Proposed Development of Ezelsjacht 110 MW Solar Photovoltaic (PV) Energy Facility, near De Doorns, Western Cape Province

AVIFAUNAL SPECIALIST SCOPING REPORT

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EXECUTIVE SUMMARY

1 INTRODUCTION

South Africa Mainstream Renewable Power Developments (Pty) Ltd ("Mainstream") is proposing to develop the Ezelsjacht Solar Photovoltaic (PV) Energy Facility (SEF), Battery Energy Storage (BESS), and their supporting infrastructure. The overall objective of the proposed development is to generate electricity by means of renewable energy technologies capturing solar energy to feed into the national grid. The proposed Ezelsjacht SEF is located approximately 13 km east of the town De Doorns, within the Cape Winelands District Municipality of the Western Cape Province. The site proposed for the SEF component of the renewable energy facility falls within the Breede Valley Local Municipalities.

A total of 190 bird species have been detected during SABAP2 observations and/or during pre-construction monitoring for the associated/overlapping Ezelsjacht Wind Energy Facility, and so could potentially occur in the broader area. Of these, 92 are classified as priority species for solar developments. Of the 92 solar priority species, 62 have a medium-to-high probability of occurring regularly in the Broader Area, of which 52 species were recorded during the on-site pre-construction monitoring.

2 SUMMARY OF FINDINGS

The proposed Ezelsjacht SEF will have several potential impacts on priority avifauna. These impacts are the following:

- Displacement due to disturbance linked to construction activities in the construction phase.
- Displacement due to habitat transformation in the construction phase.
- Priority species mortality due to collisions with solar panels during the operational phase.
- Priority species mortality due to entrapment in the perimeter fence during the operational phase
- Priority species mortality due electrocution on the 33kV MV overhead lines (if any) in the operational phase.
- Priority species mortality due collisions with the 33kV MV overhead lines (if any) in the operational phase.
- Displacement of priority species due to disturbance linked to dismantling activities in the decommissioning phase.

2.1 Displacement of priority species due to disturbance linked to construction activities in the construction phase.

At the PV facility, the solar priority species which would be most severely affected by disturbance would be ground nesting species, those that utilise low shrubs for nesting, and certain raptor species. The pre-mitigation impact is rated as **medium** but can be mitigated to **low** levels.

2.2 Displacement due to habitat transformation in the construction phase.

As far as displacement, either completely or partially (reduced densities) due to habitat transformation is concerned, it is highly likely that a pattern of reduced avifaunal densities will manifest itself at the proposed PV

facilities. Ground nesting species, shrubland specialists and some raptors are likely to be impacted most by the habitat transformation, raptors particularly as a result in reduced prey availability and accessibility. The pre-mitigation impact is rated as **medium** and will be reduced but remain at **medium** levels after mitigation.

2.3 Priority species mortality due to collisions with solar panels in the operational phase.

Based on the lack of evidence to the contrary, it is not foreseen that collisions with the solar panels at the PV facility will be a significant impact. The solar priority species which would most likely be potentially affected by this impact include small ground dwelling species which forage between the solar panels, and raptors which predate these small birds or forage for insects and other animals between the PV panels, such as Black Harrier and Lanner Falcon (i.e., if they are not completely displaced due to the habitat transformation). The pre-mitigation impact is rated as **low**, and can be reduced **very low** levels.

2.4 Priority species mortality due to entrapment in the perimeter fence in the operational phase.

It is not foreseen that entrapment of solar priority species in perimeter fences will be a significant impact at the PV facility. The solar priority species which could potentially be affected by this impact are most likely medium to large terrestrial species such as Southern Black Korhaan, and large owls such as Spotted Eagle Owl. The impact is rated as **low** pre-mitigation and **very low** post-mitigation.

2.5 Priority species mortality due to electrocution on the 33kV MV overhead lines (if any) in the operational phase.

While the intention is to place the 33kV reticulation network underground where possible at the PV facility, there are areas where the lines might have to run above ground, for technical reasons. In these instances, the line could potentially pose an electrocution risk to various species, including Red Data species such as Martial Eagle and Verreaux's Eagle. The impact is rated as **high** pre-mitigation and **very low** post-mitigation.

2.6 Collisions with the 33kV MV overhead lines (if any) in the operational phase.

While the intention is to place the 33kV reticulation network underground where possible, there are areas where the lines might have to run above ground, for technical reasons. In these instances, the line could potentially pose a collision risk to various species, particularly large terrestrial species including Red Data species such as Southern Black Korhaan, and various waterbirds when the dams are full, and the drainage lines contain water, such as Black Stork and Blue Crane. The impact is rated as **medium** pre-mitigation and **low** post-mitigation.

2.7 Displacement of priority species due to disturbance linked to dismantling activities in the decommissioning phase

The impact is likely to be similar in nature to the construction phase.

The Summary Table 1 summarises the expected impacts of the proposed SEF and proposed mitigation measures per impact.

Summary Table 1: Impact assessment and recommended mitigations per impact

Nature of impact and phase	Overall impact significance (pre - mitigation)	Proposed mitigation	Overall impact significance (post - mitigation)
Construction: Displacement due to disturbance	Medium -	(1) Construction activity should be restricted to the immediate footprint of the infrastructure as far as possible. (2) Access to the remainder of the area should be strictly controlled to prevent unnecessary disturbance of priority species. (2) Measures to control noise and dust should be applied according to current best practice in the industry. (3) No construction-related activity should take place within the buffer zone surrounding the Martial Eagle nest (-33.473392°S, 19.887225°E)	Low -
Construction: Displacement due to habitat transformation	Medium -	(1) Removal of vegetation must be restricted to a minimum and must be rehabilitated to its former state where possible after construction. (2) Construction of new roads should only be considered if existing roads cannot be upgraded. (3) The recommendations of biodiversity specialist studies must be strictly implemented, especially as far as limitation of the activity footprint is concerned.	Medium -
Operational: Collisions with the solar panels	Low -	(1) Solar panel-free buffers must be maintained around the water reservoirs and other waterbodies.	Very low -
Operational: Entrapment in perimeter fence	Low	(1) It is recommended that a single perimeter fence is used to prevent larger birds from becoming trapped between an inner and outer double fence.	Very low
Operational: Electrocutions on the 33kV MV network	High -	1) Underground cabling should be used as much as is practically possible.	Very low -

Nature of impact and phase	Overall impact significance (pre - mitigation)	Proposed mitigation	Overall impact significance (post - mitigation)
		(2) If the use of overhead lines is unavoidable due to technical reasons, the Avifaunal Specialist must be consulted timeously to ensure that a raptor friendly pole design is used, and that appropriate mitigation is implemented pro-actively for complicated pole structures e.g., insulation of live components to prevent electrocutions on terminal structures and pole transformers. (3) Regular inspections of the overhead sections of the internal reticulation network must be conducted during the operational phase to look for carcasses, as per the most recent edition of the Solar Guidelines.	
Operational: Collisions with the 33kV MV network	Medium -	Bird flight diverters should be installed on all the overhead line sections for the full span length according to the applicable Eskom standard at the time.	Low -
Decommissioning: Displacement due to disturbance	Medium -	(1) Dismantling activity should be restricted to the immediate footprint of the infrastructure as far as possible. Access to the remainder of the area should be strictly controlled to prevent unnecessary disturbance of priority species. (2) Measures to control noise and dust should be applied according to current best practice in the industry.	Low -

3 THE IDENTIFICATION OF ENVIRONMENTAL SENSITIVITIES: SOLAR ENERGY FACILITY

The following environmental sensitivities were identified from an avifaunal perspective for the proposed solar energy facility:

3.1 All infrastructure exclusion zones (high sensitivity) – raptor nest site buffers

No new infrastructure should be constructed within 2.5km of the Martial Eagle nest (-33.473392°S, 19.887225°E), which is proximal to the PAOI of the Ezelsjacht SEF (see Figure 9). The buffer area will also reduce the risk of injury to juvenile birds due to collision with solar panels, when they start flying and practicing their hunting techniques near their nests.

3.2 Solar panel exclusion zones (high sensitivity) – surface water and wetland buffers

A solar panel exclusion zone buffer is recommended around all surface water such as dams and reservoirs (100m), as well as and drainage lines and associated herbaceous wetlands (25m) (see Figure i). These exclusion zones encompass the non-perennial drainage lines which can, when flowing, attract birds. Surface water area are important congregation points for priority avifauna and many non-priority species. It is important to leave open space with no solar panels for birds to access and leave the surface water area unhindered. Surface water is also an important area for raptors to hunt birds which congregate around surface water, and they should have enough space for fast aerial pursuit. This will also benefit species like Blue Cranes which prefer to breed close to water bodies.

4 CONCLUSION AND IMPACT STATEMENT

The final layout is yet to be determined. The Ezelsjacht SEF project site is approximately 370 hectares in extent. Design and layout alternatives will be considered and assessed as part of the EIA. These will include alternatives for the substation locations and for the construction/laydown area. The development is therefore supported, provided the mitigation measures listed in this report are strictly implemented.

Error! Reference source not found. shows the layout of avifaunal sensitivities within the PAOI.

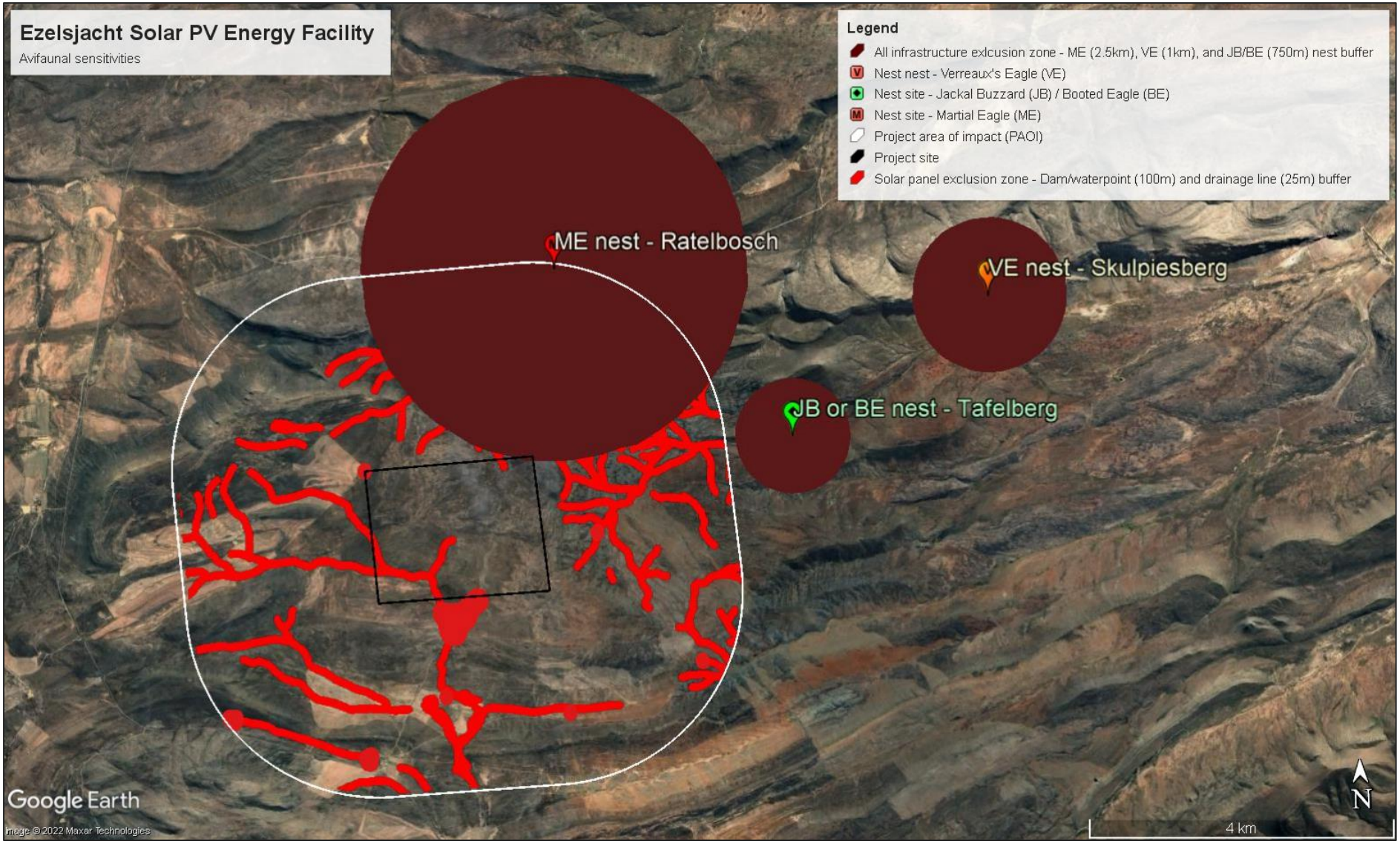

Figure i: Map of avifaunal sensitives within the Ezelsjacht SEF project area of impact (PAOI). The maroon circles are high sensitivity (all infrastructure exclusion) zones associated with the nests of Martial Eagle (ME), Verreaux's Eagle (VE), and Booted Eagle (BE) /Jackal Buzzard (JB). Red areas further delineate high sensitive (solar panel exclusion) zones around surface waterbodies (100m buffer), as well as drainage lines and wetlands (25m buffer). The which polygon is the project area of impact, and the black polygon is the project site.

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List of Abbreviations

BLSA	BirdLife South Africa
DFFE	Department of Forestry, Fisheries and Environment
NEMA	National Environmental Management Act 107 of 1998 (as amended)
PAOI	Project area of Impact
REDZ	Renewable Energy Development Zone
S&EIA	Scoping and Environmental Impact Assessment
SABAP	South African Bird Atlas Project
SACNASP	South African Council for Natural and Scientific Professions
SANBI	South African National Biodiversity Institute
SCC	Species of Conservation Concern
SEF	Solar Energy Facility
NPAES	National Protected Areas Expansion Strategy
IBA	Important Bird Area
SEA	Strategic Environment Assessment
SIP	Strategic Infrastructure Project

Glossary of Terms

Definitions

Priority species	South African Red Data species, South African endemics and near-endemics, raptors, and waterbirds.
Broader area	The area covered by the 9 SABAP2 pentads where the project is located.
Project site	The area covered by the land parcels where the proposed Project will be located, totalling approximately 370 hectares.
Project area of impact	The primary impact zone of the wind energy facility, comprising a 5km buffer around the Project Site totalling approximately 4312 hectares, including but extending beyond the project site.
Development area	The area where the actual development will be located, i.e., the footprint containing the PV solar arrays and associated infrastructure.
Pentad	A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8 × 7.6 km.

1. INTRODUCTION

South Africa Mainstream Renewable Power Developments (Pty) Ltd ("Mainstream") is proposing to develop the Ezelsjacht Solar Photovoltaic (PV) Energy Facility (SEF), Battery Energy Storage (BESS), and their supporting infrastructure. The overall objective of the proposed development is to generate electricity by means of renewable energy technologies capturing solar energy to feed into the national grid.

The proposed Ezelsjacht SEF is located approximately 13 km east of the town De Doorns, within the Cape Winelands District Municipality of the Western Cape Province. The site proposed for the SEF component of the renewable energy facility falls within the Breede Valley Local Municipalities.

In addition to the infrastructure mentioned above, the renewable energy facilities will also include energy storage infrastructure if it is deemed economically feasible to do so. This will consist of a Battery Energy Storage System (BESS) of up t 500MWh, covering an extent of up to approximately 5 hectares (ha). Currently, the battery technologies being considered are either Solid State Batteries or Redox Flow Batteries. Please refer Section 3.2 for technical details of the infrastructure associated with the SEF.

The proposed renewable energy development requires Environmental Authorisations (EAs) from the National Department of Forestry, Fisheries, and the Environment (DFFE). However, the provincial authority (the Western Cape Department of Environmental Affairs and Development Planning - WC DEADP) will also be consulted. Further details of the required legislated process to be followed is provided in Section 2 below.

1.1 Scope, Purpose, and Objectives of this Specialist Input to the Scoping Report

The purpose of the report is to determine the main issues and potential impacts of the proposed project on avifauna at a high (scoping) level, through a combination of desktop analysis and field work. The report was prepared to provide inputs to the Draft Scoping Report for the project as required by the EIA Regulations promulgated in terms of the National Environmental Management Act 107 of 1998, as amended, (NEMA).

1.2 Terms of Reference

The terms of reference for this scoping level report are as follows:

- Describe the affected environment from an avifaunal perspective;
- Discuss gaps in baseline data and other limitations and describe the expected impacts associated with the solar facilities and associated infrastructure;
- Identify potential sensitive environments and receptors that may be impacted on by the proposed facilities;
- Determine the nature and extent of potential impacts;
- Identify 'No-Go' areas, where applicable;
- Summarise the potential impacts that will be considered further in the EIA Phase through specialist assessments;

1.3 Details of Specialist

Please see Appendix 2 Specialist CVs.

2. APPROACH AND METHODOLOGY

The following methods and sources were used to compile this report:

- The project site concerns the land properties upon which the development will occur, occupying an extent of approximately 370 hectares.
- The project area of impact (PAOI) of the proposed SEF was defined as a 5km buffer zone around surrounding the land parcels making up the project site, with an extent of approximately 4312 hectares.
- Bird distribution data of the South African Bird Atlas 2 (SABAP 2) was obtained from the University of Cape Town, to ascertain which species occurs within the broader area of four pentad grid cells each within which the proposed projects are situated (see Error! Reference source not found.). A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8 × 7.6 km. To get a more representative impression of the birdlife, a consolidated data set was obtained for a total of 9 pentads which intersect with the development area, hereafter referred to as '**the broader area'**, detailed in **Table 1** below. From 2007-present, a total of 82 full protocol lists (i.e., surveys of at least two hours each) have been completed for this area. In addition, 60 *ad hoc* protocol lists (i.e., surveys lasting less than two hours but still yielding valuable data) have been completed. The SABAP2 data was therefore regarded as a reliable reflection of the avifauna which occurs in the area, but the data was also supplemented by data collected during the site surveys and general knowledge of the area and bird and habitat associations.
- Solar priority species were defined as follows:
  - South African Red Data species: High conservation significance
  - South African endemics and near-endemics: High conservation significance
  - Raptors: High conservation significance. Raptors are at the top of the food chain and play a key role in their ecosystems. When populations of birds of prey go down, then the numbers of their prey species go up, creating an imbalance in the ecosystem.
  - Waterbirds: Evidence indicate that waterbirds may be particularly susceptible to collisions with solar arrays due to the so-called lake effect, caused by the reflection of the sun of the smooth surface of solar panels.
- The national threatened status of all wind priority species was determined with the use of the most recent edition of the Red Data Book of Birds of South Africa (Taylor et al., 2015), and the latest authoritative summary of southern African bird biology (Hockey et al., 2005).
- The global threatened status of all priority species was determined by consulting the (2022.1) International Union for Conservation of Nature (IUCN) Red List of Threatened Species (http://www.iucnredlist.org/).
- A classification of the vegetation habitat ecotypes within the PAOI was obtained from the National Vegetation Map (2018) from the South African National Biodiversity Institute (SANBI) BGIS map viewer (http://bgisviewer.sanbi.org/) (Mucina & Rutherford, 2006; SANBI, 2018). The PAOI is the area where the primary impacts on avifauna are expected and includes the land parcels where the project will be located.
- Avifaunal habitat usage within the PAOI by birds was informed by the Atlas of Southern African Birds 1 (SABAP 1) (Harrison et al., 1997a, 1997b).
- Land-cover and land-use within the PAOI was determined using the 2018 South African national land-cover surveys jointly conducted by the Department of Environmental Affairs, and the Department of Rural Development and Land Reform (DEA & DALRRD, 2019).
- The Important Bird Areas of Southern Africa (Marnewick et al., 2015) was consulted for information on potentially relevant Important Bird Areas (IBAs).
- Satellite imagery (Google Earth ©2022) was used to view the PAOI and broader area on a landscape level and to help identify sensitive bird habitat.
- The 2022 South Africa Protected Areas Database compiled by the Department of Environment, Forestry and Fisheries (DFFE) was used to identify Nationally Protected Areas, National Protected Areas Expansion Strategy (NPAES) near the PAOI (DFFE, 2022).
- The Department of Forestry, Fisheries, and the Environment (DFFE) National Screening Tool was used to determine the assigned avian sensitivity of the PAOI.

- Data collected during previous site visits to the broader area was also considered as far as habitat classes and the occurrence of priority species are concerned.

- The following sources were used to determine the investigation protocol that is required for the project sites:
  - Procedures for the Assessment and Minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of NEMA when applying for Environmental Authorisation (Gazetted October 2020).
  - Guidelines for the Implementation of the Terrestrial Flora & Terrestrial Fauna Species Protocols for EIAs in South Africa produced by the SANBI on behalf of the Department of Environment, Forestry and Fisheries (2020).
  - The BirdLife South Africa (BLSA) Guidelines for assessing and monitoring the impact of solar power generating facilities on birds in southern Africa. (Jenkins, et al., 2017) (hereafter referred to as the 'Solar Guidelines') were consulted to determine the level of survey effort that is required.
- The main source of information on the avifaunal diversity and abundance at the project sites and Broader Area will be an integrated pre-construction monitoring programme to be implemented at the Project Site, covering the proposed Ezelsjacht SEF PAOI. The pre-construction avifaunal monitoring programme is following an adapted Regime 2 protocol as defined in the Birds and Solar Energy Best Practice Guidelines (Jenkins, et al., 2017) which require a minimum of two surveys over a six-month period.

