BASIC ASSESSMENT REPORT

Basic Assessment for the Proposed Construction and Operation of Electrical Grid Infrastructure to support the Sutherland, Sutherland 2 and Rietrug Wind Energy Facilities (WEFs), Northern and Western Cape Provinces

APPENDIX D.5: Avifauna Assessment

BIRD IMPACT ASSESSMENT STUDY:

Basic Assessment for the proposed construction of electrical infrastructure to support three proposed wind energy facilities, near Sutherland, in the Northern and Western Cape Provinces

Report prepared for:

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Version 1: June 2019
Version 2: September 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 recognized for its achievements in addressing airport wildlife hazards in an environmentally sensitive manner at ACSA's airports across South Africa. Albert is recognized 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: 17 June 2019

Executive Summary

The project applicant is proposing the development of a 132kV sub-transmission line, a major transmission substation and 400kV transmission line within the Renewable Energy Development Zone (REDZ): 2 Komsberg. The 132kV line routing proposed as part of this application has been previously assessed as part of the proposed construction of the electrical grid infrastructure for the Sutherland Wind Energy Facility (14/12/16/3/3/1/1816), Rietrug Wind Energy Facility (14/12/16/3/3/1/1815) and Sutherland 2 Wind Energy Facility (14/12/16/3/3/1/1814/AM1). These projects received Environmental Authorisation in February 2018.

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

- Displacement due to habitat transformation in the footprint of the proposed transmission substation;
- Displacement due to the construction of the proposed transmission substation, service road and 132kV and 400kV powerlines;
- Electrocution in the transmission substation yard; and
- Mortality due to collision with the earthwire of the proposed 132kV and 400kV powerlines.

Displacement due to habitat transformation

Habitat transformation has an impact on birds breeding, foraging and roosting in or in close proximity of the proposed transmission substation, 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 transmission substation yard 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 study area is very uniform from a bird impact perspective, therefore the loss of habitat for Red Data species due to direct habitat transformation associated with the construction of the proposed transmission substation 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 footprint to the absolute minimum, no off-road driving, maximum use of existing roads, measures to control dust, restricted access to the rest of the property, and rehabilitation of all areas disturbed.

Displacement due to disturbance

Apart from direct habitat destruction, construction 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. Large terrestrial species, including Red Data Ludwig's Bustard, Karoo Korhaan and Southern Black Korhaan, are most likely to be affected by displacement due to disturbance. The ground-nesting Black Harrier and cliff nesting Jackal Buzzard could also potentially be vulnerable to this impact, but the habitat in the study area is not ideal for the former species from a breeding perspective. **The impact is assessed to be Moderate before mitigation, and Low after mitigation**. Suggested mitigation measures are restricting footprint to the absolute minimum, no off-road driving, maximum use of existing roads, measures to control noise, restricted access to the rest of the property, training the ECO to identify

Red Data 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.

Electrocution

In the case of the proposed powerlines, no electrocution risk is envisaged because the proposed design of the 132kV and 400kV powerlines will not pose an electrocution threat to any of the priority species which are likely to occur at the site. Electrocutions within the proposed transmission substation yard 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 Very Low, both before and after mitigation.**

Collisions

The most likely Red Data candidates for collision mortality on the proposed powerlines are Ludwig's Bustards, Karoo Korhaan and Southern Black Korhaan in natural habitat, and Greater Flamingo near dams. Non-Red Data waterbirds could also be at risk near dams and where the line crosses drainage lines (see Table 2 for a list of species that could be at risk). Martial and Verreaux's Eagle might also be at risk, especially at surface water 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 Moderate through the application of mitigation measures.**

Cumulative impacts

Large raptor species, particularly Verreaux's Eagle and Martial Eagle, are potentially most at risk as far as cumulative impacts of renewable energy projects in the 50km radius around the proposed development is concerned. However, the project should not materially threaten these species. The concern from a powerline interaction perspective is more for large terrestrial species, particularly Ludwig's Bustard, which is highly susceptible to powerline collisions. The proposed project will add an additional approximately 41km 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 existing impacts on avifauna, is assessed to be Moderate, and is likely remain at that level after mitigation.**

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

Overall impact significance rating

Impact	**Rating pre-mitigation**	**Rating post-mitigation**
Displacement due to habitat transformation	Low (4)	Low (4)
Displacement due to disturbance	Moderate (3)	Low (4)
Electrocution	Very Low (5)	Very Low (5)
Collisions	High (2)	Moderate (3)
Cumulative impacts	Moderate (3)	Moderate (3)
Average:	**Moderate to Low (3.4)**	**Low to Moderate (3.8)**

Final Specialist Statement and Authorisation Recommendation

The overall potential impact on priority avifauna for the construction phase is assessed to be of **Moderate to Low significance before mitigation measures, and Low after the implementation of mitigation measures.** For the decommissioning phase, the overall potential impact on priority avifauna is assessed with a **Moderate significance before the implementation of mitigation and a Low significance after the implementation of mitigation measures**. For the operational phase, the overall potential impact on priority avifauna is assessed with a **Very Low to High significance without the implementation of mitigation measures; and Very Low to Moderate significance with the implementation of mitigation measures**. Cumulative impacts are assessed with a **Moderate significance both with and without mitigation measures**. In terms of an average, the pre-mitigation significance of all potential impacts identified in this specialist study is assessed as **Moderate to Low**, leaning more towards Moderate (i.e. average of 3.4, as shown in Table 9 above) and the post-mitigation significance is assessed as Low to Moderate, leaning more towards Low (i.e. average of 3.8, as shown in Table 9 above). It is therefore recommended that the activity is authorised, on condition that the proposed mitigation measures as detailed in the EMPr (APPENDIX 3) are strictly implemented.

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List of Abbreviations

EIA	Environmental Impact Assessment
BA	Basic Assessment
DEA	Department of Environmental Affairs
WEF	Wind Energy Facility
I&APs	Interested and affected parties
IBA	Important Bird Area
BLSA	BirdLife South Africa
EWT	Endangered Wildlife Trust
SABAP 2	Southern African Bird Atlas Project 2
BFD	Bird Flight Diverters

Glossary

Definitions	
Study area	The area comprising a 2km radius around the proposed powerline alternative alignments
Priority species	Powerline sensitive and Red Data avifauna which could potentially occur in the study area
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 5
k) any mitigation measures for inclusion in the EMPr;	Section 6
l) any conditions for inclusion in the environmental authorisation;	Section 11
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 9
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;	Sections 10 and 11
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

Requirements of Appendix 6 – GN R326 (7 April 2017)	Addressed in the Specialist Report
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

BIRD IMPACT ASSESSMENT STUDY

1. Introduction and Methodology

The project applicant is proposing the development of a 132kV sub-transmission line, a major transmission substation and 400kV transmission line within the Renewable Energy Development Zone (REDZ): 2 Komsberg. The 132kV line routing proposed as part of this application has been previously assessed as part of the proposed construction of the electrical grid infrastructure for the Sutherland Wind Energy Facility (14/12/16/3/3/1/1816), Rietrug Wind Energy Facility (14/12/16/3/3/1/1815) and Sutherland 2 Wind Energy Facility (14/12/16/3/3/1/1814/AM1). These projects received Environmental Authorisation in February 2018. Within the authorisations, the alternative line routing "1" was submitted as the preferred routing and subsequently approved.

Project components

- Major Transmission Substation (400 m x 400 m)
- Overhead 132 kV line ˜ 41 km (this line has been assessed as part of a previous Basic Assessment Process) and referred to in the reports as "Alternative 2"
- 400 kV ~ 4 km overhead transmission line connecting to an existing Eskom line
- Service roads will be constructed below the lines (jeep track)

Farm portions affected

- Northern Cape Farm Portions
    - Remaining Extent of Hartebeeste Fontein Farm 147
    - Remaining Extent of Nooitgedacht Farm 148
    - Remaining Extent of Beeren Valley Farm 150
    - Portion 1 of Farm 219
    - Remaining Extent of Farm 219

- Western Cape Farm Portions
    - Farm 280
    - Portion 1 of Rheebokkenfontein Farm 4
    - Portion 2 of Rheebokkenfontein Farm 4
    - Portion 2 of Farm De Molen 5
    - Portion 6 of Farm Hamelkraal 16
    - Portion 7 of Farm Hamelkraal 16
    - Remaining Extent of Spitskop Farm 20

The 132 kV line routing proposed as part of this application was considered as alternative line routing "2" as part of the assessments undertaken in 2017/2018. The line routing did not include any environmental fatal flaws and is a technical feasible option to enable the evacuation of the electricity generated by the abovementioned Wind Energy Facilities into the National Grid.

1.1. Scope, Purpose and Objectives of this Specialist Report

The objectives of the report are to investigate the potential impacts of the proposed 132kV sub-transmission line, a major transmission substation and 400kV transmission line 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 Sutherland, Sutherland 2 and Rietrug WEFs. The electrical infrastructure proposed as part of this application aims to provide support to the WEFs by enabling the evacuation of the electricity generated by these WEFs into the national grid.
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	27 April 2019
Season	End of rainy season
Relevance of Season	The investigation was done when there was plenty of water in the environment, which is important for bird abundance and variety in an arid environment.

2. Approach and Methodology

2.1. Information Sources

The following information sources were used in compiling the report:

- Bird distribution data of the Southern African Bird Atlas Project 2 (SABAP 2) was obtained (http://sabap2.adu.org.za/), in order to ascertain which species are likely to occur in the pentads where the proposed infrastructure will be located. A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8 × 7.6 km. In order to get a more representative impression of the birdlife, a consolidated data set was obtained for the 20 pentads which overlap substantially with the proposed infrastructure. A total of 67 full protocol lists, and 33 ad hoc protocol lists have been completed to date for the 21 pentads where the study area is located. Lists surveys lasting a minimum of two hours each are designated as full protocol lists, while ad hoc protocol lists are surveys which did not last a minimum of two hours, but still yielded valuable data. In addition, 1 402 incidental sightings were recorded within this period. The SABAP2 data was therefore regarded as a reliable snapshot of the avifauna, especially when supplemented by actual data collected during pre-construction surveys and through general knowledge of the area.
- 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).

