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Kareekloof Energy PV and BESS Electrical Grid Infrastructure

Avifaunal Impact Assessment

31 July 2024

for

Cape EAPrac

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Disclaimer by specialists

We,

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declare, that the work presented in this report is our own and has not been influenced in any way by the developer or the Environmental Assessment Practitioner (EAP). At no point has the developer asked us as specialists to manipulate the results in order to make it more favourable for the proposed development. We consider ourselves bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP) and the EIA Regulations (2014, as amended). We have the necessary qualifications and expertise (*Pr. Sci. Nat. Zoological Science)* for developing this specialist report.

EXECUTIVE SUMMARY

- Kareekloof Energy (Pty) Ltd has proposed to develop the Kareekloof Energy PV and BESS Electrical Grid Infrastructure (Kareekloof PV/BESS EGI) in conjunction with the "Kareekloof Energy PV and BESS" (see Enviro-Insight, 2024).
- The EGI study area is situated approximately 50 km northeast of De Aar within the Pixley Ka Seme District Municipality in the Northern Cape Province.
- This Avifauna Impact Assessment Report is concerned exclusively with the Kareekloof EGI and associated infrastructure.
- The proposed overhead transmission lines (3) are expected to have a total length of 11.5 km, total servitude of 51 ha, and capacity of 3 x 132 kV.
- Additional infrastructure besides overhead transmission lines and substation includes access roads and laydown areas.
- The Screening Tool Report indicated a **Medium** Animal Theme Sensitivity due to the potential presence of two avifauna species of conservation concern (SCC), namely the Endangered (EN) Tawny Eagle (*Aquila rapax*) and the EN Ludwig's Bustard (*Neotis ludwigii*).
- Both Tawny Eagle and Ludwig's Bustard were confirmed during the site surveys. The study area, specifically elevated areas, has the potential to support lekking sites for Ludwig's Bustard. These have been mapped and delineated as highly sensitive areas which must be avoided.
- Avifaunal monitoring for the Kareekloof EGI and Kareekloof Energy PV and BESS was conducted according to the "*Best-Practice Guidelines for assessing and monitoring the impact of solar energy facilities on birds in southern Africa"* (Jenkins *et al*., 2017), which classifies the Kareekloof PVSEF as a **Regime 2** facility. An additional summer site visit (totalling 3) was also conducted specifically to detect avifauna SCC in the area.
- A comprehensive desktop study with a literature survey was undertaken to predict expected avifauna species likely to occur within and surrounding the Kareekloof EGI.
- Field surveys were conducted in winter (31 July - 4 August 2023), spring (6 - 8 October 2023) and summer (10 February 2024), consisting of walking and driving transects in and around the EGI study area.
- The Kareekloof EGI is situated within the "Eastern Upper Karoo" vegetation type which considered to be Least Concern.
- The study area is not within a REDZ but is situated entirely within the Central Power Corridor.
- The nearest protected area is the Rolfontein Provincial Nature Reserve situated ~ 40 km away towards the northeast, and the study area is situated entirely within the "Platberg-Karoo Conservancy" Important Bird Area (IBA).
- A total of 123 bird species are either expected to occur or have been observed in the greater study area, including ten species of conservation concern (SCC).
- Seven avifauna SCC were observed during site surveys. These species include Cape Vulture (regionally Endangered), Ludwig's Bustard (globally and regionally Endangered), Verreaux's Eagle

(regionally Vulnerable), Tawny Eagle (regionally Endangered), Blue Crane (globally Vulnerable), Secretarybird (globally Endangered), and African Rock Pipit (regionally Near Threatened).

- Some existing impacts to avifauna were observed during surveys in the greater study area. These impacts include low-intensity livestock and game farming, agricultural infrastructure such as reservoirs and fencing, the electricity infrastructure consisting of large pylons and powerlines through the area, a large dam situated close to the powerline, and tall alien trees.
- Four potential impacts to avifauna were identified from the proposed development: habitat loss, collision and electrocution, disturbance, and attraction to the overhead powerlines (OHPLs). These have been described in detail and potential mitigation measures have been proposed.
- Cumulative impacts to avifauna were assessed and described, with some cumulative impact expected on Bustards which are prone to colliding with powerlines despite implementation of mitigation measures. However, cumulative impacts associated with habitat loss and disturbance are considered negligible.
- There are no major negative impacts to avifauna SCC expected from the proposed development, provided that the proposed mitigation measures described are applied.
- The specialists therefore recommend that the competent authority should grant environmental authorisation for the proposed Kareekloof EGI, on condition that:
    - All mitigation measures stipulated in this Impact Assessment report are adhered to and captured in an Environmental Management Plan (EMP).
    - The EMP must include the necessity for monthly post-construction avifauna monitoring of avifauna collisions with the OHPL for at least one year.

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1 INTRODUCTION

1.1 PROJECT DESCRIPTION

Kareekloof Energy (Pty) Ltd is a Special Purpose Vehicle (SPV) created solely to develop, construct, and operate a solar photovoltaic (PV) facility with a capacity of up to 900 MW, including a Battery Energy Storage System (BESS) facility. This project is located the following farms: Portion 1 of the farm Bas Berg 88, Portion 2 of the farm Koppy Alleen 83 and Portions 6, 11, 16 & 17 of the farm Karee Kloof 85, situated near De Aar in the Northern Cape Province.

The related Kareekloof Energy PV and BESS Electrical Grid Infrastructure (EGI) Corridors (referred to as the EGI) include on-site or Independent Power Producer (IPP) Substations and overhead transmission lines (up to 132 kV). In addition to the Kareekloof project farms, these EGI corridors may affect farms Swartkoppies 86 RE, Bas Berg 88 Portion 3 and Koppy Alleen 83 Portions 1 and 5. These corridors will connect three on-site substations[1] to the proposed Krypton Main Transmission Substation (MTS).

Enviro-Insight was appointed by Cape Environmental Assessment Practitioners (Pty) Ltd (Cape EAPrac) on behalf of Kareekloof Energy (Pty) Ltd to conduct an avifaunal specialist assessment to support the Environmental Impact Assessment (EIA) for the proposed Kareekloof EGI, located approximately 50km northeast of De Aar within the Pixley Ka Seme District Municipality in the Northern Cape Province. The EGI will affect up to 10 land parcels, covering a total area of 8 488.88 ha (refer to Table 1-1), and therefore 10 properties are listed in the application for Environmental Authorisation (EA). A separate avifaunal specialist assessment has been compiled for the proposed Kareekloof Energy PV and BESS (refer to Enviro-Insight, 2024).

The EGI study area covers 180 ha (159 ha on project farms & 21 ha on non-project farms), and the total grid length is approximately 11.5 km.

Table 1-2 and Table 1-3 summarise the key technical details for the EGI. A map illustrating the project and its components is provided in Figure 1-1.

Table 1-1: General Site Details

Description of all affected farm portions	Farm ID	Farm Name	Farm Number	Farm Area (ha)	Kareekloof Energy PV and BESS (Yes/No)
Surveyor General (SG) Codes	C0570000000000800002	Bas Berg	1/88	1878.04	Yes
	C0570000000000800002	Koppy Alleen	2/83	45	Yes
	C0570000000000800006	Karee Kloof	6/85	631.61	Yes
	C0570000000000800011	Karee Kloof	11/85	576.63	Yes
	C0570000000000800017	Karee Kloof	17/85	357.60	Yes
	C0570000000000800000	Swartkoppies	0/86	1675	No

[1] These are three Collector and Switching Substations of 300MVA, collecting many inputs, from PV or BESS, of 33kV via underground cables, transforming to 132 kV outputs. Their footprints are included in the development footprint of the EGI although they are part of the PV/BESS too. The input of 33kV is the project-side until it is transformed to 132 kV which will be part of the EGI-side. The EGI will be transferred to ESKOM. The On-site Substations will be in areas of overlap of the PV/BESS and the EGI.

	C05700000000008800003	Bas Berg	3/88	1685	No
	C05700000000008300001	Koppy Alleen	1/83	770	No
	C05700000000008300005	Koppy Alleen	5/83	870	No

Table 1-2: Own-Built Grid Connection Specifications

Component	Specifications
On-site substation hub (including collector and/or switching yard)	
Number of substation alternatives	The HydraB MTS position was assumed as set by ESKOM. Subsequently, Akuo Energy Afrique has proposed the Krypton MTS (refer to Figure 1-1). Either of these MTS sites are within 1.7 km of the point at which the Kareekloof EGI corridor exits the project farm's eastern border. The same substations (Sub1, Sub2, and Sub3) and powerlines to Krypton MTS that are used for connecting the Solar PV to the grid will also be used for battery power (BESS1, BESS2, and BESS3) evacuation at night when solar generation is inactive.
Footprint (ha)	For each substation (Sub1, Sub2, and Sub3): A 0.6 ha platform for the substation equipment, surrounded by a 4-ha fenced area. The remainder of the 4 ha is open ground for overhead lines to turn and connect into the substation. Total footprint = **14 ha**.
Capacity	Each substation approximately 300 MVA. Total capacity = **900MVA**
Height (m)	Max 30 m (lightening conductors). 132kV overhead line (OHL) pylons need 16 m clearance from ground (including earth and structure, 20 m maximum height). All other plant including transformers, CTs, VTs Breakers, SCADA and control room, fencing etc. will be below 10 m.
Overhead transmission powerlines for connection of PV facility to existing national grid	
Capacity (kV)	3 x 132 kV powerlines.
Pylon type	Monopole Twin circuit – various designs available.
Tower type	2 x Monopole line routes (2 x 132 kV lines can be accommodated per monopole, the 3rd 132 kV line will require a second set of pylons running in parallel).
Height (m)	Max 20 m.
Foundation	Concrete with anchors.
Width of registered servitude (m)	18 m each side – for 2 sets of monopoles with a required separation of 15 m – Total Servitude = **51 m wide** (evacuation of power from Sub1/Sub2 only will require 1 set of monopole pylons and a 31 m wide servitude).
Width of service road below powerline (m)	5 m.
Width of powerline corridor for specialist assessment (m)	Widths vary. Minimum 60 m from Sub3 on Farm Bas Berg 1/88 and minimum 150 m wide elsewhere to the eastern border of the project farms. From the project

	farms to the MTS minimum 31 m wide (on farms Koppy Alleen 83 portions 1 & 5).
Length of powerline (km)	Less than 3.7 km from Kareekloof collector substation Sub1 to Krypton MTS of 132 kV OHL. Sub2 is a further 1.3 km, sharing the same corridor as Sub1 to the Krypton MTS of 132 kV OHL. Sub3 is less than 6 km to the point where it shares the same corridor as Sub1 and Sub2 (1.22km to Krypton MTS. Total length = **11.5 km**.

Table 1-3: Component Descriptions

Component	Description
On-site Substation fenced areas	Up to 5 ha each; total 14 ha
On-site Substation plinths within fenced areas	0.56 ha each; total 1.7 ha
Powerline Corridor Study Area	180 ha
Accessing Sub1 & Sub2	About 41 km North of De Aar on the R48, the gravel road leading north to the Kareekloof Energy PV and BESS site is approximately 16 km on a regional gravel road (to Tafelkop). This would be the road access point across the farm Koppy Alleen 2/83 onto Karee Kloof 6/85. A 5 m wide gravel/hard surfaced access road will be constructed of about 1.5 km long, following the existing Eskom medium voltage powerline route travelling west to Sub1. A further 1.5 km along the existing Eskom medium voltage powerline route west (across Karee Kloof 17/85 onto farm Karee Kloof 11/85) will give access to Sub2.
Accessing Sub3	About 41 km North of De Aar on the R48, the gravel road leading north to the Kareekloof Energy PV and BESS site is approximately 16 km on a regional gravel road (to Tafelkop). Pass the Sub1/Sub2 access point and a further 5.5 km to a left turn. This would be the road access point across the farm Bas Berg 88 portion 1. An existing 5 m wide access gravel/hard surfaced access road is followed west-south-west for about 1.5 km. A 5 m wide gravel/hard surfaced access road will be constructed about 1.2 km long to the south to arrive at Sub3.
Export capacity	Up to 900 MW_{AC}. Each of the 18 x 50 MW PV stages will have distributed inverters and lead via underground cables to 10 distributed 33 kV mini substations. The mini substations will feed underground to the 3 On-Site Substations then to the MTS (via overhead 132 kV cables) or to the 3 BESSs. The BESSs can provide 4 hours of 900 MW and will make use of the same On-Site Substations to connect to the MTS during the night.

