agreement (AEWA)	The Agreement on the Conservation of AEWA is an intergovernmental treaty dedicated to the conservation of migratory waterbirds and their habitats across Africa, Europe, the Middle East, Central Asia, Greenland and the Canadian Archipelago. Developed under the framework of the Convention on Migratory Species (CMS) and administered by the United Nations Environment Programme (UNEP), AEWA brings together countries and the wider international conservation community in an effort to establish coordinated conservation and management of migratory waterbirds throughout their entire migratory range.	Regional
Convention on Biological Diversity (CBD), Nairobi, 1992	The Convention on Biological Diversity (CBD) entered into force on 29 December 1993. It has 3 main objectives: • The conservation of biological diversity; • The sustainable use of the components of biological diversity; and • The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources.	Global
Convention on the Conservation of Migratory Species of Wild Animals, (CMS), Bonn, 1979	As an environmental treaty under the aegis of the UNEP, CMS provides a global platform for the conservation and sustainable use of migratory animals and their habitats. CMS brings together the States through which migratory animals pass, the Range States, and lays the legal foundation for internationally coordinated conservation measures throughout a migratory range.	Global
Convention on the International Trade in Endangered Species of Wild Flora and Fauna, (CITES), Washington DC, 1973	CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.	Global
Ramsar Convention on Wetlands of International Importance, Ramsar, 1971	The Convention on Wetlands, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.	Global
Memorandum of Understanding on the Conservation of Migratory Birds of Prey in Africa and Eurasia	The Signatories will aim to take co-ordinated measures to achieve and maintain the favourable conservation status of birds of prey throughout their range and to reverse their decline when and where appropriate.	Regional

7.1.2 National legislation

- *Constitution of the Republic of South Africa, 1996*

The Constitution of the Republic of South Africa provides in the Bill of Rights that: Everyone has the right –

[2] (BirdLife International (2016) Country profile: South Africa. Available from: http://www.birdlife.org/datazone/country/south africa. Checked: 2016-04-02).

(a) to an environment that is not harmful to their health or well-being; and
(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that –
    (i) prevent pollution and ecological degradation;
    (ii) promote conservation; and
    (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

- *The National Environmental Management Act 107 of 1998*

The National Environmental Management Act 107 of 1998 (as amended) (NEMA) creates the legislative framework for environmental protection in South Africa and is aimed at giving effect to the environmental right in the Constitution. It sets out a number of guiding principles that apply to the actions of all organs of state that may significantly affect the environment. Sustainable development (socially, environmentally and economically) is one of the key principles, and internationally accepted principles of environmental management, such as the precautionary principle and the polluter pays principle, are also incorporated.

NEMA also provides that a wide variety of listed developmental activities (via the promulgation of the EIA Regulations (2014, as amended), which may significantly affect the environment, may be performed only after an EIA has been done and authorisation has been obtained from the relevant authority. Many of these listed activities can potentially have negative impacts on bird populations in a variety of ways. The clearance of natural vegetation, for instance, can lead to a loss of habitat and may depress prey populations, while erecting structures needed for generating and distributing energy, communication, and so forth can cause mortalities by collision or electrocution.

- *The National Environmental Management: Biodiversity Act 10 of 2004 and the Threatened or Protected Species Regulations, February 2007*

The most prominent statute containing provisions directly aimed at the conservation of birds is the National Environmental Management: Biodiversity Act (Act 10 of 2004, as amended) read with the Threatened or Protected Species Regulations, February 2007 (TOPS Regulations). Chapter 1 sets out the objectives of the Act, and they are aligned with the objectives of the Convention on Biological Diversity, which are the conservation of biodiversity, the sustainable use of its components, and the fair and equitable sharing of the benefits of the use of genetic resources. The Act also gives effect to CITES, the Ramsar Convention, and the Bonn Convention on Migratory Species of Wild Animals (as noted in Table 7 above). The State is endowed with the trusteeship of biodiversity and has the responsibility to manage, conserve and sustain the biodiversity of South Africa.

9. Environmental Management Programme Inputs

Refer to APPENDIX 6 for the EMPr inputs. Below in Table 3 is a summary of the key monitoring recommendations contained in the EMPr specifically pertaining to avifauna. It is important to note that a comprehensive EMPr is included in the BA Report, which includes input from all specialists in this regard.

Table 3: **Key monitoring requirements contained in the EMPr**

Monitoring requirement	Frequency	Responsibility
• Avifaunal specialist must conduct a quarterly walk-through of the powerlines to assess the level of collision mortality of avifauna. Prior to	Quarterly	Avifaunal specialist

	construction, an avifaunal specialist should conduct a site walkthrough, covering the final power line route, to identify any nests/breeding/roosting activity of priority species, and to advise on which spans require mitigation in the form of BFDs	Once before construction commences	

10. Conclusion and Recommendations

The proposed project will have the following potential impacts on avifauna:

- Displacement due to habitat transformation in the footprint of the proposed substations and batching plant;
- Displacement due to disturbance associated with the construction of the proposed substations, batching plant and 132kV powerline;
- Electrocution in the substation yards; and
- Mortality due to collision with the earth wire of the proposed 132kV powerlines, and 400kV turn-in.