- 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, Lesotho and Swaziland (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 (http://www.iucnredlist.org/).
- The BirdLife South Africa (BLSA) was consulted on Important Bird Areas of Southern Africa for information on relevant Important Bird Areas (IBAs) (Marnewick *et al*. 2015).
- Satellite imagery from Google Earth was used in order to view the broader area on a landscape level and to help identify bird habitat on the ground.
- Information on bird diversity and abundance at the proposed Sutherland, Sutherland 2 and Rietrug WEF development sites were obtained through a 12-months monitoring programme. These three WEFs were assessed as part of a separate Environmental Impact Assessment (EIA) Process, which received Environmental Authorisation (EA) on 22 February 2012, an amended EA on 6 October 2015 and separate amended EAs in November 2016. Data was collected through transect counts, incidental sightings, inspection of potential focal points and the recording of flight behaviour from vantage points. In addition, extensive nest searches were conducted. This data was used as a supplementary source of information on the variety and abundance of avifauna in the study area.
- Information on existing raptor nests were obtained from avifaunal specialists Dr. Andrew Jenkins (Avisense Consulting) and Andrew Pearson (Arcus), as well as from the staff of the Komsberg Nature Reserve. Various landowners were also interviewed to obtain information on nests and roosting sites in the greater area. Dedicated nest searches were repeated by Eric Hermann in June 2019.
- A site visit to the proposed 400kV line, substation site and part of the 132kV alignment was conducted on 27 April 2019.

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 12).
- 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 powerlines and substation.
- Priority species were defined as species vulnerable to collisions with and electrocutions on the proposed electrical infrastructure.
- Cumulative impacts were assessed by adding expected impacts from this proposed development to existing and proposed developments with similar impacts in a 50-70km radius around the proposed

development. The existing and proposed developments that were taken into consideration for cumulative impacts include:

- Gunstfontein Wind Energy Project
- Sutherland WEF
- Sutherland 2 WEF
- Rietrug WEF
- Maralla East Wind Energy Project
- Maralla West Wind Energy Project
- Esizayo Wind Energy Project
- Hidden Valley Wind Energy Project
- Proposed Photovoltaic (PV) Solar Energy Facility on a site south of Sutherland
- Suurplaat WEF
- Komsberg East and West WEF
- Sutherland 2 and Rietrug Electricity Grid Infrastructure Projects

2.3. Consultation Processes Undertaken

As noted above, information on existing raptor nests were obtained from avifaunal specialists Dr. Andrew Jenkins (Avisense Consulting) and Andrew Pearson (Arcus), as well as from the staff of the Komsberg Nature Reserve. Various landowners were also interviewed to obtain information on nests and roosting sites in the greater area.

3. Description of Project Aspects relevant to Avifaunal Impacts

The following project aspects are relevant from a bird impact assessment perspective:

- Major Transmission Substation (400 m x 400 m);
- Overhead 132kV line of approximately 41km;
- 400 kV ~ 4 km overhead transmission line connecting to an existing Eskom line;

See Figures 1 and 2 below for a map indicating the location and lay-out of the proposed infrastructure.

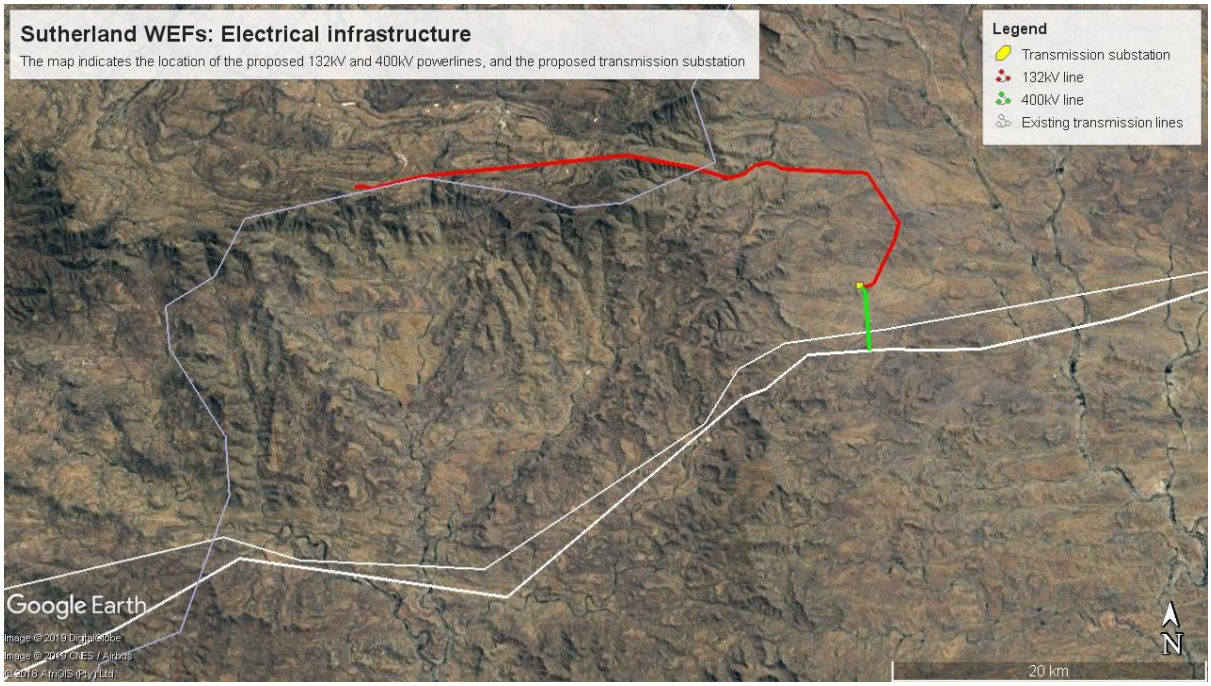

Figure 1: Layout of the proposed infrastructure

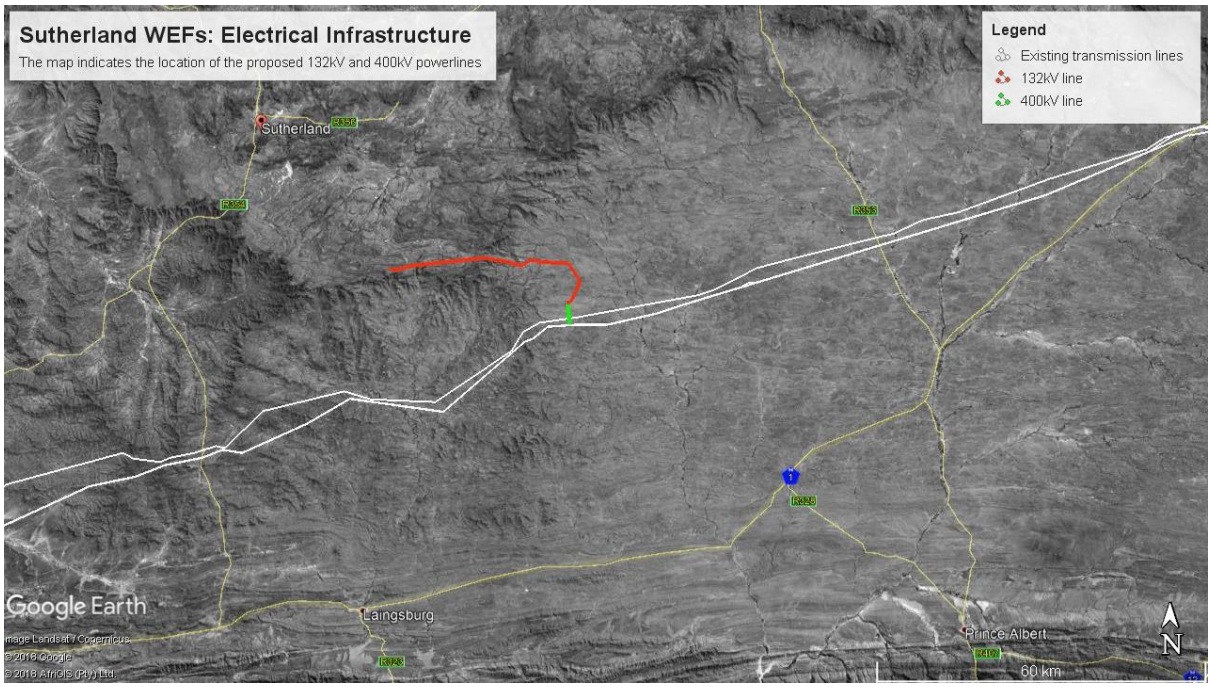

Figure 2: The location of the proposed infrastructure

4. Description of the Receiving Environment

4.1. Baseline Environmental Description

The proposed development is located at the junction of the Fynbos and Nama Karoo biomes (Mucina & Rutherford 2006). The study area is primarily situated on a plateau at an altitude of between 1600 and 1700 meters above sea-level and partially straddles the escarpment of the Klein-Roggeveld and Komsberg mountain ranges, but also extends eastwards onto the plains below the plateau. The dominant vegetation types on the plateau are Roggeveld Shale Renosterveld and Central Mountain Shale Renosterveld (Mucina & Rutherford 2006). Roggeveld Shale Renosterveld vegetation type occurs on undulating, plateau landscapes with low hills and broad shallow valleys, supporting mainly

moderately tall schrublands dominated by renosterbos, with rich geophytic flora in the wetter and rocky habitats. Central Mountain Shale Renosterveld is found on slopes and broad ridges of low mountains and escarpments. It consists of tall shrubland dominated by renosterbos and large suites of mainly non-succulent karoo shrubs with a rich geophytic flora in the undergrowth or in more open, wetter or rocky habitats. The dominant vegetation type on the plains below the plateau is Gamka Karoo which consists of dwarf spiny shrubland dominated by Karoo dwarf shrubs (e.g. *Chrysocoma ciliata, Eriocephalus ericoides*) with rare low trees (e.g. *Euclea undulata*). Dense stands of drought-resistant grasses (*Stipagrostis, Aristida*) cover (especially after abundant rains) broad sandy bottomlands. Stands of alien trees, mostly Eucalyptus, are present at farm steads.