Proposed technology	Use of component substations to build 3 x 300 MVA substations. 2 x Monopole line routes, carrying 3 x 132 kV powerlines.
Dimensions	3 x Substations, each 0.6 ha plinth in at least 4 ha fenced area. 2 x monopole routes and 3 x 132 kV powerlines: 3 x Substations, each up to 10 m high with 30 m high lightening conductors. OHLs on monopole pylons: maximum height 20 m. Minimum servitude width 31 m, length approx. 5 km from Sub1 and Sub2 to the Krypton MTS. Minimum servitude width increases to 51 m, and a total approx. length of 11.5 km from Sub3 to Krypton MTS.

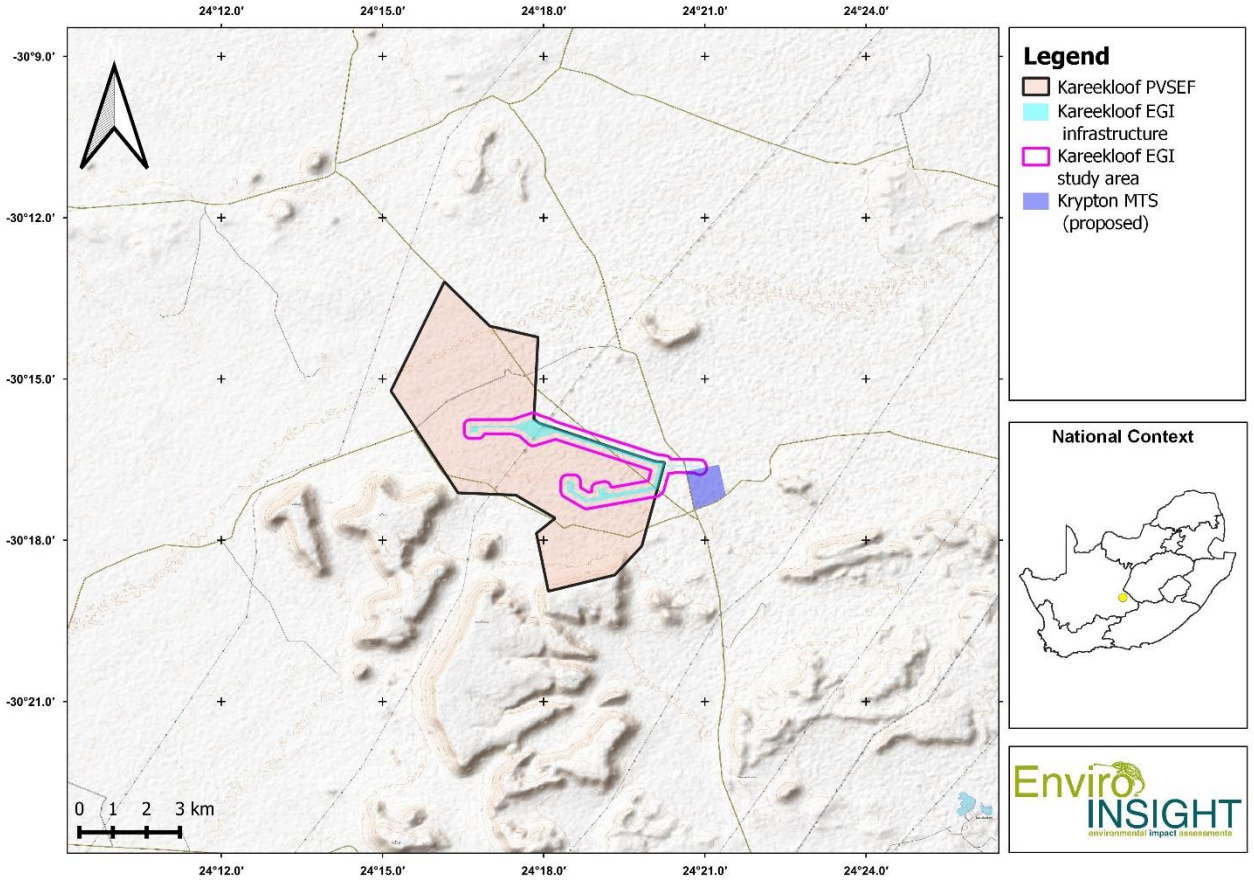

Figure 1-1. Kareekloof Energy PV and BESS Electrical Grid Infrastructure (EGI).

1.2 Legal Context & Study Guidance

- This report addresses identified avifaunal sensitivities within the Animal Species Theme of the Environmental Impact Assessment report (EIAr) required for the Environmental Authorisation (EA) process for a proposed development.
- The minimum report content requirements for environmental impacts on terrestrial animal and plant species in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998)[2] are applicable.
- Guidance for the implementation of the above-mentioned protocol is followed according to SANBI (2022), hereafter referred to as "the animal species protocol guidelines".

1.3 Screening Tool Report

The Screening Tool Report (STR) produced by the National Environmental Screening Tool[3] identifies environmental sensitivities for the study area. This is based on available desktop data and requires that a suitably qualified specialist verify the findings. Of relevance to this report is the Animal Species Theme. The STR generated for the study area classified the Animal Species Theme of the project as MEDIUM due to the potential occurrence of two endangered (EN) bird species (Table 1-4). Verification of avifaunal sensitivities assessed in this report is based on data collected in the field and from available data sources.

Table 1-4: Screening Tool Report theme sensitivities and features for the Kareekloof EGI study area.

Theme	Sensitivity	Sensitivity Features
Animal Species	**MEDIUM**[4]	Two sensitive bird species: • Tawny Eagle (*Aquila rapax*) • Ludwig's Bustard (*Neotis ludwigii*)

2 Methods

2.1 GIS Mapping

Existing data layers were incorporated into a Geographic Information System (GIS) to establish how the study area interacts with important terrestrial features. Emphasis was placed on the following spatial datasets:

- National Vegetation Map (SANBI, 2006-2018)
- Important Bird and Biodiversity Areas of South Africa (IBA) (2015)
- South African Protected Areas Database (SAPAD) (2023, Q4)

[2] GOVERNMENT GAZETTE, No. 43855, 30 OCTOBER 2020. Available from: http://www.gpwonline.co.za/Gazettes/Gazettes/43855_30-10_NationalGovernment.pdf
[3] https://screening.environment.gov.za/screeningtool/
[4] 'Medium' sensitivity does not indicate the known presence of a threatened animal within the proposed development footprint/PAOI but could indicate moderate likelihood of occurrence based on species distribution modelling, which relies on data such as habitat preferences and proximity to known locations of specific species (SANBI 2022).

- Strategic Environmental Assessment for wind and solar photovoltaic energy in South Africa (SEA, 2015)
- South African National Land Cover (SANLC, 2020)

The existing national landcover classification was used to assist with the identification of habitat types of importance for avifauna during the initial surveys. Furthermore, a drainage and aquatic habitat map was obtained from the aquatic specialist. These were pre-emptively buffered by 100 m to include the more prominent marginal vegetation. Finally, a digital elevation model (DEM) was obtained for the area and a slope analysis was performed to delineate sensitive rocky habitats. Slopes of > 7° were considered steep enough in this region to constitute potentially sensitive rocky habitats and these were buffered by 30 m. All mapping was performed using open-source GIS software (QGIS[5] and SAGA[6]).

2.2 Desktop and Literature Survey

A desktop study and literature review was undertaken to evaluate all bird species which could potentially occur in the greater study area (see Figure 2-1), relying primarily on data collected from the second South African Bird Atlas Project (SABAP 2[7]; [SABAP2, 2020]) but cross-referencing with Hockey *et al*. (2005) and Sinclair & Ryan (2010). SABAP 2 data are collected as records per pentad (i.e., 5' X 5' or roughly 9 x 9 km). A list of species potentially occurring within and adjacent to the EGI study area was therefore developed from SABAP 2 data for nine pentads (3010_2410, 3010_2415, 3010_2420, 3015_2410, 3015_2415, 3015_2420, 3020_2410, 3020_2415, 3020_2420; Figure 2-1). The expected species list is therefore based on an area much larger than the EGI study area. This approach was adopted to ensure that all species potentially occurring within the EGI study area, whether resident, nomadic, or migratory, were included.

Species were considered as sensitive to the proposed development based on their abundance, flight characteristics, ecological role, population trend and conservation status.

The following main literature sources were consulted for the assessment:

- Information relating to avifauna species of conservation concern (SCC) was obtained from Taylor *et al.* (2015) and the IUCN Red List of threatened species (IUCN, 2024).
- del Hoyo *et al.* (1992) and Hockey *et al.* (2005) were consulted for general information on the life history attributes of relevant bird species.
- Distribution data was sourced from the Southern Africa Bird Atlas Project (SABAP 2 2023), Hockey *et al.* (2005), del Hoyo *et al.* (1992) and Sinclair & Ryan (2010).
- iNaturalist[8] records within ~15 km of the EGI were also consulted – no records of Tawny Eagle and Ludwig's Bustard found before surveys were conducted.
- Nomenclature and taxonomy followed the IOC World Bird Names[9] unless otherwise specified (Gill & Donsker, 2012).

[5] http://qgis.osgeo.org/en/site/
[6] https://saga-gis.sourceforge.io/
[7] http://sabap2.birdmap.africa/
[8] https://www.inaturalist.org/home
[9] https://www.worldbirdnames.org/new/

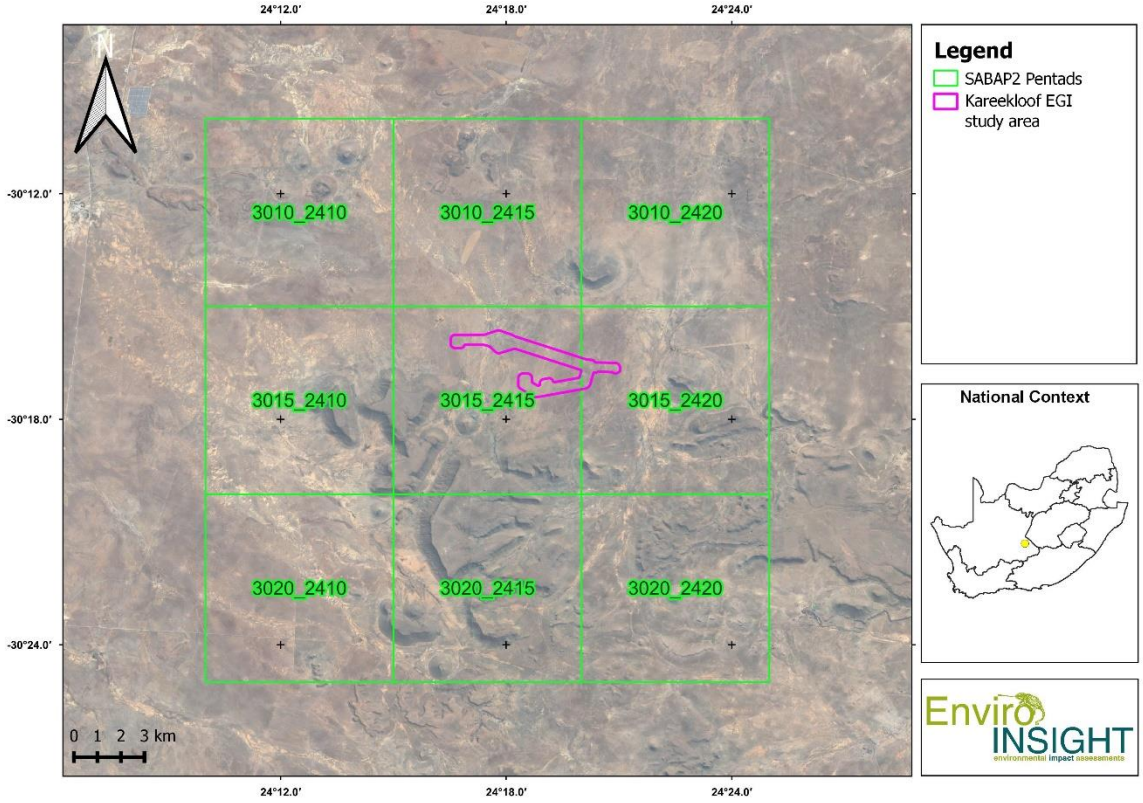

Figure 2-1. The Kareekloof EGI study area in relation to the SABAP2 pentads.