10.1 Displacement due to habitat transformation

Habitat transformation has an impact on birds breeding, foraging and roosting in or in close proximity to the proposed substations and batching plant, which could result in temporary or permanent displacement. Unfortunately, very little mitigation can be applied to reduce this impact as the total permanent transformation of the natural habitat within the construction footprint of the proposed infrastructure is unavoidable. However, due to the nature of the vegetation, and judged by the existing transmission lines, very little if any vegetation clearing will be required in the powerline servitudes. The habitat in the area where the substations and batching plant are planned is very uniform from a bird impact perspective. Therefore the loss of habitat for priority species due to direct habitat transformation associated with the construction of the proposed substations is likely to be fairly minimal. **The impact significance is assessed to be Low, both before and after mitigation**. The species most likely to be directly affected by this impact would be small, non-Red Data species. Suggested mitigation measures are restricting the footprint to the absolute minimum, no off-road driving, maximum use of existing roads, measures to control dust, restrict access to the rest of the property, and rehabilitation of all areas disturbed.

10.2 Displacement due to disturbance

Construction activities in close proximity to breeding locations could be a source of disturbance and could lead to temporary breeding failure or even permanent abandonment of nests. A potential mitigation measure is the timeous identification of nests and the timing of the construction activities to avoid disturbance during a critical phase of the breeding cycle, although in practice that can admittedly be very challenging to implement. Terrestrial priority species namely Ludwig's Bustard, Karoo Korhaan, Southern Black Korhaan, Blue Crane, Grey-winged Francolin, Melodious Lark and African Rock Pipit are most likely to be affected by displacement due to disturbance. The ground-nesting Black Harrier and cliff-nesters such as Jackal Buzzard and Cape Eagle Owl could also potentially be vulnerable to this impact, but the habitat in the study area is not ideal for Black Harrier from a breeding perspective. The cliff-nesting Verreaux's Eagle should not be affected as no known nests are within the impact zone of the proposed developments. **The impact is assessed to be Moderate before mitigation, and Low after mitigation**. Suggested mitigation measures are restricting the footprint to the absolute minimum, no off-road driving, maximum use of existing roads, measures to control noise, restrict access to the rest of the property, training the ECO to identify Red Data species nests during construction, and a pre-

construction walk-through by the avifaunal specialist to identify and Red Data nests coupled with the timing of the construction if need be.

10.3 Electrocution

In the case of the proposed powerlines, no electrocution risk is envisaged because the proposed design of the 132kV powerlines and 400kV turn-in will not pose an electrocution threat to any of the priority species which are likely to occur at the site. Electrocutions within the proposed substation yards are possible but should not affect the more sensitive Red Data bird species, as these species are unlikely to use the infrastructure within the substation yards for perching or roosting. Suggested mitigation measures are reactive mitigation in the substation if electrocutions are recorded. **The risk is assessed to be Medium, and Low after mitigation.**

10.4 Collisions

The most likely priority species candidates for collision mortality on the proposed powerline are Ludwig's Bustard, Karoo Korhaan, Blue Crane, Secretarybird, White Stork and Northern Black Korhaan in natural habitat, and Greater Flamingo and Blue Crane near dams. Non-Red Data waterbirds could also be at risk near dams and where the line crosses drainage lines. Large raptors, e.g. Martial, Tawny and Verreaux's Eagle might also be at risk, especially at dams when they descend to bath and drink. Suggested mitigation measures is a walk-through by the avifaunal specialist of the final alignment to identify sections that require mitigation, the fitting of BFDs on those pre-identified sections and quarterly line inspections by the avifaunal specialist to record collision-related mortality. **The risk is assessed to be High, but it can be reduced to Medium through the application of mitigation measures.**

10.5 Cumulative impacts

The concern from a powerline interaction perspective within the 35km radius is mostly for large terrestrial priority species, particularly Ludwig's Bustard, Secretarybird, White Stork and Blue Crane, which are highly susceptible to powerline collisions. The proposed development will add an additional 30-40km of HV line to the existing HV network in the area. Several hundred kilometres of HV line already exists within this area, and several more are planned should the renewable energy projects all be built. **The overall cumulative impact of the proposed project, when viewed with the potential impact of similar and planned projects, is assessed to be of high significance. It could be reduced to some extent with mitigation but will remain at a medium level after mitigation.**

11. Final Specialist Statement and Authorisation Recommendation

Table 4 below provides a summary of the respective significance ratings and an average overall rating before and after mitigation.

Table 4: Summary of impact significance ratings

Impact	Rating pre-mitigation	Rating post-mitigation
Displacement due to habitat transformation	Low	Low
Displacement due to disturbance	Medium	Low
Electrocution	Medium	Low
Collisions	High	Medium
Cumulative impacts	High	Medium

It is recommended that the activity is authorised, on condition that the proposed mitigation measures as detailed in the EMPr (APPENDIX 6) are strictly implemented.

12. References

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APPENDIX 1: LIST OF SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA

Family Name	Scientific Name	Red Data Global	Red Data Regional	Endemnicity South Africa	Endemnicity Southern Africa	Average Report Rate in greater area %
Eagle, Verreaux's	*Aquila verreauxii*	LC	VU			16.22
Falcon, Lanner	*Falco biarmicus*	LC	VU			2.70
Stork, Black	*Ciconia nigra*	LC	VU			2.70
Crane, Blue	*Anthropoides paradiseus*	VU	NT		Endemic	40.54
Flamingo, Greater	*Phoenicopterus roseus*	LC	NT			1.35
Korhaan, Karoo	*Eupodotis vigorsii*	LC	NT		Endemic	1.35
Pipit, African Rock	*Anthus crenatus*	NT	NT	Endemic (SA, Lesotho, Swaziland)	Endemic	39.19
Roller, European	*Coracias garrulus*	LC	NT			1.35
Korhaan, Blue	*Eupodotis caerulescens*	NT	LC	Endemic (SA, Lesotho, Swaziland)	Endemic	9.46
Lark, Melodious	*Mirafra cheniana*	LC	LC	Near endemic	Endemic	2.70
Bustard, Ludwig's	*Neotis ludwigii*	EN	EN		Near-endemic	4.05
Eagle, Martial	*Polemaetus bellicosus*	VU	EN			2.70
Eagle, Tawny	*Aquila rapax*	VU	EN			1.35
Apalis, Bar-throated	*Apalis thoracica*					2.70
Avocet, Pied	*Recurvirostra avosetta*					8.11
Barbet, Acacia Pied	*Tricholaema leucomelas*				Near-endemic	63.51
Barbet, Crested	*Trachyphonus vaillantii*					9.46
Batis, Pririt	*Batis pririt*				Near-endemic	1.35
Bee-eater, European	*Merops apiaster*					21.62
Bishop, Southern Red	*Euplectes orix*					60.81
Bittern, Little	*Ixobrychus minutus*					1.35
Bokmakierie	*Telophorus zeylonus*				Near-endemic	93.24
Bulbul, African Red-eyed	*Pycnonotus nigricans*				Near-endemic	75.68
Bunting, Cape	*Emberiza capensis*				Near-endemic	81.08
Bunting, Cinnamon-breasted	*Emberiza tahapisi*					12.16
Bunting, Lark-like	*Emberiza impetuani*				Near-endemic	28.38
Buzzard, Jackal	*Buteo rufofuscus*			Near endemic	Endemic	35.14
Buzzard, Common	*Buteo buteo*					13.51
Canary, Black-headed	*Serinus alario*			Near endemic	Endemic	41.89
Canary, Black-throated	*Crithagra atrogularis*					31.08
Canary, Cape	*Serinus canicollis*				Endemic	33.78
Canary, White-throated	*Crithagra albogularis*				Near-endemic	35.14
Canary, Yellow	*Crithagra flaviventris*				Near-endemic	22.97
Chat, Anteating	*Myrmecocichla formicivora*				Endemic	68.92

Family Name	Scientific Name	Red Data Global	Red Data Regional	Endemnicity South Africa	Endemnicity Southern Africa	Average Report Rate in greater area %
Chat, Familiar	*Cercomela familiaris*					85.14
Chat, Karoo	*Cercomela schlegelii*				Near-endemic	1.35
Chat, Sickle-winged	*Cercomela sinuata*			Near endemic	Endemic	21.62
Cisticola, Cloud	*Cisticola textrix*			Near endemic	Near-endemic	13.51
Cisticola, Desert	*Cisticola aridulus*					17.57
Cisticola, Grey-backed	*Cisticola subruficapilla*				Near-endemic	67.57
Cisticola, Levaillant's	*Cisticola tinniens*					25.68
Cisticola, Zitting	*Cisticola juncidis*					6.76
Coot, Red-knobbed	*Fulica cristata*					24.32
Cormorant, Reed	*Phalacrocorax africanus*					2.70
Cormorant, White-breasted	*Phalacrocorax lucidus*					2.70
Crombec, Long-billed	*Sylvietta rufescens*					22.97
Crow, Cape	*Corvus capensis*					5.41
Crow, Pied	*Corvus albus*					85.14
Cuckoo, Diderick	*Chrysococcyx caprius*					16.22
Cuckoo, Jacobin	*Clamator jacobinus*					1.35
Dove, Laughing	*Streptopelia senegalensis*					52.70
Dove, Namaqua	*Oena capensis*					9.46
Dove, Red-eyed	*Streptopelia semitorquata*					41.89
Dove, Rock	*Columba livia*					1.35
Drongo, Fork-tailed	*Dicrurus adsimilis*					16.22
Duck, African Black	*Anas sparsa*					8.11
Duck, Yellow-billed	*Anas undulata*					36.49
Eagle, Booted	*Hieraaetus pennatus*					20.27
Eagle-owl, Cape	*Bubo capensis*					1.35
Eagle-owl, Spotted	*Bubo africanus*					5.41
Egret, Cattle	*Bubulcus ibis*					6.76
Eremomela, Yellow-bellied	*Eremomela icteropygialis*					13.51
Falcon, Amur	*Falco amurensis*					6.76
Finch, Red-headed	*Amadina erythrocephala*				Near-endemic	1.35
Fiscal, Common	*Lanius collaris*					93.24
Flycatcher, Chat	*Bradornis infuscatus*				Near-endemic	1.35
Flycatcher, Fairy	*Stenostira scita*			Near endemic	Endemic	29.73
Flycatcher, Fiscal	*Sigelus silens*			Near endemic	Endemic	58.11
Flycatcher, Spotted	*Muscicapa striata*					1.35
Francolin, Grey-winged	*Scleroptila afra*			Endemic (SA, Lesotho, Swaziland)	Endemic	28.38
Goose, Egyptian	*Alopochen aegyptiaca*					59.46
Goose, Spur-winged	*Plectropterus gambensis*					21.62
Goshawk, Gabar	*Melierax gabar*					6.76
Goshawk, Southern Pale Chanting	*Melierax canorus*				Near-endemic	27.03
Grebe, Great Crested	*Podiceps cristatus*					1.35
Grebe, Little	*Tachybaptus ruficollis*					5.41