Table 1: The number of SABAP2 lists completed for the broader area

Pentad	Number of full protocol lists	Ad hoc protocol lists
3325_1945	**6**	**9**
3325_1950	**10**	**7**
3325_1955	**2**	**2**
3330_1945	**11**	**5**
3330_1950	**16**	**7**
3330_1955	**6**	**8**
3335_1945	**5**	**2**
3335_1950	**14**	**13**
3335_1955	**12**	**7**
Total	**82**	**60**

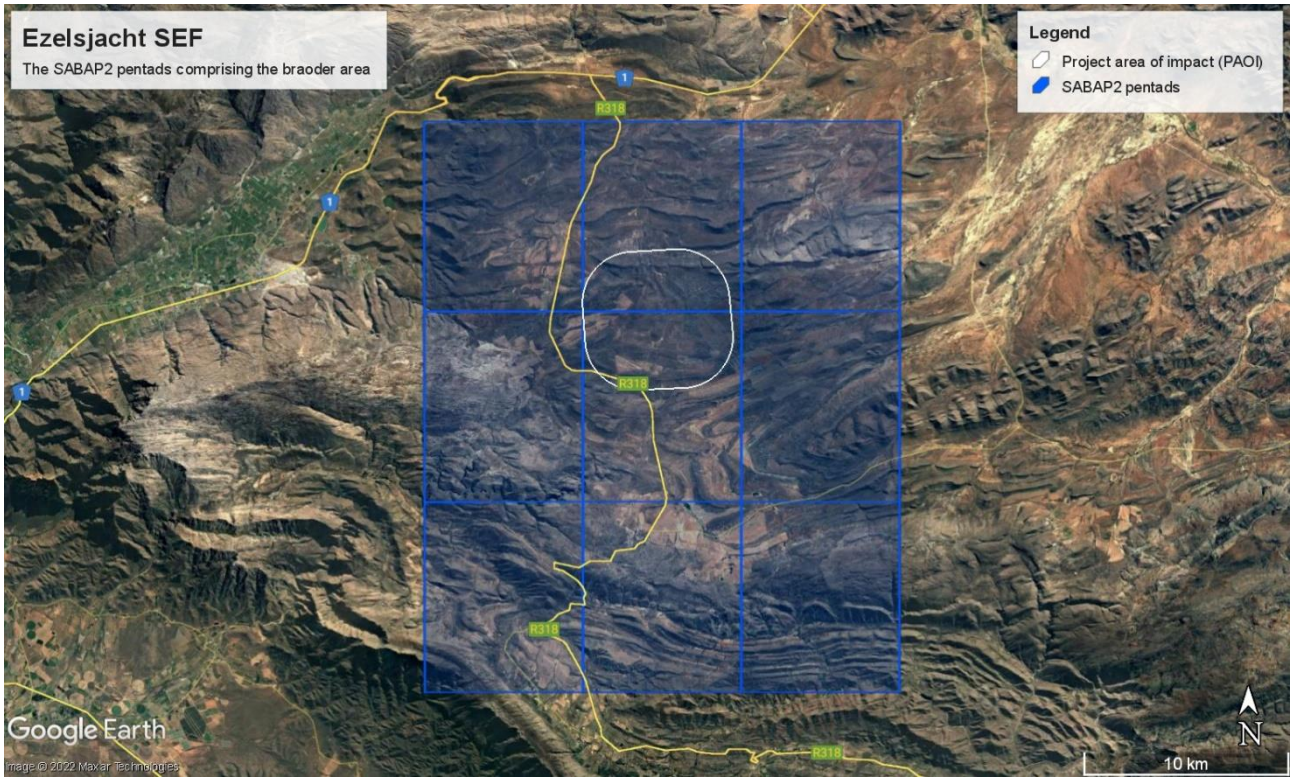


Figure 1: The nine SABAP2 pentads comprising the broader area of the Ezelsjacht SEF project site

2.1 Information Sources

The data sources were used to compile this report are detailed in Table 2.

Table 2: Data sources used to compile this report

Data / Information	Source	Date	Type	Description
South African Protected Areas Database (SAPAD)	Department of Forestry, Fisheries and the Environment (DFFE)	2021, Q3	Spatial	Spatial delineation of protected areas in South Africa. Updated quarterly
Atlas of Southern African Birds 1 (SABAP1)	University of Cape Town	1987-1991	Spatial, reference	SABAP1, which took place from 1987-1991.
South African Bird Atlas Project 2 (SABAP2)	University of Cape Town	May 2022	Spatial, database	SABAP2 is the follow-up project to the SABAP1. The second bird atlas project started on 1 July 2007 and is still growing. The project aims to map the distribution and relative abundance of birds in southern Africa.
National Vegetation Map	South African National Biodiversity Institute (SANBI) (BGIS)	2018	Spatial	The National Vegetation Map Project (VEGMAP) is a large collaborative project established to classify, map and sample the vegetation of South Africa, Lesotho and Swaziland.
Red Data Book of Birds of South Africa, Lesotho, and Swaziland	BirdLife South Africa	2015	Reference	The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland is an updated and peer-reviewed conservation status assessment of the 854 bird species

Data / Information	Source	Date	Type	Description
				occurring in South Africa undertaken in collaboration between BirdLife South Africa, the Animal Demography Unit of the University of Cape Town, and the SANBI.
IUCN Red List of Threatened Species (2022.1)	IUCN	2022.1	Online reference source	Established in 1964, the International Union for Conservation of Nature's Red List of Threatened Species is the world's most comprehensive information source on the global extinction risk status of animal, fungus and plant species.
Important Bird and Biodiversity Areas of South Africa	BirdLife South Africa	2015	Reference work	Important Bird and Biodiversity Areas (IBAs), as defined by BirdLife International, constitute a global network of over 13 500 sites, of which 112 sites are found in South Africa. IBAs are sites of global significance for bird conservation, identified nationally through multi-stakeholder processes using globally standardised, quantitative and scientifically agreed criteria.
Strategic Environmental Assessment for wind and solar photovoltaic energy in South Africa	Department of Environmental Affairs, 2015. Strategic Environmental Assessment for wind and solar photovoltaic energy in South Africa. CSIR Report Number: CSIR/CAS/EMS/ER/2015/0001/B. Stellenbosch.	2015	SEA	The SEA identifies areas where large scale wind and solar PV energy facilities can be developed in terms of Strategic Infrastructure Project (SIP) and in a manner that limits significant negative impacts on the natural environment, while yielding the highest possible socio-economic benefits to the country. These areas are referred to as Renewable Energy Development Zones (REDZs).
Phase 2 Strategic Environmental Assessment for wind and solar photovoltaic energy in South Africa	Department of Environment, Forestry and Fisheries, 2019. Phase 2 Strategic Environmental Assessment for wind and solar PV energy in South Africa. CSIR Report Number: CSIR/SPLA/SECO/ER/2019/0085 Stellenbosch, Western Cape.	2019	SEA	The SEA identifies additional areas where large scale wind and solar PV energy facilities can be developed in terms of Strategic Infrastructure Project (SIP) 8 and in a manner that limits significant negative impacts on the natural environment, while yielding the highest possible socio-economic benefits to the country. These areas are referred to as Renewable Energy Development Zones (REDZs). These are referred to as FA9 eMalahleni (solar PV), FA10 Klerksdorp and. (solar PV) and FA11 Beaufort West (wind). The numbers are a continuation from the5 already gazetted eight REDZs from the Phase 1 wind and solar PV SEA.
The National Screening Tool	Department of Forestry, Fisheries and Environment	September 2022	Spatial	The National Web based Environmental Screening Tool is a geographically based web-enabled application which allows a proponent intending to submit an application for environmental authorisation in terms of the Environmental Impact Assessment

Data / Information	Source	Date	Type	Description
				(EIA) Regulations 2014, as amended to screen their proposed site for any environmental sensitivity.
National Protected Areas and National Protected Areas Expansion Strategy (NPAES)	DFFE	2016	Spatial	The goal of NPAES is to achieve cost effective protected area expansion for ecological sustainability and adaptation to climate change. The NPAES sets targets for protected area expansion, provides maps of the most important areas for protected area expansion, and makes recommendations on mechanisms for protected area expansion.
Procedures for the Assessment and Minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of NEMA when applying for Environmental Authorisation (Gazetted October 2020)	NEMA	2020	Regulations	Prescribe protocols in respect of specific environmental themes for the assessment of, as well as the minimum report content requirements on, the environmental impacts for activities requiring environmental authorisation.
Guidelines for the Implementation of the Terrestrial Flora & Terrestrial Fauna Species Protocols for EIAs in South Africa produced by the South African National Biodiversity Institute on behalf of the Department of Environment, Forestry and Fisheries (2020).	South African National Biodiversity Institute (SANBI) (BGIS)	2020	Guidelines	The purpose of the Species Environmental Assessment Guideline is to provide background and context to the assessment and minimum reporting criteria contained within the Terrestrial Animal and Plant Species Protocols; as well as to provide guidance on sampling and data collection methodologies for the different taxonomic groups that are represented in the respective protocols. This guideline is intended for specialist studies undertaken for activities that have triggered a listed and specified activity in terms of the National Environmental Management Act, 1998 (No. 107 of 1998) (NEMA), as identified by the EIA Regulations, 2014 (as amended) and Listing Notices 1-3.6
The BirdLife South Africa (BLSA) Guidelines for assessing and monitoring the impact of solar power generating facilities on birds in southern Africa. BirdLife South Africa by Jenkins, A.R., Ralston-Patton, Smit- Robinson, A.H. 2017	BirdLife South Africa	2017	Guidelines	These guidelines were developed to ensure that any negative impacts on threatened or potentially threatened bird species are identified and effectively mitigated using structured, methodical and scientific methods. The guidelines prescribe the best practice approach to gathering bird data at proposed utility-scale solar energy plants, primarily for the purposes of accurate and effective impact assessment.

Data / Information	Source	Date	Type	Description
Roberts Birds of Southern Africa, 7th edition.	John Voelcker Bird Book Fund and Percy FitzPatrick Institute of African Ornithology.	2005	Handbook	The most comprehensive single volume handbook on the birds of southern Africa.

2.2 Assumptions, Knowledge Gaps and Limitations

This study assumed that the sources of information used in this report are reliable. In this respect, the following must be noted:

- The SABAP2 data is regarded as an adequate indicator of the avifauna which could occur within the Broader Area. The SABAP2 data was further supplemented by data collected during the on-site surveys to date.
- The focus of the study was on the potential impacts of the proposed solar PV facilities on solar priority species.
- The impact of solar installations on avifauna is a new field of study, with only two published scientific study on the impact of PV facilities on avifauna in South Africa (Rudman, et al., 2017) (Visser, et al., 2019); and one related study on the impacts of concentrated solar power facilities on wildlife in South Africa (Jeal, et al., 2019). Strong reliance was therefore placed on expert opinion and data from existing monitoring programmes at solar facilities in the USA where monitoring has been ongoing since 2013. The pre-cautionary principle was applied throughout as the full extent of impacts on avifauna at solar facilities is not presently known.
- The assessment of impacts is based on the baseline environment as it currently exists at the Broader Area (see Figure 1).

3. TECHNICAL DESCRIPTION

3.1 Project location

The proposed Ezelsjacht SEF is located approximately 13 km east of the town De Doorns, within the Cape Winelands District Municipality of the Western Cape Province. The site proposed for the SEF falls within the Breede Valley Local Municipalities (see Error! Reference source not found. **and** Error! Reference source not found.). **Table 3** shows the farm properties that will be affected by the proposed development.

Table 3: Farm properties which will are included in the Ezelsjacht SEF Project Site.

Applicant	Project Name	Capacity (MW)	Affected Property
South Africa Mainstream Renewable Power Developments (Pty) Ltd	Ezelsjacht Solar PV Energy Facility (SEF)	110 MW	Portion 6 of the Farm Ratelbosch No. 149

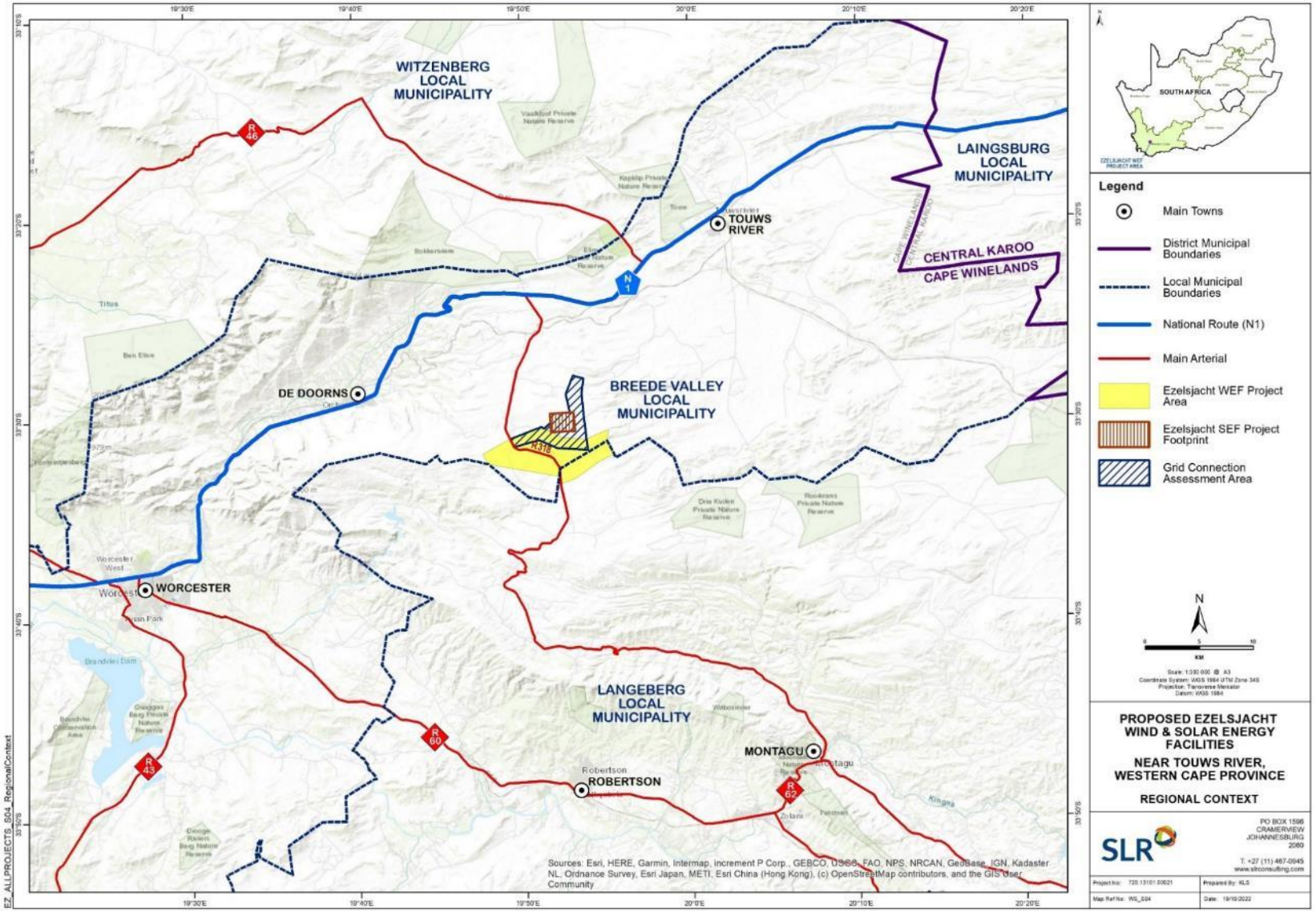


Figure 2: Regional context map – location of the Ezelsjacht SEF

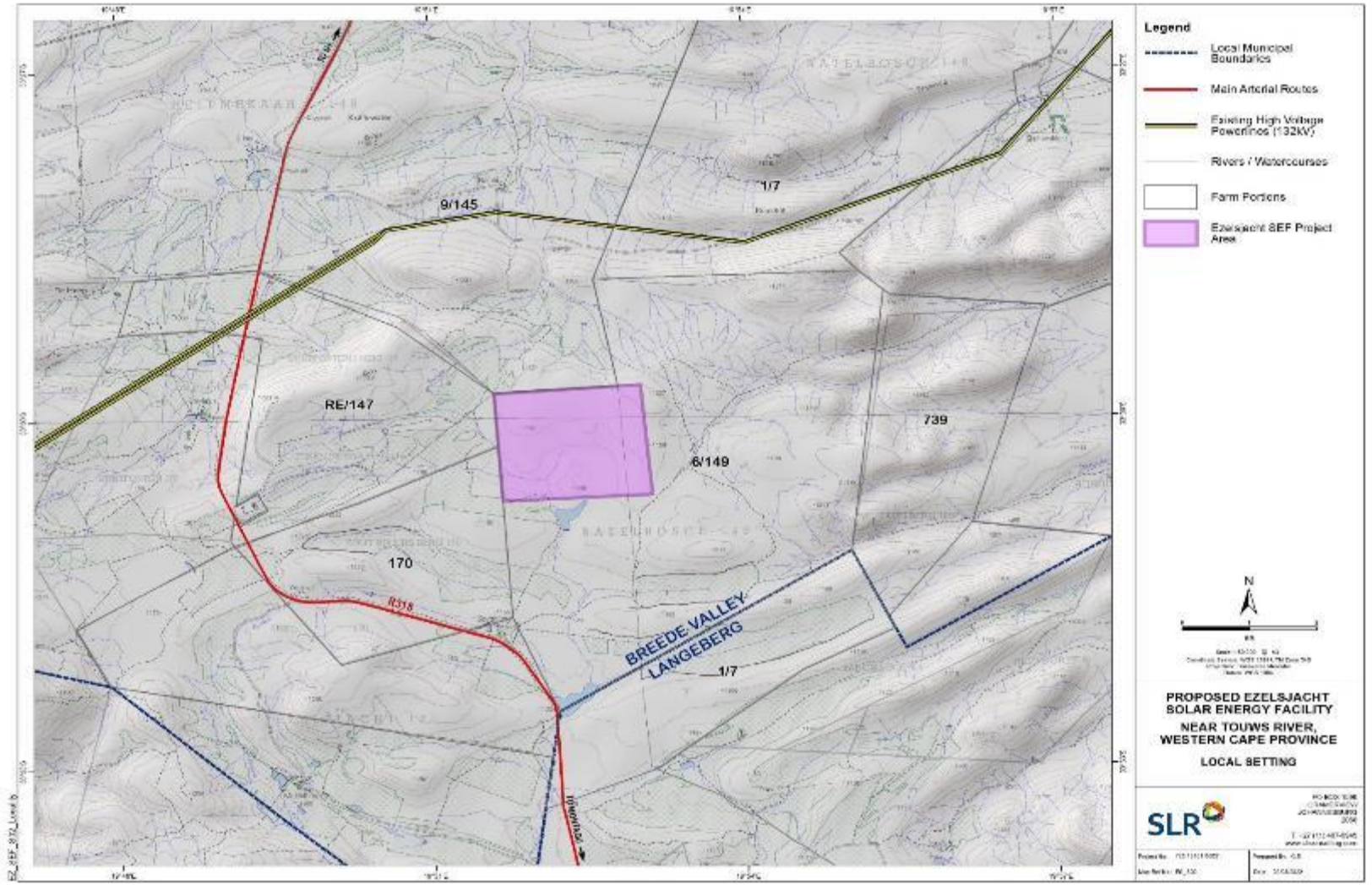


Figure 3: Ezelsjacht SEF site locality.

3.2 Project description

The proposed SEF will consist of PV Panels, internal and access roads (with a width of up to 12 m during construction), a construction laydown area/camp, Operation and Maintenance (O&M) Building and Independent Power Producer (IPP) portion of Substation, amongst other associated infrastructure. The solar PV energy facility will have a generation capacity of up to 110 MW. In addition to the infrastructure mentioned above, the SEF will also potentially include energy storage infrastructure if it is deemed economically feasible to do so. This will consist of an area for a Battery Energy Storage System (BESS) covering an extent of up to approximately 5 hectares (ha). Currently, the battery technologies being considered are either Solid State Batteries or Redox Flow Batteries.

Table 4 below details the aspects of proposed infrastructure for the Ezelsjacht SEF.