2.3 AVIFAUNAL MONITORING

Pre-construction avifaunal monitoring for the proposed Kareekloof Energy PV and BESS and associated Kareekloof EGI was conducted simultaneously using the methods prescribed in the Birds and Solar Energy Guidelines (Jenkins *et al*., 2017). This document provides clear requirements for Avifauna Impact Assessments of Solar Energy Facilities (SEFs). Regime 2 assessment protocols were adopted because the proposed Karekloof SEF has a large footprint (>150 ha), and the project area is of medium avifauna sensitivity (Table 1-4).

As per Jenkins et al. (2017), a Regime 2 facility has the following requirements:

1. Preliminary Assessment
    a. Literature review, habitats and desktop – *provided in this report and Enviro-Insight (2024)*.
2. Structured and detailed data collection
    a. Baseline data collection over 6-12 months, across as many seasons as possible – two seasonal surveys were performed in Winter and Spring respectively.
    b. Small bird abundance estimates – *provided in this report and Enviro-Insight (2024)*.
    c. Transect and vantage point abundances for large birds and raptors – *provided in this report and Enviro-Insight (2024)*.
    d. Flight behaviour of priority species – *provided in this report and Enviro-Insight (2024)*.

e. Wetland bird counts and movements between wetlands using the CWAC initiative (Taylor *et al*. 1999) – *not possible for these project sites as no suitable CWAC sites exist within or around the Project Area of Interest (PAOI)*.
f. Existing power line collision mortalities – *none observed in the Winter survey, but one mortality observed in the Spring survey*.

3. Impact Assessment (informed by 2)
   a. Map key habitats and flyways to be avoided – *provided in this report and Enviro-Insight (2024)*.
   b. Inform SEF layout – *provided in Enviro-Insight (2024)*.
   c. Assess impacts and mitigation strategies – *provided in this impact assessment report (relevant to proposed powerlines and associated infrastructure)*.

2.4 Walking & Driving Transects

Three site visits were conducted.

Winter: 31 July – 4 August 2023

Sampling was performed by means of combined walking and driving transects in and around the PAOI for the PVSEF area (see Enviro-Insight 2024). Driving was done at very low speeds, with frequent stoppages to observe birds and record data. Short walking transects were conducted from the vehicle wherever habitat allowed, and bird productivity was high. The entire PAOI and all the different habitats were surveyed in this manner. Although waterbodies were present in the PAOI, none were appropriate for waterbirds counts (CWAC) as far fewer than 500 individual birds were present at a time. Suitable nesting structures and habitats were evaluated carefully for any possible nests of sensitive/priority bird species and recorded for mapping purposes.

Spring: 6 – 8 October 2023

A second survey was undertaken in Spring to comply with the requirements of a Regime 2 facility (Jenkins *et al*., 2017). As with the first season, sampling by means of walking and driving transects was performed in and around the PAOI for the PVSEF area (see Enviro-Insight 2024). The same walking and driving transects were repeated to ensure consistency with the first survey, with efforts to cover all habitats. Efforts to monitor waterbodies on and around the site were made, but these sites still did not qualify as CWAC sites. Nest scoping continued in the second survey to assess if new priority species nests had been built after the first survey.

Summer: 10 – 11 February 2024

A third rapid survey was undertaken with specific aims to evaluate avifauna sensitivities related to OHPLs and their associated infrastructure. Only species of conservation concern (SCC) were recorded though walking and driving transects in and around the PAOI for the PVSEF area.

2.5 Species of Conservation Concern (SCC)

The Red List of threatened species generated by the IUCN[10] provided the global conservation status of avifauna. However, Taylor *et al*. (2015) produced a regional conservation status assessment following the IUCN criteria which takes precedent for this assessment, but only in cases where the current global status is not of a higher risk. The first three categories – Critically Endangered, Endangered, and Vulnerable – are collectively known as 'threatened' species. The extinction risk status categories defined by the IUCN, which are considered here to represent species of conservation concern (SCC), are defined as follows:

- **Critically Endangered (CR)** - Critically Endangered refers to species facing immediate threat of extinction in the wild.
- **Endangered (EN)** - Endangered species are those facing a very high risk of extinction in the wild within the foreseeable future.
- **Vulnerable (VU)** - Vulnerable species are those facing a high risk of extinction in the wild in the medium-term.
- **Near Threatened (NT)** - any indigenous species which does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

2.6 Site Sensitivity Verification

The sensitivity of the EGI study area for avifauna was evaluated according to habitat usage by SCC and their likelihood for collisions/electrocution with overhead powerlines OHPLs. Site Ecological Importance (SEI) was not evaluated as per the Species Environmental Assessment Guideline (SANBI, 2020) because SEI typically does not apply to narrow linear projects such as an OHPL.

2.7 Impact Assessment

The following impact assessment methodology was followed for the EIA phase of the project. SANBI (2020) cautions that assessing impacts by assigning numerical rankings that are then mathematically combined is not the preferred manner to evaluate impacts and may frequently lead to erroneous evaluations. Care must therefore be taken when interpreting such evaluations. The Mitigation Hierarchy Guideline for South Africa which offers appropriate guidance to determine impact significance is still in development and therefore cannot be implemented here. As such, the “traditional” method of evaluating impacts is followed in lieu of an accepted published alternative.

[10] http://www.iucnredlist.org/

2.7.1 Definitions of Terminology

ITEM	DEFINITION
EXTENT	
Local	Extending only as far as the boundaries of the activity, limited to the site and its immediate surroundings
Regional	Impact on the broader region
National	Will have an impact on a national scale or across international borders
DURATION	
Short-term	0-5 years
Medium-term	5-15 years
Long-term	>15 years, where the impact will cease after the operational life of the activity
Permanent	Where mitigation, either by natural process or human intervention, will not occur in such a way or in such a time span that the impact can be considered transient.
MAGNITUDE OR INTENSITY	
Low	Where the receiving natural, cultural or social function/environment is negligibly affected or where the impact is so low that remedial action is not required.
Medium	Where the affected environment is altered, but not severely and the impact can be mitigated successfully and natural, cultural or social functions and processes can continue, albeit in a modified way.
High	Where natural, cultural or social functions or processes are substantially altered to a very large degree. If a negative impact, then this could lead to unacceptable consequences for the cultural and/or social functions and/or irreplaceable loss of biodiversity to the extent that natural, cultural or social functions could temporarily or permanently cease.
PROBABILITY	
Improbable	Where the possibility of the impact materialising is very low, either because of design or historic experience
Probable	Where there is a distinct possibility that the impact will occur
Highly Probable	Where it is most likely that the impact will occur
Definite	Where the impact will undoubtedly occur, regardless of any prevention measures
SIGNIFICANCE	

Low	Where a potential impact will have a negligible effect on natural, cultural or social environments and the effect on the decision is negligible. This will not require special design considerations for the project
Medium	Where it would have, or there would be a moderate risk to natural, cultural or social environments and should influence the decision. The project will require modification or mitigation measures to be included in the design
High	Where it would have, or there would be a high risk of, a large effect on natural, cultural or social environments. These impacts should have a major influence on decision making.
Very High	Where it would have, or there would be a high risk of, an irreversible negative impact on biodiversity and irreplaceable loss of natural capital that could result in the project being environmentally unacceptable, even with mitigation. Alternatively, it could lead to a major positive effect. Impacts of this nature must be a central factor in decision making.
STATUS OF IMPACT	
Whether the impact is positive (a benefit), negative (a cost) or neutral (status quo maintained)	
DEGREE OF CONFIDENCE IN PREDICTIONS	
The degree of confidence in the predictions is based on the availability of information and specialist knowledge (e.g. low, medium or high)	
MITIGATION	
Mechanisms used to control, minimise and/or eliminate negative impacts on the environment and to enhance project benefits. Mitigation measures should be considered in terms of the following hierarchy: (1) avoidance, (2) minimisation, (3) restoration and (4) off-sets.	

2.7.2 Scoring System for Impact Assessment Ratings

To comparatively rank the impacts, each impact has been assigned a score using the scoring system outlined in the table below. This scoring system allows for a comparative, accountable assessment of the indicative cumulative positive or negative impacts of each aspect assessed.

IMPACT PARAMETER	SCORE
Extent (A)	Rating
Local	1
Regional	2
National	3
Duration (B)	Rating
Short term	1

Medium Term	2	
Long Term	3	
Permanent	4	
Probability (C)	Rating	
Improbable	1	
Probable	2	
Highly Probable	3	
Definite	4	
IMPACT PARAMETER	**NEGATIVE IMPACT SCORE**	**POSITIVE IMPACT SCORE**
Magnitude/Intensity (D)	Rating	Rating
Low	-1	1
Medium	-2	2
High	-3	3
SIGNIFICANCE RATING (F) = (A*B*D)*C	**Rating**	**Rating**
Low	0 to - 40	0 to 40
Medium	- 41 to - 80	41 to 80
High	- 81 to - 120	81 to 120
Very High	> - 120	> 120

2.8 Assumptions & Limitations

- It is assumed that data sources used (e.g., GIS data; satellite imagery; SANBI) are reliable and the situation has not changed since their publication, and that the data sufficiently represent the situation on the ground.
- Due to the timing of the seasonal surveys, summer migrants were not observed in either season of fieldwork. This may impact observational results by reducing the perceived likelihood of migratory priority species (such as Lesser Kestrels) being present or being impacted by the proposed development if observational data is solely used. To overcome this limitation, it is assumed in the impact assessment (based on iNaturalist and SABAP 2 records) that migratory birds will be present in the study area during summer months if the species is likely to occur in the available habitats.

3 RESULTS

3.1 REGIONAL CONTEXT

The EGI study area spans only a single regional vegetation type (eastern Upper Karoo), which is of Least Concern (Figure 3-1; SANBI, 2006-2018). This is mostly natural habitats, with some low intensity impacts from sheep farming. The study area does not fall within a Renewable Energy Zone (REDZ) but is situated entirely within the Central Power Corridor. The nearest protected area is the Rolfontein Provincial Nature Reserve situated ~ 40 km away towards the northeast, and the study area is situated entirely within the "Platberg-Karoo Conservancy" Important Bird Area (IBA). In 2014, this IBA's conservation state (condition) was indicated as "very unfavourable" due to "high" threat levels and "negligible" response or action taken (Birdlife International, 2024). The IBA trigger species include globally threatened species (Blue Crane, Ludwig's Bustard, Kori Bustard, Secretarybird, Martial Eagle, Blue Korhaan, Black Harrier and Denham's Bustard), regionally threatened species (Black Stork, Lanner Falcon, Tawny Eagle, Karoo Korhaan and Verreaux's Eagle), congregatory species (Lesser Kestrel and Amur Falcon) and several biome-restricted species. During the summer, this IBA provides close to 10% of the global population of Lesser Kestrel roosting sites. Renewable energy developments have been identified as a new threat, but only moderate susceptibility has been predicted to the various impacts of solar-energy facilities. Concerns continue for the lack of effective mitigation methods to prevent powerline collisions and the use of harmful pest control within the region to target damage-causing predators and pests, such as black-backed jackals and brown locusts. This issue is particularly concerning as non-target raptor species can be directly affected by poisoning as scavengers or indirectly by consuming poisoned locusts.