The climate is quite severe, with about 170 mm of rain per annum, falling mostly in winter, with mean winter minimum and summer maximum temperatures of 0˚C and 29˚C respectively (Mucina & Rutherford 2006). The study area is bisected by several ephemeral drainage lines. There are also several artificial impoundments in the study area as well as a number of natural, flat depressions which hold water after good rains, as was the case in April 2019 when the field visit was conducted. The principal land-use is sheep farming. Three transmission lines run south of the study area, namely the Droërivier Kappa 2 400kV, Gamma Kappa 1 765kV and the Droërivier Kappa 1 400kV.

Refer to Figures 3 to 6 for representative examples of the habitat in the study area.

Figure 3: Typical renosterveld vegetation in the study area on the plateau above the Komsberg mountains.

Figure 4: A example Gamka Karoo at the site of the proposed transmission substation.

Figure 5: An ephemeral drainage line on the plains below the plateau.

Figure 6: An ephemeral waterbody near the proposed 400kV line.

A total of 159 bird species could potentially occur in the study area. Of these, 38 are classified as powerline priority species. Of these, eight are classified as locally threatened (Taylor *et al*. 2015). 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 (Red Data) species potentially occurring in the study area. VU = Vulnerable, EN = Endangered, NT = Near-threatened, LC = Least Concern.

Species	Taxonmic name	Powerline priority species	SABAP2 Average reporting rate: full protocol	Red Data status: International	Red Data status: Regional	Endemic - South Africa	Endemic - Southern Africa	Possibility of occurrence	Recorded during surveys	Renosterveld	Gamka Karoo	Surface water	Alien trees	Cliffs	Powerlines	Collisions	Displacement - disturbance	Displacement - habitat loss	Electrocution (substations)
African Black Duck	*Anas sparsa*	x	8.82									x				x			
African Sacred Ibis	*Threskiornis aethiopicus*	x	4.41									x				x			
African Spoonbill	*Platalea alba*	x	2.94									x				x			
Black Harrier	*Circus maurus*	x	2.94	EN	EN	Near endemic	Endemic		x	x		x					x		
Black Stork	*Ciconia nigra*	x	1.47	LC	VU				x			x		x		x			
Black-chested Snake Eagle	*Circaetus pectoralis*	x	1.47						x	x	x	x	x		x	x			
Black-headed Heron	*Ardea melanocephala*	x	4.41						x			x	x			x			
Black-shouldered Kite	*Elanus caeruleus*	x	1.47							x	x		x						
Booted Eagle	*Aquila pennatus*	x	11.76						x	x	x	x	x	x		x			
Cape Crow	*Corvus capensis*	x	0.00						x	x	x		x						x
Cape Eagle-Owl	*Bubo capensis*	x	0.00						x	x				x		x			
Cape Shoveler	*Anas smithii*	x	11.76				Near-endemic		x			x				x			
Cape Teal	*Anas capensis*	x	5.88						x			x				x			
Common (Steppe) Buzzard	*Buteo vulpinus*	x	1.47							x	x	x	x		x	x			x
Egyptian Goose	*Alopochen aegyptiacus*	x	32.35						x			x			x	x			x
Glossy Ibis	*Plegadis falcinellus*	x	0.00						x			x	x			x			
Greater Flamingo	*Phoenicopterus ruber*	x	0.00	LC	NT				x			x				x			
Grey Heron	*Ardea cinerea*	x	4.41						x			x	x			x			
Hadeda Ibis	*Bostrychia hagedash*	x	29.41						x	x	x	x	x		x				x
Hamerkop	*Scopus umbretta*	x	2.94									x		x					
Jackal Buzzard	*Buteo rufofuscus*	x	38.24			Near endemic	Endemic		x	x	x	x	x	x	x	x	x	x	x
Karoo Korhaan	*Eupodotis vigorsii*	x	41.18	LC	NT		Endemic		x		x					x			
Lanner Falcon	*Falco biarmicus*	x	0.00						x	x	x	x	x	x	x	x	x		x
Little Grebe	*Tachybaptus ruficollis*	x	5.88									x				x			
Ludwig's Bustard	*Neotis ludwigii*	x	11.76	EN	EN		Near-endemic		x		x					x			

Species	Taxonmic name	Powerline priority species	SABAP2 Average reporting rate: full protocol	Red Data status: International	Red Data status: Regional	Endemic - South Africa	Endemic - Southern Africa	Possibility of occurrence	Recorded during surveys	Renosterveld	Gamka Karoo	Surface water	Alien trees	Cliffs	Powerlines	Collisions	Displacement - disturbance	Displacement - habitat loss	Electrocution (substations)
Martial Eagle	*Polemaetus bellicosus*	x	14.71	VU	EN				x	x	x	x	x		x	x	x		
Pale Chanting Goshawk	*Melierax canorus*	x	36.76				Near-endemic			x	x	x	x		x				x
Species	**Taxonmic name**	**Powerline priority species**	**SABAP2 Average reporting rate: full protocol**	**Red Data status: International**	**Red Data status: Regional**	**Endemic - South Africa**	**Endemic - Southern Africa**	**Possibility of occurrence**	**Recorded during surveys**	**Renosterveld**	**Gamka Karoo**	**Surface water**	**Alien trees**	**Cliffs**	**Powerlines**	**Collisions**	**Displacement - disturbance**	**Displacement - habitat loss**	**Electrocution (substations)**
Peregrine Falcon	*Falco peregrinus*	x	0.00						x				x	x	x	x			
Pied Crow	*Corvus albus*	x	38.24						x	x	x	x	x		x				x
Red-billed Teal	*Anas erythrorhyncha*	x	5.88						x			x							
Red-knobbed Coot	*Fulica cristata*	x	4.41									x				x			
South African Shelduck	*Tadorna cana*	x	27.94				Endemic		x			x				x			
Southern Black Korhaan	*Afrotis afra*	x	7.35	VU	VU	Endemic	Endemic		x	x						x			
Spotted Eagle-Owl	*Bubo africanus*	x	4.41						x	x	x		x		x				x
Spur-winged Goose	*Plectropterus gambensis*	x	2.94						x			x				x			
Verreaux's' Eagle	*Aquila verreauxii*	x	16.18	LC	VU				x	x		x	x	x	x	x	x		x
White-necked Raven	*Corvus albicollis*	x	58.82						x	x			x	x	x	x	x		x
Yellow-billed Duck	*Anas undulata*	x	14.71						x			x				x			

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

4.2. Identification of Environmental Sensitivities

The following environmental sensitivities have been identified in the study area from an avifaunal perspective (see Figure 7 below):

- No-go areas: These are areas in close proximity to known active Verreaux's Eagle and Jackal Buzzard nests, where the construction of the proposed powerline and associated infrastructure will constitute a disturbance risk. **No such areas will be impacted by the proposed alignment**.
- High sensitivity: Included are areas within 300m of small waterbodies, and within 500m of large waterbodies (both artificial dams and natural pans), where the proposed powerline will constitute a collision risk. These areas should ideally be avoided, or if this is not possible, there should be adequate mitigation implemented to reduce the risks materially (see Section 7 for a discussion of proposed mitigation measures). Red Data species that could be impacted through collisions with the proposed powerline due to being attracted to the surface water include Greater Flamingo, Black Stork and raptors such as Martial Eagle and Verreaux's Eagle. Many non-Red Data powerline sensitive species could also be attracted to surface water and be at risk of collisions e.g. various species of raptors, ducks, herons, grebes and waders. Ephemeral drainage lines and their immediate environments are also included in this category. When these ephemeral drainage lines contain water, they serve as flyways for waterbirds, and may temporarily attract Red Data species such as Black Stork, while standing pools of water could attract raptors for purposes of drinking and bathing, e.g. Red Data Martial Eagle and Verreaux's Eagle as well as non-Red Data raptors. These areas should likewise ideally be avoided, or if this is not possible, there should be adequate mitigation implemented to reduce the risks materially, e.g. marking with anti-collision devices.
- 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 and Karoo Korhaan. Ludwig's Bustard in particular is known to be highly susceptible to powerline collisions.