Table 4: Description of proposed infrastructure for the Ezelsjacht SEF

Ezelsjacht SEF infrastructure	
Location of the site (centre point)	33°30'21.04"S 19°53'33.22"E
Application site area	+/- 370 hectares
Affected Farm Portions	Portion 6 of the Farm Ratelbosch No. 149
SG Codes	C08500000000014900006
Export Capacity	110 MW
Height of PV panels	Up to 5m
33kV/132kV IPP portion of onsite substation	• The 33kV/132kV IPP portion of the onsite substation will be located adjacent to the 132kV Eskom portion of the substation (EGI for WEF EA Application) within the 25ha Infrastructure Area that has been assessed. • 33kV/132kV IPP portion of the onsite substation will cover an area of approx. 120m x 120m
Battery Energy Storage System (BESS)	• BESS storage of up to 500 MWh will be located within the 25ha Infrastructure Area that has been assessed and will cover an area of approx. 5 ha. A Battery Energy Storage System (BESS) will be located next to the IPP portion / yard of the shared onsite 33/132kV substation and will cover an area of 5 ha. The storage capacity and type of technology would be determined at a later stage during the development phase, but will most likely be either solid state or redox flow.
Roads	Internal roads will be constructed between turbines, existing roads will be utilized as far as possible. The width of the internal roads will be up to 12m wide

Associated Infrastructure	• Operations and Maintenance Building of approx. 5ha within the 25ha infrastructure area that has been assessed. Temporary laydown or staging area, approximately 3ha. • Underground 33kV cables, buried along internal access roads where feasible; and outside of the road footprints and where there are topography and environmental concerns. • Overhead 33kV power lines will be constructed, using monopole structures where burying is not possible due to technical, geological, environmental or topographical constraints. 33kV overhead power lines supported by 132 kV pylons of approximately 22 m high will be required, as well as tracks for access to the pylons. • Galvanized steel fencing of approx. 1.8 m in height. • Other associated infrastructure, stores, workshops,.

3.3 'No go' alternatives

The 'no-go' alternative is the option of not undertaking the proposed SEF and / or grid connection infrastructure projects. Hence, if the 'no-go' option is implemented, there would be no development. This alternative would result in no environmental impacts from the proposed project on the site or surrounding local area. It provides the baseline against which other alternatives are compared and will be considered throughout the report.

4. LEGISLATIVE AND PERMIT REQUIREMENTS

There is no legislation pertaining specifically to the impact of solar facilities and associated electrical infrastructure on avifauna.

4.1 Agreements and conventions

Table 5 below lists agreements and conventions which South Africa is party to, and which is relevant to the conservation of avifauna[1].

[1] (BirdLife International (2022) Country profile: South Africa. Available from: http://www.birdlife.org/datazone/country/south africa.

Table 5: Agreements and conventions which South Africa is party to, and which is relevant to the conservation of avifauna.

Convention name	Description	Geographic scope
African-Eurasian Waterbird Agreement (AEWA)	The Agreement on the Conservation of African-Eurasian Migratory Waterbirds (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 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, (CMS), Bonn, 1979	As an environmental treaty under the aegis of the United Nations Environment Programme, CMS provides a global platform for the conservation and sustainable use of migratory animals and their habitats. CMS brings together the States through which migratory animals pass, the Range States, and lays the legal foundation for internationally coordinated conservation measures throughout a migratory range.	Global
Convention on the International Trade in Endangered Species of Wild Flora and Fauna, (CITES), Washington DC, 1973	CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.	Global
Ramsar Convention on Wetlands of International Importance, Ramsar, 1971	The Convention on Wetlands, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.	Global
Memorandum of Understanding on the Conservation of Migratory Birds of Prey in Africa and Eurasia	The Signatories will aim to take co-ordinated measures to achieve and maintain the favourable conservation status of birds of prey throughout their range and to reverse their decline when and where appropriate.	Regional

4.2 National legislation

4.2.1 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.

4.2.2 The National Environmental Management Act 107 of 1998, as amended (NEMA)

The National Environmental Management Act 107 of 1998, as amended, (NEMA) (as amended) 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, which may significantly affect the environment, may be performed only after an environmental impact assessment or basic assessment has been done and authorization 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.

NEMA makes provision for the prescription of procedures for the assessment and minimum criteria for reporting on identified environmental themes (Sections 24(5)(a) and (h) and 44) when applying for environmental authorisation. The Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020) is applicable in the case of solar PV and powerline developments.

4.2.3 The National Environmental Management: Biodiversity Act 10 of 2004 (NEMBA) and the Threatened or Protected Species Regulations, February 2007 (TOPS Regulations)

The most prominent statute containing provisions directly aimed at the conservation of birds is the National Environmental Management: Biodiversity Act 10 of 2004 (as amended) (NEMBA) 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. The State is endowed with the trusteeship of biodiversity and has the responsibility to manage, conserve and sustain the biodiversity of South Africa.

4.2.4 Provincial Legislation

The current legislation applicable to the conservation of fauna and flora in the Western Cape is the Western Cape Nature Conservation Laws Amendment Act of 2000. This statute provides for the amendment of various laws on nature conservation to transfer the administration of the provisions of those laws to the Western Cape Nature Conservation Board, which includes various regulations pertaining to wild animals, including avifauna.

4.3 Best practice guidelines

In this study, we consulted the BirdLife South Africa (BLSA) Guidelines for assessing and monitoring the impact of solar power generating facilities on birds in southern Africa. (Jenkins, et al., 2017) – hereafter referred to as the 'Solar Guidelines.'

Additionally, we followed the Procedures for the Assessment and Minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of NEMA when applying for Environmental Authorisation (Gazetted October 2020).

Lastly, we followed Guidelines for the Implementation of the Terrestrial Flora & Terrestrial Fauna Species Protocols for EIAs in South Africa produced by the SANBI on behalf of the Department of Environment, Forestry and Fisheries (2020).

5. BASELINE ENVIRONMENTAL DESCRIPTION

5.1. Important Bird Areas (IBAs)

The Langeberg Mountains IBA SA113) (29km south) and Anysberg Nature Reserve IBA SA108 (29km southeast) respectively are the closest IBAs to the Ezelsjacht SEF PAOI (Marnewick et al., 2015). The development is not expected to have any impact on the avifauna in this IBA due to the distance from the development area.

5.2. National Protected Areas and National Protected Areas Expansion Strategy (NPAES) focus areas

There are seven national protected areas located close to (with 10km) of the Ezelsjacht SEF PAOI (DFFE, 2022):

1. Matroosberg Mountain Catchment Area (0km, overlaps with the western portions of the PAOI).
2. Langeberg Mountain Catchment Area (3km southeast).
3. Drie Kuilen Private Nature Reserve (3km east).
4. Bokkeriviere Provincial Nature Reserve (8.5km north).
5. Elim Private Nature Reserve (9km north).
6. Aquila Private Game Reserve (9.5km North)
7. Rooikrans Private Nature Reserve (9.5 km east).

The Mountain Catchment Areas and Provincial Nature Reserves constitute part of the Hex River Conservation Area managed by Cape Nature. Cape Nature highlight Verreaux's Eagle (Globally Least Concern, Regionally Vulnerable) as a Focal Conservation Target species (Cape Nature, 2021).

Drie Kuilen Private Nature Reserve, certified as a conservation stewardship site by Cape Nature, is also stated to include conserve Verreaux's Eagle and (Globally Vulnerable, Regionally Neat Threatened), among other wind priority bird species (https://www.driekuilen.co.za/about). Aquila Private Game Reserve is not stated to consciously conserve Red List/wind priority avifauna (https://www.aquilasafari.com/wildlife-and-conservation/).

No avifaunal conservation information could be procured for Elim Private Nature Reserve and Rooikrans Private Nature Reserve.

Verreaux's Eagle and Blue Crane are a recognised wind priority species with an observed presence within the PAOI (see Sections 5.6 and 5.7). It is therefore anticipated that Verreaux's Eagle will likely be impacted by the Ezelsjacht SEF, undermining provincial conservation efforts in this key conservation area.

5.3. The DFFE National Screening Tool

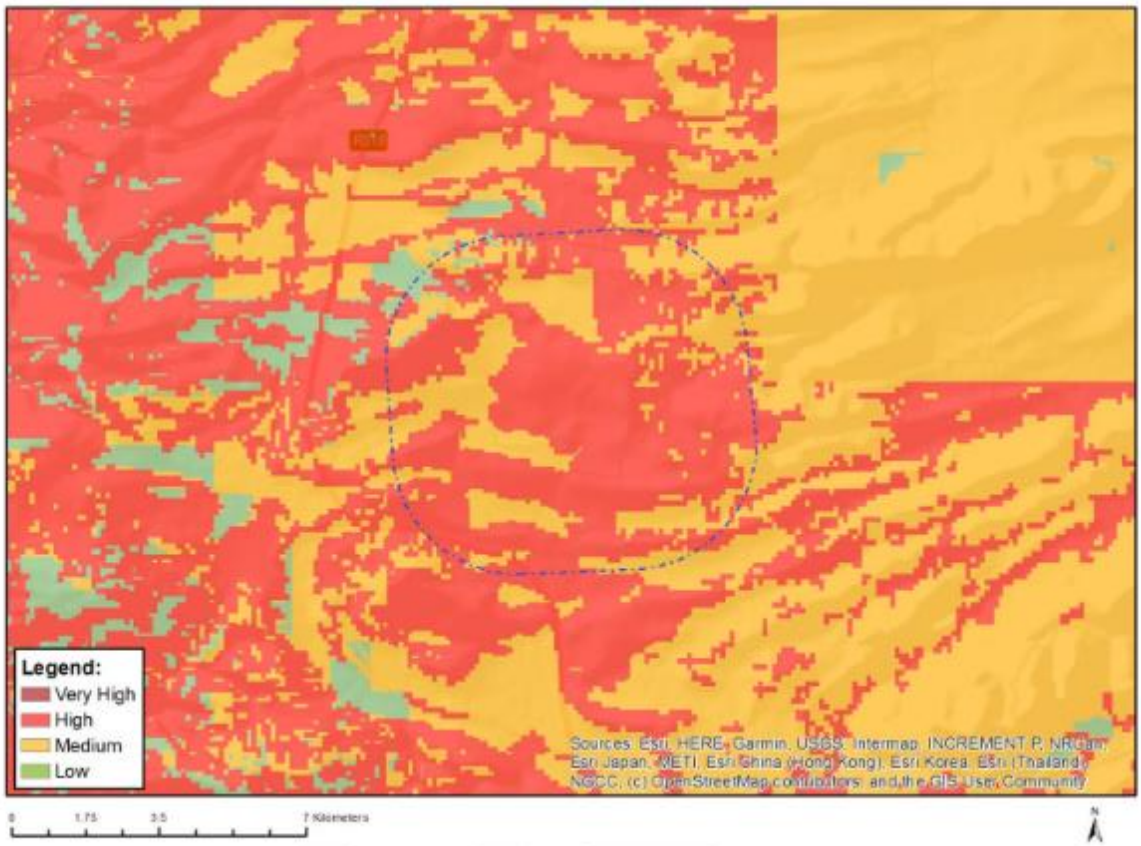
According to the DFFE national screening tool, the habitat within the PAOI is classified as **High Sensitivity** according to the Terrestrial Animal Species theme (see **Error! Reference source not found.**)[2]. The classification of **High Sensitivity** and **Medium Sensitivity** in the Terrestrial Animal Species theme is linked to the potential presence of species of conservation concern (SCC), namely Black Harrier (Globally Endangered, Regionally Endangered), Southern Black Korhaan (Globally Vulnerable, Regionally Vulnerable), and Verreaux's Eagle (Globally Least Concern, Regionally Vulnerable).

The PAOI contains confirmed habitat for the species of conservation concern (SCC) as defined in the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020). The occurrence of SCC was confirmed during the integrated pre-construction monitoring programme for the overlapping Ezelsjacht SEF PAOI, with observations of the above four SCC recorded during pre-construction monitoring. Other Red List species were also during preconstruction monitoring include Black Stork (Globally Least Concern, Regionally Vulnerable), Blue Crane (Globally Vulnerable, Regionally Near Threatened), Lanner Falcon (Globally Least Concern, Regionally Vulnerable), Secretarybird (Globally Endangered, Regionally Vulnerable).

Based on the field surveys to date, a classification of **High sensitivity** for avifauna in the screening tool for the whole PAOI is therefore appropriate.

[2] The Wind Theme is only applicable to sites within Renewable Energy Development Zones (REDZ).

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Circus maurus
High	Aves-Afrotis afra
High	Aves-Aquila verreauxii
Low	Subject to confirmation
Medium	Aves-Circus maurus
Medium	Aves-Aquila verreauxii
Medium	Insecta-Aloeides caledoni
Medium	Mammalia-Bunolagus monticularis

Figure 4: The classification of the PAOI according to the avian theme for terrestrial animal species theme in the DFFE National Screening Tool. Medium and High sensitivity is linked to Black Harrier (*Circus maurus*), Martial Eage (*Polemaetus bellicosus*), Southern Black Korhaan (*Afrotis afra*), and Verreaux's Eagle *(Aquila verreauxii*).

5.4 Physical landscape (terrain and hydrology), climate, and biome characteristics

The Ezelsjacht SEF PAOI is situated within mountainous terrain, with rugged slopes, ridges and ravines present throughout the PAOI (see Error! Reference source not found.). The Project Site itself positioned with comparably gentler slopes within a broad valley between mountains flanking the PAOI. There are numerous minor drainage lines intersecting the PAOI, which are all non-perennial streams that originate from the local mountains (see Error! Reference source not found.).

The PAOI has drier Mediterranean climate seasonality, experiencing warm, dry summers and mildly cold, wet winters (https://www.meteoblue.com/, accessed October 2022). The mean temperatures range 33°C (January) to 5°C (July). The mean annual precipitation is 267 mm. Rainfall seasonality is relatively low within the PAOI, ranging from 14mm during the drier summer months to 35mm during the late autumn/winter months.

The PAOI is situated in the Western Fynbos-Renosterverld Bioregion of the Fynbos Biome (SANBI, 2018), represented here as by Matjiesfontein Shale Renosterveld with Matjiesfontein Quartzite along ridgeline slopes (see Error! Reference source not found.) (Rebelo et al., 2006; SANBI, 2018). Renosterveld vegetation is the dominant natural habitat over much of the PAOI (see Error! Reference source not found.) (Rebelo et al., 2006; SANBI, 2018), and this is characterized as “open to medium dense leptophyllous shrubland with a medium dense matrix of short divaricate shrubs, dominated by renosterbos” (Rebelo et al., 2006).

The bioregions within the PAOI form part of the Cape Floristic Region, a recognised Centre of Endemism within South Africa (Van Wyk & Smith, 2001).

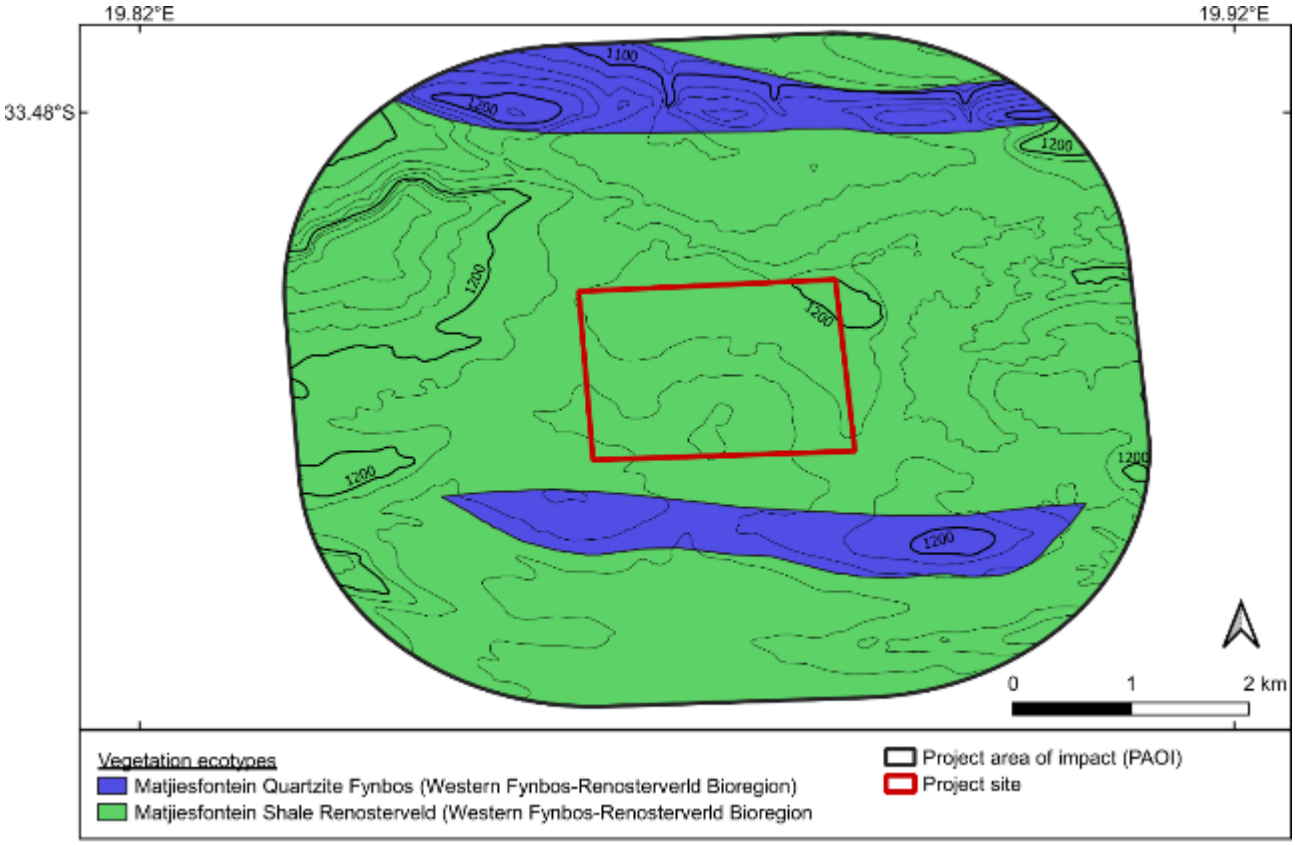


Figure 5: Map of the physical environment within the Ezelsjacht SEF project area of impact, showing elevation (Chief Directorate: National GeoSpatial Information, 2017) and floral bioregions and ecotypes (SANBI, 2018).

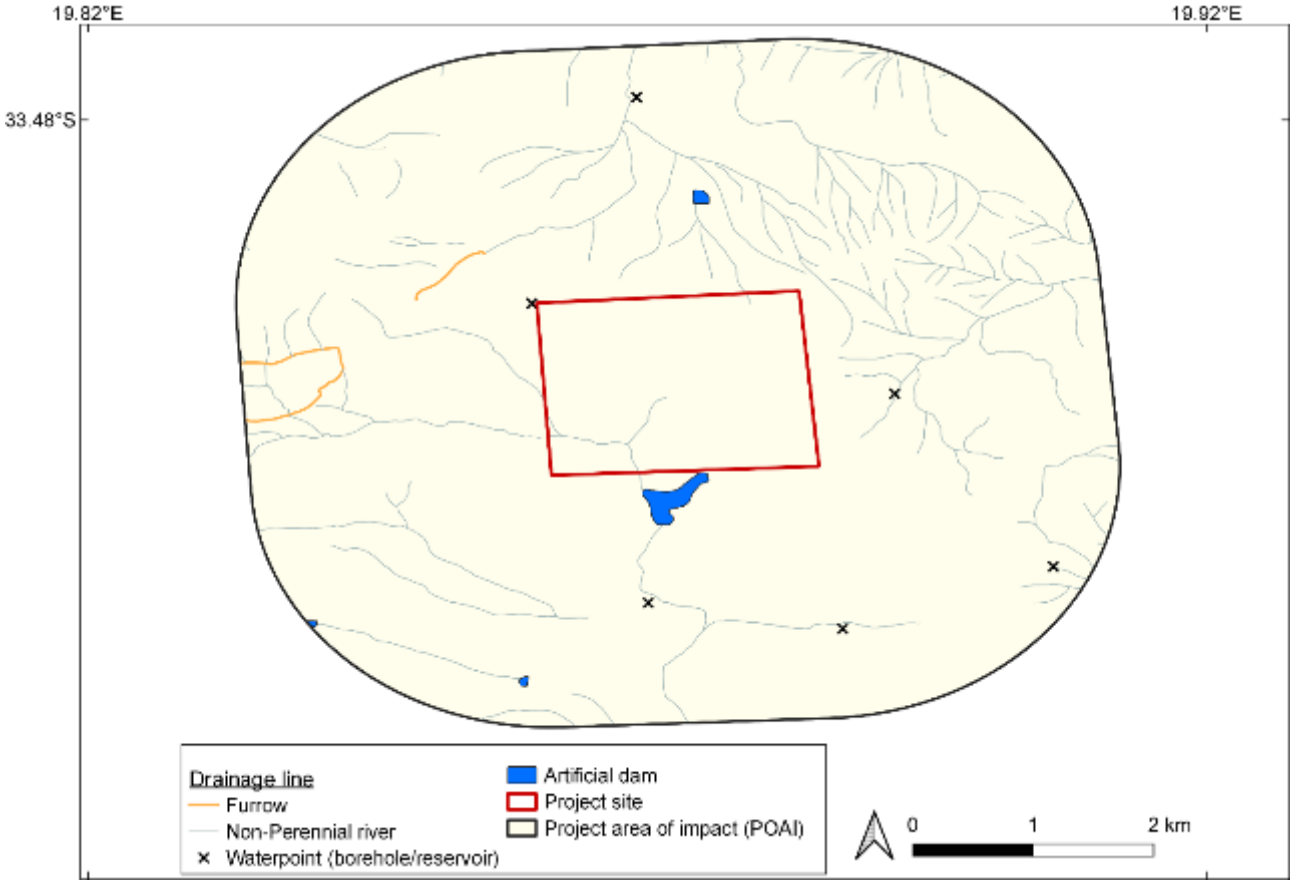


Figure 6: Map of drainage lines, artificial dams, furrows, and irrigation canals, as well as waterpoints (boreholes and reservoirs) within the Ezelsjacht SEF project area of impact (Chief Directorate: National GeoSpatial Information, 2017).