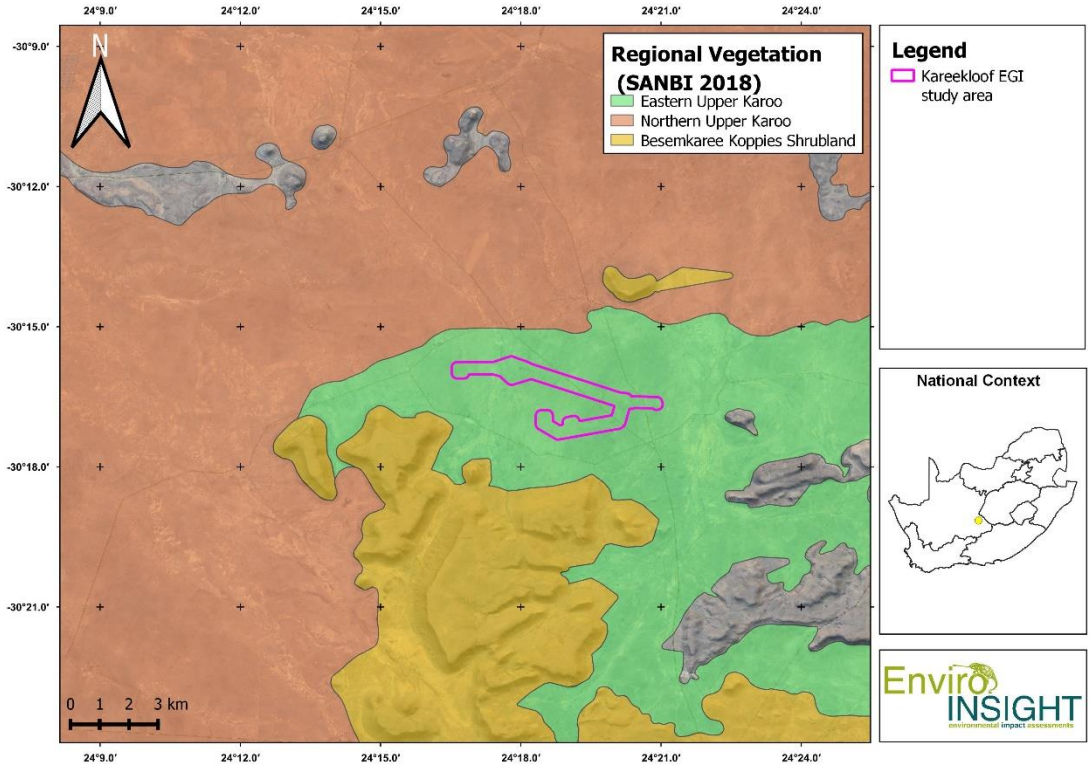

Figure 3-1.The Kareekloof EGI study area in relation to the regional vegetation types (SANBI, 2006-2018).

3.2 HABITAT DESCRIPTION

The EGI study area is predominantly located on relatively flat land, with elevated rocky ridges characterising the southern areas outside of the EGI. These flat areas of Northern and Eastern Upper Karoo vegetation types are characterised by two major habitat types – Nama Karoo Low Shrubland and Natural Grassland – according to the National Landcover Classification (SANLC, 2020[11]). In addition, aquatic habitats are represented by a prominent drainage area bisecting the study area with several scattered artificial dams). Furthermore, artificial habitat has been created by the Eskom power lines running across the centre of the site.

There are four specific avifauna habitats within the EGI study area, mostly consistent with the SANLC data. These habitats are each briefly described below.

3.2.1 Grassland

This is the dominant habitat and is mostly present on softer, sandier soils. It is characterised by a dense grass sward with no or only few shrubs present (Figure 3-2). It extends up onto the foot-slopes of the rocky ridges. Given the very expansive occurrence of this habitat and its ability to support only few avifauna species of conservation (SCC) at low densities, it is not considered to be highly sensitive from an avifauna perspective to clearing activities. However, this habitat does provide ample foraging opportunity for Ludwig's bustards which are highly susceptible to collisions with OHPLs.

Figure 3-2. Major habitat of the Kareekloof EGI: Grassland on soft sandy soils.

[11] https://www.dffe.gov.za/projectsprogrammes/egis_landcover_datasets

3.2.2 Scrubland

This habitat is present as patches amongst the grassland, typically characterised by the absence or near-absence of grasses and the presence of large, woody shrubs (Figure 3-3). However, it often forms a habitat mosaic with the grassland, particularly on the ecotone of the two habitats. As with the grassland habitat, scrubland has a very expansive occurrence in the region and does not support SCC at high densities and is therefore not considered to be highly sensitive from an avifauna perspective, to clearing activities. However, it also provides ample foraging opportunity for Ludwig's bustards which are highly susceptible to collisions with OHPLs.

Figure 3-3. Major habitat of the Kareekloof EGI: Scrubland.

3.2.3 Rocky Ridges & Steep Slopes

This structurally defined habitat (Figure 3-4) is limited in the region and has the potential to support lekking sites for the Endangered Ludwig's Bustard and was confirmed to have a nesting pair of Vulnerable Verreaux's Eagles too. Due to the importance of lekking habitat for breeding success of Ludwig's Bustard, the presence of nesting Verreaux's Eagles, and the fact that such habitat is limited in the landscape, it is deemed sensitive from an avifauna perspective and has therefore been buffered from development by 30 m.

Figure 3-4. Major habitat of the Kareekloof EGI: Rocky ridges & steep slopes.

3.2.4 Drainage, Wetlands & Dams

This is a collection of aquatic habitats predominantly characterised by the ephemeral drainage lines and their marginal vegetation, but also the man-made impoundments (dams) in these drainage lines which retain surface water for longer (Figure 3-5). These habitats are very limited in this arid region, and due to the periodic presence of water, provide excellent foraging habitats for avifauna, particularly in the dry months. The dense marginal vegetation is also often suitable for breeding purposes. Since certain avifauna SCC may rely on these habitats for foraging purposes and also use these linear features for migration/dispersal flights, this habitat is deemed sensitive from an avifauna perspective and has therefore been buffered from development by 100 m.

Figure 3-5. Major habitat of the Kareekloof EGI: Drainage, wetlands & dams.

3.2.5 Electricity Powerlines and Pylons

The existing Eskom powerline traversing in a north-easterly/south-westerly direction has created artificial habitat for some avian species (Figure 3-6). The infrastructure provides both perching and nesting opportunities for some raptor species and other large birds (crows and geese). Survey observations revealed the use of these structures by large birds, which may attract species into the area. Since the powerline is aligned alongside the main drainage line, the area is already considered as sensitive.

Figure 3-6: Artificial habitat created by electricity powerlines and pylons in or near the Kareekloof EGI study area.

3.3 SURVEY COVERAGE

The flat, open landscape without any obstructions and the large-bodied target avifauna SCC meant that observations were possible for up to 1 km on either side of the road/transect with the aid of binoculars, cameras and spotting scopes. The survey coverage of the PVSEF (see Enviro-Insight 2024) and EGI study area was comprehensive and sufficient (Figure 3-7).

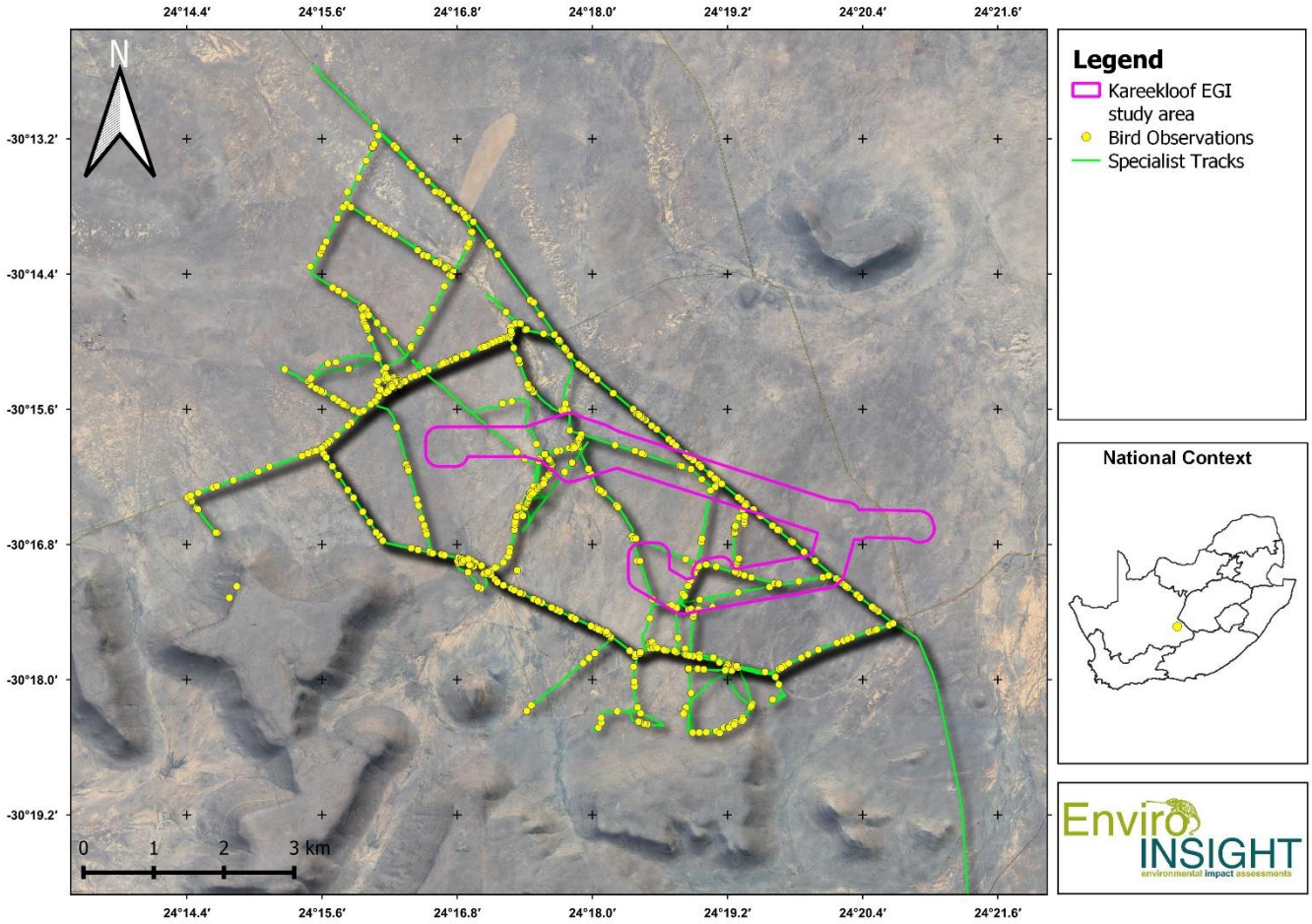

Figure 3-7: Avifauna survey coverage of the Kareekloof EGI study area during all seasonal surveys.

3.4 Expected & Observed Avifauna

Within the nine focal pentads, a total of 109 bird species have been recorded in SABAP2 (Table 6-1), all of which are expected to occur in the study area. Eight species of conservation concern (SCC; threatened and near threatened) have been observed within at least one of the nine focal pentads overlapping with the EGI study area (Table 3-1), two of which were observed during the winter survey (August 2023). These two species include Secretarybird (*Sagittarius serpentarius*) and Verreaux's Eagle (*Aquila verreauxii*). During the spring survey (October 2023) five SCC species were observed, including Secretarybird, African Rock Pipit (*Anthus crenatus*), Verreaux's Eagle, Blue Crane (*Grus paradisea*), and Tawny Eagle (*A. rapax*). Finally, three SCC were observed in the summer survey including 54 Cape Vultures (*Gyps coprotheres*), one Ludwig's Bustard (*Neotis ludwigii*) and two Blue Cranes (*Grus paradisea*) (Table 6-1).

Table 3-1: Expected and observed avifauna SCC for the Kareekloof EGI Study Area.

Common Name	Scientific Name	Global Status (IUCN)	Regional Status (Taylor *et al*. 2015)	Winter (Aug '23)	Spring (Oct '23)	Summer (Feb '24)
Ludwig's Bustard	*Neotis ludwigii*	EN	EN			1
Cape Vulture	*Gyps coprotheres*	VU	EN			54
Martial Eagle	*Polemaetus bellicosus*	EN	EN			
Secretarybird	*Sagittarius serpentarius*	EN	VU	1	4	
African Rock Pipit	*Anthus crenatus*	LC	NT		1	
Verreaux's Eagle	*Aquila verreauxii*	LC	VU	5	2	
Lanner Falcon	*Falco biarmicus*	LC	VU			
Blue Korhaan	*Eupodotis caerulescens*	NT	LC			
Blue Crane	*Grus paradisea*	VU	NT		2	2
Tawny Eagle	*Aquila rapax*	VU	EN		1	

The total number of bird species observed within and around the EGI study area during the winter survey (31 July – 4 August 2023) was 69, comprising a total of 907 individuals. Of these, two species are of conservation concern, namely Secretarybird (EN) and Verreaux's Eagle (VU). In general, the observed avian species richness is relatively low but expected for this region and abundances were moderate to high due to a productive summer season. For the spring survey (6-8 October), a total of 88 species, comprising 793 individuals were observed. Of these, five are SSC, including Secretarybird (EN), African Rock Pipit (NT), Verreaux's Eagle (VU), Blue Crane (VU) and Tawny Eagle (EN). Observed species richness was higher in the spring season which is to be expected since this season is generally more productive in terms of foraging opportunities. Individual densities were, however, considerably lower in spring than in winter despite the greater species richness. This was largely due to a winter eruption of the highly nomadic Grey-backed Sparrow-Lark (*Eremopterix verticalis*) and Lark-like Bunting (*Emberiza impetuani*) that were dispersed widely and not present in high localized densities in spring. A combined total of 97 species were observed across both seasons, with 1700 observations (Table 6-1).