Family Name	Scientific Name	Red Data Global	Red Data Regional	Endemnicity South Africa	Endemnicity Southern Africa	Average Report Rate in greater area %
Greenshank, Common	*Tringa nebularia*					6.76
Guineafowl, Helmeted	*Numida meleagris*					52.70
Hamerkop	*Scopus umbretta*					10.81
Harrier-Hawk, African	*Polyboroides typus*					1.35
Heron, Black-headed	*Ardea melanocephala*					12.16
Heron, Grey	*Ardea cinerea*					25.68
Honeyguide, Greater	*Indicator indicator*					5.41
Honeyguide, Lesser	*Indicator minor*					2.70
Hoopoe, African	*Upupa africana*					40.54
Ibis, African Sacred	*Threskiornis aethiopicus*					12.16
Ibis, Glossy	*Plegadis falcinellus*					1.35
Ibis, Hadeda	*Bostrychia hagedash*					67.57
Kestrel, Greater	*Falco rupicoloides*					2.70
Kestrel, Lesser	*Falco naumanni*					32.43
Kestrel, Rock	*Falco rupicolus*					37.84
Kingfisher, Brown-hooded	*Halcyon albiventris*					2.70
Kingfisher, Malachite	*Alcedo cristata*					1.35
Kite, Black-shouldered	*Elanus caeruleus*					12.16
Korhaan, Northern Black	*Afrotis afraoides*				Endemic	33.78
Lapwing, Blacksmith	*Vanellus armatus*					45.95
Lapwing, Crowned	*Vanellus coronatus*					32.43
Lark, Cape Clapper	*Mirafra apiata*			Near endemic	Endemic	1.35
Lark, Eastern Clapper	*Mirafra fasciolata*				Near-endemic	67.57
Lark, Eastern Long-billed	*Certhilauda semitorquata*			Endemic (SA, Lesotho, Swaziland)	Endemic	16.22
Lark, Karoo Long-billed	*Certhilauda subcoronata*				Endemic	2.70
Lark, Large-billed	*Galerida magnirostris*			Near endemic	Endemic	31.08
Lark, Red-capped	*Calandrella cinerea*					9.46
Lark, Spike-heeled	*Chersomanes albofasciata*				Near-endemic	35.14
Longclaw, Cape	*Macronyx capensis*				Endemic	33.78
Martin, Brown-throated	*Riparia paludicola*					20.27
Martin, Rock	*Hirundo fuligula*					47.30
Masked-weaver, Southern	*Ploceus velatus*					86.49
Moorhen, Common	*Gallinula chloropus*					14.86
Mousebird, Red-faced	*Urocolius indicus*					32.43
Mousebird, Speckled	*Colius striatus*					41.89
Mousebird, White-backed	*Colius colius*				Endemic	44.59
Neddicky, Neddicky	*Cisticola fulvicapilla*					68.92
Nightjar, Fiery-necked	*Caprimulgus pectoralis*					1.35
Nightjar, Rufous-cheeked	*Caprimulgus rufigena*					1.35
Owl, Barn	*Tyto alba*					2.70
Paradise-flycatcher, African	*Terpsiphone viridis*					2.70
Penduline-tit, Cape	*Anthoscopus minutus*				Near-endemic	2.70
Pigeon, Speckled	*Columba guinea*					70.27
Pipit, African	*Anthus cinnamomeus*					55.41
Pipit, Buffy	*Anthus vaalensis*					4.05
Pipit, Long-billed	*Anthus similis*					33.78