5.5 Bird habitat classes

While the dominant vegetation, topography, and hydrology largely explain the distribution and abundance of the bird species within the PAOI, it is also important to examine the modifications which have changed the natural landscape, and which may impact the distribution of avifauna. These are sometimes evident at a much smaller spatial scale than the biome or vegetation types and are determined by a host of factors such as land use and man-made infrastructure.

The following six habitat classes were identified as relevant to priority bird species in the PAOI (Harrison et al., 1997a, 1997b). See Error! Reference source not found. for map of land-cover classes within the PAOI, and see Appendix 5 for photographs of the habitat classes.

5.5.1. Fynbos and Renosterveld

The fynbos and renosterveld bioregions and ecotypes within the PAOI are characterised by similar vegetation structure and are collectively classified as Low Fynbos Shrubland according to the official 2018 national land-cover census (DEA & DALRRD, 2019): natural, low (0.2-2m canopy height) woody shrubland comprising Fynbos (and Karoo-type) vegetation communities, where the total plant canopy cover is typically dominant over any adjacent bare ground exposure.

This low fynbos shrubland habitat has ostensibly remained intact across most the PAOI (see Error! Reference source not found.), in part due to the mountainous terrain precluding landscape transformation for viable economic use; along shallower slopes within the valley, this habitat class has been more extensively replaced by agriculture (DEA & DALRRD, 2019). Pockets of grass species-dominated communities appear present on certain mountain slopes in the PAOI (see Error! Reference source not found.); however, these habitats can be both subsumed within the dominant low fynbos shrubland. The low fynbos shrubland within the PAOI likely attracts a range of fynbos avifauna, especially montane fynbos bird species.

5.5.2. Agriculture

Commercial agriculture has replaced some of the indigenous renosterveld and fynbos at lower elevations and gentler slopes within the PAOI (see Error! Reference source not found.). Most of this agriculture is non-irrigated cereal croplands (wheat/barley), although there are pivot irrigation schemes and fruit orchards as well. Cereal croplands within the Western Cape can attract priority bird species primarily present in grassland habitats. Fallow fields have afforded opportunities for the re-establishment of secondary (disturbed) renosterveld/fynbos communities.

5.5.3. Artificial dams and waterpoints

There are numerous small artificial dams and waterpoints (boreholes and reservoirs) within the PAOI (see Error! Reference source not found. and Error! Reference source not found.). The artificial dams are constructed along the non-perennial streams present within the PAOI, and likely serve to store the infrequent water from these drainage lines. Additionally, there are artificial furrows dug from different dams and water points to agricultural fields. Surface water is a notable attraction for many priority bird species, including raptors, which use these locations as opportunities to bath and drink.

5.5.4. Drainage lines and herbaceous wetlands

There is an extensive network of non-perennial drainage lines throughout the PAOI (see Error! Reference source not found.). Herbaceous wetlands are established along certain drainage lines, particularly along the gentler slopes (see Error! Reference source not found.). These drainage lines provide temporary drinking/bathing opportunities for many bird species, and the herbaceous wetlands provide potential foraging, roosting, and perhaps breeding opportunities for certain priority bird species.

5.5.5. Mountain ridges

The mountain ridges and rugged hills within the PAOI include sections of exposed rocky cliffs (see Error! Reference source not found. and Error! Reference source not found.) which are attractive nest sites for many priority species, particularly raptors. Additionally, these terrain features also provide opportunities for slope-soaring and -kiting, and behavior in which certain priority raptor species are known to engage.

5.5.6. Alien trees

Small stands of alien tree species are established within the PAOI, serving as wind breaks next to agricultural lands and around homesteads. Some of the drainage lines also have alien trees growing alongside, some of which were originally planted to protect earth-embankment dams. Alien tree stands occupy too small an area

within the PAOI to have been detected by official land-cover surveys, yet do still provide nesting and roosting opportunities for certain priority bird species.

5.5.7. Overhead high voltage powerlines

The Boskloof-Quarry Traction 1 132kV OHL reticulation powerline intersects the northern portions of the PAOI (see Error! Reference source not found.), affording roosting and breeding opportunities for several priority bird species.

Appendix 5 provides the photographic records of the relevant habitats with the Ezelsjacht SEF PAOI.

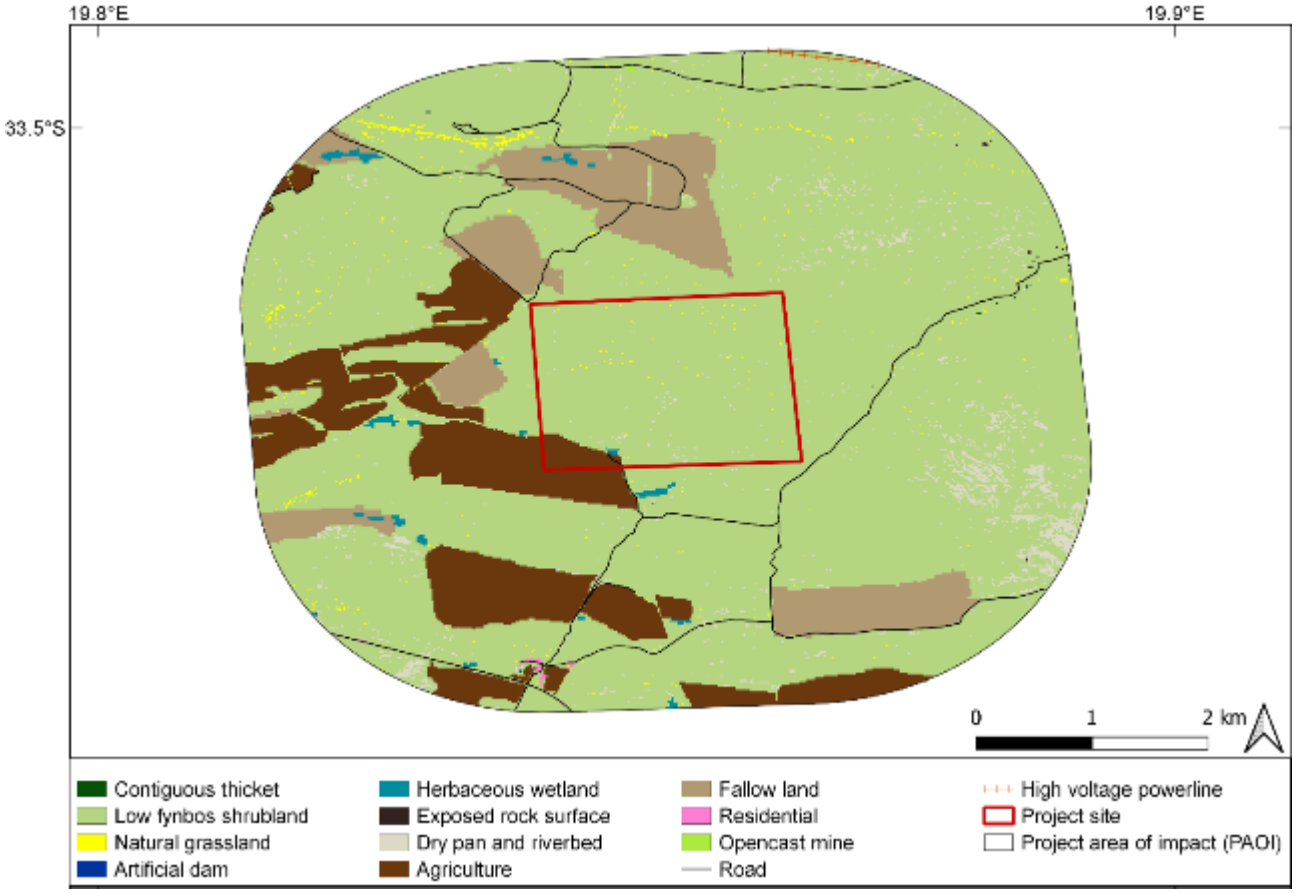


Figure 7: Land-cover and land-use within the Ezelsjacht SEF project area of impact (DEA & DALRRD, 2019)

5.6. Avifauna in the Broader Area

A total of 190 bird species have been detected during SABAP2 observations and/or during pre-construction monitoring at the proposed Ezelsjacht WEF project area, that overlaps with the SEF, and so could potentially occur in the broader area – see Appendix 6. Of these, 92 are classified as priority species for solar developments[3]. Of the 92 solar priority species, 62 have a medium-to-high probability of occurring regularly in the Broader Area, of which 52 species were recorded during the on-site pre-construction monitoring.

See Appendix 6 for a list of species potentially occurring in the Broader Area. The possibility of solar priority species occurring in the Broader Area and potential impacts on them by the proposed PV facilities and associated infrastructure, are listed in Table 6 below.

[3] The two planned surveys in the solar development area have not yet been completed at the time of writing.

Table 6: The solar priority bird species likely to occur within the PAOI, and the associated potential impacts of the proposed Ezelsjacht SEF to which these species are vulnerable.

Red List status: EN = Endangered, VU = Vulnerable, NT = Near threatened, LC = Least Concern
Likelihood of occurrence in the PAIO: L = Low, M = Medium; H = High

Species name	Scientific name	Full protocol reporting rate	Ad hoc protocol reporting rate	Global status	Regional status	Endemic (SA)	Recorded during monitoring	Likelihood of regular occurrence	Renosterveld/Fynbos	Agriculture	Dams and boreholes	Drainage lines and wetlands	Mountains	HV lines	Alien trees	Collisions with solar panels	Displacement: Disturbance	Displacement: Habitat transformation	Entanglement in fences	Electrocution MV 33kV	Collision 33kV
Black Sparrowhawk	*Accipiter melanoleucus*	1.22	0.00	-	-			L		x	x				x		x	x		x	
Rufous-breasted Sparrowhawk	*Accipiter rufiventris*	3.66	3.33	-	-		x	M		x					x		x	x		x	
Common Sandpiper	*Actitis hypoleucos*	1.22	0.00	-	-			L			x	x				x					
Southern Black Korhaan	*Afrotis afra*	35.37	20.00	VU	VU	x	x	H	x							x	x	x	x		x
Egyptian Goose	*Alopochen aegyptiaca*	75.61	35.00	-	-		x	H		x	x	x		x	x	x	x			x	x
Cape Teal	*Anas capensis*	9.76	1.67	-	-		x	M			x					x					x
Red-billed Teal	*Anas erythrorhyncha*	18.29	1.67	-	-		x	M			x	x				x					x
African Black Duck	*Anas sparsa*	3.66	0.00	-	-		x	M				x				x					x
Yellow-billed Duck	*Anas undulata*	42.68	10.00	-	-		x	H			x	x				x					x
African Darter	*Anhinga rufa*	2.44	0.00	-	-			L			x					x					x
Orange-breasted Sunbird	*Anthobaphes violacea*	15.85	1.67	-	-	x		M	x					x	x	x	x	x			
Verreaux's Eagle	*Aquila verreauxii*	30.49	6.67	-	VU		x	M	x		x		x	x	x		x	x		x	x

Species name	Scientific name	Full protocol reporting rate	Ad hoc protocol reporting rate	Global status	Regional status	Endemic (SA)	Recorded during monitoring	Likelihood of regular occurrence	Renosterveld/Fynbos	Agriculture	Dams and boreholes	Drainage lines and wetlands	Mountains	HV lines	Alien trees	Collisions with solar panels	Displacement: Disturbance	Displacement: Habitat transformation	Entanglement in fences	Electrocution MV 33kV	Collision 33kV
Grey Heron	*Ardea cinerea*	21.95	8.33	-	-			M			x	x				x					x
Black-headed Heron	*Ardea melanocephala*	31.71	10.00	-	-		x	H		x	x	x			x	x	x	x		x	x
Spotted Eagle-Owl	*Bubo africanus*	8.54	0.00	-	-		x	M	x	x	x			x	x	x	x	x	x	x	x
Western Cattle Egret	*Bubulcus ibis*	2.44	1.67	-	-			L		x	x	x			x	x				x	x
Common Buzzard	*Buteo buteo*	3.66	1.67	-	-			L	x	x	x			x				x		x	
Jackal Buzzard	*Buteo rufofuscus*	40.24	16.67	-	-	x	x	M	x	x	x		x	x	x		x	x		x	
Karoo Lark	*Calendulauda albescens*	21.95	10.00	-	-	x	x	M	x							x	x				
Little Stint	*Calidris minuta*	12.20	0.00	-	-		x	M			x	x				x					
Agulhas Long-billed Lark	*Certhilauda brevirostris*	1.22	0.00	-	NT	x		L		x						x	x				
Pied Kingfisher	*Ceryle rudis*	1.22	0.00	-	-			L			x					x					
Cape Rockjumper	*Chaetops frenatus*	4.88	0.00	NT	NT	x		L					x			x	x	x			
Common Ringed Plover	*Charadrius hiaticula*	2.44	0.00	-	-			L			x	x				x					
Kittlitz's Plover	*Charadrius pecuarius*	14.63	0.00	-	-		x	M			x	x				x					
Three-banded Plover	*Charadrius tricollaris*	37.80	6.67	-	-		x	H			x	x				x					
Black Stork	*Ciconia nigra*	0.00	0.00	-	VU		x	M			x	x	x			x				x	x
Southern Double-collared Sunbird	*Cinnyris chalybeus*	36.59	8.33	-	-	x	x	M	x						x	x	x	x			
Black-chested Snake Eagle	*Circaetus pectoralis*	0.00	0.00	-	-		x	M	x	x	x			x	x		x	x		x	
Black Harrier	*Circus maurus*	18.29	1.67	EN	EN	x	x	H	x	x	x	x					x	x		x	

Species name	Scientific name	Full protocol reporting rate	Ad hoc protocol reporting rate	Global status	Regional status	Endemic (SA)	Recorded during monitoring	Likelihood of regular occurrence	Renosterveld/Fynbos	Agriculture	Dams and boreholes	Drainage lines and wetlands	Mountains	HV lines	Alien trees	Collisions with solar panels	Displacement: Disturbance	Displacement: Habitat transformation	Entanglement in fences	Electrocution MV 33kV	Collision 33kV
Protea Canary	*Crithagra leucoptera*	3.66	0.00	NT	NT	x		L	x							x	x	x			
Forest Canary	*Crithagra scotops*	1.22	0.00	-	-	x		L	x						x	x	x	x			
Cape Siskin	*Crithagra totta*	10.98	0.00	-	-	x		M	x			x	x		x	x	x	x			
Layard's Warbler	*Curruca layardi*	12.20	0.00	-	-	x	x	M	x				x		x	x	x	x			
Black-winged Kite	*Elanus caeruleus*	13.41	0.00	-	-		x	M	x	x				x	x		x	x		x	
Sickle-winged Chat	*Emarginata sinuata*	43.90	8.33	-	-	x	x	M	x				x			x	x	x			
Karoo Eremomela	*Eremomela gregalis*	0.00	1.67	-	-	x		L	x							x	x	x			
Black-eared Sparrow-Lark	*Eremopterix australis*	0.00	0.00	-	-	x	x	M	x		x					x	x	x			
Lanner Falcon	*Falco biarmicus*	4.88	0.00	-	VU		x	M	x	x	x			x	x	x	x	x		x	
Greater Kestrel	*Falco rupicoloides*	1.22	0.00	-	-			L	x					x	x		x			x	
Rock Kestrel	*Falco rupicolus*	64.63	23.33	-	-		x	H	x	x				x	x		x	x		x	
Red-knobbed Coot	*Fulica cristata*	29.27	6.67	-	-		x	M			x					x					x
Large-billed Lark	*Galerida magnirostris*	70.73	26.67	-	-	x	x	H	x							x	x	x			
Common Moorhen	*Gallinula chloropus*	7.32	0.00	-	-			L			x	x				x					
Ground Woodpecker	*Geocolaptes olivaceus*	10.98	1.67	NT	LC	x	x	M	x				x			x	x	x			
Blue Crane	*Grus paradisea*	43.90	21.67	VU	NT		x	H		x	x	x				x	x	x	x		x
African Fish Eagle	*Haliaeetus vocifer*	2.44	0.00	-	-		x	M			x				x		x			x	
Booted Eagle	*Hieraaetus pennatus*	23.17	23.33	-	-		x	M	x				x	x	x		x	x		x	

Species name	Scientific name	Full protocol reporting rate	Ad hoc protocol reporting rate	Global status	Regional status	Endemic (SA)	Recorded during monitoring	Likelihood of regular occurrence	Renosterveld/Fynbos	Agriculture	Dams and boreholes	Drainage lines and wetlands	Mountains	HV lines	Alien trees	Collisions with solar panels	Displacement: Disturbance	Displacement: Habitat transformation	Entanglement in fences	Electrocution MV 33kV	Collision 33kV
Black-winged Stilt	*Himantopus himantopus*	13.41	6.67	-	-		x	M			x					x					
Pied Starling	*Lamprotornis bicolor*	74.39	23.33	-	-	x	x	H	x						x	x	x	x			
Fiscal Flycatcher	*Melaenornis silens*	15.85	5.00	-	-	x		M							x	x	x	x			
Grey Tit	*Melaniparus afer*	1.22	1.67	-	-	x	x	M	x						x	x	x	x			
Pale Chanting Goshawk	*Melierax canorus*	50.00	16.67	-	-		x	H	x	x	x			x	x		x	x		x	
Reed Cormorant	*Microcarbo africanus*	14.63	3.33	-	-			M			x					x					x
Yellow-billed Kite	*Milvus aegyptius*	1.22	1.67	-	-			L	x	x	x			x	x			x		x	
Cape Clapper Lark	*Mirafra apiata*	20.73	3.33	-	-	x	x	H	x							x	x	x			
Sentinel Rock Thrush	*Monticola explorator*	8.54	0.00	NT	LC	x		L	x				x			x	x	x			
Cape Rock Thrush	*Monticola rupestris*	8.54	0.00	-	-	x		L					x			x	x	x			
Southern Pochard	*Netta erythrophthalma*	2.44	0.00	-	-			L			x					x					x
Maccoa Duck	*Oxyura maccoa*	1.22	0.00	EN	NT			L			x					x					x
White-breasted Cormorant	*Phalacrocorax lucidus*	3.66	1.67	-	-		x	M			x				x	x					x
Greater Flamingo	*Phoenicopterus roseus*	1.22	0.00	-	NT			L			x					x					x
Namaqua Warbler	*Phragmacia substriata*	3.66	0.00	-	-	x		L	x							x	x	x			
African Spoonbill	*Platalea alba*	6.10	0.00	-	-						x	x			x	x					x
Spur-winged Goose	*Plectropterus gambensis*	10.98	1.67	-	-			M			x	x		x		x					x
Cape Weaver	*Ploceus capensis*	51.22	18.33	-	-	x	x	M				x				x	x	x			

Species name	Scientific name	Full protocol reporting rate	Ad hoc protocol reporting rate	Global status	Regional status	Endemic (SA)	Recorded during monitoring	Likelihood of regular occurrence	Renosterveld/Fynbos	Agriculture	Dams and boreholes	Drainage lines and wetlands	Mountains	HV lines	Alien trees	Collisions with solar panels	Displacement: Disturbance	Displacement: Habitat transformation	Entanglement in fences	Electrocution MV 33kV	Collision 33kV
Great Crested Grebe	*Podiceps cristatus*	3.66	1.67	-	-			L			x					x					x
Black-necked Grebe	*Podiceps nigricollis*	1.22	0.00	-	-			L			x					x					x
Martial Eagle	*Polemaetus bellicosus*	7.32	0.00	EN	EN		x	M	x	x	x			x	x		x	x		x	
African Harrier-Hawk	*Polyboroides typus*	4.88	3.33	-	-		x	M	x						x		x	x		x	
Karoo Prinia	*Prinia maculosa*	90.24	35.00	-	-	x	x	H	x							x	x	x			
Cape Sugarbird	*Promerops cafer*	18.29	1.67	-	-	x		M	x				x			x	x	x			
Cape Spurfowl	*Pternistis capensis*	45.12	8.33	-	-	x	x	H	x	x							x	x			
Cape Bulbul	*Pycnonotus capensis*	31.71	6.67	-	-	x	x	H	x						x	x	x	x			
Pied Avocet	*Recurvirostra avosetta*	3.66	1.67	-	-		x	M			x	x				x					
Secretarybird	*Sagittarius serpentarius*	1.22	0.00	EN	VU		x	M	x	x	x				x		x	x	x		x
Grey-winged Francolin	*Scleroptila afra*	15.85	1.67	-	-	x	x	H	x				x			x	x	x			
Hamerkop	*Scopus umbretta*	6.10	3.33	-	-			M			x	x			x	x				x	x
Black-headed Canary	*Serinus alario*	28.05	3.33	-	-	x	x	H	x		x					x	x	x			
Cape Shoveler	*Spatula smithii*	8.54	0.00	-	-			L			x					x					x
Cape Grassbird	*Sphenoeacus afer*	4.88	0.00	-	-	x		L	x							x	x	x			
Fairy Flycatcher	*Stenostira scita*	6.10	0.00	-	-	x	x	M	x						x	x	x	x			
Little Grebe	*Tachybaptus ruficollis*	15.85	3.33	-	-		x	M			x					x					x
South African Shelduck	*Tadorna cana*	59.76	26.67	-	-		x	H			x	x				x					x

Species name	Scientific name	Full protocol reporting rate	Ad hoc protocol reporting rate	Global status	Regional status	Endemic (SA)	Recorded during monitoring	Likelihood of regular occurrence	Renosterveld/Fynbos	Agriculture	Dams and boreholes	Drainage lines and wetlands	Mountains	HV lines	Alien trees	Collisions with solar panels	Displacement: Disturbance	Displacement: Habitat transformation	Entanglement in fences	Electrocution MV 33kV	Collision 33kV
Southern Tchagra	*Tchagra tchagra*	6.10	0.00	-	-	x		L	x						x	x	x	x			
African Sacred Ibis	*Threskiornis aethiopicus*	13.41	3.33	-	-		x	M		x	x	x			x	x				x	x
Wood Sandpiper	*Tringa glareola*	2.44	0.00	-	-			L			x	x				x					
Common Greenshank	*Tringa nebularia*	6.10	0.00	-	-			M			x	x				x					
Karoo Thrush	*Turdus smithi*	6.10	0.00	-	-	x		L							x	x	x	x			
Western Barn Owl	*Tyto alba*	0.00	1.67	-	-			L	x	x	x				x		x	x		x	x
Blacksmith Lapwing	*Vanellus armatus*	51.22	8.33	-	-		x	M			x	x				x	x	x			
Cape White-eye	*Zosterops virens*	14.63	3.33	-	-	x		M							x	x	x	x			

6. SCOPING LEVEL IMPACT ASSESSMENT

6.1 Introduction

Anthropogenic climate change poses a global conservation concern, and is predicted to drive rapid redistribution of plant and animal species (National Audubon Society, 2015). Such redistribution events include large-scale population displacements alongside species range reductions and fragmentation, alongside population displacements (Ehrlén & Morris, 2015; Pecl et al., 2017), and changes to the timing interactions (Kharouba et al., 2018). Collectively, these anthropogenically-induced changes pose the risk of extinction event occurring at unprecedented rates compared to natural long-term climate (Urban, 2015) – which is itself a fundamental driver behind species distributions. In 2006, WWF Australia produced a report on the envisaged impact of climate change on birds worldwide (Wormworth & Mallon, 2006). The report found that:

- Anthropogenic Climate change now affects bird species' behaviour, ranges and population dynamics.
- Some bird species are already experiencing strong negative impacts from climate change.
- In future, subject to greenhouse gas emissions levels and climatic response, climate change will put large numbers of bird species at risk of extinction, with estimates of extinction rates varying from 2 to 72%, depending on the region, climate scenario and potential for birds to shift to new habitat.