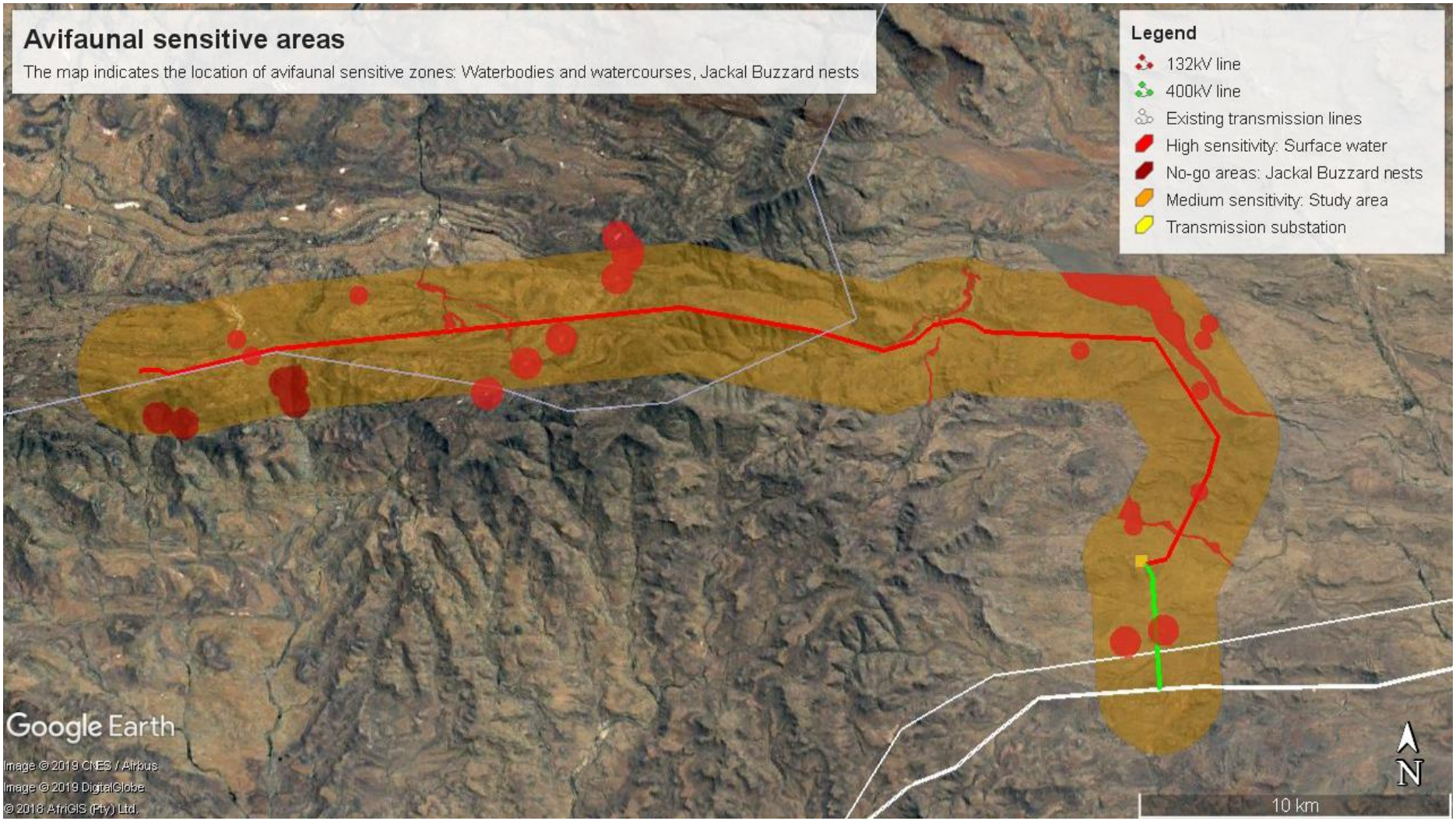

Figure 7: Sensitive areas from an avifaunal impact perspective

5. 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, service road and transmission substation.
- Potential impact 2: Displacement of priority avifauna due to habitat transformation associated with the construction of the transmission substation.

5.2 Operational Phase

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

5.3 Decommissioning Phase

- Potential impact 5: Displacement of priority avifauna due to disturbance associated with the decommissioning of the proposed powerline, service road and transmission substation.

5.4 Cumulative Impacts

- Cumulative impact 1: Displacement of priority avifauna due to disturbance associated with the construction of the proposed powerlines, service road and transmission substation 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 transmission substation 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 lines
- Cumulative impact 4: Electrocutions in the transmission substation yard in conjunction with existing and future similar projects.

6. Impact Assessment

6.1 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.

6.2 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 proposed design of the 132kV line, namely the steel monopole, and the 400kV transmission towers, will not pose an electrocution threat to any of the priority species which

are likely to occur at the site. Electrocutions within the proposed transmission substation yard 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 yard for perching or roosting.

6.3 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 recent 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).

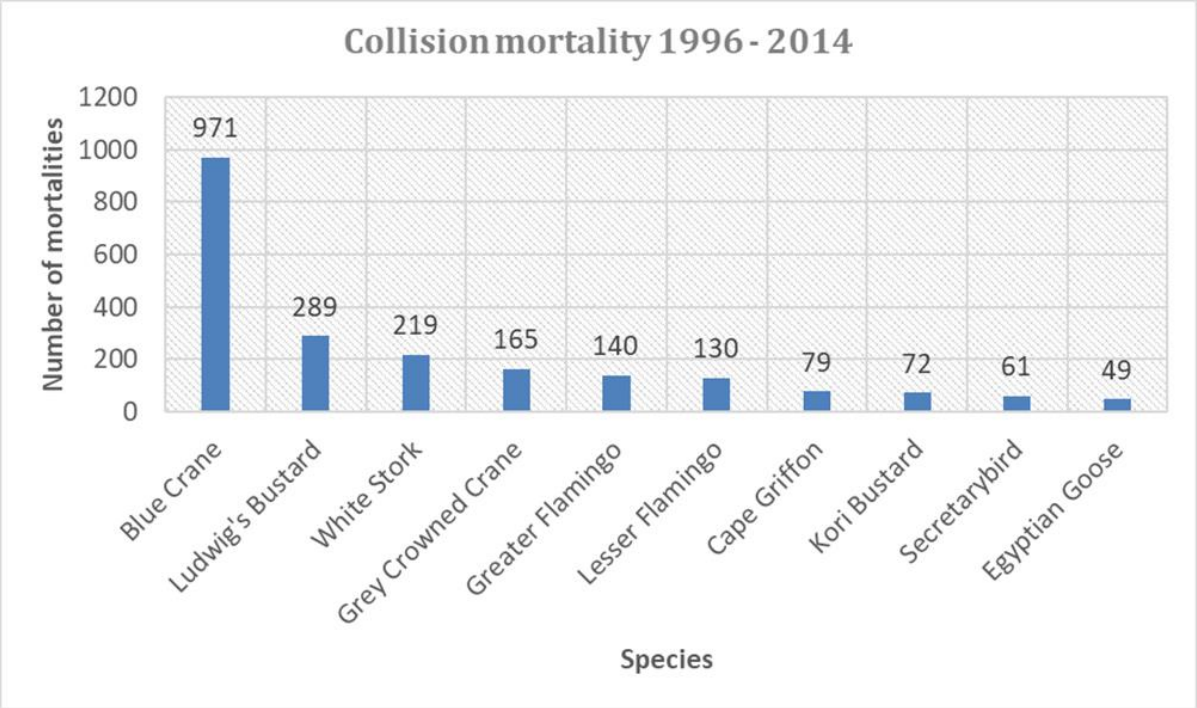

Figure 8: The top 10 collision prone bird species in South Africa, in terms of reported incidents contained in the Eskom/Endangered Wildlife Trust Strategic Partnership central incident register 1996 - 2014 (EWT unpublished data)

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 Bustards, Blue Cranes *Anthropoides paradiseus* and White Storks *Ciconia ciconia*. 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 Red Data candidates for collision mortality on the proposed powerline are Ludwig's Bustards, Karoo Korhaan and Southern Black Korhaan in natural habitat, and Greater Flamingo 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). Martial and Verreaux's Eagle might also be at risk, especially at surface water when they descend to bath and drink.

6.4 Displacement due to habitat destruction and disturbance

During the construction of power lines, service roads (jeep track) and substations, habitat destruction/transformation inevitably takes place. The construction activities will constitute the following:

- Site clearance and preparation:
- Construction of the infrastructure (i.e. the transmission substation, powerlines and service road);
- Transportation of personnel, construction material and equipment to the site, and personnel away from the site;
- Removal of vegetation for the proposed substation and 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 transmission substation 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 habitat in the study area is very uniform from a bird impact perspective; therefore the loss of habitat for Red Data species due to direct habitat transformation associated with the construction of the proposed substation 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. Large terrestrial species namely Ludwig's Bustard, Karoo Korhaan and Southern Black Korhaan are most likely to be affected by displacement due to disturbance. The ground-nesting Black Harrier and cliff-nesting Jackal Buzzard could also potentially be vulnerable to this impact, but the habitat in the study area is not ideal for the former species from a breeding perspective. The cliff-nesting Verreaux's Eagle will not be affected as no known nests are within the impact zone of the proposed developments.

6.5 Cumulative impacts (all phases)

The cluster of renewable energy project applications currently registered with the Department of Environmental Affairs (DEA) within a 50km radius around the proposed development are listed in APPENDIX 2 of this report, together with a map indicating their locality relative to the proposed development. Possible impacts by renewable energy projects on birds within this area are temporary displacement due to disturbance associated with the construction of the facilities and associated infrastructure, collisions with solar panels and wind turbines, permanent displacement due to habitat transformation, entrapment in perimeter fences, collisions with the associated power lines, and electrocutions in substation yards.

Large raptor species, particularly Verreaux's Eagle and Martial Eagle, are potentially most at risk as far as cumulative impacts of the cluster of renewable energy projects in the 50km radius around the proposed development is concerned. However, the proposed development should not materially threaten these species. The concern from a powerline interaction perspective is more for large terrestrial species, particularly Ludwig's Bustard, which is highly susceptible to powerline collisions. The proposed development will add an additional ˜41km 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 existing impacts on avifauna, is assessed to be of moderate significance. It could be reduced to some extent with mitigation, but will remain at a moderate level.