Encountered abundances of avifauna species groups are presented in Enviro-Insight (2024).

3.5 Species of Conservation Concern (SCC)

Brief descriptions of each of the expected and observed threatened (CR, EN, VU) SCC (Table 3-1) are provided below in context with the proposed development.

3.5.1 Endangered species

- Ludwig's Bustard (*Neotis ludwigii*) is widely but patchily distributed across the arid interior of South Africa, extending into western Namibia (Shaw, 2015). This species is particularly prone to fatalities caused by collisions with electricity transmission lines and is also susceptible to disturbance, as well as hunting and poisoning (Shaw, 2015). This species was recorded only once during the survey. Lekking sites for this species are typically elevated areas compared to the surrounding landscape and therefore all such areas, indicated by the delineated "Rocky Ridges & Steep Slopes" have been pre-emptively buffered from development. Recently, Enviro-Insight engaged with Matt Pretorius (EWT) to discuss potential mitigation solutions with Ludwig's Bustards colliding with OHPLs. EWT has managed to put GPS trackers on

16 Ludwig's Bustards to inform on the movement of these birds and allow for insights into why they are prone to collisions with OHPLs. While the study is not complete and published, the following key outcomes are apparent and are of direct relevance to the proposed Kareekloof OHPL:

- Ludwig's Bustards fly long distances at night, something previously not known.
- When they do these migratory flights at night, they tend to fly higher than usual, which is why the larger OHPLs pose the greatest risk of collision, particularly the thin earth wire strand at the top.
- Illuminated bird flight diverters (BFDs), such as the Overhead Warning Light (OWL) are very effective to prevent collisions by this species but may pose challenges from a visual impact. However they are not visible at long distances and there is a UV lighting alternative which is invisible to humans (although this option seems to be less effective than the visible light alternative);
- There are alternatives to using illuminated BFDs – an Australian brand (Rotamarka) uses highly reflective tapes which are apparently as effective as the OWL device since the majority of birds appear to be flying on nights when there is some moonlight.
- The current rate of Ludwig's Bustard deaths from collision with OHPLs is completely unsustainable. Apart from appropriate action to retrofit all existing OHPLs with appropriate BFDs, any new OHPLs within the habitats of Ludwig's Bustards must take this impact into consideration and mitigate it comprehensively to prevent any cumulative impacts from new OHPLs. Simply put, all new OHPLs should be fitted with appropriate BFDs over their entire spans in areas where Ludwig's Bustards occur.

- Martial Eagle (*Polemaetus bellicosus*) is infrequently recorded for the nine focal pentads. No observations of this species have been recorded for the region on iNaturalist. This species forages extremely widely and could occasionally fly over the study area but will not breed there "naturally" owing to the absence of suitable natural breeding habitat. However, it regularly breeds on large electricity pylons. It was not observed during the fieldwork surveys but is considered likely to be affected by the proposed development.
- Tawny Eagle (*Aquila rapax*) is one of the most threatened eagles in South Africa with a high sensitivity to land transformation. They are known to have been electrocuted by overhead powerlines (Taylor *et al.*, 2015). They forage extremely widely and require tall structures (trees or electricity pylons) for breeding. This species is expected to sporadically forage over the EGI study area, which was confirmed by single observation during the spring survey.
- Secretarybird (*Sagittarius serpentarius*) is listed as Endangered globally and Vulnerable regionally (Taylor *et al*., 2015; BirdLife International, 2020). Secretarybirds favour open habitats for terrestrial foraging and seek out flat-top trees for nesting. This species has an extremely wide distribution across Africa but occurs at very low densities. It is prone to collision with powerlines and fences (from being flushed), while habitat loss and alteration are also major regional threats. Since only one individual was observed on site during the winter survey, the species was initially thought to be an infrequent visitor to the area. However, the second (spring) survey observed three live individuals (two individuals likely to be a breeding pair on one day, and another individual the next day) and one dead individual trapped in a roadside fence (likely caused by flushing from a passing vehicle) (Figure 3-8). This species is more likely to be a frequent visitor on site with the potential to breed in future.

Figure 3-8: A foraging Secretarybird observed during the winter survey (left) and a carcass of a Secretarybird found caught in a roadside fence during the spring survey (right).

- Cape Vultures (*Gyps coprotheres*) is listed as Endangered regionally (Taylor *et al*., 2015) and Vulnerable globally (IUCN 2024). This species was not predicted to occur on site by the STR (Table 1-4) but clearly does forage across the region – 54 individuals were observed roosting on OHPL pylons adjacent to the Kareekloof EGI corridor (Figure 3-9). It is susceptible to collisions and electrocution with OHPLs due tot it's propensity for roosting on the larger OHPL structures and its large body size.

Figure 3-9: Cape Vultures roosting on a powerline pylon adjacent to the Kareekloof EGI corridor.

3.5.2 Vulnerable species

- Lanner Falcon (*Falco biarmicus*) occurs widely across South Africa in nearly all open habitat types. Major threats include habitat loss and collisions with powerlines. No individuals were recorded within the project area during the surveys. This species is adept at using man-made structures such as transmission pylons as perches, sites to hunt from, and nesting sites. It is an infrequent visitor to the EGI study area.
- Verreaux's Eagle (*Aquila verreauxii*) is widely distributed in South Africa, showing a preference for rocky ridges and mountains on which it breeds and hunts for Dassies and Rock Rabbits. The main threats facing this species in South Africa are direct persecution, drowning in farm dams, and collisions with, and electrocutions on, electricity transmission lines. Collisions with wind turbines is a growing threat. This species is breeding on the cliffs close to the study area and was regularly observed during the surveys (Figure 3-10).

Figure 3-10: A soaring adult Verreaux's Eagle observed in the study area during the winter survey (left) and a Verreaux's Eagle nest photographed close to the study area during the spring survey (right).

- Blue Crane (*Grus paradisea*) was downgraded from regionally Vulnerable to Near Threatened (Taylor *et al*., 2015), but is still considered as globally Vulnerable (IUCN, 2024). The species was not observed in the study area during the winter seasonal survey, but a pair was observed foraging in the study area during the spring and summer seasonal surveys. No suitable breeding habitat was observed, but the species is considered as a foraging visitor on site and the greater region. It is susceptible to collisions with OHPLs.

3.5.3 Summary

Potential collisions and electrocutions with powerlines associated with the EGI represent a potential threat to most of the identified avifauna SCC in this report. The loss of suitable foraging or breeding habitat due to the proposed development is considered a minor impact. Many of the species in question have broad habitat requirements and are likely to occupy large

home ranges that extend beyond the habitat types identified in this report. Consequently, the impact of the proposed development on these species and their associated habitats could be considered as limited, given the small size of the development footprint relative to their extensive home ranges. Nevertheless, the continued potential of an OHPL to remove SCC from the population (through collision and electrocution) cannot be overlooked and consequently appropriate mitigation will be required, particularly due to the presence of numerous SCC that are slow breeders with low fecundity and are prone to such impacts. Figure 3-11 shows a collage of photographs for several bird species observed in the study area during the surveys.

Figure 3-11: Photographs taken of birds encountered during both seasonal surveys. EN (Endangered); VU (Vulnerable); NT (Near Threatened); NE (Near Endemic).

3.6 EXISTING IMPACTS

Existing impacts to avifauna were observed in the EGI study area and surrounds during the surveys. Land use is almost exclusively low intensity livestock and game farming, but other impacts are also present. Several current impacts to avifauna observed on site are listed below and illustrated in Figure 3-12.

- Livestock and game grazing – this reduces plant diversity and abundance and therefore habitat suitability for foraging avifauna. However, the low intensity of this practice is unlikely to have significantly altered the avifauna assemblage within the region. Death of game and livestock likely will attract scavenging species (e.g., Tawny Eagle) and could bring such species into direct contact with the project infrastructure (specifically powerlines), leading to possible fatalities.
- Livestock water facilities/waterholes – drinking facilities for livestock and small associated manmade structures are present throughout the site. Such facilities modify natural habitat through the presence of alien trees acting as an attractant for avifauna, as well as the trampling of vegetation by livestock, thereby removing foraging habitat for birds.
- Alien and invasive species – alien trees are present throughout the study area, but mostly near developed infrastructure such as buildings, waterholes and impoundments. While their presence may reduce natural foraging or roosting habitat for some avian species, it also provides roosting and nesting opportunities. Larger alien trees such as pines and Eucalyptus tend to attract large birds such as raptors and crows.
- Electricity powerlines and pylons – as mentioned above, electricity powerlines and pylons are both opportunities and risks for avifauna. While the infrastructure provides roosting, nesting and perching habitat for birds (e.g. Figure 3-9), it also subjects avifauna to potential risks of collision and electrocution. As shown in Figure 3-12, a photo of a dead Jackal Buzzard was taken under a powerline near the study area. Due to its proximity to the powerline, this individual was likely killed due to collision with the line. This poses a continuous threat to avifauna in the greater study area.
- Impoundment situated close to the powerline – the large dam on site is an important attractant for waterbirds, as observed during both seasonal surveys. The location of the powerline within proximity to the dam increases the risk of waterfowl collisions with powerlines, making both the powerline and dam greater risks to birds on site.
- Farm fences – present throughout the site, livestock fences are a noteworthy impact to avifauna. While birds may use fences for perching, they also pose collision and entrapment risks. Fences running parallel to roads pose greater risks to avifauna, as birds may be flushed by passing vehicles and collide with fences.

Figure 3-12: Examples of current impacts to avifauna observed in the greater EGI study area.

3.7 Site Sensitivity

Habitat sensitivity was evaluated according to the perceived likelihood of an avifauna SCC interacting with the EGI corridor. Habitats with regular usage as flyways or breeding display sites by avifauna SCC where therefore considered to be more sensitive than others (Figure 3-13). Nevertheless, even the low sensitivity habitats shown in Figure 3-13 will require bird flight diverters (BFDs) as a mitigation measure for collisions (see discussion on Ludwig's Bustards in 3.5.1 Endangered species).

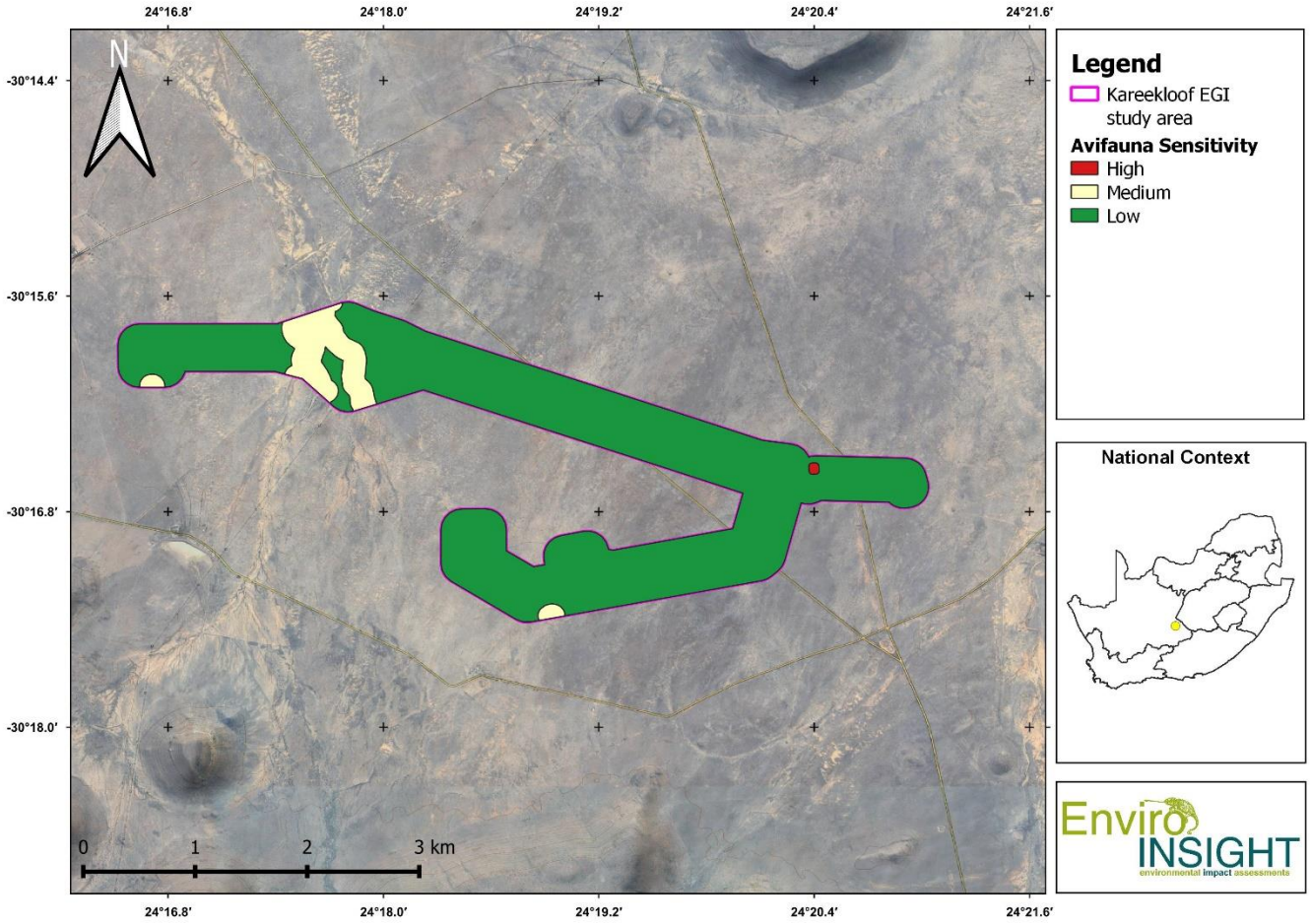

Figure 3-13: The avifauna habitat sensitivities in relation to the EGI study area.