Using statistical models based on the North American Breeding Bird Survey and Audubon Christmas Bird Count datasets, the National Audubon Society assessed geographic range shifts through the end of the century for 588 North American bird species during both the summer and winter seasons under a range of future climate change scenarios (National Audubon Society, 2015). Their analysis showed the following:

- 314 of 588 species modelled (53%) lose more than half of their current geographic range in all three modelled scenarios.
- For 126 species, range loss is predicted to occur without accompanying range expansion.
- For 188 species, predicted range loss is coupled with the potential to colonize new areas.

Climate sensitivity is an important piece of information to incorporate into conservation planning and adaptive management strategies. The persistence of many birds will depend on their ability to colonize climatically suitable areas outside of current ranges and management actions that target climate change adaptation.

South Africa is among the world's top 10 developing countries required to significantly reduce their carbon emissions (Seymore et al., 2014), and the introduction of low carbon-emitting technologies into the country's compliment of power generation will greatly facilitate achieving this important objective (Walwyn & Brent, 2015). Given that South Africa receives among the highest levels of solar radiation on earth (Fluri, 2009; Munzhedzi & Sebitosi, 2009), it is clear that solar power generation should feature prominently in future national efforts to convert to a more sustainable energy suite of energy productions to combat human-induced climate change.
From an avifaunal perspective, solar power generation undoubtedly presents a long-term benefit to species viability, given that solar power generation is anticipated to mitigate the environmental threats posed by anthropogenic climate change (i.e. rapid species redistribution and broad-scale habitat transformation). However, renewable energy facilities – including solar PV facilities – themselves can impede the viability of bird species populations. The environmental risks associated with solar PV facilities need to be recognised and addressed to minimise the negate impacts such facilities may have of bird species populations.

A literature review reveals a scarcity of published, scientifically examined information regarding large-scale PV plants and birds. The reason for this is mainly that large-scale PV plants is a relatively recent phenomenon. The main source of information for these types of impacts are from compliance reports and a few government-sponsored studies relating to recently constructed solar plants in the south-western United States. In South Africa, only two published scientific studies been conducted on the environmental impacts of PV plants in a South African context (Rudman et al., 2017; Visser et al., 2019). A related scientific study has also been conducted upon the effects of concentrated solar power facilities on wildlife in South Africa (Jeal et al., 2019)

In summary, the main impacts of PV plants on avifauna which have emerged so far include the following:

- Displacement of certain avifaunal priority species due to disturbance associated with the construction and decommissioning of the solar PV plant and associated infrastructure.
- Displacement of certain avifaunal priority species due to disturbance associated with the construction of the solar PV plant and associated infrastructure.
- Mortality of certain avifaunal priority species due to collisions with the solar panels.
- Mortality of certain avifaunal priority species due to entrapment in perimeter fences.
- Mortality of certain avifaunal priority species due to electrocutions in the onsite substations and 33kV medium voltage overhead lines.
- Mortality of certain avifaunal priority species due to collisions with the 33kV medium voltage overhead lines.

6.2 Displacement of certain avifaunal priority species due to disturbance associated with the construction and decommissioning of the solar PV plant and associated infrastructure

As far as disturbance is concerned, it is likely that all the avifauna, including all the solar priority species, will be temporarily displaced in the footprint area, either completely or more likely partially (reduced densities) during the construction and decommissioning phases, due to the disturbance associated with the construction activities e.g., increased vehicle traffic, and short-term construction-related noise (from equipment) and visual disturbance. Rudman et al. (2017) found that the construction phase solar PV facilities present the most significant impacts to birds and other wildlife in arid environments in South Africa. With the implementation of mitigation measures, the significance of the impact is reduced to low.

Construction related disturbances impact surrounding natural habitats in away which compounds the effects of habitat transformation (discussed in Section 6.3). Such impacts include ground disturbance, which can disrupt ecological processes (Lovich & Ennen, 2011; Rudman et al., 2017) as follows:

- lessening soil density,
- worsening water infiltration rate
- exacerbating soil erosion
- dust and crytobiotiotic soil crust destabilisation
- promoting secondary plant succession, and encroachment of invasion plant species)

These processes can collectively contribute to local and regional habitat transformation and degradation, often to the detriment of wildlife, including avifauna. Any disturbance and alteration to the landscape, including the construction and decommissioning of utility-scale solar energy facilities, has the potential to increase soil erosion, and exacerbate the magnitude of dust occurrence within the immediate environment of the solar PV facility (Lovich & Ennen, 2011; Rudman et al., 2017). Erosion and dust destabilisation can physically and physiologically lessen plant species productivity, thereby adversely influence primary production and food

availability for wildlife (Lovich & Ennen, 2011); dust destabilisation can also present respiratory health risks to both people and wildlife (Rudman et al., 2017).

At the PV facility, the solar priority species which would be most severely affected by disturbance would be ground nesting species, those that utilise low shrubs for nesting, and certain raptor species.

Species sensitive to construction- and decommissioning-related disturbances are listed below:

Species Name	Global Status	Regional Status	Occurrence Likelihood
African Fish Eagle	Least Concern	Least Concern	Medium
African Harrier-Hawk	Least Concern	Least Concern	Medium
Agulhas Long-Billed Lark	Least Concern	Near Threatened	Low
Black Harrier	Endangered	Endangered	High
Black Sparrowhawk	Least Concern	Least Concern	Low
Black-Chested Snake Eagle	Least Concern	Least Concern	Medium
Black-Eared Sparrow-Lark	Least Concern	Least Concern	Medium
Black-Headed Canary	Least Concern	Least Concern	High
Black-Headed Heron	Least Concern	Least Concern	High
Blacksmith Lapwing	Least Concern	Least Concern	Medium
Black-Winged Kite	Least Concern	Least Concern	Medium
Blue Crane	Vulnerable	Near Threatened	High
Booted Eagle	Least Concern	Least Concern	Medium
Cape Bulbul	Least Concern	Least Concern	High
Cape Clapper Lark	Least Concern	Least Concern	High
Cape Grassbird	Least Concern	Least Concern	Low
Cape Rock Thrush	Least Concern	Least Concern	Low
Cape Rockjumper	Near Threatened	Near Threatened	Low
Cape Siskin	Least Concern	Least Concern	Medium
Cape Spurfowl	Least Concern	Least Concern	High
Cape Sugarbird	Least Concern	Least Concern	Medium
Cape Weaver	Least Concern	Least Concern	Medium
Cape White-Eye	Least Concern	Least Concern	Medium
Egyptian Goose	Least Concern	Least Concern	High
Fairy Flycatcher	Least Concern	Least Concern	Medium
Fiscal Flycatcher	Least Concern	Least Concern	Medium
Forest Canary	Least Concern	Least Concern	Low
Greater Kestrel	Least Concern	Least Concern	Low
Grey Tit	Least Concern	Least Concern	Medium
Grey-Winged Francolin	Least Concern	Least Concern	High
Ground Woodpecker	Near Threatened	Least Concern	Medium
Jackal Buzzard	Least Concern	Least Concern	Medium
Karoo Eremomela	Least Concern	Least Concern	Low
Karoo Lark	Least Concern	Least Concern	Medium

Species Name	Global Status	Regional Status	Occurrence Likelihood
Karoo Prinia	Least Concern	Least Concern	High
Karoo Thrush	Least Concern	Least Concern	Low
Lanner Falcon	Least Concern	Vulnerable	Medium
Large-Billed Lark	Least Concern	Least Concern	High
Layard's Warbler	Least Concern	Least Concern	Medium
Martial Eagle	Endangered	Endangered	Medium
Namaqua Warbler	Least Concern	Least Concern	Low
Orange-Breasted Sunbird	Least Concern	Least Concern	Medium
Pale Chanting Goshawk	Least Concern	Least Concern	High
Pied Starling	Least Concern	Least Concern	High
Protea Canary	Near Threatened	Near Threatened	Low
Rock Kestrel	Least Concern	Least Concern	High
Rufous-Breasted Sparrowhawk	Least Concern	Least Concern	Medium
Secretarybird	Endangered	Vulnerable	Medium
Sentinel Rock Thrush	Near Threatened	Least Concern	Low
Sickle-Winged Chat	Least Concern	Least Concern	Medium
Southern Black Korhaan	Vulnerable	Vulnerable	High
Southern Double-Collared Sunbird	Least Concern	Least Concern	Medium
Southern Tchagra	Least Concern	Least Concern	Low
Spotted Eagle-Owl	Least Concern	Least Concern	Medium
Verreaux's Eagle	Least Concern	Vulnerable	Medium
Western Barn Owl	Least Concern	Least Concern	Low

6.3 Displacement of certain avifaunal priority species due to habitat transformation associated with the construction of the solar PV plant and associated infrastructure

Habitat transformation refers the anthropogenic conversion of areas natural habitats for human-related purposes. In this instance, some natural habitats are expected to be replaced by the SEF and associated infrastructure. Removal of natural vegetation can entail the reduction of the total area of former natural vegetation, as well as the fragmentation and spatial reconfiguration of natural habitats tracts which may lead to the disruption of ecological processes and isolation of species populations and ecosystem communities to increasing smaller pockets of remnant natural habitat (Fletcher et al., 2018; Haddad et al., 2015; Wilson et al., 2016).

At the landscape level, birds generally appear more sensitive to habitat loss than habitat fragmentation (DeCamargo et al., 2018), including some fynbos bird species (Sandberg et al., 2016). However, habitat specialist bird species are most sensitive to habitat transformation (Bregman et al., 2014; Keinath et al., 2017).

Habitat transformation can disrupt the breeding, foraging, and roosting behaviour of bird populations within the development area. In a study comparing the avifaunal habitat use in PV arrays with adjoining managed grassland at airports in the USA, (DeVault et al., 2014) found that species diversity in PV arrays was reduced compared to the grasslands (37 vs 46), supporting the view that solar development is generally detrimental to wildlife on a local scale.

To identify functional and structural changes in bird communities in and around the development footprint, Visser et al. (2019) gathered bird transect data at the 180 hectares, 96MW Jasper PV solar facility in the Northern Cape, representing the solar development, boundary, and untransformed landscape. The study found both bird density and diversity per unit area was higher in the boundary and untransformed landscape, however, the extent therefore was not considered to be statistically significant. This indicates that the PV facility matrix is permeable to most species. However, key environmental features, including available habitat and vegetation quality are most likely the overriding factors influencing species' occurrence and their relative density within the development footprint. Their most significant finding was that the distribution of birds in the landscape changed, from a shrubland to open country and grassland bird community, in response to changes in the distribution and abundance of habitat resources such as food, water and nesting sites. These changes in resource availability patterns were detrimental to some bird species and beneficial to others. Shrubland specialists appeared to be negatively affected by the presence of the PV facility. In contrast, open country/grassland and generalist species, were favoured by its development (Visser et al., 2019).

As far as displacement, either completely or partially (reduced densities) due to habitat transformation is concerned, it is highly likely that a pattern of reduced avifaunal densities will manifest itself at the proposed PV facilities. Ground nesting species, shrubland specialists and some raptors are likely to be impacted most by the habitat transformation, raptors particularly as a result in reduced prey availability and accessibility.

The following priority species are expected to be vulnerable to displacement due to habitat transformation:

Species Name	Global Status	Regional Status	Occurrence Likelihood
African Harrier-Hawk	Least Concern	Least Concern	Medium
Black Harrier	Endangered	Endangered	High
Black Sparrowhawk	Least Concern	Least Concern	Low
Black-Chested Snake Eagle	Least Concern	Least Concern	Medium
Black-Eared Sparrow-Lark	Least Concern	Least Concern	Medium
Black-Headed Canary	Least Concern	Least Concern	High
Black-Headed Heron	Least Concern	Least Concern	High
Blacksmith Lapwing	Least Concern	Least Concern	Medium
Black-Winged Kite	Least Concern	Least Concern	Medium
Blue Crane	Vulnerable	Near Threatened	High
Booted Eagle	Least Concern	Least Concern	Medium
Cape Bulbul	Least Concern	Least Concern	High
Cape Clapper Lark	Least Concern	Least Concern	High
Cape Grassbird	Least Concern	Least Concern	Low
Cape Rock Thrush	Least Concern	Least Concern	Low
Cape Rockjumper	Near Threatened	Near Threatened	Low
Cape Siskin	Least Concern	Least Concern	Medium
Cape Spurfowl	Least Concern	Least Concern	High
Cape Sugarbird	Least Concern	Least Concern	Medium
Cape Weaver	Least Concern	Least Concern	Medium
Cape White-Eye	Least Concern	Least Concern	Medium

Species Name	Global Status	Regional Status	Occurrence Likelihood
Common Buzzard	Least Concern	Least Concern	Low
Fairy Flycatcher	Least Concern	Least Concern	Medium
Fiscal Flycatcher	Least Concern	Least Concern	Medium
Forest Canary	Least Concern	Least Concern	Low
Grey Tit	Least Concern	Least Concern	Medium
Grey-Winged Francolin	Least Concern	Least Concern	High
Ground Woodpecker	Near Threatened	Least Concern	Medium
Jackal Buzzard	Least Concern	Least Concern	Medium
Karoo Eremomela	Least Concern	Least Concern	Low
Karoo Prinia	Least Concern	Least Concern	High
Karoo Thrush	Least Concern	Least Concern	Low
Lanner Falcon	Least Concern	Vulnerable	Medium
Large-Billed Lark	Least Concern	Least Concern	High
Layard's Warbler	Least Concern	Least Concern	Medium
Martial Eagle	Endangered	Endangered	Medium
Namaqua Warbler	Least Concern	Least Concern	Low
Orange-Breasted Sunbird	Least Concern	Least Concern	Medium
Pale Chanting Goshawk	Least Concern	Least Concern	High
Pied Starling	Least Concern	Least Concern	High
Protea Canary	Near Threatened	Near Threatened	Low
Rock Kestrel	Least Concern	Least Concern	High
Rufous-Breasted Sparrowhawk	Least Concern	Least Concern	M
Secretarybird	Endangered	Vulnerable	M
Sentinel Rock Thrush	Near Threatened	Least Concern	L
Sickle-Winged Chat	Least Concern	Least Concern	M
Southern Black Korhaan	Vulnerable	Vulnerable	H
Southern Double-Collared Sunbird	Least Concern	Least Concern	M
Southern Tchagra	Least Concern	Least Concern	L
Spotted Eagle-Owl	Least Concern	Least Concern	M
Verreaux's Eagle	Least Concern	Vulnerable	M
Western Barn Owl	Least Concern	Least Concern	L
Yellow-Billed Kite	Least Concern	Least Concern	L

6.4 Mortality of certain avifaunal priority species due to collisions with the solar panels

Impact trauma refers to collision-related fatalities incurred by birds due to solar PV facility infrastructure (i.e., fatalities resulting birds flying into project structures). This type of fatality has been occasionally documented at solar projects of all technology types (Hernandez et al., 2014; Kagan et al., 2014; McCrary et al., 1986). Impact trauma fatality can result indirectly through wounded birds more readily succumbing to predation. Sheet glass used in buildings are a well-known hazard for birds, as birds can be misguided by reflections of the sky from sheet glass, oftentimes resulting in high-speed collisions with the glass (Loss, Will, Loss, et al., 2014). Reflective

surfaces of solar panels may pose an avifaunal risk like sheet glass, although this concern remains unsubstantiated.

A related, rarer problem is 'lake effect' whereby the reflective surfaces – particularly of large sheets of dark blue photovoltaic panels – attract flying birds which mistake these surfaces for water (Kagan et al., 2014). This concern is supported by a high proportion of waterbird mortalities (44%) at the Desert Sunlight PV Facility, USA, (Western EcoSystems Technology Inc., 2014), although nearby evaporation ponds are a confounding factor. A meta-analysis by Kosciuch et al. (2020) found no significant evidence for mass mortality related to the lake effect at 10 PV solar facilities in the USA across 13 site years, despite the occurrence of water-obligate birds at 9/10 of these sites. In South Africa, no avian fatalities at solar power facilities have been formally ascribed to the lake effect hypothesis (Jeal et al., 2019; Rudman et al., 2017; Visser et al., 2019). However, the remains insufficient scientific evidence to confidently reject 'lake effect' hypothesis, and so its potential impacts should still be considered.
Weekly mortality searches at 20% coverage were conducted at the California Valley Solar Ranch PV site (Harvey, 2015b, 2015a). These reports found 152 and 54 avian mortalities between November 2013 – 15 February 2014, and February 2014 – May 2014, respectively, for which ~90% had unknown cause of death. These figures give an estimated unadjusted 1,030 mortalities per year, ignoring adjustments for carcasses removed by scavengers, and those missed by searchers. A report by the National Fish and Wildlife Forensic Laboratory (Kagan et al., 2014) determined that impact trauma emerged as the highest identifiable cause of avian mortality, although for most mortalities the cause was unidentifiable. Walston et al. (2015) reviewed avian fatality data from large scale solar facilities in the USA, finding collisions to be the second highest cause of death, after unknown causes; predation following impact trauma is speculated for some of the unknown mortalities. Kosciuch et al. (2020) found that most confirmed collision mortalities involved smaller species that are primarily ground dwelling and inhabit landscapes with relatively low-growing vegetation.

The only study assessing the avifaunal impacts of a South African PV facility was completed in 2016 at the 96MW Jasper PV solar facility (28°17′53″S, 23°21′56″E), 30km east of Postmasburg in the Northern Cape Province (Visser et al., 2019). The Jasper PV facility contains 325 360 solar panels over a footprint of 180 hectares with the capacity to deliver 180 000 MWh of renewable electricity annually. Mortality surveys were conducted from the 14th of September 2015 - 6th of December 2015, reporting seven total avian mortalities inferred from feather spots (0.003 birds/ha/yr). The extrapolated bird mortality within the solar field at the Jasper PV facility was 435 birds/yr (95% CI 133 - 805). The broad confidence intervals result from the small sample size. The mortality estimate is likely conservative because detection probabilities were based on intact birds, which decrease for older carcasses and feather spots. The study concluded *inter alia* that the short study period, and lack of comparable results from other sources made it difficult to provide a meaningful assessment of avian mortality at PV facilities in South Africa. Despite these limitations, the few bird fatalities observed suggest non-significant collision-related mortality at the study site (Visser et al., 2019).