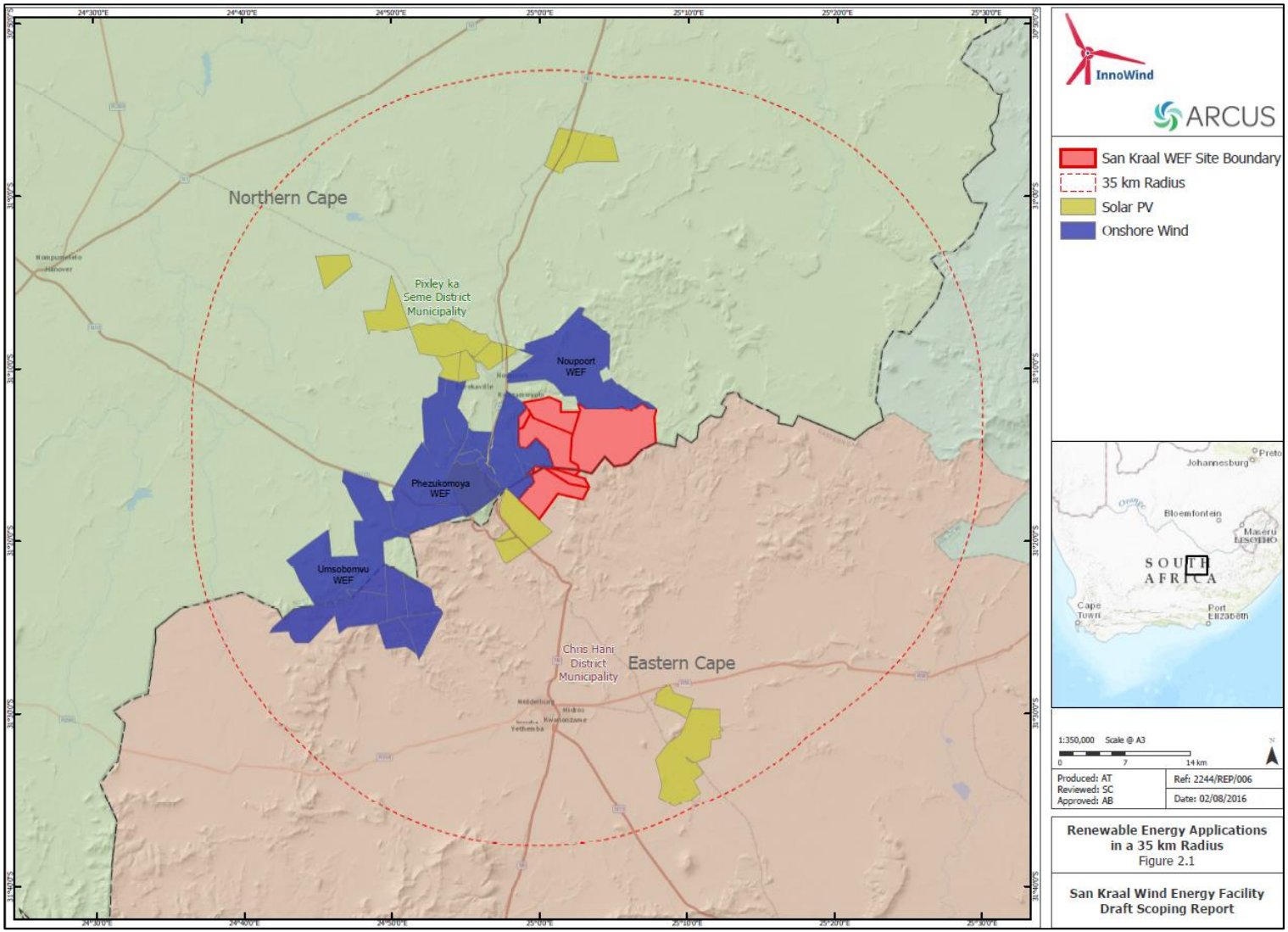
Family Name	Scientific Name	Red Data Global	Red Data Regional	Endemnicity South Africa	Endemnicity Southern Africa	Average Report Rate in greater area %
Pipit, Plain-backed	*Anthus leucophrys*					5.41
Plover, Kittlitz's	*Charadrius pecuarius*					2.70
Plover, Three-banded	*Charadrius tricollaris*					33.78
Prinia, Karoo	*Prinia maculosa*			Near endemic	Endemic	82.43
Quail, Common	*Coturnix coturnix*					1.35
Quailfinch, African	*Ortygospiza fuscocrissa*					12.16
Quelea, Red-billed	*Quelea quelea*					10.81
Raven, White-necked	*Corvus albicollis*					36.49
Reed-warbler, African	*Acrocephalus baeticatus*					12.16
Robin-chat, Cape	*Cossypha caffra*					64.86
Rock-thrush, Short-toed	*Monticola brevipes*				Near-endemic	8.11
Sandgrouse, Namaqua	*Pterocles namaqua*				Near-endemic	5.41
Sandpiper, Common	*Actitis hypoleucos*					1.35
Scrub-robin, Karoo	*Erythropygia coryphoeus*				Endemic	94.59
Shelduck, South African	*Tadorna cana*				Endemic	39.19
Shoveler, Cape	*Anas smithii*				Near-endemic	2.70
Shrike, Red-backed	*Lanius collurio*					1.35
Snipe, African	*Gallinago nigripennis*					1.35
Sparrow, Cape	*Passer melanurus*				Near-endemic	82.43
Sparrow, House	*Passer domesticus*					33.78
Sparrow, Southern Grey-headed	*Passer diffusus*					33.78
Sparrow-weaver, White-browed	*Plocepasser mahali*					1.35
Sparrowhawk, Black	*Accipiter melanoleucus*					1.35
Sparrowhawk, Rufous-chested	*Accipiter rufiventris*					2.70
Sparrowlark, Grey-backed	*Eremopterix verticalis*				Near-endemic	1.35
Spoonbill, African	*Platalea alba*					9.46
Starling, Cape Glossy	*Lamprotornis nitens*					13.51
Starling, Common	*Sturnus vulgaris*					12.16
Starling, Pale-winged	*Onychognathus nabouroup*				Near-endemic	20.27
Starling, Pied	*Lamprotornis bicolor*			Endemic (SA, Lesotho, Swaziland)	Endemic	93.24
Starling, Red-winged	*Onychognathus morio*					39.19
Starling, Wattled	*Creatophora cinerea*					12.16
Stilt, Black-winged	*Himantopus himantopus*					8.11
Stonechat, African	*Saxicola torquatus*					28.38
Stork, White	*Ciconia ciconia*					5.41
Sunbird, Amethyst	*Chalcomitra amethystina*					1.35
Sunbird, Malachite	*Nectarinia famosa*					27.03
Sunbird, Southern Double-collared	*Cinnyris chalybeus*			Near endemic	Endemic	20.27
Swallow, Barn	*Hirundo rustica*					51.35
Swallow, Greater Striped	*Cecropis cucullata*					79.73
Swallow, Pearl-breasted	*Hirundo dimidiata*					1.35
Swallow, White-throated	*Hirundo albigularis*					16.22