6.6 Potential Impacts during the Construction Phase

6.6.1. Displacement of priority avifauna due to habitat transformation

Aspect/Activity	The clearing of vegetation in the proposed transmission substation yard
Type of Impact (i.e. Impact Status)	Direct
Potential Impact	Displacement of priority species due to permanent habitat transformation
Status	Negative
Mitigation Required	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.
Impact Significance (Pre-Mitigation)	Low (Level 4)
Impact Significance (Post-Mitigation)	Low (Level 4)
I&AP Concern	None to date

6.6.2. Displacement due to Disturbance

Aspect/Activity	Construction activities
Type of Impact (i.e. Impact Status)	Direct
Potential Impact	Displacement of priority species, particularly Red Data species, due to disturbance
Status	Negative
Mitigation Required	A site-specific CEMPr must be implemented, which gives 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 walk through, covering the final service road and power line routes, to identify any nests/breeding/roosting activity of priority species, as well as any additional sensitive habitats. 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.
Impact Significance (Pre-Mitigation)	Moderate (Level 3)
Impact Significance (Post-Mitigation)	Low (Level 4)
I&AP Concern	None to date

6.7 Potential Impacts during the Operational Phase

6.7.1. Electrocution of priority avifauna

Aspect/Activity	The transmission of electricity generated from the proposed three Mainstream WEFs
Type of Impact (i.e. Impact Status)	Direct
Potential Impact	Electrocution of priority species in the transmission substation
Status	Negative
Mitigation Required	• The hardware within the proposed transmission substation yard 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. This is an acceptable approach because priority avifauna, especially Red Data species, is unlikely to frequent the substation and be electrocuted.
Impact Significance (Pre-Mitigation)	Very low (Level 5)
Impact Significance (Post-Mitigation)	Very low (Level 5)
I&AP Concern	None to date

6.7.2. Mortality of priority avifauna due to collisions

Aspect/Activity	The transmission of electricity generated from the proposed three Mainstream WEFs
Type of Impact (i.e. Impact Status)	Direct
Potential Impact	Mortality of priority avifauna due to collisions with the earthwire of the proposed powerlines
Status	Negative
Mitigation Required	• An avifaunal specialist must conduct a site walk through 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 walk through, 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.
Impact Significance (Pre-Mitigation)	High (Level 2)
Impact Significance (Post-Mitigation)	Moderate (Level 3)
I&AP Concern	None to date

6.8 Potential Impacts during the Decommissioning Phase

6.8.1. Displacement of priority avifauna due to disturbance

Aspect/Activity	Removal of the proposed infrastructure during decommissioning
Type of Impact (i.e. Impact Status)	Direct
Potential Impact	Displacement of priority species, especially Red Data species, due to disturbance
Status	Negative
Mitigation Required	• A site-specific Decommissioning EMPr (DEMPr) must be implemented, which gives 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. • Following decommissioning, rehabilitation of all areas disturbed must be undertaken and to this end a habitat restoration plan is to be developed by a rehabilitation specialist and implemented accordingly.
Impact Significance (Pre-Mitigation)	Moderate (Level 3)
Impact Significance (Post-Mitigation)	Low (Level 4)
I&AP Concern	None to date

6.9 Cumulative Impacts

Aspect/Activity	The incremental impact of the proposed transmission, service road and powerlines on priority avifauna added to the impacts of other past, present or reasonably foreseeable future activities.
Type of Impact (i.e. Impact Status)	Cumulative
Potential Impact	Temporary displacement of priority avifauna due to disturbance associated with the construction of the proposed transmission substation, service road and powerlines; permanent displacement of priority avifauna due to habitat transformation associated with the construction of the proposed powerlines, service road and transmission substation, and mortality of priority avifauna due to collisions with the powerline, and electrocutions in the substation yard.
Status	Negative
Mitigation Required	• • Please refer to all the proposed mitigation measures as listed in the preceding tables in Section 6 for all the impacts and all the phases.
Impact Significance (Pre-Mitigation)	Moderate risk (Level 3)
Impact Significance (Post-Mitigation)	Moderate risk (Level 3)
I&AP Concern	None to date

6.10 No-go option

The no-go option will result in no additional impacts on avifauna and will result in the ecological status quo being maintained (as described in Section 4 of this report).

7. Impact Assessment Tables

The assessment of impacts and recommendation of mitigation measures as discussed above are collated in Tables 2 to 5 below.

Table 2: Impact Assessment Summary Table for the Construction Phase

Construction Phase													
Direct Impacts													
Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of Impact	Irreplaceability	Potential Mitigation Measures	Significance Without Mitigation	Significance With Mitigation	Ranking of Residual Impact/ Risk	Confidence Level
The clearing of vegetation for the proposed transmission substation yard	Displacement of priority species, especially Red Data species due to permanent habitat transformation	Negative	Site Specific	Long term	Extreme	Very unlikely	High reversibility	Replaceable	A site-specific 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; • 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.	Low risk (4)	Low risk (4)	Low risk (4)	High
Construction of the proposed transmission substation, service road and powerline	Displacement of priority species, especially Red Data species, due to disturbance	Negative	Site	Short term	Substantial	Likely	Highly reversible	Replaceable	A site-specific CEMPr must be implemented, which gives 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 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.	Moderate risk (3)	Low risk (4)	Low Risk (4)	High

									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. • Prior to construction, an avifaunal specialist should conduct a site walk through, covering the final service road and power line routes, to identify any nests/breeding/roosting activity of priority species, as well as any additional sensitive habitats. 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.				

Table 3: Impact Assessment Summary Table for the Operational Phase

Operational Phase												
Direct Impacts												
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
The transmission of electricity generated by the three proposed Mainstream WEFs	Electrocution of Red Data avifauna in the transmission substation	Negative	Local	Long term	Severe	Extremely unlikely	High	Replaceable	• The hardware within the proposed transmission substation yard 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. This is an acceptable approach because Red Data avifauna is unlikely to frequent the substation and be electrocuted.	Very low risk (5)	Very low risk (5)	Very low risk (5)	High
The transmission of electricity generated by the three proposed Mainstream WEFs	Mortality of priority avifauna due to collisions with the earthwire of the proposed powerlines	Negative	Local	Long term	Severe	Likely	High	Replaceable	• An avifaunal specialist must conduct a site walk through 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 walk through, which may include the need for modified BFDs fitted with solar powered LED lights on certain spans. • The operational monitoring programme must include regular (quarterly) monitoring of the grid connection power line for collision mortalities.	High risk (2)	Moderate risk (3)	Moderate risk (3)	High

Table 4: Impact Assessment Summary Table for the Decommissioning Phase

Decommissioning Phase													
Direct Impacts													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Removal of the infrastructure	Displacement of priority species, especially Red Data species, due to disturbance	Negative	Site Specific	Short term	Substantial	Likely	Highly reversible	Replaceable	• A site-specific DEMPr must be implemented, which gives 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. • Following decommissioning, rehabilitation of all areas disturbed must be undertaken and to this end a habitat restoration plan is to be developed by a rehabilitation specialist and implemented accordingly.	Moderate risk (3)	Low risk (4)	Low risk (4)	Medium

Table 5: Cumulative Impact Assessment Summary Table

Cumulative Impacts (Construction, Operational and Decommissioning Phases)												
Direct Impacts												
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation / Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
The incremental impact of the proposed transmission substation, service road and powerlines on priority avifauna added to the impacts of other past, present or reasonably foreseeable future activities.	Temporary displacement of priority avifauna, especially Red Data avifauna, due to disturbance associated with the construction of the proposed transmission substation, service road and powerlines; permanent displacement of Red Data avifauna due to habitat transformation associated with the construction of the proposed transmission substation; and mortality of Red Data avifauna due to collisions with the powerline, and electrocutions in the substation yard.	Negative	Local	Long term	Substantial	Very likely	High	Replaceable	• Please refer to all the proposed mitigation measures as listed in the impact tables in Section 6 for all impacts in all the phases.	Moderate risk (3)	Moderate risk (3)	Moderate risk (3)	Low

7.1 Impact Assessment Summary

Table 6 below provides an indication of the overall impact significance with the implementation of mitigation measures for the various phases.

Table 6: Overall Impact Significance (Post Mitigation)

Phase	**Overall Impact Significance**
Construction	Low (Level 4)
Operational	Very Low (Level 5) to Moderate (Level 3)
Decommissioning	Low (Level 4)
Nature of Impact	**Overall Impact Significance**
Cumulative	Moderate (Level 3)

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.

8.1.1 Agreements and conventions

Table 7 below lists international agreements and conventions which South Africa is party to and which is relevant to the conservation of avifauna[1].

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 utilization of genetic resources.	Global
Convention on the Conservation of Migratory Species of Wild Animals,	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	Global

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

Convention name	Description	Geographic scope
(CMS), Bonn, 1979	migratory animals pass, the Range States, and lays the legal foundation for internationally coordinated conservation measures throughout a migratory range.	
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

8.1.2 National legislation

8.1.2.1 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 –

(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.

8.1.2.2 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.

8.1.2.3 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 3 for the EMPr inputs. Below in Table 8 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 7: 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 construction, an avifaunal specialist should conduct a site walk through, covering the final service road and power line route, to identify any nests/breeding/roosting activity of priority species, as well as any additional sensitive habitats	Quarterly Once before construction commences	Avifaunal specialist

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 transmission substation;
- Displacement due to the construction of the proposed transmission substation, service road and 132kV and 400kV powerlines;
- Electrocution in the transmission substation yard; and
- Mortality due to collision with the earthwire of the proposed 132kV and 400kV powerlines.