The results of the available literature lack compelling evidence of collisions as a cause of large-scale mortality among birds at PV facilities. However, it is apparent that the lack of systematic and standardised data collection is a major problem in the assessment of the causes and extent of avian mortality at all types of solar facilities, regardless of the technology employed. Until statistically tested results emerge from existing compliance programmes and more dedicated scientific research, conclusions will inevitably be largely speculative and based on professional opinion.

Based on the lack of evidence to the contrary, it is not foreseen that collisions with the solar panels at the PV facility will be a significant impact. The solar priority species which would most likely be potentially affected by this impact include small ground dwelling species which forage between the solar panels, and raptors which predate these small birds or forage for insects and other animals between the PV panels, such as Black Harrier and Lanner Falcon (i.e. if they are not completely displaced due to the habitat transformation).

The following solar priority species which could potentially be impacted due to collisions with the solar panels:

Species Name	Global Status	Regional Status	Occurrence Likelihood
African Black Duck	Least Concern	Least Concern	Medium
African Darter	Least Concern	Least Concern	Low
African Sacred Ibis	Least Concern	Least Concern	Medium
African Spoonbill	Least Concern	Least Concern	Low
Agulhas Long-Billed Lark	Least Concern	Near Threatened	Low
Black Stork	Least Concern	Vulnerable	Medium
Black-Eared Sparrow-Lark	Least Concern	Least Concern	Medium
Black-Headed Canary	Least Concern	Least Concern	High
Black-Headed Heron	Least Concern	Least Concern	High
Black-Necked Grebe	Least Concern	Least Concern	Low
Blacksmith Lapwing	Least Concern	Least Concern	Medium
Black-Winged Stilt	Least Concern	Least Concern	Medium
Blue Crane	Vulnerable	Near Threatened	High
Cape Bulbul	Least Concern	Least Concern	High
Cape Clapper Lark	Least Concern	Least Concern	High
Cape Grassbird	Least Concern	Least Concern	Low
Cape Rock Thrush	Least Concern	Least Concern	Low
Cape Rockjumper	Near Threatened	Near Threatened	Low
Cape Shoveler	Least Concern	Least Concern	Low
Cape Siskin	Least Concern	Least Concern	Medium
Cape Sugarbird	Least Concern	Least Concern	Medium
Cape Teal	Least Concern	Least Concern	Medium
Cape Weaver	Least Concern	Least Concern	Medium
Cape White-Eye	Least Concern	Least Concern	Medium
Common Greenshank	Least Concern	Least Concern	Medium
Common Moorhen	Least Concern	Least Concern	Low
Common Ringed Plover	Least Concern	Least Concern	Low
Common Sandpiper	Least Concern	Least Concern	Low
Egyptian Goose	Least Concern	Least Concern	High
Fairy Flycatcher	Least Concern	Least Concern	Medium
Fiscal Flycatcher	Least Concern	Least Concern	Medium
Forest Canary	Least Concern	Least Concern	Low
Great Crested Grebe	Least Concern	Least Concern	Low
Greater Flamingo	Least Concern	Near Threatened	Low
Grey Heron	Least Concern	Least Concern	Medium

Species Name	Global Status	Regional Status	Occurrence Likelihood
Grey Tit	Least Concern	Least Concern	Medium
Grey-Winged Francolin	Least Concern	Least Concern	High
Ground Woodpecker	Near Threatened	Least Concern	Medium
Hamerkop	Least Concern	Least Concern	Medium
Karoo Eremomela	Least Concern	Least Concern	Low
Karoo Lark	Least Concern	Least Concern	Medium
Karoo Prinia	Least Concern	Least Concern	High
Karoo Thrush	Least Concern	Least Concern	Low
Kittlitz's Plover	Least Concern	Least Concern	Medium
Lanner Falcon	Least Concern	Vulnerable	Medium
Large-Billed Lark	Least Concern	Least Concern	High
Layard's Warbler	Least Concern	Least Concern	Medium
Little Grebe	Least Concern	Least Concern	Medium
Little Stint	Least Concern	Least Concern	Medium
Maccoa Duck	Endangered	Near Threatened	Low
Namaqua Warbler	Least Concern	Least Concern	Low
Orange-Breasted Sunbird	Least Concern	Least Concern	Medium
Pied Avocet	Least Concern	Least Concern	Medium
Pied Kingfisher	Least Concern	Least Concern	Low
Pied Starling	Least Concern	Least Concern	High
Protea Canary	Near Threatened	Near Threatened	Low
Red-Billed Teal	Least Concern	Least Concern	Medium
Red-Knobbed Coot	Least Concern	Least Concern	Medium
Reed Cormorant	Least Concern	Least Concern	Medium
Sentinel Rock Thrush	Near Threatened	Least Concern	Low
Sickle-Winged Chat	Least Concern	Least Concern	Medium
South African Shelduck	Least Concern	Least Concern	High
Southern Black Korhaan	Vulnerable	Vulnerable	High
Southern Double-Collared Sunbird	Least Concern	Least Concern	Medium
Southern Pochard	Least Concern	Least Concern	Low
Southern Tchagra	Least Concern	Least Concern	Low
Spotted Eagle-Owl	Least Concern	Least Concern	Medium
Spur-Winged Goose	Least Concern	Least Concern	Medium
Three-Banded Plover	Least Concern	Least Concern	High
Western Cattle Egret	Least Concern	Least Concern	Low
White-Breasted Cormorant	Least Concern	Least Concern	Medium
Wood Sandpiper	Least Concern	Least Concern	Low
Yellow-Billed Duck	Least Concern	Least Concern	High

6.5 Mortality of certain avifaunal priority species due to entrapment in perimeter fence

Visser et al. (2019) recorded a fence-line fatality of an Orange River Francolin *Scleroptila gutturalis* resulting entrapment between the inner and outer perimeter fence of the facility; additionally, three Red-crested Korhaans

were claimed to be unable to escape between these two fences without intervention from facility personnel. Considering that one would expect the birds to be able to take off in the lengthwise direction (parallel to the fences), it seems possible that the birds panicked when they were approached by observers and thus flew into the fence. Potentially, too-close a parallel configuration of double-fenced perimeters can cause fatalities, particularly of larger terrestrial birds, by way of entrapment, and especially if disturbed by people. This risk remains low, however, with Visser et al. (2019) tentatively presenting a fatality rate of 0.002 birds per km per month from this risk factor, although qualifying that the single documented fatality was inadequate for robust extrapolations. Owls are also prone to getting entangled in barbed wire fences (personal observation).

It is not foreseen that entrapment of solar priority species in perimeter fences will be a significant impact at the PV facility. The solar priority species which could potentially be affected by this impact are most likely medium to large terrestrial species such as Southern Black Korhaan, Blue Crane and large owls such as Spotted Eagle Owl

The following solar priority species which could potentially be impacted due to entrapment:

Species name	Global status	Regional status	Occurrence likelihood
Blue Crane	VU	NT	H
Secretarybird	EN	VU	M
Southern Black Korhaan	VU	VU	H
Spotted Eagle-Owl	-	-	M

6.6 Mortality of certain avifaunal priority species due to electrocution on the internal medium voltage reticulation lines

While the normal practice is to place the medium voltage reticulation network underground as far as possible at the PV facility, there are typically areas where the lines could run above ground, for technical and/or ecological reasons. Above-ground reticulation lines, however, pose an electrocution risk for priority avifauna.

Electrocution refers to instances where birds perch, or attempt to perch, upon electrical structure in a manner that physically bridges the air gap between live components and/or live and earthed components, causing a fatal electrical short circuit through the birds (Bevanger, 1994; van Rooyen, 2000). The electrocution risk is largely determined by the design of the electrical hardware, with medium voltage electricity poles posing a potential electrocution risk to raptors (Cole & Dahl, 2013; Haas et al., 2006; Loss, Will, & Marra, 2014).

While the intention is to place the 33kV reticulation network underground where possible at the PV facility, there are areas where the lines might have to run above ground, for technical reasons. In these instances, the line could potentially pose an electrocution risk to various species, including Red Data species such as Martial Eagle and Verreaux's Eagle.

The following solar priority species and other powerline sensitive species are at risk of electrocution on the medium voltage powerlines, and to a lesser extent in substations:

Species Name	Global Status	Regional Status	Occurrence Likelihood

African Fish Eagle	Least Concern	Least Concern	Medium
African Harrier-Hawk	Least Concern	Least Concern	Medium
African Sacred Ibis	Least Concern	Least Concern	Medium
Black Harrier	Endangered	Endangered	High
Black Sparrowhawk	Least Concern	Least Concern	Low
Black Stork	Least Concern	Vulnerable	Medium
Black-Chested Snake Eagle	Least Concern	Least Concern	Medium
Black-Headed Heron	Least Concern	Least Concern	High
Black-Winged Kite	Least Concern	Least Concern	Medium
Booted Eagle	Least Concern	Least Concern	Medium
Common Buzzard	Least Concern	Least Concern	Low
Egyptian Goose	Least Concern	Least Concern	High
Greater Kestrel	Least Concern	Least Concern	Low
Hamerkop	Least Concern	Least Concern	Medium
Jackal Buzzard	Least Concern	Least Concern	Medium
Lanner Falcon	Least Concern	Vulnerable	Medium
Martial Eagle	Endangered	Endangered	Medium
Pale Chanting Goshawk	Least Concern	Least Concern	High
Rock Kestrel	Least Concern	Least Concern	High
Rufous-Breasted Sparrowhawk	Least Concern	Least Concern	Medium
Spotted Eagle-Owl	Least Concern	Least Concern	Medium
Verreaux's Eagle	Least Concern	Vulnerable	Medium
Western Barn Owl	Least Concern	Least Concern	Low
Western Cattle Egret	Least Concern	Least Concern	Low
Yellow-Billed Kite	Least Concern	Least Concern	Low

6.7 Mortality of certain avifaunal priority species due to collisions with the internal medium voltage reticulation lines

Transmission line collisions pose the greatest threat to birds in southern Africa (van Rooyen, 2004), including in the Overberg near the PAOI (Shaw et al., 2010). Most heavily impacted upon are bustards, storks, cranes and various species of waterbirds, and to a lesser extent, vultures (Shaw et al., 2010; van Rooyen, 2004). 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).

Power line collisions are generally accepted as a key threat to bustards (Barrientos et al., 2012; Raab et al., 2009, 2011; Shaw, 2013; Shaw et al., 2010). One two-year South African study conducted in the Karoo found that bustards comprised 87% of transmission line collision-related mortalities, with Ludwig's bustards alone representing 69% of these mortalities (Shaw, 2013). 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).

Using a controlled experiment spanning a period of nearly eight years (2008 to 2016), the Endangered Wildlife Trust (EWT) and Eskom tested the effectiveness of two types of line markers in reducing power line collision mortalities of large birds on three 400kV transmission lines near Hydra substation in the Karoo. Marking was highly effective for Blue Cranes, with a 92% reduction in mortality, and large birds in general with a 56% reduction in mortality, but not for bustards, including the endangered Ludwig's Bustard. The two different marking devices were approximately equally effective, namely spirals and bird flappers, they found no evidence supporting the preferential use of one type of marker over the other (Shaw et al., 2017).

While the intention is to place the 33kV reticulation network underground where possible at the PV facility, there are areas where the lines might have to run above ground, for technical reasons. In these instances, the line could potentially pose a collision risk to various species.

The following solar priority species and other powerline sensitive species which are most at risk of collisions with the medium voltage powerlines are the following:

Species Name	Global Status	Regional Status	Occurrence Likelihood
African Black Duck	Least Concern	Least Concern	Medium
African Darter	Least Concern	Least Concern	Low
African Sacred Ibis	Least Concern	Least Concern	Medium
African Spoonbill	Least Concern	Least Concern	Low
Black Stork	Least Concern	Vulnerable	Medium
Black-Headed Heron	Least Concern	Least Concern	High
Black-Necked Grebe	Least Concern	Least Concern	Low
Blue Crane	Vulnerable	Near Threatened	High
Cape Shoveler	Least Concern	Least Concern	Low
Cape Teal	Least Concern	Least Concern	Medium
Egyptian Goose	Least Concern	Least Concern	High
Great Crested Grebe	Least Concern	Least Concern	Low
Greater Flamingo	Least Concern	Near Threatened	Low
Grey Heron	Least Concern	Least Concern	Medium
Hamerkop	Least Concern	Least Concern	Medium
Little Grebe	Least Concern	Least Concern	Medium
Maccoa Duck	Endangered	Near Threatened	Low
Red-Billed Teal	Least Concern	Least Concern	Medium
Red-Knobbed Coot	Least Concern	Least Concern	Medium
Reed Cormorant	Least Concern	Least Concern	Medium
Secretarybird	Endangered	Vulnerable	Medium
South African Shelduck	Least Concern	Least Concern	High
Southern Black Korhaan	Vulnerable	Vulnerable	High
Southern Pochard	Least Concern	Least Concern	Low
Spotted Eagle-Owl	Least Concern	Least Concern	Medium
Spur-Winged Goose	Least Concern	Least Concern	Medium
Verreaux's Eagle	Least Concern	Vulnerable	Medium
Western Barn Owl	Least Concern	Least Concern	Low

Western Cattle Egret	Least Concern	Least Concern	Low
White-Breasted Cormorant	Least Concern	Least Concern	Medium
Yellow-Billed Duck	Least Concern	Least Concern	High

7. THE IDENTIFICATION AND ASSESSMENT OF POTENTIAL IMPACTS: SOLAR ENERGY FACILITY

The potential impacts on avifauna identified during the study are listed and assessed in the tables below.

Please Note: this is a preliminary scoping phase assessment and may be revised based on the final conclusions made after the pre-construction monitoring has been completed.

The impact criteria are explained in Appendix 7.

7.1. Construction Phase

- Displacement of priority species due to disturbance associated with the construction of the solar PV energy facility and associated infrastructure (see **Table 7**).
- Displacement of priority species due to habitat transformation associated with the construction of the solar PV energy facility and associated infrastructure (see **Table 8**).

Table 7: Impact assessment and recommended mitigations for the displacement of priority species due to disturbance associated with the construction phase

Issue	Displacement of priority species due to disturbance associated with the construction of the solar PV energy facility and associated infrastructure	
Description of Impact		
Disturbances, dust unsettling, and noise pollution during the construction phase may displace priority bird species, resulting in temporary/long-term local population reductions of these species (see Section 6.2.)		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Construction	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Medium	Low
Duration	Short-term	Very short-term
Extent	Local	Site
Consequence	Medium	Very low
Probability	Probable	Probable
Significance	Medium -	Low -
Degree to which impact can be reversed	There is a potential of reversibility for this impact, especially if the recommended mitigation measures are followed.	
Degree to which impact may cause irreplaceable loss of resources	Species of conservation concern may be displaced from breeding/roosting/foraging habitats; it is possible that such local population reductions may not recover for the foreseeable future.	
Degree to which impact can be mitigated	There is significant scope for mitigation as per the recommended mitigation measures below.	

Mitigation actions		
The following measures are recommended:	(1) Construction activity should be restricted to the immediate footprint of the infrastructure as far as possible. (2) Access to the remainder of the area should be strictly controlled to prevent unnecessary disturbance of priority species. (2) Measures to control noise and dust should be applied according to current best practice in the industry. (3) No construction-related activity should take place within the buffer zone surrounding the observed Martial Eagle nest (-33.473392°S, 19.887225°E)	
Monitoring		
The following monitoring is recommended:	None	
Cumulative impacts		
Nature of cumulative impacts	Repeated successive displacement of priority birds through construction-related disturbance within a 30km radius of the Project Site (see **Figure 8**) may cause regional-scale population reductions in these species. Mitigation measures should reduce the severity of disturbance and allow priority species to largely remain within the regional area.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	Medium -	Low -

Table 8: Impact assessment and recommended mitigations for the displacement of priority species due to habitat transformation associated with the construction of the solar PV energy facility and associated infrastructure.

Issue	Displacement of priority species due to habitat transformation associated with the construction of the solar PV facility and associated infrastructure.	
Description of Impact		
Construction of the SEF and associated infrastructure could result in the loss, fragmentation, and degradation of habitats used by priority species for foraging, roosting, and/or breeding.		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Construction	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Medium	Medium
Duration	Long term	Long term
Extent	Local	Site
Consequence	Medium	Medium
Probability	Probable	Probable
Significance	Medium -	Medium -
Degree to which impact can be reversed	The impact can be reversed by following the mitigation measure below, and through rehabilitation of lost habitat.	

Degree to which impact may cause irreplaceable loss of resources	Species of conservation concern may be displaced from breeding/roosting/foraging habitats; it is possible that such local population reductions may not recover for the foreseeable future.	
Degree to which impact can be mitigated	There is significant scope for mitigation as per the recommended mitigation measures below.	
Mitigation actions		
The following measures are recommended:	(1) Removal of vegetation must be restricted to a minimum and must be rehabilitated to its former state where possible after construction. (2) Vegetation removal in highly sensitive Black Harrier suitable habitats should be avoided wherever possible. (3) Construction of new roads should only be considered if existing roads cannot be upgraded. (4) The recommendations of biodiversity specialist studies must be strictly implemented, especially as far as limitation of the activity footprint is concerned.	
Monitoring		
The following monitoring is recommended:	None	
Cumulative impacts		
Nature of cumulative impacts	The repeated transformation and fragmentation of habitats utilised by priority species due to related developments within a 30km radius of the Project Site (see **Figure 8**) will reduce the ecological carrying capacity of regional natural habitats resulting in population reductions of priority species. However, the extent of habitat transformation from related regional development is relatively restricted, and so the cumulative impacts are not anticipated to result in substantial habitat loss, especially when following the recommended mitigations.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	Medium -	Low -

7.2. Operational Phase

- Priority species mortality due to collisions with the solar panels (see **Table 9**).
- Priority species mortality due to entrapment in perimeter fence (see **Table 10**).
- Priority species mortality due to electrocutions on the overhead sections of the internal 33kV cables (see **Table 11**).
- Priority species mortality due to collisions with the overhead sections of the internal 33kV cables (see **Table 12**).

Table 9: Impact assessment and recommended mitigations for the priority species mortality due to collisions with the solar panels.

Issue	Priority bird species mortality due to collisions with the solar panels.
Description of Impact	
Bird collisions with solar panels pose mortality risks for solar priority bird species.	

Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Operation	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Low	Low
Duration	Long-term	Long-term
Extent	Site	Site
Consequence	Medium	Low
Probability	Probable	Possible
Significance	Low	Very low -
Degree to which impact can be reversed	The reversibility of this impact is highly species dependent. For many priority bird species, population sizes and range extents can recover on their own. However, for Red List species within the PAOI, especially Endangered species, reversing this impact would require proactive conservation efforts to recover population sizes, and compensation for local/regional population displacements.	
Degree to which impact may cause irreplaceable loss of resources	There is a generally low degree to which solar panel collisions can lead to irreplaceable loss/reductions of local avifauna. However, given that there are several Red List, and South African endemic species occurring within the PAOI, potential mortalities of these species due to solar panel collisions can add to the conservation concerns for these species.	
Degree to which impact can be mitigated	There is significant scope for mitigation as per the recommended mitigation measures below.	
Mitigation actions		
The following measures are recommended:	(1) Solar panel-free buffers must be maintained around the water reservoirs and other waterbodies	
Monitoring		
The following monitoring is recommended:	None	
Cumulative impacts		
Nature of cumulative impacts	There are 3-4 additional solar PV energy facilities declared within a 30km of the Ezelsjacht SEF (see Figure 8). The low mortality risks of priority avifauna from solar panel collisions can aggregate across these regional facilities, and collectively pose a moderate mortality risk for regional avifauna without adequate mitigation measures in place.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	Medium -	Low -

Table 10: Priority species mortality due to entrapment in perimeter fence

Issue	Priority bird species mortality due entrapment in the perimeter fences.	
Description of Impact		
Bird entrapment in the perimeter fence of the SEF poses a mortality risk for priority species.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Operation	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Low	Very low
Duration	Long-term	Long-term
Extent	Site	Site
Consequence	Medium	Low
Probability	Possible	Conceivable
Significance	Low	Very low -
Degree to which impact can be reversed	The reversibility of this impact is highly species dependent. For many priority bird species, population sizes and range extents can recover on their own. However, for Red List species within the PAOI, especially Endangered species, reversing this impact would require proactive conservation efforts to recover population sizes, and compensation for local/regional population displacements.	
Degree to which impact may cause irreplaceable loss of resources	There is a generally low degree to which perimeter fence entrapment would lead to irreplaceable loss/reductions of local avifauna. However, given that there are several Red List, and South African endemic species occurring within the PAOI, potential mortalities of these species due to solar panel collisions can add to the conservation concerns for these species.	
Degree to which impact can be mitigated	There is significant scope for mitigation as per the recommended mitigation measures below.	
Mitigation actions		
The following measures are recommended:	(1) It is recommended that a single perimeter fence is used to prevent larger birds become trapped between an inner and outer double fence.	
Monitoring		
The following monitoring is recommended:	None	
Cumulative impacts		
Nature of cumulative impacts	There are 3-4 additional solar PV energy facilities declared within a 30km of the Ezelsjacht SEF (see Figure 8). The low mortality risks of priority avifauna from perimeter entrapment can aggregate across these regional facilities, although the collective regional-level impact of this impact would likely remain low, especially when adhering to the recommended mitigation measures.	