Family Name	Scientific Name	Red Data Global	Red Data Regional	Endemnicity South Africa	Endemnicity Southern Africa	Average Report Rate in greater area %
Swamp-warbler, Lesser	*Acrocephalus gracilirostris*					20.27
Swift, Alpine	*Tachymarptis melba*					10.81
Swift, Little	*Apus affinis*					35.14
Swift, White-rumped	*Apus caffer*					39.19
Tchagra, Southern	*Tchagra tchagra*			Near endemic	Endemic	1.35
Teal, Cape	*Anas capensis*					2.70
Teal, Red-billed	*Anas erythrorhyncha*					13.51
Thick-knee, Spotted	*Burhinus capensis*					13.51
Thrush, Karoo	*Turdus smithi*			Near endemic	Endemic	45.95
Tit, Grey	*Parus afer*			Near endemic	Endemic	4.05
Tit-babbler, Chestnut-vented	*Sylvia subcaerulea*				Near-endemic	35.14
Tit-babbler, Layard's	*Sylvia layardi*			Near endemic	Endemic	44.59
Turtle-dove, Cape	*Streptopelia capicola*					86.49
Wagtail, Cape	*Motacilla capensis*					82.43
Warbler, Namaqua	*Phragmacia substriata*			Near endemic	Endemic	9.46
Warbler, Rufous-eared	*Malcorus pectoralis*				Endemic	70.27
Warbler, Willow	*Phylloscopus trochilus*					1.35
Waxbill, Common	*Estrilda astrild*					28.38
Weaver, Cape	*Ploceus capensis*			Near endemic	Endemic	1.35
Wheatear, Capped	*Oenanthe pileata*					1.35
Wheatear, Mountain	*Oenanthe monticola*				Near-endemic	58.11
White-eye, Cape	*Zosterops virens*			Near endemic	Endemic	45.95
White-eye, Orange River	*Zosterops pallidus*				Endemic	1.35
Whydah, Pin-tailed	*Vidua macroura*					14.86
Woodpecker, Cardinal	*Dendropicos fuscescens*					1.35
Woodpecker, Ground	*Geocolaptes olivaceus*	NT		Endemic (SA, Lesotho, Swaziland)	Endemic	16.22

APPENDIX 2: LIST OF PROPOSED AND EXISTING RENEWABLE PROJECTS WITHIN A 35KM RADIUS.

TYPE		PROJECT TITLE	DETAILS
1	WIND	Umsobomvu Wind Energy Facility	**EAP** - Coastal and Environmental Services **Client:** Innowind (Pty) Ltd **DEA**: 14/12/16/3/3/2/730 Approved NPB
2	WIND	The Construction of A 188.6 Mw Wind Energy Facility And Its Associated Infrastructure At Noupoort Within The Umsobomvu Local Municipality, Northern Cape Province	**EAP** - SiVest SA (Pty) Ltd **Client**: South African Mainstream Renewable Power Noupoort Pty Ltd **DEA**: 12/12/20/2319 Operational PB_R3
4	SOLAR	Construction of the 75MW Naauw Poort Solar Energy Facility near Naupoort	**EAP**-Savannah Environmental Consultants (Pty) Ltd **DE**A: 14/12/16/3/3/2/355 Approved NPB
5	SOLAR	The Construction of The Collet 75mw Photovoltaic Power Plant On Farm Harmsfontein 335, Buffelspoort 336 And Remainder Of Brakke Kuilen 180 Near Middelburg In The Eastern Cape Province	**EAP** - Coastal and Environmental Services **DEA**: 14/12/16/3/3/2/385/AM1 Approved NPB
6	SOLAR	Proposed Establishment of A 150mw Photovoltaic (Pv) Solar Power Plant On A Site Near Middleburg, Eastern Cape Province	**EAP**- Savannah Environmental Consultants (Pty) Ltd **DEA**: 12/12/20/2465/2 Approved NPB
7	SOLAR	For The Proposed Klip Gat Solar Energy Facility (75mw) Near Noupoort, Emthangeni Local Municipality In The Northern Cape Province	**EAP** - Savannah Environmental Consultants (Pty) Ltd **DEA**: 14/12/16/3/3/2/354 Approved NPB
8	SOLAR	Construction of Allemans Fontein Solar Energy Facility near Noupoort, Northern Cape (20MW)	**EAP**- Savannah Environmental Consultants (Pty) Ltd **DEA**: 14/12/16/3/3/1/730 Approved NPB

9	SOLAR	The Proposed Establishment Of Photovoltaic (Solar Power) Farms In The Northern Cape Province- Linde	**EAP**: Sustainable Development Projects cc **Client:** Scatec Solar SA Pty Ltd **DEA**: 12/12/20/2258/2 Approved PB_R2
11	SOLAR	Proposed Dida Solar Energy installation on a site near Noupoort, Northern Cape (20 MW)	**EAP**: Savannah Environmental Consultants (Pty) Ltd **DEA**: 14/12/16/3/3/1/529 Approved NPB
12	SOLAR	Noupoort Concentrated Solar Power (CSP) Project, Northern Cape Province (150MW)	**EAP**: Savannah Environmental Consultants (Pty) Ltd **DEA**: 14/12/16/3/3/2/944 Approved NPB



Renewable energy developments planned in a 35km radius around the San Kraal/Phezukomoya WEF cluster.

APPENDIX 4: EXAMPLES OF BIRD HABITAT

Figure 1: The grassy habitat on the plateau in the vicinity of the proposed on-site substation.

Figure 2: A view of the boulder-strewn slopes of the escarpment.

Figure 3: A view of the grassy plains which will be crossed by the proposed powerline.

Figure 4: A view of the broken, hilly terrain in the west of the study area.

Figure 5: A typical dam with alien trees in the greater area.

Figure 6: Existing high voltage lines in the study area.

APPENDIX 5: IMPACT ASSESSMENT CRITERIA

Where significant environmental aspects are present, significant environmental impacts ***may*** result. The significance of the impacts associated with the significant aspects can be determined by considering the risk:

Significance of Environmental Impact (Risk) = Probability x Consequence

The consequence of impacts can be described by considering the severity, spatial extent and duration of the impact.

1. Severity of Impacts

Table 1 presents the ranking criteria that were used to determine the severity of impacts on priority species.

Table 1: Criteria for ranking the *Severity* of negative impacts on priority species

Environment	**Ranking Criteria**		
	Low (L-)	**Medium (M-)**	**High (H-)**
Ecology (Plant and animal life)	Disturbance of areas that are degraded have little conservation value. Minor change in species variety or prevalence.	Disturbance of areas that have some conservation value. Complete change in species variety or prevalence.	Disturbance of areas that are pristine have conservation value. Destruction of rare or endangered species.