10.1 Displacement due to habitat transformation

Habitat transformation has an impact on birds breeding, foraging and roosting in or in close proximity of the proposed transmission substation, 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, transmission substation yard 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 study area is very uniform from a bird impact perspective, therefore the loss of habitat for Red Data species due to direct habitat transformation associated with the construction of the proposed transmission substation 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 footprint to the absolute minimum, no off-road driving, maximum use of existing roads, measures to control dust, restricted access to the rest of the property, and rehabilitation of all areas disturbed.

10.2 Displacement due to disturbance

Apart from direct habitat destruction, construction 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. Large terrestrial species, including Red Data Ludwig's Bustard, Karoo Korhaan and Southern Black Korhaan, are most likely to be affected by displacement due to disturbance. The ground-nesting Black Harrier and cliff nesting Jackal Buzzard could also potentially be vulnerable to this impact, but the habitat in the study area is not ideal for the former species from a breeding perspective. **The impact is assessed to be Moderate before mitigation, and Low after mitigation**. Suggested mitigation measures are restricting footprint to the absolute minimum, no off-road driving, maximum use of existing roads, measures to control noise, restricted access to the rest of the property, training the ECO to identify Red Data 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 and 400kV powerlines will not pose an electrocution threat to any of the priority species which are likely to occur at the site. Electrocutions within the proposed transmission substation yard 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 Very Low, both before and after mitigation.**

10.4 Collisions

The most likely Red Data candidates for collision mortality on the proposed powerlines are Ludwig's Bustards, Karoo Korhaan and Southern Black Korhaan in natural habitat, and Greater Flamingo 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). Martial and Verreaux's Eagle might also be at risk, especially at surface water 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 Moderate through the application of mitigation measures.**

10.5 Cumulative impacts

Large raptor species, particularly Verreaux's Eagle and Martial Eagle, are potentially most at risk as far as cumulative impacts of renewable energy projects in the 50km radius around the proposed development is concerned. However, the project should not materially threaten these species. The concern from a powerline interaction perspective is more for large terrestrial species, particularly Ludwig's Bustard, which is highly susceptible to powerline collisions. The proposed project will add an additional ˜41km 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 existing impacts on avifauna, is assessed to be Moderate, and is likely remain at that level after mitigation.**

Table 9 below provides a summary of the respective significance ratings, and an average overall rating before and after mitigation.

Table 8: Overall impact significance rating

Impact	**Rating pre-mitigation**	**Rating post-mitigation**
Displacement due to habitat transformation	Low (4)	Low (4)
Displacement due to disturbance	Moderate (3)	Low (4)
Electrocution	Very Low (5)	Very Low (5)
Collisions	High (2)	Moderate (3)
Cumulative impacts	Moderate (3)	Moderate (3)
Average:	**Moderate to Low (3.4)**	**Low to Moderate (3.8)**

11. Final Specialist Statement and Authorisation Recommendation

The overall potential impact on priority avifauna for the construction phase is assessed to be of **Moderate to Low significance before mitigation measures, and Low after the implementation of mitigation measures.** For the decommissioning phase, the overall potential impact on priority avifauna is assessed with a **Moderate significance before the implementation of mitigation and a Low significance after the implementation of mitigation measures**. For the operational phase, the overall potential impact on priority avifauna is assessed with a **Very Low to High significance without the implementation of mitigation measures; and Very Low to Moderate significance with the implementation of mitigation measures**. Cumulative impacts are assessed with a **Moderate significance both with and without mitigation measures**. In terms of an average, the pre-mitigation significance of all potential impacts identified in this specialist study is assessed as **Moderate to Low**, leaning more towards Moderate (i.e. average of 3.4, as shown in Table 9 above) and the post-mitigation significance is assessed as Low to Moderate, leaning more towards Low (i.e. average of 3.8, as shown in Table 9 above). It is therefore recommended that the activity is authorised, on condition that the proposed mitigation measures as detailed in the EMPr (APPENDIX 3) are strictly implemented.

11.1. EA Condition Recommendations

The proposed mitigation measures are detailed in the EMPr (APPENDIX 3)

12. References

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

Species	Taxonmic name	Powerline priority species	SABAP2 Average reporting rate: full protocol	Red Data status: International	Red Data status: Regional	Endemic - South Africa	Endemic - Southern Africa	Possibility of occurrence	Recorded during surveys
Acacia Pied Barbet	*Tricholaema leucomelas*		10.29				Near-endemic		
African Black Duck	*Anas sparsa*	x	8.82						
African Black Swift	*Apus barbatus*		1.47						
African Hoopoe	*Upupa africana*		0.00						
African Pipit	*Anthus cinnamomeus*		16.18						x
African Red-eyed Bulbul	*Pycnonotus nigricans*		7.35				Near-endemic		
African Reed Warbler	*Acrocephalus baeticatus*		1.47						
African Rock Pipit	*Anthus crenatus*		5.88	LC	NT	Endemic (SA, Lesotho, Swaziland)	Endemic		
African Sacred Ibis	*Threskiornis aethiopicus*	x	4.41						
African Spoonbill	*Platalea alba*	x	2.94						
African StoneChat	*Saxicola torquatus*		5.88						
Alpine Swift	*Tachymarptis melba*		7.35						
Ant-eating Chat	*Myrmecocichla formicivora*		4.41				Endemic		
Barn Swallow	*Hirundo rustica*		27.94						x
Black Harrier	*Circus maurus*	x	2.94	EN	EN	Near endemic	Endemic		x
Black Stork	*Ciconia nigra*	x	1.47	LC	VU				x
Black-chested Snake Eagle	*Circaetus pectoralis*	x	1.47						x
Black-eared Sparrow-lark	*Eremopterix australis*		7.35			Near endemic	Endemic		x
Black-headed Canary	*Serinus alario*		33.82			Near endemic	Endemic		x
Black-headed Heron	*Ardea melanocephala*	x	4.41						x
Black-shouldered Kite	*Elanus caeruleus*	x	1.47						
Blacksmith Lapwing	*Vanellus armatus*		20.59						x
Black-winged Stilt	*Himantopus himantopus*		5.88						
Bokmakierie	*Telophorus zeylonus*		64.71				Near-endemic		x
Booted Eagle	*Aquila pennatus*	x	11.76						x
Brown-throated Martin	*Riparia paludicola*		5.88						
Cape Bulbul	*Pycnonotus capensis*		2.94			Endemic	Endemic		x
Cape Bunting	*Emberiza capensis*		75.00				Near-endemic		x
Cape Canary	*Serinus canicollis*		0.00				Endemic		
Cape Clapper Lark	*Mirafra apiata*		25.00			Near endemic	Endemic		x
Cape Crow	*Corvus capensis*	x	0.00						x
Cape Eagle-Owl	*Bubo capensis*	x	0.00						x
Cape Penduline-Tit	*Anthoscopus minutus*		0.00						
Cape Robin-Chat	*Cossypha caffra*		10.29						
Cape Rock Thrush	*Monticola rupestris*		1.47			Endemic (SA, Lesotho, Swaziland)	Endemic		
Cape Shoveler	*Anas smithii*	x	11.76				Near-endemic		x
Cape Siskin	*Crithagra totta*		1.47			Endemic	Endemic		
Cape Sparrow	*Passer melanurus*		41.18				Near-endemic		x

Species	Taxonmic name	Powerline priority species	SABAP2 Average reporting rate: full protocol	Red Data status: International	Red Data status: Regional	Endemic - South Africa	Endemic - Southern Africa	Possibility of occurrence	Recorded during surveys
Cape Spurfowl	*Pternistis capensis*		17.65			Near endemic	Endemic		x
Cape Sugarbird	*Promerops cafer*		1.47			Endemic	Endemic		
Cape Teal	*Anas capensis*	x	5.88						x
Cape Turtle Dove	*Streptopelia capicola*		47.06						x
Cape Wagtail	*Motacilla capensis*		38.24						x
Cape Weaver	*Ploceus capensis*		14.71			Near endemic	Endemic		
Cape White-eye	*Zosterops virens*		5.88			Near endemic	Endemic		
Capped Wheatear	*Oenanthe pileata*		0.00						x
Cardinal Woodpecker	*Dendropicos fuscescens*		2.94						
Chat Flycatcher	*Bradornis infuscatus*		5.88				Near-endemic		
Chestnut-vented Tit-Babbler	*Parisoma subcaeruleum*		11.76				Near-endemic		
Cinnamon-breasted Bunting	*Emberiza tahapisi*		0.00						x
Common (Steppe) Buzzard	*Buteo vulpinus*	x	1.47						
Common Fiscal	*Lanius collaris*		39.71						x
Common Greenshank	*Tringa nebularia*		4.41						x
Common House Martin	*Delichon urbicum*		2.94						x
Common Moorhen	*Gallinula chloropus*		1.47						
Common Quail	*Coturnix coturnix*		2.94						
Common Starling	*Sturnus vulgaris*		8.82						x
Common Swift	*Apus apus*		5.88						x
Common Waxbill	*Estrilda astrild*		10.29						x
Crowned Lapwing	*Vanellus coronatus*		11.76						x
Diederik Cuckoo	*Chrysococcyx caprius*		1.47						
Dusky Sunbird	*Cinnyris fuscus*		10.29				Near-endemic		x
Egyptian Goose	*Alopochen aegyptiacus*	x	32.35						x
European Bee-eater	*Merops apiaster*		5.88						
European Roller	*Coracias garrulus*		2.94	LC	NT				x
Fairy Flycatcher	*Stenostira scita*		10.29			Near endemic	Endemic		x
Familiar Chat	*Cercomela familiaris*		25.00						x
Fiscal Flycatcher	*Sigelus silens*		2.94			Near endemic	Endemic		
Glossy Ibis	*Plegadis falcinellus*	x	0.00						x
Greater Flamingo	*Phoenicopterus ruber*	x	0.00	LC	NT				x
Greater Kestrel	*Falco rupicoloides*		1.47						
Greater Striped Swallow	*Hirundo cucullata*		29.41						x
Grey Heron	*Ardea cinerea*	x	4.41						x
Grey Penduline-Tit	*Anthoscopus minutus*		16.18				Near-endemic		
Grey Tit	*Parus afer*		19.12			Near endemic	Endemic		x
Grey-backed Cisticola	*Cisticola subruficapilla*		63.24				Near-endemic		x
Grey-backed Sparrow-lark	*Eremopterix verticalis*		1.47				Near-endemic		