Rating of cumulative impacts	Without Mitigation	With Mitigation
	Low -	Very low -

Table 11: Impact assessment and recommended mitigations for the priority species mortality due to electrocutions on the overhead sections of the internal 33kV cables

Issue	Priority bird species mortality due to electrocutions on the overhead sections of the internal 33kV cables.	
Description of Impact		
Bird electrocutions on overhead sections of internal 33kV lines pose mortality risks for priority bird species.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Operation	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	High	Very low
Duration	Long-term	Long-term
Extent	Local	Local
Consequence	High	Low
Probability	Probable	Conceivable
Significance	High -	Very low -
Degree to which impact can be reversed	The reversibility of this impact is highly species dependent. For many priority bird species, population sizes and range extents can recover on their own. However, for Red List species within the PAOI, especially Endangered species, reversing this impact would require proactive conservation efforts to recover population sizes, and compensation for local/regional population displacements. The species most vulnerable to electrocution within the PAOI are the larger raptors, such as the Red List species Martial Eagle and Verreaux's Eagle.	
Degree to which impact may cause irreplaceable loss of resources	Electrocution-related mortalities can cause priority bird species population reduction, although to a lesser degree than collision-related moralities with solar panels and reticulation lines. Mortalities of Red List species present within the PAOI, especially Endangered species, can exacerbate national and international conservations for these bird species.	
Degree to which impact can be mitigated	There is significant scope for mitigation as per recommended mitigation measures below.	
Mitigation actions		

The following measures are recommended:	1) Underground cabling should be used as much as is practically possible. (2) If the use of overhead lines is unavoidable due to technical reasons, the Avifaunal Specialist must be consulted timeously to ensure that a raptor friendly pole design is used, and that appropriate mitigation is implemented pro-actively for complicated pole structures e.g., insulation of live components to prevent electrocutions on terminal structures and pole transformers.	
Monitoring		
The following monitoring is recommended:	None	
Cumulative impacts		
Nature of cumulative impacts	There is approximately 350km of overhead high voltage powerlines within the 30km radius of the Ezelsjacht SEF (not shown in **Figure 8**), and so the lengthwise contribution of overhead powerlines by the project is comparatively minor. However, the heightened density of overhead powerlines within this 30km radius zone poses an increasing risk for priority avifauna, although this the risk of electrocution-related mortality is moderately low, especially if appropriate mitigation measures are employed.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	High -	Low -

Table 12: Impact assessment and recommended mitigations for the priority species mortality due to collisions with the overhead sections of the internal 33kV cables

Issue	Priority species mortality due to collisions with the overhead sections of the internal 33kV cables.	
Description of Impact		
Bird collisions with overhead sections of internal 33kV reticulation lines pose mortality risks for priority bird species.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Operation	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	High	Low
Duration	Long-term	Long-term
Extent	Local	Local
Consequence	Medium	Low
Probability	Probable	Conceivable
Significance	Medium -	Low -
Degree to which impact can be reversed	The reversibility of this impact is highly species dependent. For many priority bird species, population sizes and range extents can recover on their own. However, for Red List species within the PAOI, especially Endangered species, reversing this impact would require proactive conservation efforts	

	to recover population sizes, and compensation for local/regional population displacements. The species most sensitive to this risk are larger terrestrial Red List species such as Southern Black Korhaan, as well as Red List waterbirds when the dams are full, and the drainage lines contain water, such as Black Stork and Blue Crane.	
Degree to which impact may cause irreplaceable loss of resources	Collision-related mortalities from overhead powerlines can cause priority bird species population reduction. Mortalities of Red List species present within the PAOI, especially Endangered species, can exacerbate national and international conservations for these bird species.	
Degree to which impact can be mitigated	There is significant scope for mitigation as per recommended mitigation measures below.	
Mitigation actions		
The following measures are recommended:	Bird flight diverters should be installed on all the overhead line sections for the full span length according to the applicable Eskom standard at the time.	
Monitoring		
The following monitoring is recommended:	None	
Cumulative impacts		
Nature of cumulative impacts	There is approximately 350km of overhead high voltage powerlines within the 30km radius of the Ezelsjacht SEF (not shown in **Figure 8**), and so the lengthwise contribution of overhead powerlines by the project is comparatively minor. However, the heightened density of overhead powerlines within this 30km radius zone increases the powerline collision-morality risk for priority avifauna, although this risk can be ameliorated following the recommended mitigation measures.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	Medium -	Low -

7.3. Decommissioning Phase

- Displacement due to disturbance associated with the decommissioning (dismantling) of the solar panels and associated infrastructure (see **Table 13**).

Table 13: Impact assessment and recommended mitigations for the displacement of priority species due to disturbance associated with the decommissioning (dismantling) of the solar panels and associated infrastructure

Issue	Displacement due to disturbance associated with the decommissioning (dismantling) of the solar panels and associated infrastructure.
Description of Impact	
Disturbances, dust unsettling, and noise pollution during the construction phase may displace priority bird species, resulting in temporary/long-term local population reductions of these species (see Section 6.2.)	
Type of Impact	Indirect

Nature of Impact	Negative	
Phases	Construction	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Medium	Low
Duration	Short-term	Very short-term
Extent	Local	Site
Consequence	Medium	Very low
Probability	Probable	Probable
Significance	Medium -	Low -
Degree to which impact can be reversed	There is a potential of reversibility for this impact, especially if the recommended mitigation measures are followed.	
Degree to which impact may cause irreplaceable loss of resources	Species of conservation concern may be displaced from breeding/roosting/foraging habitats; it is possible that such local population reductions may not recover for the foreseeable future.	
Degree to which impact can be mitigated	There is significant scope for mitigation as per the recommended mitigation measures below.	
Mitigation actions		
The following measures are recommended:	(1) Dismantling activity should be restricted to the immediate footprint of the infrastructure as far as possible. Access to the remainder of the area should be strictly controlled to prevent unnecessary disturbance of priority species. (2) Measures to control noise and dust should be applied according to current best practice in the industry.	
Monitoring		
The following monitoring is recommended:	None	
Cumulative impacts		
Nature of cumulative impacts	Repeated successive displacement of priority birds through infrastructural decommission-related disturbance within a 30km radius of the Project Site (see **Figure 8**) may cause regional-scale population reductions in these species. Mitigation measures should reduce the severity of disturbance and allow priority species to largely remain within the regional area.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	Medium -	Low -

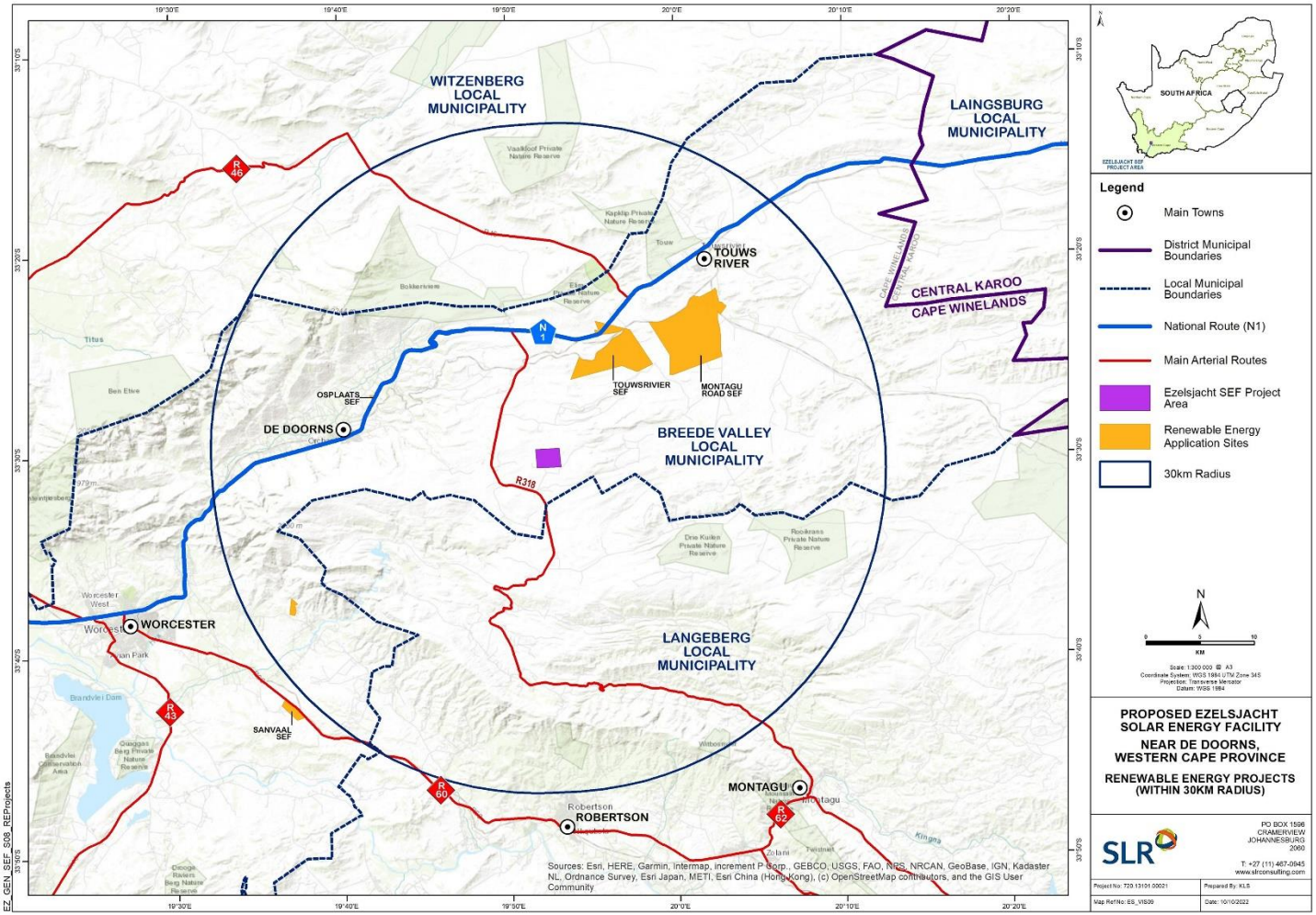


Figure 8: Cumulative impact map showing other renewable energy developments within a 30 km radius from the Ezelsjacht Renewable Energy Facilities

7.4. The identification of environmental sensitivities: Solar Energy facility

The avifaunal sensitivity zones that have been identified through the fieldwork are listed and described below.

7.4.1. All infrastructure exclusion zones (high sensitivity) – raptor nest site buffers

No new infrastructure should be constructed within 2.5km of the Martial Eagle nest (-33.473392°S, 19.887225°E), within 1k of the Verreaux's Eagle nest (-33.478181°S, 19.948129°E), and within 750m of the Booted Eagle or Jackal Buzzard nest (-33.493918°S, 19.920024°E) which are proximal to the PAOI of the Ezelsjacht SEF (see Figure). The buffer areas will also reduce the risk of injury to juvenile birds due to collision with solar panels, when they start flying and practicing their hunting techniques near their nests.

7.4.2. Solar panel exclusion zones (high sensitivity) – surface water and wetland buffers

A 100m solar panel exclusion zone buffer is recommended around all surface water, drainage lines, and associated herbaceous wetlands (see Figure). These exclusion zones encompass the non-perennial drainage lines which can, when flowing, attract birds. Surface water area are important congregation points for priority avifauna and many non-priority species. It is important to leave open space with no solar panels for birds to access and leave the surface water area unhindered. Surface water is also an important area for raptors to hunt birds which congregate around surface water, and they should have enough space for fast aerial pursuit. This will also benefit species like Blue Cranes which prefer to breed close to water bodies.

Figure shows the avifaunal sensitivity map for the Ezelsjacht SEF's PAOI (and adjacent areas), indicating sensitivity areas identified for PV Development Areas. These maps are subject to potential further refinement based on additional data to be collected during the pre-construction monitoring survey.

8. COMPARATIVE ASSESSMENT OF ALTERNATIVES

8.1. Solar Energy Facility

The final layout has yet to be determined. The Ezelsjacht SEF project site is approximately approximately 370 hectares in extent. Design and layout alternatives will be considered and assessed as part of the EIA. These will include alternatives for the substation locations and for the construction / laydown area.

8.2. No-Go Alternative

The no-go alternative will result in the current *status quo* being maintained as far as the avifauna is concerned. The low human population in the area is definitely advantageous to sensitive avifauna, especially Red Data species. The no-go option would eliminate any additional impact on the ecological integrity of the proposed PAOI as far as avifauna is concerned.

9. CONCLUSION AND SUMMARY

9.1. Summary of Findings

The proposed Ezelsjacht SEF will have several potential impacts on priority avifauna. These impacts are the following:

- Displacement due to disturbance linked to construction activities in the construction phase.
- Displacement due to habitat transformation in the construction phase.
- Priority species mortality due to collisions with solar panels during the operational phase.
- Priority species mortality due to entrapment in the perimeter fence during the operational phase
- Priority species mortality due electrocution on the 33kV MV overhead lines (if any) in the operational phase.
- Priority species mortality due collisions with the 33kV MV overhead lines (if any) in the operational phase.
- Displacement of priority species due to disturbance linked to dismantling activities in the decommissioning phase.

*9.1.1. **Displacement of priority species due to disturbance linked to construction activities in the** construction phase.*

At the PV facility, the solar priority species which would be most severely affected by disturbance would be ground nesting species, those that utilise low shrubs for nesting, and certain raptor species. The pre-mitigation impact is rated as **medium** but can be mitigated to **low** levels.

*9.1.2. **Displacement due to habitat transformation in the construction phase.***

As far as displacement, either completely or partially (reduced densities) due to habitat transformation is concerned, it is highly likely that a pattern of reduced avifaunal densities will manifest itself at the proposed PV facilities. Ground nesting species, shrubland specialists and some raptors are likely to be impacted most by the habitat transformation, raptors particularly as a result in reduced prey availability and accessibility. The pre-mitigation impact is rated as **medium**, and will be reduced, but remain at **medium** levels after mitigation.

9.1.3. Priority species mortality due to collisions with solar panels in the operational phase.

Based on the lack of evidence to the contrary, it is not foreseen that collisions with the solar panels at the PV facility will be a significant impact. The solar priority species which would most likely be potentially affected by this impact include small ground dwelling species which forage between the solar panels, and raptors which predate these small birds or forage for insects and other animals between the PV panels, such as Black Harrier and Lanner Falcon (i.e., if they are not completely displaced due to the habitat transformation). The pre-mitigation impact is rated as **low**, and can be reduced very **low** levels.

9.1.4. Priority species mortality due to entrapment in the perimeter fence in the operational phase.

It is not foreseen that entrapment of solar priority species in perimeter fences will be a significant impact at the PV facility. The solar priority species which could potentially be affected by this impact are most likely medium to large terrestrial species such as Southern Black Korhaan, and large owls such as Spotted Eagle Owl. The impact is rated as **low** pre-mitigation and **very low** post-mitigation.

9.1.5. Priority species mortality due to electrocution on the 33kV MV overhead lines (if any) in the operational phase.

While the intention is to place the 33kV reticulation network underground where possible at the PV facility, there are areas where the lines might have to run above ground, for technical reasons. In these instances, the line could potentially pose an electrocution risk to various species, including Red Data species such as Martial Eagle and Verreaux's Eagle. The impact is rated as **high** pre-mitigation and **very low** post-mitigation.

9.1.6. Collisions with the 33kV MV overhead lines (if any) in the operational phase.

While the intention is to place the 33kV reticulation network underground where possible, there are areas where the lines might have to run above ground, for technical reasons. In these instances, the line could potentially pose a collision risk to various species, particularly large terrestrial species including Red Data species such as Southern Black Korhaan, and various waterbirds when the dams are full, and the drainage lines contain water, such as Black Stork and Blue Crane. The impact is rated as **medium** pre-mitigation and **low** post-mitigation.

*9.1.7. **Displacement of priority species due to disturbance linked to dismantling activities in the** decommissioning phase.*

The impact is likely to be similar in nature to the construction phase.

Table 14 summarises the expected impacts of the proposed SEF and proposed mitigation measures per impact.

Table 14: Overall Impact Significance for the SEF (Pre- and Post-Mitigation)

Nature of impact and phase	Overall impact significance (pre - mitigation)	Proposed mitigation	Overall impact significance (post - mitigation)
Construction: Displacement due to disturbance	Medium -	(1) Construction activity should be restricted to the immediate footprint of the infrastructure as far as possible. (2) Access to the remainder of the area should be strictly controlled to prevent unnecessary disturbance of priority species. (2) Measures to control noise and dust should be applied according to current best practice in the industry. (3) No construction-related activity should take place within the buffer zone surrounding the observed Martial Eagle nest (-33.473392°S, 19.887225°E)	Low -
Construction: Displacement due to habitat transformation	Medium -	(1) Removal of vegetation must be restricted to a minimum and must be rehabilitated to its former state where possible after construction. (2) Construction of new roads should only be considered if existing roads cannot be upgraded. (3) The recommendations of biodiversity specialist studies must be strictly implemented, especially as far as limitation of the activity footprint is concerned.	Medium -
Operational: Collisions with the solar panels	Low -	(1) Solar panel-free buffers must be maintained around the water reservoirs and other waterbodies.	Very low -
Operational: Entrapment in perimeter fence	Low	(1) It is recommended that a single perimeter fence is used to prevent larger birds become trapped between an inner and outer double fence.	Very low

Nature of impact and phase	Overall impact significance (pre - mitigation)	Proposed mitigation	Overall impact significance (post - mitigation)
Operational: Electrocutions on the 33kV MV network	High -	1) Underground cabling should be used as much as is practically possible. (2) If the use of overhead lines is unavoidable due to technical reasons, the Avifaunal Specialist must be consulted timeously to ensure that a raptor friendly pole design is used, and that appropriate mitigation is implemented pro-actively for complicated pole structures e.g., insulation of live components to prevent electrocutions on terminal structures and pole transformers.	Very low -
Operational: Collisions with the 33kV MV network	Medium -	Bird flight diverters should be installed on all the overhead line sections for the full span length according to the applicable Eskom standard at the time.	Low -
Decommissioning: Displacement due to disturbance	Medium -	(1) Dismantling activity should be restricted to the immediate footprint of the infrastructure as far as possible. Access to the remainder of the area should be strictly controlled to prevent unnecessary disturbance of priority species. (2) Measures to control noise and dust should be applied according to current best practice in the industry.	Low -

9.2. Conclusion and Impact Statement

The proposed Ezelsjacht SEF will have a **medium impact** on avifauna which, in most instances, and could be reduced to a **low impact** through appropriate mitigation. Any alternative substation and laydown locations will all be situated in essentially the same habitat, i.e., Renosterveld and Fynbos Low shrubland. The habitat is not particularly sensitive, as far as avifauna is concerned.

No fatal flaws are expected to be discovered during the onsite investigations. The development is therefore supported, provided the mitigation measures listed in this report are strictly implemented.

10. FINAL LAYOUT

The final layout is yet to be determined. The Ezelsjacht SEF project site is approximately 370 hectares in extent. Design and layout alternatives will be considered and assessed as part of the EIA. These will include alternatives for the substation locations and for the construction/laydown area.

Figure 9 shows the layout of avifaunal sensitivities within the PAOI.