3.8 ANTICIPATED IMPACT DESCRIPTION AND ASSESSMENT

The main anticipated environmental impacts on avifauna species of conservation of concern (SCC) from the proposed Kareekloof EGI are:

- **Habitat Loss:** Removal or alteration of habitats used by avifauna SCC.
- **Collision and Electrocution:** Avifauna SCC face risks from collision or electrocution with overhead powerlines (OHPLs) and fences.
- **Disturbance:** Disruptions such as noise and dust created by movement of machinery and maintenance activities during both the construction and operational phases of the proposed Kareekloof EGI.
- **Attraction to the OHPL:** Avifauna SCC using OHPL structures for perching, nesting, and shade.

Each potential impact is detailed below, along with proposed mitigation measures to minimize these impacts.

3.8.1 Habitat Loss

IMPACT NATURE	**Direct loss of avifaunal habitat**		**STATUS**	**NEGATIVE**
Impact Description	Clearing natural vegetation for the construction of the OHPL and associated infrastructure (roads and substations) will lead to the loss, degradation and fragmentation of foraging and breeding habitats for avifauna species of conservation concern (SCC). Clearing of habitat in the optimal foraging habitats around the drainage areas (including the 100 m buffer) cannot be avoided but must be limited as much as possible. While there may be some loss of breeding or mating display habitats for SCC or the loss of habitat for important bird congregations, this is unlikely to be significant given the small footprint of the OHPL and associated infrastructure. Although no nests were found during site surveys, the presence of scrubland and grassland for regular foraging suggests potential for nearby nesting for Secretarybirds, which were recorded during both surveys, indicating the area is attractive to them and they may be locally impacted by habitat loss. Furthermore, the Kareekloof EGI study area does not support significant congregations of waterbirds or migratory species at any global, national or regional scale. While the no-go alternative will not require construction activities associated with the proposed development to take place and therefore will not result in any additional loss of avifaunal habitats, grazing of livestock and game, as well as the presence of alien trees, in the study area are already contributing to habitat loss in the study area.			
Impact Source(s)	Site clearing and preparation for pylon construction, laydown areas, roads (servitudes), substations.			
Receptor(s)	Secretarybird and Ludwig's Bustard.			
PARAMETER	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	4
	No-Go Alternative:	3	No-Go Alternative:	3
PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	3
	No-Go Alternative:	2	No-Go Alternative:	2
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-1
	No-Go Alternative:	+1	No-Go Alternative:	+1
SIGNIFICANCE RATING (F) = A*B*D*C	Preferred Alternative:	**-32**	Preferred Alternative:	**-12**
	No-Go Alternative:	**6**	No-Go Alternative:	**6**
CUMULATIVE IMPACTS	Existing and planned activities and developments in the study area and its surroundings have likely already led to some loss of avifaunal habitats. However, the habitat loss expected from the construction and operation of the OHPL is minimal, as the pylon footprints are very small, and the servitudes are not extensive roads. As such, the cumulative impacts on receptor species are unlikely to be significant.			
CONFIDENCE	High			

MITIGATION MEASURES	• Limit the areas cleared for construction purposes (e.g. laydown areas) and avoid this in all the medium sensitivity areas (where possible). • Avoid all nesting and lekking habitats for Ludwig's Bustard (high sensitivity habitat in Figure 3-13). • Demarcate such areas on the ground during construction and sign post them as "Environmentally sensitive areas - keep out!". • Rehabilitate all areas disturbed immediately after construction. • Prioritise existing roads for access routes. • Keep servitudes as a two-tyre track (instead of wide, fully graded road) wherever possible to limit habitat loss. • Develop and implement an Alien and Invasive Plant Control Plan.

3.8.2 Collision and Electrocution

IMPACT NATURE	**Direct mortality through collision and electrocution**		**STATUS**	**NEGATIVE**
Impact Description	Mortality from collision and electrocution is a potential impact to avifauna from OHPLs, including the proposed Kareekloof OHPL. This risk is highest where electrical transmission infrastructure is placed near areas of higher habitat complexity and resource availability, such as wetlands, rivers, and rocky ridges, where bird abundances are greater or where bird species prone to collisions with OHPLs are nesting or displaying for breeding purposes. Electrocution of birds within the substations/switching zones is also possible. Additionally, vehicle-induced collisions, whether direct (i.e., roadkill) or caused by birds being flushed into fence infrastructure, can pose a significant mortality risk, especially to large ground-dwelling species. Several SCC likely or known to occur in the proposed development region have wingspans large enough (>1.5 m) to bridge gaps between live and earthed components or between powerline phases. This impact can be reduced through careful planning of OHPL infrastructure layout to avoid highly sensitive areas, such as Ludwig's Bustard breeding and lekking sites, and through designing the OHPL to limit electrocutions risks (e.g., wings and faecal streamers) and increasing wire visibility with appropriate bird flight diverters (BFDs). Additionally, bird electrocution within substations or switching zones can be reduced through proper infrastructure layout planning based on the SEI evaluation. While the no-go alternative will not require construction activities associated with the proposed development to take place and therefore will not result in greater collision or electrocution risks, electricity powerlines and fences in the study area and surroundings have already resulted in bird mortalities, for example a Jackal Buzzard carcass was found under a powerline and a Secretarybird carcass was found trapped in a fence.			
Impact Source(s)	Electrical transmission line infrastructure			
Receptor(s)	All birds but particularly waterbirds, raptors and other large-bodied species with low power to weight ratios and in-flight manoeuvrability. Major receptors include Ludwig's Bustard and Secretarybird.			
PARAMETER	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
EXTENT (A)	Preferred Alternative:	2	Preferred Alternative:	2
	No-Go Alternative:	1	No-Go Alternative:	1
DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	4
	No-Go Alternative:	4	No-Go Alternative:	4

PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	2
	No-Go Alternative:	4	No-Go Alternative:	4
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-3	Preferred Alternative:	-1
	No-Go Alternative:	+1	No-Go Alternative:	+1
SIGNIFICANCE RATING (F) = A*B*D*C	Preferred Alternative:	**-72**	Preferred Alternative:	**-16**
	No-Go Alternative:	**16**	No-Go Alternative:	**16**
CUMULATIVE IMPACTS	Existing powerlines and fences in the development region have already resulted in mortalities of birds, including one SCC (see Figure 3-12). The construction of the Kareekloof OHPL and associated infrastructure will further increase the risk of collision and electrocution. Numerous existing ESKOM OHPLs are already present in the landscape and currently causing negative impacts to avifauna (3.9 Anticipated Cumulative Impacts). Without appropriate mitigation, the cumulative impacts on the receptors most at risk (bustards) from collisions with powerlines in the region will be extreme and unsustainable, particularly as the planned EGI alignment is perpendicular to that of the existing Eskom lines. Even with typical mitigation such as spiral bird flight diverters, collisions are not unavoidable and there is likely to be an appreciable cumulative impact on bustard species in the region, unless the latest recommendations on BFDs for Ludwig's Bustards are followed (see discussion on Ludwig's Bustards in 3.5.1 Endangered species).			
CONFIDENCE	High			
MITIGATION MEASURES	• Attempts should be made to minimise the OHPL route length and for the route to be aligned with existing powerlines as far as possible. • The route should avoid or minimise wetland/riverine crossings. • Rocky ridges/rises (delineated in red in Figure 3-13) must be avoided. • Increase the visibility of transmission lines, especially the thinner earth line with which most collisions tend to be associated, by the application of appropriate illuminated/highly reflective BFDs – this must be done in consultation with EWT (Matt Pretorius) and ESKOM, as discussed in 3.5.1 Endangered species. Spacing of BFDs must follow the recommended guidance from EWT in relation to the habitat, considering that OHPL alignment sections near sensitive habitats require denser application of BFDs. • Design of OHPLs must consider potential for electrocution by large species and pre-emptively avoid the likelihood of this by increasing distances between spans to avoid faecal "streamers" or large open wings creating a short. • Installation of bird deterrent devices on transmission line poles, pylons and monopoles, as well as security/boundary fences, will be required to limit collision and electrocution risk. • In all areas where service roads intersect with semi natural or natural habitat, all fences must be set back at least (strictly) 75 m from the edge of every service road to allow for vulnerable species such as bustards, cranes and Secretarybirds to obtain adequate height after being flushed by vehicle traffic. Alternatively, the fences must be placed completely adjacent to the roads with a maximum of 3 m buffer and marked with fence flappers in order to reduce flush related collisions.			

3.8.3 Disturbance

IMPACT NATURE	**Sensory disturbance**	**STATUS**	**NEGATIVE**

Impact Description	Sensory disturbances to avifauna are inevitable and can negatively impact upon breeding or nesting SCC and is mainly likely to be restricted to the construction phase. Although dust, noise and human activity during construction is unavoidable, much can be done to reduce the effect of these sensory disturbance impacts on avifauna. During operation, impacts associated with sensory disturbance are expected to be negligible. The no-go alternative, which avoids construction and operational activities of the proposed development, will not increase sensory disturbances. However, ongoing farming activities in the study area and surroundings are likely to continue causing disturbances to some species. Although, these are also considered negligible due to the low intensity impact.			
Impact Source(s)	Machinery, construction staff, noise, dust, light.			
Receptor(s)	All avifauna, particularly large terrestrial birds and raptors.			
PARAMETER	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
DURATION (B)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	3	No-Go Alternative:	3
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	2
	No-Go Alternative:	2	No-Go Alternative:	2
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-1
	No-Go Alternative:	+1	No-Go Alternative:	+1
SIGNIFICANCE RATING (F) = A*B*D*C	Preferred Alternative:	**-6**	Preferred Alternative:	**-2**
	No-Go Alternative:	**6**	No-Go Alternative:	**6**
CUMULATIVE IMPACTS	Disturbances to birds from the construction of renewable energy facilities and associated grid infrastructure in the region is likely to be short lived and very occasional and therefore unlikely to represent a significant cumulative impact.			
CONFIDENCE	High			
MITIGATION MEASURES	• Adopt temporal avoidance strategies. In the Nama Karoo, Ludwig's Bustards perform lekking displays for 6 weeks following spring rains and nest September to February (Chittenden *et al*., 2016). Attempt, as far as practically possible, to conduct most of the highly disturbing activities outside of this period and > 1 km from potential nesting sites to minimize disturbance to this species during sensitive life stages such as lekking, courting, nesting and fledging. • Minimise light pollution and fit external lighting with downward facing hoods. • Train staff and contractors on the importance of birds and other biodiversity and the sensitive areas for these species which should be avoided. • Introduce and enforce a speed limit (40 km/h) on site.			