Species	Taxonmic name	Powerline priority species	SABAP2 Average reporting rate: full protocol	Red Data status: International	Red Data status: Regional	Endemic - South Africa	Endemic - Southern Africa	Possibility of occurrence	Recorded during surveys
Grey-winged Francolin	*Scleroptila africanus*		19.12			Endemic (SA, Lesotho, Swaziland)	Endemic		x
Ground Woodpecker	*Geocolaptes olivaceus*		22.06			Endemic (SA, Lesotho, Swaziland)	Endemic		x
Hadeda Ibis	*Bostrychia hagedash*	x	29.41						x
Hamerkop	*Scopus umbretta*	x	2.94						
Helmeted Guineafowl	*Numida meleagris*		0.00						x
Horus Swift	*Apus horus*		2.94						x
House Sparrow	*Passer domesticus*		11.76						x
Jackal Buzzard	*Buteo rufofuscus*	x	38.24			Near endemic	Endemic		x
Karoo Chat	*Cercomela schlegelii*		39.71				Near-endemic		x
Karoo Eremomela	*Eremomela gregalis*		27.94			Near endemic	Endemic		x
Karoo Korhaan	*Eupodotis vigorsii*	x	41.18	LC	NT		Endemic		x
Karoo Lark	*Calendulauda albescens*		23.53			Near endemic	Endemic		x
Karoo Long-billed Lark	*Certhilauda subcoronata*		41.18				Endemic		x
Karoo Prinia	*Prinia maculosa*		48.53			Near endemic	Endemic		x
Karoo Scrub Robin	*Cercotrichas coryphoeus*		55.88				Endemic		x
Kittlitz's Plover	*Charadrius pecuarius*		4.41						x
Lanner Falcon	*Falco biarmicus*	x	0.00						x
Large-billed Lark	*Galerida magnirostris*		57.35			Near endemic	Endemic		x
Lark-like Bunting	*Emberiza impetuani*		44.12				Near-endemic		x
Laughing Dove	*Streptopelia senegalensis*		8.82						
Layard's Tit-Babbler	*Parisoma layardi*		20.59			Near endemic	Endemic		x
Lesser Swamp Warbler	*Acrocephalus gracilirostris*		1.47						
Levaillant's Cisticola	*Cisticola tinniens*		0.00						x
Little Grebe	*Tachybaptus ruficollis*	x	5.88						
Little Stint	*Calidris minuta*		0.00						x
Little Swift	*Apus affinis*		10.29						x
Long-billed crombec	*Sylvietta rufescens*		11.76						x
Long-billed Pipit	*Anthus similis*		0.00						
Ludwig's Bustard	*Neotis ludwigii*	x	11.76	EN	EN		Near-endemic		x
Malachite Kingfisher	*Alcedo cristata*		1.47						
Malachite Sunbird	*Nectarinia famosa*		16.18						x
Martial Eagle	*Polemaetus bellicosus*	x	14.71	VU	EN				x
Mountain Wheatear	*Oenanthe monticola*		52.94				Near-endemic		x
Namaqua Dove	*Oena capensis*		8.82						
Namaqua Sandgrouse	*Pterocles namaqua*		29.41				Near-endemic		x
Namaqua Warbler	*Phragmacia substriata*		8.82			Near endemic	Endemic		
Neddicky	*Cisticola fulvicapilla*		1.47						
Orange-breasted Sunbird	*Anthobaphes violacea*		1.47			Endemic	Endemic		

Species	Taxonmic name	Powerline priority species	SABAP2 Average reporting rate: full protocol	Red Data status: International	Red Data status: Regional	Endemic - South Africa	Endemic - Southern Africa	Possibility of occurrence	Recorded during surveys
Pale Chanting Goshawk	*Melierax canorus*	x	36.76				Near-endemic		
Pale-winged Starling	*Onychognathus nabouroup*		22.06				Near-endemic		
Peregrine Falcon	*Falco peregrinus*	x	0.00						x
Pied Avocet	*Recurvirostra avosetta*		5.88						x
Pied Crow	*Corvus albus*	x	38.24						x
Pied Starling	*Spreo bicolor*		30.88			Endemic (SA, Lesotho, Swaziland)	Endemic		x
Pririt Batis	*Batis pririt*		5.88				Near-endemic		
Red-billed Teal	*Anas erythrorhyncha*	x	5.88						x
Red-capped Lark	*Calandrella cinerea*		32.35						x
Red-eyed Dove	*Streptopelia semitorquata*		16.18						x
Red-faced Mousebird	*Urocolius indicus*		8.82						
Red-knobbed Coot	*Fulica cristata*	x	4.41						
Red-winged Starling	*Onychognathus morio*		4.41						x
Rock Kestrel	*Falco rupicolus*		45.59						x
Rock Martin	*Hirundo fuligula*		36.76						x
Rufous-cheeked Nightjar	*Caprimulgus rufigena*		1.47						
Rufous-eared Warbler	*Malcorus pectoralis*		44.12				Endemic		x
Sabota Lark	*Calendulauda sabota*		4.41				Near-endemic		
Sclater's Lark	*Spizocorys sclateri*		0.00						x
Sickle-winged Chat	*Cercomela sinuata*		54.41			Near endemic	Endemic		x
South African Shelduck	*Tadorna cana*	x	27.94				Endemic		x
Southern Black Korhaan	*Afrotis afra*	x	7.35	VU	VU	Endemic	Endemic		x
Southern Double-collared Sunbird	*Cinnyris chalybeus*		5.88			Near endemic	Endemic		x
Southern Grey-headed Sparrow	*Passer diffusus*		4.41						
Southern Masked Weaver	*Ploceus velatus*		25.00						x
Southern Red Bishop	*Euplectes orix*		2.94						
Speckled Pigeon	*Columba guinea*		38.24						x
Spike-heeled Lark	*Chersomanes albofasciata*		17.65				Near-endemic		x
Spotted Eagle-Owl	*Bubo africanus*	x	4.41						x
Spotted Thick-knee	*Burhinus capensis*		2.94						
Spur-winged Goose	*Plectropterus gambensis*	x	2.94						x
Streaky-headed Seedeater	*Crithagra gularis*		1.47						
Three-banded Plover	*Charadrius tricollaris*		29.41						x
Verreauxs' Eagle	*Aquila verreauxii*	x	16.18	LC	VU				x
White-backed Mousebird	*Colius colius*		8.82				Endemic		
White-breasted Cormorant	*Phalacrocorax carbo*		2.94						
White-necked Raven	*Corvus albicollis*	x	58.82						x
White-rumped Swift	*Apus caffer*		11.76						x
White-throated Canary	*Crithagra albogularis*		33.82				Near-endemic		x
White-throated Swallow	*Hirundo albigularis*		4.41						
Wood Sandpiper	*Tringa glareola*		0.00						x
Yellow Canary	*Crithagra flaviventris*		58.82				Near-endemic		x
Yellow-bellied Eremomela	*Eremomela icteropygialis*		19.12						x
Yellow-billed Duck	*Anas undulata*	x	14.71						x