2. Spatial Extent and Duration of Impacts

The duration and spatial scale of impacts were ranked using the following criteria:

Table 2: Ranking the *Duration* and *Spatial Scale* of impacts

	Ranking Criteria		
	L	**M**	**H**
Duration	Quickly reversible Less than the project life Short-term	Reversible over time/life of the project Medium-term	Permanent Beyond closure Long-term
Spatial Scale	Localised Within site boundary Site	Fairly widespread Beyond site boundary Local	Widespread Far beyond site boundary Regional/national

3. Consequence of Impacts

Having ranked the severity, duration and spatial extent, the overall consequence of impacts was determined using the following qualitative guidelines:

Table 3: Ranking the *Consequence* of an impact

			SEVERITY = L		
DURATION	Long-term	**H**			
	Medium-term	**M**			**MEDIUM**
	Short-term	**L**	**LOW**		
			SEVERITY = M		
DURATION	Long-term	**H**			**HIGH**
	Medium-term	**M**		**MEDIUM**	
	Short-term	**L**	**LOW**		
			SEVERITY = H		
DURATION	Long-term	**H**			
	Medium-term	**M**			**HIGH**
	Short-term	**L**	**MEDIUM**		
			L	**M**	**H**
			Localised Within site boundary Site	Fairly widespread Beyond site boundary Local	Widespread Far beyond site boundary Regional/national
			SPATIAL SCALE		

To use Table 5, one of the three “layers” based on the severity ranking was obtained from Table 3. Thereafter the consequence ranking was obtained by locating the intersection of the appropriate duration and spatial scale rankings.

4. Overall Significance of Impacts

Combining the consequence of the impact and the probability of occurrence, as shown by Table 4, provided the overall significance (risk) of impacts.

Table 4: Ranking the *Overall Significance* of impacts

PROBABILITY	Definite Continuous	**H**	**MEDIUM**		**HIGH**
	Possible Frequent	**M**		**MEDIUM**	
	Unlikely Seldom	**L**	**LOW**		**MEDIUM**
			L	**M**	**H**
			CONSEQUENCE (from Table 9-3)		

The overall significance ranking of the negative environmental impacts provides the following guidelines for decision making:

Table 5: Guidelines for decision-making

Overall Significance Ranking	**Nature of Impact**	**Decision Guideline**
High	Unacceptable impacts.	Likely to be a fatal flaw.
Medium	Noticeable impact.	These are unavoidable consequence, which will need to be accepted if the project is allowed to proceed.
Low	Minor impacts.	These impacts are not likely to affect the project decision.

APPENDIX 6: ENVIRONMENTAL MANAGEMENT PROGRAMME

Management Plan for the Construction Phase (Including pre- and post-construction activities)

Action	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
Displacement of priority species due to permanent habitat transformation					
The clearing of vegetation in the proposed substation yards and batching plant	Prevent unnecessary impacts on the surrounding environment by ensuring that contractors are aware of the requirements of the site-specific Construction Environmental Management Programme (CEMPr).	A site-specific CEMPr must be implemented, which gives an appropriate and detailed description of how construction activities must be conducted to reduce unnecessary destruction and degradation of habitat. All contractors are to adhere to the CEMPr and should apply good environmental practice during construction. The CEMPr should specifically include the following: 1. The minimum footprint areas for infrastructure should be used wherever possible, including road widths and lengths; 2. No off-road driving; 3. Maximum use of existing roads; 4. Measures to control dust; 5. Restricted access to the rest of the property; 6. Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks) must be undertaken, and to this end, a habitat restoration plan is to be developed by a rehabilitation specialist and implemented accordingly.	1. Implementation of the CEMPr. Oversee activitie to ensure that the CEMPr is implemented and enforced via site audits and inspections. Report and record any non-compliance. 2. Ensure that the construction area and footprint are kept to a minimum. Carry out regular site inspections to verify the limits of the construction area to ensure unnecessary disturbance is avoided. 3. Ensure that construction personnel are made aware of the impacts relating to off-road driving. Construction access roads must be demarcated clearly. Undertake site inspections to verify. 4. Construction access roads must be demarcated clearly. Undertake site inspections to verify. 5. Monitor the implementation of dust control mechanisms via site inspections and	1. On a daily basis 2. Weekly 3. Weekly 4. Weekly 5. Weekly 6. Weekly 7. Once-off prior to the completion of construction. 8. Monthly during the construction phase.	1. ECO 2. ECO 3. ECO 4. ECO 5. ECO 6. ECO 7. ECO, Project Developer and Rehabilitation Specialist, 8. ECO and Construction Manager or Contractor

Action	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
			record and report non-compliance. 6. Ensure that the construction area is demarcated clearly and that construction personnel are made aware of these demarcations. Monitor via site inspections and report non-compliance. 7. Appointment of Rehabilitation Specialist to develop a Habitat Restoration Plan and ensure that it is approved by auditing the final and signed report acceptance. 8. Monitor rehabilitation via site audits and site inspections to ensure compliance. Record and report any non-compliance.		
Displacement of priority species due to disturbance					
Construction of the substations, batching plants and powerlines	Prevent unnecessary displacement of Red Data avifauna by ensuring that contractors are aware of the requirements of the CEMPr.	A site-specific CEMPr must be implemented, which gives an appropriate and detailed description of how construction activities must be conducted. All contractors are to adhere to the CEMPr and should apply good environmental practice during construction. The CEMPr must specifically include the following: 1. No off-road driving; 2. Maximum use of existing roads; 3. Measures to control noise; 4. Restricted access to the rest of the property; 5. The appointed ECO must be trained by an avifaunal	1. Implementation of the CEMPr. Oversee activities to ensure that the CEMPr is implemented and enforced via site audits and inspections. Report and record any non-compliance. 2. Ensure that construction personnel are made aware of the impacts relating to off-road driving. Construction access roads must be demarcated clearly.	1. On a daily basis 2. Weekly 3. Weekly 4. Weekly 5. Weekly 6. Once-off before construction commences, for a three-day period. 7. Weekly 8. Once-off and ensure all new construction personnel are trained in this regard. 9. Throughout construction, when	1. ECO 2. ECO 3. ECO 4. ECO 5. ECO 6. Project Developer, Avifauna Specialist and ECO 7. ECO 8. ECO 9. Project Developer, Avifauna Specialist and ECO 10. Project Developer, Avifauna Specialist and ECO