3.8.4 Attraction to the OHPL

IMPACT NATURE	Attraction of birds		STATUS	NEGATIVE
Impact Description	Certain species are attracted by the establishment of OHPLs as it presents additional resources in the form of perches, nesting habitat, shade and often food availability (collisions). The attraction of opportunistic species and their predators increases the at risk of collision and electrocution. Existing electricity powerlines and pylons have been identified as attractants for avifauna in the development region (Figure 3-9 and Figure 3-12).			
Impact Source(s)	OHPL infrastructure.			
Receptor(s)	Commensal and opportunistic species, as well as their predators, including raptors such as Cape Vulture, Verreaux's Eagle, Martial Eagle, Tawny Eagle, and Lanner Falcon.			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
DURATION (B)	Preferred Alternative:	2	Preferred Alternative:	1
	No-Go Alternative:	2	No-Go Alternative:	2
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	1
	No-Go Alternative:	4	No-Go Alternative:	4
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-1
	No-Go Alternative:	+1	No-Go Alternative:	+1
SIGNIFICANCE RATING (F) = A*B*D*C	Preferred Alternative:	**-12**	Preferred Alternative:	**-1**
	No-Go Alternative:	**8**	No-Go Alternative:	**8**
CUMULATIVE IMPACTS	Expected to be low.			
CONFIDENCE	High			
MITIGATION MEASURES	• Use infrastructure design that is not conducive to perching or nesting by birds. • Install bird deterrent devices on transmission line poles, pylons and monopoles to limit perching and minimise collision and electrocution risk.			

3.9 Anticipated Cumulative Impacts

It is very difficult to assess the cumulative impacts of overhead power lines (OHPLs) since there is no structured monitoring for bird collisions and electrocutions along all existing powerlines in South Africa from which to assess the realized impact. Deaths, such as those observed during the fieldwork (Figure 3-12) are usually only sporadically encountered and often go unreported. However, given the significant number of threatened bird species for which the IUCN lists collisions and electrocutions with

OHPLs as major threats, these species are already facing cumulative impacts on their populations in South Africa. Collisions with power lines have been identified as a major threat to avian species of conservation concern (SCC) such as the Secretarybird (Hartley, 1991, in Taylor *et al*., 2015) and the Blue Crane (Shaw et al., 2010b, in Taylor *et al*., 2015), as well as more recently, Ludwig's Bustard (3.5.1 Endangered species).

The most recently available information on existing and planned transmission lines available from ESKOM (2018) was mapped in relation to the proposed Kareekloof EGI (Figure 3-14). This shows a large number of existing OHPLs in the area as well as numerous renewable energy developments likely to have their own internal OHPLs. Most of the existing Eskom OHPLs do not have bird flight diverters and it is likley that many bird collisions must occur from such a dense network of OHPLs. Adding an additional OHPL at right angles to the existing lines must be carefully mitigated as described above to avoid contributing significantly to the potential impacts from OHPLs in the region.

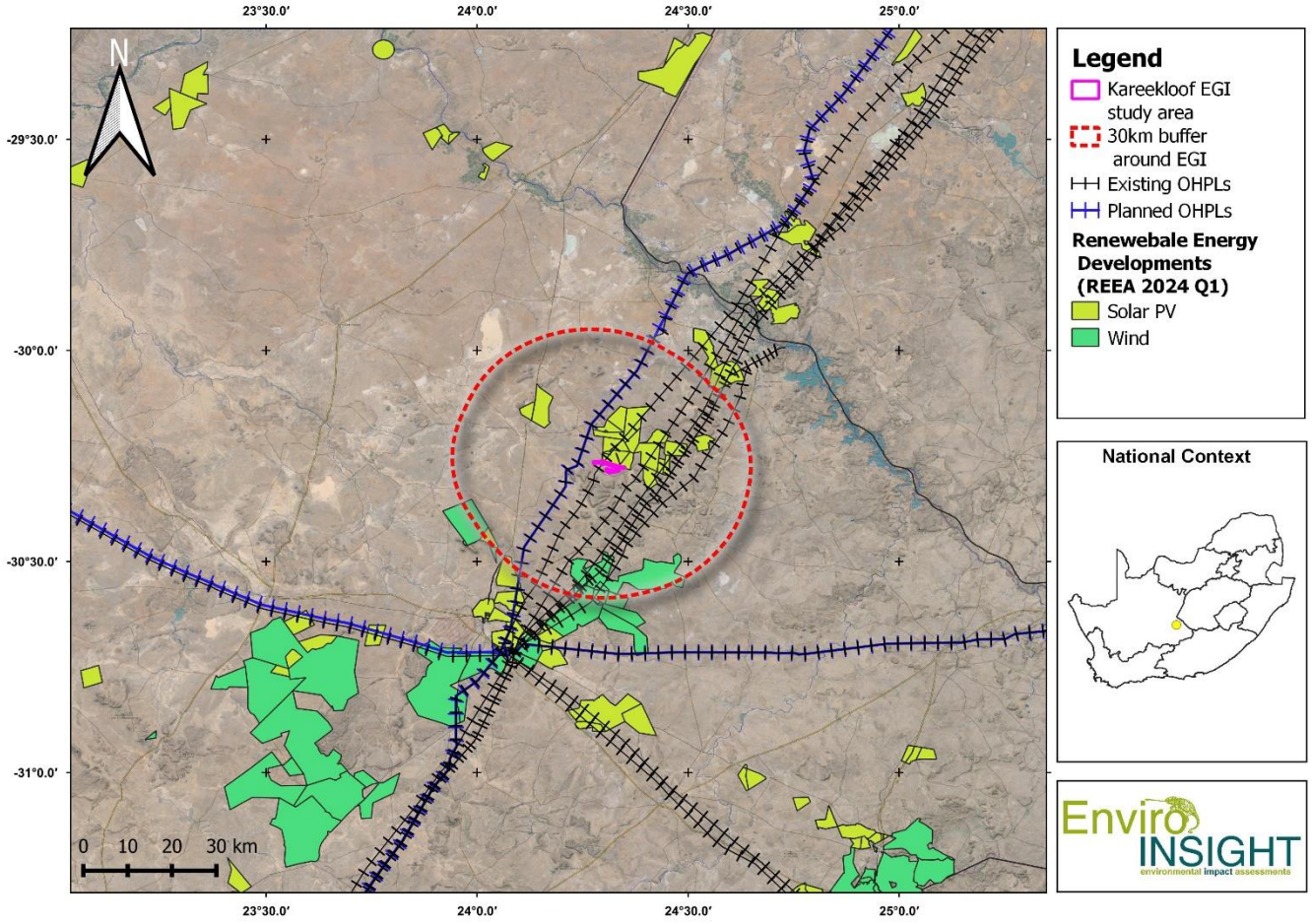

Figure 3-14: Existing and planned transmission lines (ESKOM, 2018) as well as renewable energy developments (REEA 2024 Q1) in relation to the Kareekloof EGI.

4 Conclusions and Professional Opinion

Although negative impacts cannot be entirely avoided, to adequately minimize anticipated impacts on avifauna species of conservation concern (SCC) expected from the proposed Kareekloof EGI, appropriate mitigation measures must be implemented. The specialists recommend that the Competent Authority (CA) grant Environmental Authorization (EA) for the EGI and its associated infrastructure under the following conditions:

- All mitigation measures outlined in this report are adhered to and included in the Environmental Management Plan (EMP) for the proposed development.
- Prior to commencement of construction of the proposed EGI, consultation with the Endangered Wildlife Trust (EWT – Matt Pretorius) and ESKOM is required to implement the most effective and approved bird flight diverters to prevent collisions by Ludwig's Bustards during night-time flights.
- The EMP must include a post-construction avifauna monitoring plan to record and evaluate any collisions or electrocutions monthly for at least one year following construction of the OHPL, with the aim of adaptively managing unforeseen impacts. The appointed avifauna specialist must assess after the first year if additional monitoring is required.

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6 APPENDIX

6.1 EXPECTED & OBSERVED AVIFAUNA SPECIES

Table 6-1 : Observed avifauna species for the nine focal SABAP2 pentads of the Kareekloof EGI study area [see Figure 2-1]. Species of conservation concern are highlighted at the top of the table.

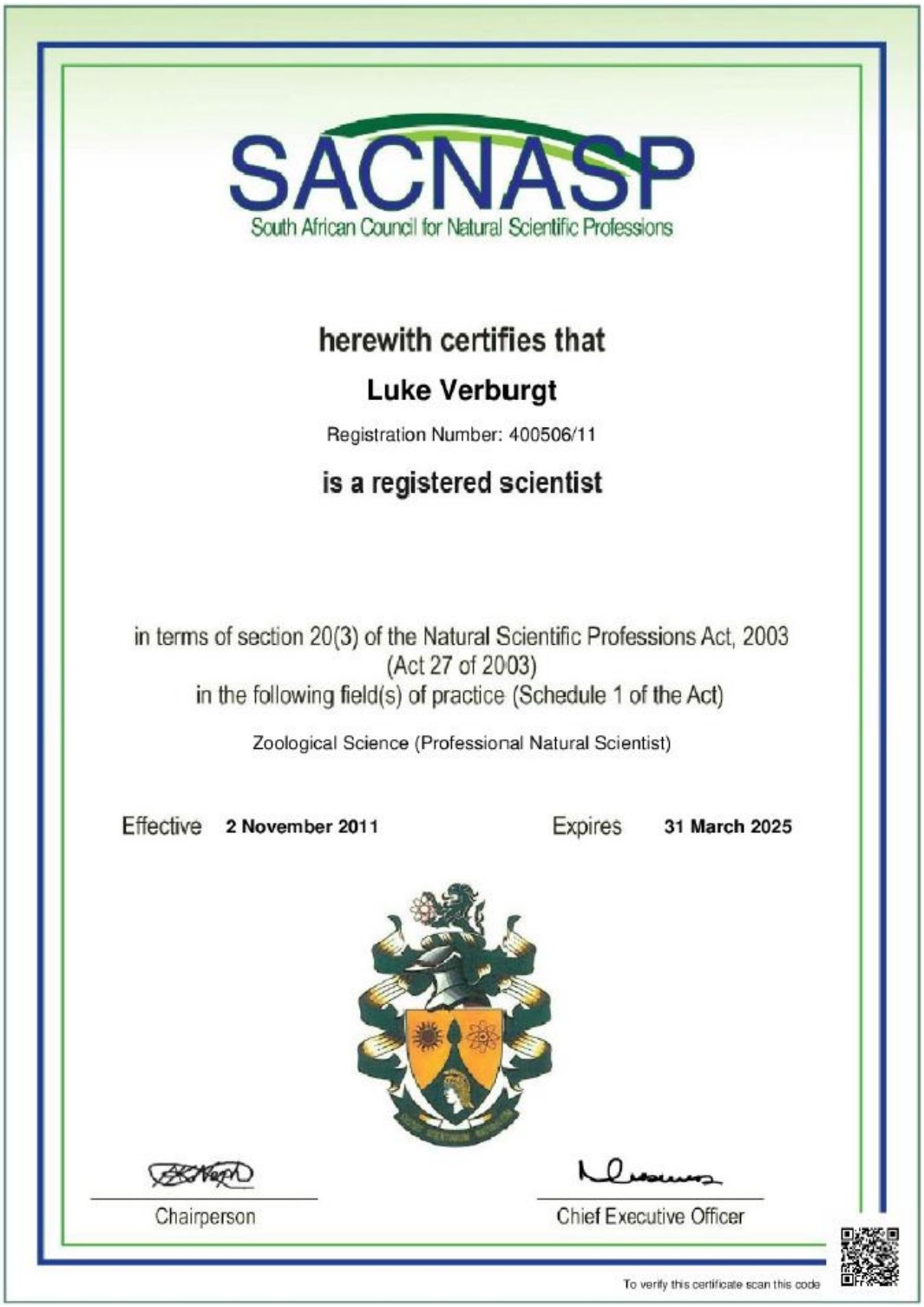
Common Name	Scientific Name	Global Status (IUCN)	Regional Status (Taylor et al. 2015)	Winter (Aug '23)	Spring (Oct '23)	Summer (Feb '24)
Ludwig's Bustard	*Neotis ludwigii*	EN	EN			1
Cape Vulture	*Gyps coprotheres*	VU	EN			54
Martial Eagle	*Polemaetus bellicosus*	EN	EN			
Secretarybird	*Sagittarius serpentarius*	EN	VU	1	4	
African Rock Pipit	*Anthus crenatus*	LC	NT		1	
Verreaux's Eagle	*Aquila verreauxii*	LC	VU	5	2	
Lanner Falcon	*Falco biarmicus*	LC	VU			
Blue Korhaan	*Eupodotis caerulescens*	NT	LC			
Blue Crane	*Grus paradisea*	VU	NT		2	2
Tawny Eagle	*Aquila rapax*	VU	EN		1	
Northern Black Korhaan	*Afrotis afraoides*			10	12	
Egyptian Goose	*Alopochen aegyptiaca*			3	10	
Red-headed Finch	*Amadina erythrocephala*				14	
African Pipit	*Anthus cinnamomeus*			1	1	
Nicholson's Pipit	*Anthus nicholsoni*					
Buffy Pipit	*Anthus vaalensis*					
Little Swift	*Apus affinis*				5	
Common Swift	*Apus apus*					
White-rumped Swift	*Apus caffer*				4	
Black-headed Heron	*Ardea melanocephala*					
Pririt Batis	*Batis pririt*				2	
Hadada Ibis	*Bostrychia hagedash*				9	
Black-faced Waxbill	*Brunhilda erythronotos*				1	
Spotted Eagle-Owl	*Bubo africanus*				4	
Common Buzzard	*Buteo buteo*					
Jackal Buzzard	*Buteo rufofuscus*			5	4	
Red-capped Lark	*Calandrella cinerea*					
Fawn-colored Lark	*Calendulauda africanoides*				2	
Sabota Lark	*Calendulauda sabota*			4	22	
Greater Striped Swallow	*Cecropis cucullata*				14	
Red-breasted Swallow	*Cecropis semirufa*					
Karoo Scrub Robin	*Cercotrichas coryphoeus*			14	13	
Kalahari Scrub Robin	*Cercotrichas paena*			5	11	
Karoo Long-billed Lark	*Certhilauda subcoronata*					
Three-banded Plover	*Charadrius tricollaris*			1	1	