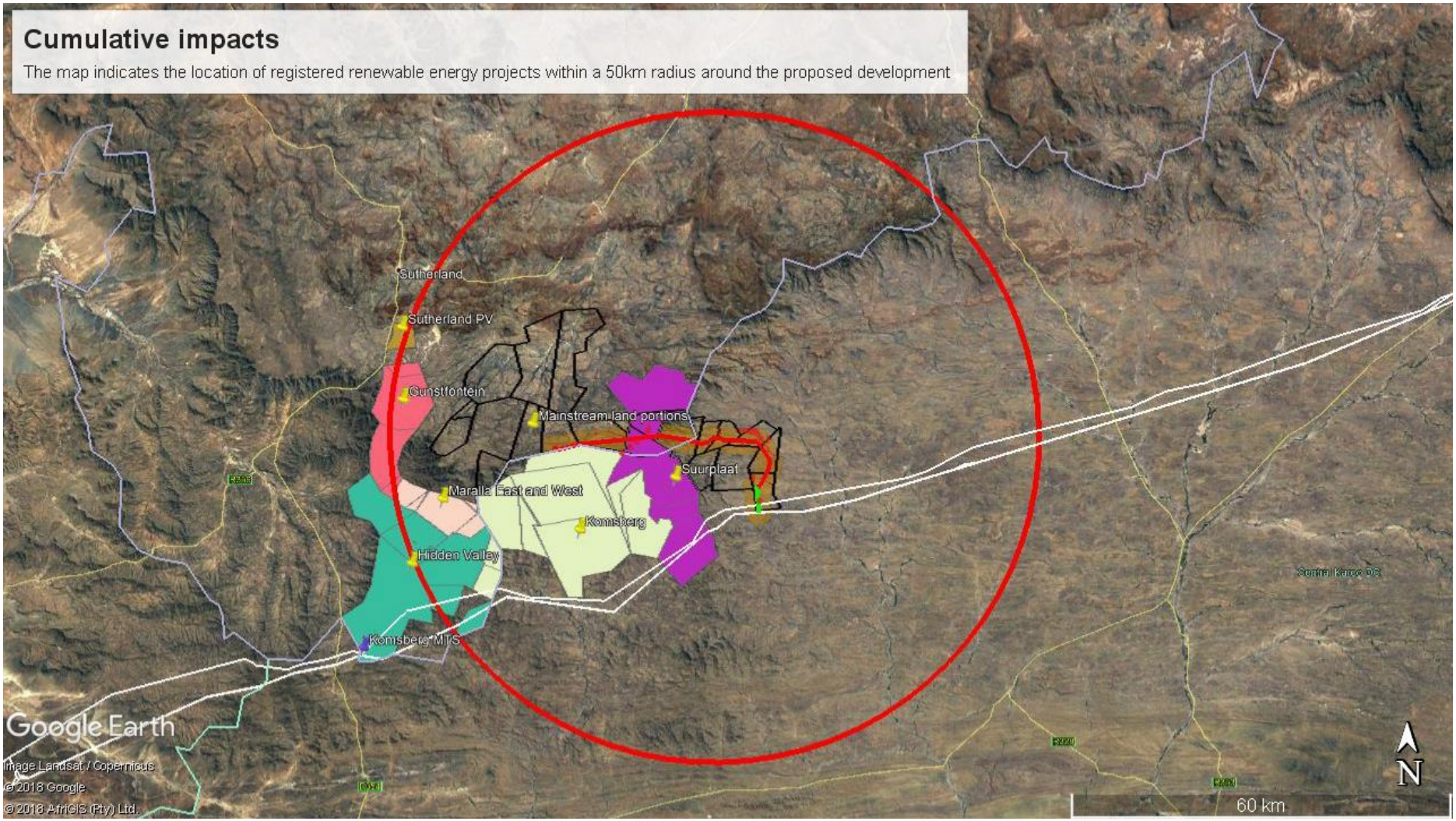
APPENDIX 2: LIST OF RENEWABLE ENERGY PROJECTS WITHIN A 50KM RADIUS AROUND THE PROPOSED PROJECT						
Proposed Development Name	**DEA Reference**	**Current EA Status**	**Proponent**	**Extent**	**Proposed Capacity**	**Proposed Mitigation Measures for avifaunal impacts as detailed in the relevant specialist reports**
Proposed 280 MW Gunstfontein Wind Energy Project	14/12/16/3/3/2/395	S&EIR	Networx Eolos Renewables (Pty) Ltd	12 000	280 MW	Pre-construction monitoring Delineation of suitable buffer zones Post-construction monitoring
Proposed development of renewable energy facility at 3 x Mainstream wind farm sites, Western and Northern Cape.	12/12/20/1782/AM1 12/12/20/1782/1 12/12/20/1782/2 12/12/20/1782/3	S&EIR	Mainstream Power Sutherland	28 600	420 MW	Delineation of no-go zones and pre-construction monitoring. On-site demarcation of 'no-go' areas identified during pre-construction monitoring must be undertaken to minimise disturbance impacts associated with the construction of the facility. Schedule maintenance activities to avoid disturbances in sensitive areas (identified through operational monitoring). Carefully monitoring the local avifauna pre- and post-construction monitoring must be undertaken. Excluding development from within 500 m of the edge of the escarpment along its entire

APPENDIX 2: LIST OF RENEWABLE ENERGY PROJECTS WITHIN A 50KM RADIUS AROUND THE PROPOSED PROJECT						
						length through the development area to reduce collision risk, primarily for slope soaring raptors.
Proposed Hidden Valley Wind Energy Facility, Northern Cape	12/12/20/2370/2	S&EIR	Hidden Valley Wind- African Clean Energy Developments (Pty) Ltd	9 530	150 MW	Implement exclusion zones In high sensitivity zones Implement post-construction monitoring Curtailment of turbines if need be Nest searches Control of staff and equipment to prevent disturbance
Proposed Hidden Valley Wind Energy Facility, Northern Cape	12/12/20/2370/3	S&EIR	Hidden Valley Wind- African Clean Energy Developments (Pty) Ltd	9 180	150 MW	Implement exclusion zones In high sensitivity zones Implement post-construction monitoring Curtailment of turbines if need be Nest searches Control of staff and equipment to prevent disturbance
Proposed Hidden Valley Wind Energy Facility, Northern Cape	12/12/20/2370/1	S&EIR	Hidden Valley Wind- African Clean Energy Developments (Pty) Ltd	16 620	150MW	Implement exclusion zones In high sensitivity zones Implement post-construction

APPENDIX 2: LIST OF RENEWABLE ENERGY PROJECTS WITHIN A 50KM RADIUS AROUND THE PROPOSED PROJECT						
						monitoring Curtailment of turbines if need be Nest searches Control of staff and equipment to prevent disturbance
Proposed Hidden Valley wind energy facility, Northern Cape	12/12/20/2370	S&EIR	Hidden Valley Wind- African Clean Energy Developments (Pty) Ltd		650 MW	Implement exclusion zones In high sensitivity zones Implement post-construction monitoring Curtailment of turbines if need be Nest searches Control of staff and equipment to prevent disturbance
Proposed establishment of the Suurplaat wind energy facility and associated infrastructure on a site near Sutherland, Western Cape and Northern Cape.	12/12/20/1583	S&EIR	Moyeng Energy (Pty) Ltd	28 600	120 MW	All construction and maintenance activities should be carried out according to generally accepted environmental best practice. No permanent lights to be used on the turbines, only red strobe lights. Location of turbines in the high sensitivity zones to be guided by the results of the pre-construction programme. Powerline walk-down to be conducted to identify spans for

APPENDIX 2: LIST OF RENEWABLE ENERGY PROJECTS WITHIN A 50KM RADIUS AROUND THE PROPOSED PROJECT						
						marking with Bird Flight Diverters.
Proposed development of renewable energy facility at Komsberg East and West near Sutherland	14/12/16/3/3/1/1562 14/12/16/3/3/1/1561	S&EIR	Komsberg Wind Farms (Pty) Ltd	25 600	550 MW	Implement exclusion zones in high sensitivity areas Implement operational phase monitoring Use bird-friendly powerline designs Mark powerlines with BFDs Implement construction phase monitoring of raptor nests
Maralla East & West Wind Facilities (grid connection)	14/12/16/3/3/2/962	S&EIR	Biotherm	9 157	250MW	• Measures to control noise and dust should be applied according to current best practice in the industry. • Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum as far as practical. • The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint and rehabilitation of disturbed areas is concerned. • Prior to construction commencing, an inspection should be performed by the avifaunal specialist to record

APPENDIX 2: LIST OF RENEWABLE ENERGY PROJECTS WITHIN A 50KM RADIUS AROUND THE PROPOSED PROJECT						
						any large raptor nests on the existing Droërivier-Muldersvlei 1 400kV line that could be impacted by the construction of the proposed powerline • Should any nests be recorded, it would require management of the potential impacts on the breeding birds once construction commences, which would necessitate the involvement of the avifaunal specialist, and the Environmental Control Officer. An effective communication strategy should be implemented whereby the avifaunal specialist is provided with a construction schedule which will enable him/her to ascertain when and where breeding priority raptors could be impacted by the construction activities. This could then be addressed through the timing of construction activities during critical periods of the breeding cycle, once it has been established that a particular nest is active. • A walk-through must be conducted by the avifaunal specialist after final pole positions have been determined, to demarcate sections of line that will need to be mitigated with Bird Flight Diverters.


Cumulative impacts
The map indicates the location of registered renewable energy projects within a 50km radius around the proposed development
Sutherland
Sutherland PV
Cunstfontein
Mainstream land portions
Suurplaat
Maralle East and West
Komsberg
Hidden Valley
Komsberg MTS
Google Earth
Image Landsat / Copernicus
© 2018 Google
© 2018 AfriGIS (Pty) Ltd.
60 km
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APPENDIX 3: ENVIRONMENTAL MANAGEMENT PROGRAMME

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

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
Displacement of Red Data species due to permanent habitat transformation					
The clearing of vegetation in the proposed transmission substation yard	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 activities 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 is 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 record and report non-	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 (Mainstream), and Rehabilitation Specialist, 8. ECO and Construction Manager or Contractor

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
			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 Red Data species due to disturbance					
Construction of the transmission substation, service road and powerline	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 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 specialist to identify the potential priority species as well as the signs that	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. Undertake site inspections to verify. 3. Construction access roads must be	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 breeding sites are found.	1. ECO 2. ECO 3. ECO 4. ECO 5. ECO 6. Project Developer (Mainstream), Avifauna Specialist and ECO 7. ECO 8. ECO 9. Project Developer (Mainstream), Avifauna Specialist and ECO 10. Project Developer (Mainstream), Avifauna Specialist and ECO

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		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 walk through, covering the final road and power line routes, to identify any nests/breeding/roosting activity of priority species, as well as any additional sensitive habitats. 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.	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 m of any breeding sites of Red Data species. Ensure that an Avifaunal Specialist is contacted	10. Once-off before the start of construction activities	

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
			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 walk through of the final road and power line routes. Record and report any non-compliance.		

Management Plan for the Operational Phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
Electrocution of Red Data avifauna in the transmission substation					
The transmission of electricity generated by the proposed three Mainstream WEFs	Ensure effective reactive mitigation if need be in the proposed transmission substation yard if Red Data species are electrocuted.	The hardware within the proposed transmission substation yard 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 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, Project Developer (Mainstream) and Environmental Manager
Mortality of priority avifauna due to collisions with the earthwire of the proposed powerline					
The transmission of electricity generated from the proposed three Mainstream WEFs	Mortality of priority avifauna due to collisions with the earthwire 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 Facility Manager

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 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. Project Developer (Mainstream) and Rehabilitation Specialist and ECO 3. ECO, Construction Manager or Contractor