Action	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		specialist to identify the potential priority species as well as the signs that indicate possible breeding by these species. The ECO must then, during audits/site visits, make a concerted effort to look out for such breeding activities of Red Data species, and such efforts may include the training of construction staff to identify Red Data species, followed by regular questioning of staff as to the regular whereabouts on site of these species. If any of the Red Data species are confirmed to be breeding (e.g. if a nest site is found), construction activities within 500m of the breeding site must cease, and an avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed. 6. Prior to construction, an avifaunal specialist should conduct a site walkthrough, covering the final road and power line routes, to identify any nests/breeding/roosting activity of priority species, the results of which may inform the final construction schedule in close proximity to that specific area, including abbreviating construction time, scheduling activities around avian breeding and/or movement schedules, and lowering levels of associated noise.	Undertake site inspections to verify. 3. Construction access roads must be demarcated clearly. Undertake site inspections to verify. 4. Monitor the implementation of noise control mechanisms via site inspections and record and report non-compliance. 5. Ensure that the construction area is demarcated clearly and that construction personnel are made aware of these demarcations. Monitor via site inspections and report non-compliance. 6. Appoint an Avifauna Specialist prior to the construction phase to train and guide the ECO in identify potential priority species and signs for potential breeding. 7. ECO to undertake site visits and audits to find breeding sites. 8. ECO to provide training and information sessions to the construction personnel to identify Red Data species. Conduct regular audits of attendance registers for training. 9. Ensure that construction activities are stopped within 500	breeding sites are found. 10. Once-off before the start of construction activities	

Action	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
			m of any breeding sites of Red Data species. Ensure that an Avifaunal Specialist is contacted immediately for further assessment. Conduct audits to verify the placement of the buffer area and verify if the Avifaunal Specialist has been appointed. 10. Appointment of Avifaunal Specialist to conduct a site walkthrough of the final road and power line routes. Record and report any non-compliance.		

Management Plan for the Operational Phase

Action	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
Electrocution of priority avifauna in the substation yards					
The transmission of electricity generated by the WEFs	Ensure effective reactive mitigation if need be in the proposed substation yards if Red Data species are electrocuted.	The hardware within the proposed substation yards is too complex to warrant any mitigation for electrocution at this stage. It is recommended that if on-going impacts are recorded once operational, site-specific mitigation be applied reactively. If any electrocutions of Red Data avifauna are reported in the proposed transmission substation yard, the avifaunal specialist must be notified for an inspection of the problem and advice on how the problem can be resolved, if at all, through appropriate mitigation.	1. Avifaunal specialist to be appointed to conduct an on-site investigation. 2. Environmental Manager to record impacts of electrocution of Red Data avifauna at the proposed transmission substation and ensure that reactive site-specific mitigation is implemented if required. Record and report any non-compliance.	As and when required.	Avifaunal Specialist, Operator and Environmental Manager
Mortality of priority avifauna due to collisions with the earth wire of the proposed powerline					
The transmission of electricity generated by the WEFs	Mortality of priority avifauna due to collisions with the earth wire of the proposed powerline.	The operational monitoring programme must include regular monitoring of the grid connection power line for collision mortalities.	1. Avifaunal specialist to be appointed and must conduct a quarterly walk-through of the grid connection. 2. Environmental Manager to verify appointment of specialist and monitor the frequency of monitoring by auditing signed reports and minutes of meetings.	Quarterly	Avifaunal specialist and Operator

Management Plan for the Decommissioning Phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
Displacement of Red Data species due to disturbance					
Removal of the infrastructure	Prevent unnecessary displacement of Red Data avifauna by ensuring that contractors are aware of the requirements of the site-specific Decommissioning Environmental Management Programme (DEMPr).	1. A site-specific DEMPr must be implemented, which gives an appropriate and detailed description of how decommissioning activities must be conducted to reduce unnecessary destruction of habitat. All contractors are to adhere to the DEMPr and should apply good environmental practice during decommissioning. 2. Following decommissioning, rehabilitation of all areas disturbed (e.g. temporary access tracks) must be undertaken, and to this end, a habitat restoration plan is to be developed by a rehabilitation specialist and implemented accordingly.	1. Implementation of DEMPr and oversee activities to ensure that the DEMPr is implemented and enforced, via site audits and inspections. Record and report any non-compliance. 2. Appointment of Rehabilitation Specialist to develop a Habitat Restoration Plan and ensure that it is approved by auditing the final and signed report acceptance. 3. Monitor rehabilitation via site audits and site inspections to ensure compliance. Record and report any non-compliance.	1. On a daily basis 2. Once-off prior to the completion of decommissioning. 3. Monthly during the decommissioning phase.	1. ECO 2. Contractor, Rehabilitation Specialist and ECO 3. ECO, Contractor