Common Name	Scientific Name	Global Status (IUCN)	Regional Status (Taylor et al. 2015)	Winter (Aug '23)	Spring (Oct '23)	Summer (Feb '24)
Spike-heeled Lark	*Chersomanes albofasciata*			18	26	
White Stork	*Ciconia ciconia*					
Dusky Sunbird	*Cinnyris fuscus*			5	8	
Desert Cisticola	*Cisticola aridulus*			12	31	
Neddicky	*Cisticola fulvicapilla*			5	6	
Grey-backed Cisticola	*Cisticola subruficapilla*			10	11	
Cloud Cisticola	*Cisticola textrix*					
White-backed Mousebird	*Colius colius*				4	
Speckled Pigeon	*Columba guinea*				3	
White-necked Raven	*Corvus albicollis*					
Pied Crow	*Corvus albus*			74	39	
Cape Robin-Chat	*Cossypha caffra*			1	2	
Wattled Starling	*Creatophora cinerea*			5	1	
White-throated Canary	*Crithagra albogularis*			14	9	
Black-throated Canary	*Crithagra atrogularis*					
Yellow Canary	*Crithagra flaviventris*			15	12	
Layard's Warbler	*Curruca layardi*			3	2	
Chestnut-vented Warbler	*Curruca subcoerulea*				11	
African Palm Swift	*Cypsiurus parvus*					
Sickle-winged Chat	*Emarginata sinuata*			2	3	
Cape Bunting	*Emberiza capensis*			6	3	
Lark-like Bunting	*Emberiza impetuani*			282	44	
Cinnamon-breasted Bunting	*Emberiza tahapisi*				2	
Yellow-bellied Eremomela	*Eremomela icteropygialis*			1	6	
Grey-backed Sparrow-Lark	*Eremopterix verticalis*			107	22	
Southern Red Bishop	*Euplectes orix*					
Cinnamon-breasted Warbler	*Euryptila subcinnamomea*					
Lesser Kestrel	*Falconaumanni*					8
Greater Kestrel	*Falco rupicoloides*			1	6	
Rock Kestrel	*Falco rupicolus*			1		
Large-billed Lark	*Galerida magnirostris*			4	4	
Booted Eagle	*Hieraaetus pennatus*					
White-throated Swallow	*Hirundo albigularis*				4	
Barn Swallow	*Hirundo rustica*					
Pied Starling	*Lamprotornis bicolor*			6	2	
Cape Starling	*Lamprotornis nitens*				16	
Southern Fiscal	*Lanius collaris*			11	2	
Red-backed Shrike	*Lanius collurio*					
Lesser Grey Shrike	*Lanius minor*					
Rufous-eared Warbler	*Malcorus pectoralis*			28	22	
Chat Flycatcher	*Melaenornis infuscatus*			11	9	

Common Name	Scientific Name	Global Status (IUCN)	Regional Status (Taylor et al. 2015)	Winter (Aug '23)	Spring (Oct '23)	Summer (Feb '24)
Fiscal Flycatcher	*Melaenornis silens*			3	13	
Pale Chanting Goshawk	*Melierax canorus*			15	9	
European Bee-eater	*Merops apiaster*				1	
Gabar Goshawk	*Micronisus gabar*					
Eastern Clapper Lark	*Mirafra fasciolata*			3	35	
Short-toed Rock Thrush	*Monticola brevipes*			1	4	
Cape Wagtail	*Motacilla capensis*			4	6	
Spotted Flycatcher	*Muscicapa striata*					
Ant-eating Chat	*Myrmecocichla formicivora*			42	31	
Mountain Wheatear	*Myrmecocichla monticola*			2	3	
Malachite Sunbird	*Nectarinia famosa*				2	
Helmeted Guineafowl	*Numida meleagris*			24	20	
Namaqua Dove	*Oena capensis*				10	
Familiar Chat	*Oenanthe familiaris*			3	7	
Capped Wheatear	*Oenanthe pileata*					
Pale-winged Starling	*Onychognathus nabouroup*				2	
Southern Grey-headed Sparrow	*Passer diffusus*				6	
House Sparrow	*Passer domesticus*				7	
Cape Sparrow	*Passer melanurus*			16	6	
South African Cliff Swallow	*Petrochelidon spilodera*					
Willow Warbler	*Phylloscopus trochilus*					
White-browed Sparrow-Weaver	*Plocepasser mahali*			11	6	
Southern Masked Weaver	*Ploceus velatus*				5	
African Harrier-Hawk	*Polyboroides typus*				1	
Black-chested Prinia	*Prinia flavicans*			4	32	
Rock Martin	*Ptyonoprogne fuligula*			3	7	
African Red-eyed Bulbul	*Pycnonotus nigricans*			7	22	
Red-billed Quelea	*Quelea quelea*			10		
Grey-winged Francolin	*Scleroptila afra*					
Laughing Dove	*Spilopelia senegalensis*				5	
Pink-billed Lark	*Spizocorys conirostris*					
Scaly-feathered Weaver	*Sporopipes squamifrons*			8	8	
Fairy Flycatcher	*Stenostira scita*				4	
Cape Turtle Dove	*Streptopelia capicola*			6	10	
Common Ostrich	*Struthio camelus*					
Long-billed Crombec	*Sylvietta rufescens*				2	
Alpine Swift	*Tachymarptis melba*					
South African Shelduck	*Tadorna cana*				18	
Bokmakierie	*Telophorus zeylonus*			6	1	
Crested Barbet	*Trachyphonus vaillantii*				2	
Acacia Pied Barbet	*Tricholaema leucomelas*			10	14	

Common Name	Scientific Name	Global Status (IUCN)	Regional Status (Taylor et al. 2015)	Winter (Aug '23)	Spring (Oct '23)	Summer (Feb '24)
Karoo Thrush	*Turdus smithi*			1	3	
Violet-eared Waxbill	*Uraeginthus granatinus*				5	
Red-faced Mousebird	*Urocolius indicus*			20	28	
Blacksmith Lapwing	*Vanellus armatus*					
Crowned Lapwing	*Vanellus coronatus*					
Pin-tailed Whydah	*Vidua macroura*				4	
Orange River White-eye	*Zosterops pallidus*				2	
Cape White-eye	*Zosterops virens*					

6.2 SACNASP REGISTRATION OF SPECIALISTS



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Luke Verburgt

Registration Number: 400506/11

is a registered scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following field(s) of practice (Schedule 1 of the Act)

Zoological Science (Professional Natural Scientist)

Effective **2 November 2011** Expires **31 March 2025**

Chairperson

Chief Executive Officer

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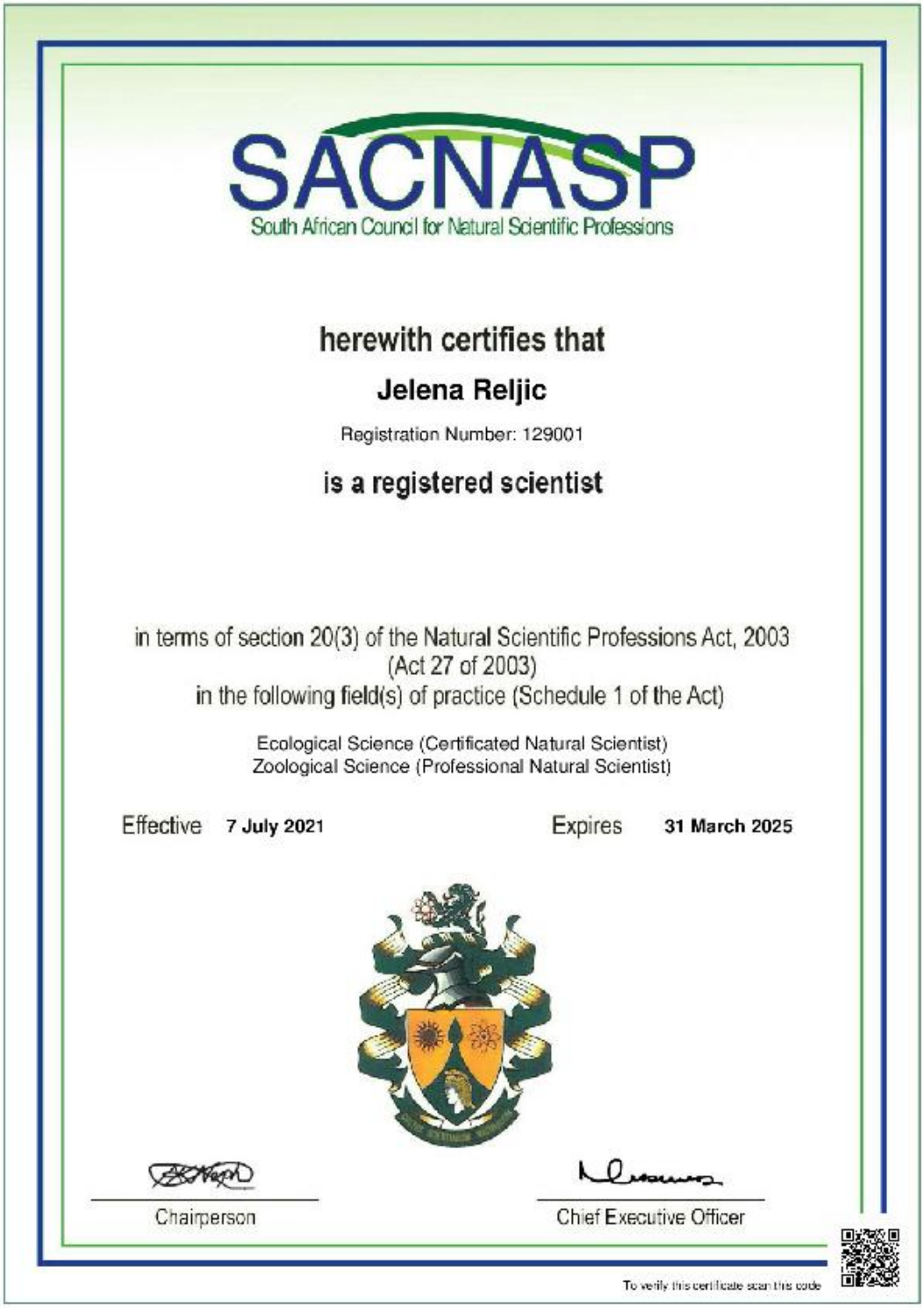

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Jelena Reljic

Registration Number: 129001

is a registered scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following field(s) of practice (Schedule 1 of the Act)

Ecological Science (Certificated Natural Scientist)
Zoological Science (Professional Natural Scientist)

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