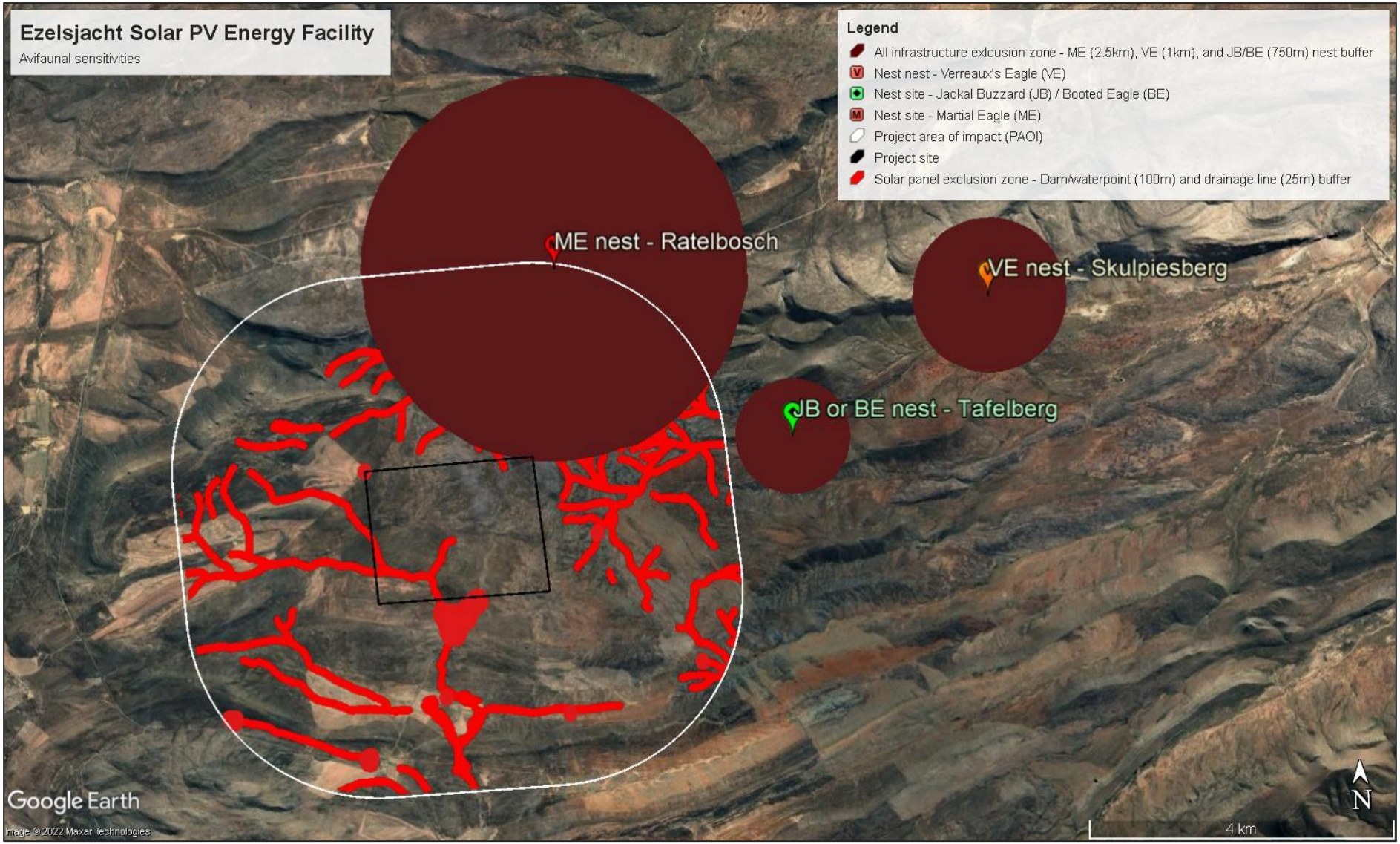


Figure 9: Map of avifaunal sensitives within the Ezelsjacht SEF project area of impact (PAOI). The maroon circles are high sensitivity (all infrastructure exclusion) zones associated with the nests of Martial Eagle (ME), Verreaux's Eagle (VE), and Booted Eagle (BE) /Jackal Buzzard (JB). Red areas further delineate high sensitive (solar panel exclusion) zones around surface waterbodies (100m buffer), as well as drainage lines and wetlands (25m buffer). The which polygon is the project area of impact, and the black polygon is the project site.

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APPENDIX 1: TERMS OF REFERENCE

Site Sensitivity Verification and Reporting

The Specialists are required to compile four (4) separate Specialist Impact Assessment Reports / Compliance Statements (including Site Sensitivity Verification Reports - SSVRs), as required (depending on sensitivities identified and level of assessment required considering the findings of DFFE's online screening tool report1). Appendix 1 Table 1 shows a summary of the number of specialist reports required for the proposed project, as well as the requisite processes (Scoping & EIA or BA) being undertaken for the proposed project.

Appendix 1 Table 1: NEMA processes for proposed Ezelsjacht Renewable Energy Facilities

Specialist Report	Project	Process
140 MW Wind Energy Facility (WEF)	Ezelsjacht Renewable Energy Facilities	Scoping and EIA Process
100 MW Solar PV Energy Facility (SEF)		Scoping and EIA Process
EGI for WEF		BA Process
EGI for SEF		BA Process

Site Sensitivity Verification Report (SSVR)

SSVRs are mandatory for all specialists, according to GN. 320 of March 2020. This will be appended to the specialist's Impact Assessment Report or factored into the Compliance Statement (depending on level of assessment required).

In summary, the key content is as follows:

1. If relevant, a table cross referencing how the requirements for specialist reports have been adhered to according to Appendix 6 of the EIA Regs, 2014 (as amended).
2. Executive summary
3. Project description
4. Relevant legislation and guidelines including the requirement for any permits
5. Methodology including details of field work, consultations, gaps and uncertainties
6. Baseline environment
7. Sensitivity mapping (overlain with the layout/s)
8. Impact assessment, including the no-go assessment
9. Mitigation and EMPr requirements
10. Cumulative impact assessment
11. Conclusion / impact statement on the acceptability of the project/s

Executive Summary

Specialists must provide an Executive Summary summarising the findings of their report to allow for easy inclusion in the EIA / BA reports.

Project Description

The project descriptions for each of the projects are set out in the Assessment Report template which has been compiled so as to explicitly depict the differences between the respective projects. This same project description can then be used for the SSV Reports and Compliance Reports although not repeated in these templates.

Relevant legislation and guidelines including the requirement for any permits

The specialist report must include a thorough overview of all applicable best practice guidelines, relevant legislation, prescribed Assessment Protocols and authority requirements.

Methodology including details of field work, consultations, gaps and uncertainties

The impacts of the proposed project (during the Construction, Operation and Decommissioning phases) are to be assessed and rated according to the methodology described below, which was developed by SLR to align with the requirements of the EIA Regulations, 2014 (as amended). Specialists will be required to make use of the impact rating matrix provided by SLR (in Excel format) for this purpose (see Appendix 6).

Baseline environment

The specialist report must include a description of the baseline environment, including baseline environmental sensitivity.

Sensitivity mapping

The report must present the findings of the specialist studies and explain the implications of these findings for the proposed development (e.g. permits, licenses etc.). This section of the report should also identify any sensitive and/or 'no-go' areas on the PAOI or within the power line assessment corridors. These areas must be mapped clearly with a supporting explanation provided.

This section of the report should also specify if any further assessment will be required.

Impact assessment, including the no-go assessments

The impacts (both direct and indirect) of the proposed WEF, SEF, and the proposed grid connection infrastructure (during the Construction, Operation and Decommissioning phases) are to be assessed and rated *separately* according to the methodology developed by SLR. Specialists will be required to make use of the impact rating matrix provided (in Excel format) for this purpose, and *separate tables* must be provided for the WEF and for the grid connection infrastructure respectively. **Please note that the significance of Cumulative Impacts should also be rated in this section.** Both the methodology and the rating matrix will be provided by SLR.

Please be advised that this section must include mitigation measures aimed at minimising the impact of the proposed development.

Consideration must be given to the 'no-go' option in the respective Scoping & EIA and BA processes. The 'no-go' option assumes that the respective project sites remain in their current state, i.e., there is no construction of the WEF, solar PV energy facility (including associated infrastructure) and supporting grid infrastructure in the proposed project area and the status quo would proceed.

The findings of the respective specialist studies will be used to further inform the location of the wind turbines and solar PV array. All identified sensitive and/or no-go areas (including their respective buffers) will be avoided accordingly, as required. The site areas / location alternatives for the associated infrastructure such as the O&M Buildings, IPP Substations and BESS, as well as the respective powerline corridor alternatives, will also need to be assessed against the 'no go' alternative. The 'no-go' alternative is the option of not constructing the respective projects, where the status quo of the current status and/or activities on the site would prevail.

Mitigation and EMPr requirements

The report must include a description of the key monitoring recommendations for each applicable mitigation measure identified for each phase of the project for inclusion in the Environmental Management Programme (EMPr) or Environmental Authorisation (EA).

Please make use of the Impact Rating Table (in Excel format) for each of the phases i.e. Design, Construction, Operation and Decommissioning.

Cumulative Impact Assessment

A cumulative impact assessment must be undertaken for each respective proposed project (namely the WEF, solar PV energy facility and supporting grid infrastructure projects), to determine the cumulative impact that will materialise should the other Renewable Energy Facilities (REFs) mentioned above, with their associated powerlines and substations (i.e., grid infrastructure), and large-scale industrial developments be constructed within a 30 km radius of the proposed Ezelsjacht Renewable Energy Facilities project site.

The cumulative impact assessment must contain the following:

- A cumulative environmental impact statement noting whether the overall impact is acceptable; and
- A review of the specialist reports undertaken for other REFs and an indication of how the recommendations, mitigation measures and conclusion of the studies have been considered.

Conclusion / impact statement on the acceptability of the project/s

The conclusion section of the specialist report must include an Impact Statement, indicating whether any fatal flaws have been identified and ultimately whether the proposed development can be authorised or not (i.e. whether EA should be granted / issued or not).

Compliance Statements

Where a compliance statement is required, it needs to be undertaken/compiled according to GN. 320 of March 2020, where applicable; and an impact assessment is mandatory and needs to be undertaken in accordance with GN. 320 of March 2020 and Appendix 6 of GN. R982 (as amended) of NEMA. As mentioned above, SSVRs are mandatory for all specialists and thus this needs to be included in the impact assessment.

As specified in the respective protocols, in summary the compliance statement must:

1. be applicable to the preferred site and proposed development footprint
2. confirm the sensitivity of the site for your discipline; and
3. indicate whether the proposed development will have any impact/unacceptable impact on the
4. resource.
5. The compliance statement must contain, as a minimum, the following information:
    - the contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae.
    - a signed statement of independence by the specialist
    - baseline profile or sensitivity mapping as required by the applicable protocol.
    - methodology including details of site inspection, any modelling or calculations required by the protocol, or any associated design recommendations that have applied to reduce impacts.
    - a substantiated statement from the specialist on the acceptability, or not, of the proposed development and a recommendation on the approval, or not, of the proposed development.
    - any conditions to which this statement is subjected.
    - in the case of a linear activity, confirmation from the specialist that, in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase.
    - where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr.
    - a description of the assumptions made and any uncertainties or gaps in knowledge or data.

APPENDIX 2: SPECIALIST EXPERTISE

Curriculum vitae: Chris van Rooyen

Profession/Specialisation	:	Avifaunal Specialist
Highest Qualification	:	BA 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.

Key Project Experience

Bird Impact Assessment Studies and avifaunal monitoring for wind-powered generation facilities:

1. Eskom Klipheuwel Experimental Wind Power Facility, Western Cape
2. Mainstream Wind Facility Jeffreys Bay, Eastern Cape (EIA and monitoring)
3. Biotherm, Swellendam, (Excelsior), Western Cape (EIA and monitoring)
4. Biotherm, Napier, (Matjieskloof), Western Cape (pre-feasibility)
5. Windcurrent SA, Jeffreys Bay, Eastern Cape (2 sites) (EIA and monitoring)
6. Caledon Wind, Caledon, Western Cape (EIA)
7. Innowind (4 sites), Western Cape (EIA)
8. Renewable Energy Systems (RES) Oyster Bay, Eastern Cape (EIA and monitoring)
9. Oelsner Group (Kerriefontein), Western Cape (EIA)
10. Oelsner Group (Langefontein), Western Cape (EIA)
11. InCa Energy, Vredendal Wind Energy Facility Western Cape (EIA)
12. Mainstream Loeriesfontein Wind Energy Facility (EIA and monitoring)
13. Mainstream Noupoort Wind Energy Facility (EIA and monitoring)
14. Biotherm Port Nolloth Wind Energy Facility (Monitoring)
15. Biotherm Laingsburg Wind Energy Facility (EIA and monitoring)
16. Langhoogte Wind Energy Facility (EIA)
17. Vleesbaai Wind Energy Facility (EIA and monitoring)
18. St. Helena Bay Wind Energy Facility (EIA and monitoring)
19. Electrawind, St Helena Bay Wind Energy Facility (EIA and monitoring)
20. Electrawind, Vredendal Wind Energy Facility (EIA)
21. SAGIT, Langhoogte and Wolseley Wind Energy facilities
22. Renosterberg Wind Energy Project – 12-month preconstruction avifaunal monitoring project
23. De Aar – North (Mulilo) Wind Energy Project – 12-month preconstruction avifaunal monitoring project
24. De Aar – South (Mulilo) Wind Energy Project – 12-month bird monitoring
25. Namies – Aggenys Wind Energy Project – 12-month bird monitoring
26. Pofadder - Wind Energy Project – 12-month bird monitoring

27. Dwarsrug Loeriesfontein - Wind Energy Project – 12-month bird monitoring
28. Waaihoek – Utrecht Wind Energy Project – 12-month bird monitoring
29. Amathole – Butterworth Utrecht Wind Energy Project – 12-month bird monitoring & EIA specialist
30. Phezukomoya and San Kraal Wind Energy Projects 12-month bird monitoring & EIA specialist study (Innowind)
31. Beaufort West Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mainstream)
32. Leeuwdraai Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mainstream)
33. Sutherland Wind Energy Facility 12-month bird monitoring (Mainstream)
34. Maralla Wind Energy Facility 12-month bird monitoring & EIA specialist study (Biotherm)
35. Esizayo Wind Energy Facility 12-month bird monitoring & EIA specialist study (Biotherm)
36. Humansdorp Wind Energy Facility 12-month bird monitoring & EIA specialist study (Cennergi)
37. Aletta Wind Energy Facility 12-month bird monitoring & EIA specialist study (Biotherm)
38. Eureka Wind Energy Facility 12-month bird monitoring & EIA specialist study (Biotherm)
39. Makambako Wind Energy Faclity (Tanzania) 12-month bird monitoring & EIA specialist study (Windlab)
40. R355 Wind Energy Facility 12-month bird monitoring (Mainstream)
41. Groenekloof Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mulilo)
42. Tsitsikamma Wind Energy Facility 24-months post-construction monitoring (Cennergi)
43. Noupoort Wind Energy Facility 24-months post-construction monitoring (Mainstream)
44. Kokerboom Wind Energy Facility 12-month bird monitoring & EIA specialist study (Business Venture Investments)
45. Kuruman Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mulilo)
46. Dassieklip Wind Energy Facility 3 years post-construction monitoring (Biotherm)
47. Loeriesfontein 2 Wind Energy Facility 2 years post-construction monitoring (Mainstream)
48. Khobab Wind Energy Facility 2 years post-construction monitoring (Mainstream)
49. Excelsior Wind Energy Facility 18 months construction phase monitoring (Biotherm)
50. Boesmansberg Wind Energy Facility 12-months pre-construction bird monitoring (juwi)
51. Mañhica Wind Energy Facility, Mozambique, 12-months pre-construction monitoring (Windlab)
52. Kwagga Wind Energy Facility, Beaufort West, 12-months pre-construction monitoring (ABO)
53. Pienaarspoort Wind Energy Facility, Touws River, Western Cape, 12-months pre-construction monitoring (ABO).
54. Koup 1 and 2 Wind Energy Facilities, Beaufort West, Western Cape, 12 months pre-construction monitoring (Genesis Eco-energy)
55. Duiker Wind Energy Facility, Vredendal, Western Cape 12 months pre-construction monitoring (ABO)
56. Perdekraal East Wind Energy Facility, Touws River, Western Cape, 18 months construction phase monitoring (Mainstream).
57. Swellendam Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (Veld Renewables)
58. Lombardskraal Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (Enertrag SA)
59. Mainstream Kolkies & Heuweltjies Wind Energy Facilities, Western Cape, 12-month pre-construction monitoring (Mainstream)
60. Great Karoo Wind Energy Facility, Northern Cape, 12-month pre-construction monitoring (African Green Ventures).
61. Mpumalanga & Gauteng Wind and Hybrid Energy Facilities (6x), pre-construction monitoring (Enertrag SA)
62. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (Enertrag SA)
63. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (ACED)
64. Nanibees North & South Wind Energy Facilities, Northern Cape, Screening Report (juwi)
65. Sutherland Wind Energy Facilities, Northern Cape, Screening Report (WKN Windcurrent)
66. Pofadder Wind Energy Facility, Northern Cape, Screening Report (Atlantic Energy)
67. Haga Haga Wind Energy Facility, Eastern Cape, Amendment Report (WKN Windcurrent)
68. Banken Wind Energy Facility, Northern Cape, Screening Report (Atlantic Energy)
69. Hartebeest Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (juwi).

Bird Impact Assessment Studies for Solar Energy Plants:

1. Concentrated Solar Power Plant, Upington, Northern Cape.
2. Globeleq De Aar and Droogfontein Solar PV Pre- and Post-construction avifaunal monitoring

3. JUWI Kronos PV project, Copperton, Northern Cape
4. Sand Draai CSP project, Groblershoop, Northern Cape
5. Biotherm Helena PV Project, Copperton, Northern Cape
6. Biotherm Letsiao CSP Project, Aggeneys, Northern Cape
7. Biotherm Enamandla PV Project, Aggeneys, Northern Cape
8. Biotherm Sendawo PV Project, Vryburg, North-West
9. Biotherm Tlisitseng PV Project, Lichtenburg, North-West
10. JUWI Hotazel Solar Park Project, Hotazel, Northern Cape
11. Namakwa Solar Project, Aggeneys, Northern Cape
12. Brypaal Solar Power Project, Kakamas, Northern Cape
13. ABO Vryburg 1,2,3 Solar PV Project, Vryburg, North-West
14. NamPower CSP Facility near Arandis, Namibia
15. Dayson Klip PV Facility near Upington, Northern Cape
16. Geelkop PV Facility near Upington, Northern Cape
17. Oya PV Facility, Ceres, Western Cape
18. Vrede and Rondawel PV Facilities, Free State
19. Kolkies & Sadawa PV Facilities, Western Cape
20. Leeuwbosch PV1 and 2 and Wildebeeskuil PV1 and 2 Facilities, North-West
21. Kenhardt PV 3,4 and 5, Northern Cape
22. Wittewal PV, Grootfontein PV and Hoekdoornen PV Facilities, Touws River, Western Cape

Bird Impact Assessment Studies for the following overhead line projects:

1. Chobe 33kV Distribution line
2. Athene - Umfolozi 400kV
3. Beta-Delphi 400kV
4. Cape Strengthening Scheme 765kV
5. Flurian-Louis-Trichardt 132kV
6. Ghanzi 132kV (Botswana)
7. Ikaros 400kV
8. Matimba-Witkop 400kV
9. Naboomspruit 132kV
10. Tabor-Flurian 132kV
11. Windhoek - Walvisbaai 220 kV (Namibia)
12. Witkop-Overyssel 132kV
13. Breyten 88kV
14. Adis-Phoebus 400kV
15. Dhuva-Janus 400kV
16. Perseus-Mercury 400kV
17. Gravelotte 132kV
18. Ikaros 400 kV
19. Khanye 132kV (Botswana)
20. Moropule – Thamaga 220 kV (Botswana)
21. Parys 132kV
22. Simplon –Everest 132kV
23. Tutuka-Alpha 400kV
24. Simplon-Der Brochen 132kV
25. Big Tree 132kV
26. Mercury-Ferrum-Garona 400kV
27. Zeus-Perseus 765kV
28. Matimba B Integration Project
29. Caprivi 350kV DC (Namibia)
30. Gerus-Mururani Gate 350kV DC (Namibia)
31. Mmamabula 220kV (Botswana)
32. Steenberg-Der Brochen 132kV
33. Venetia-Paradise T 132kV
34. Burgersfort 132kV
35. Majuba-Umfolozi 765kV
36. Delta 765kV Substation

37. Braamhoek 22kV
38. Steelpoort Merensky 400kV
39. Mmamabula Delta 400kV
40. Delta Epsilon 765kV
41. Gerus-Zambezi 350kV DC Interconnector: Review of proposed avian mitigation measures for the Okavango and Kwando River crossings
42. Giyani 22kV Distribution line
43. Liqhobong-Kao 132/11kV distribution power line, Lesotho
44. 132kV Leslie – Wildebeest distribution line
45. A proposed new 50 kV Spoornet feeder line between Sishen and Saldanha
46. Cairns 132kv substation extension and associated power lines
47. Pimlico 132kv substation extension and associated power lines
48. Gyani 22kV
49. Matafin 132kV
50. Nkomazi_Fig Tree 132kV
51. Pebble Rock 132kV
52. Reddersburg 132kV
53. Thaba Combine 132kV
54. Nkomati 132kV
55. Louis Trichardt – Musina 132kV
56. Endicot 44kV
57. Apollo Lepini 400kV
58. Tarlton-Spring Farms 132kV
59. Kuschke 132kV substation
60. Bendstore 66kV Substation and associated lines
61. Kuiseb 400kV (Namibia)
62. Gyani-Malamulele 132kV
63. Watershed 132kV
64. Bakone 132kV substation
65. Eerstegoud 132kV LILO lines
66. Kumba Iron Ore: SWEP - Relocation of Infrastructure
67. Kudu Gas Power Station: Associated power lines
68. Steenberg Booysendal 132kV
69. Toulon Pumps 33kV
70. Thabatshipi 132kV
71. Witkop-Silica 132kV
72. Bakubung 132kV
73. Nelsriver 132kV
74. Rethabiseng 132kV
75. Tilburg 132kV
76. GaKgapane 66kV
77. Knobel Gilead 132kV
78. Bochum Knobel 132kV
79. Madibeng 132kV
80. Witbank Railway Line and associated infrastructure
81. Spencer NDP phase 2 (5 lines)
82. Akanani 132kV
83. Hermes-Dominion Reefs 132kV
84. Cape Pensinsula Strengthening Project 400kV
85. Magalakwena 132kV
86. Benficosa 132kV
87. Dithabaneng 132kV
88. Taunus Diepkloof 132kV
89. Taunus Doornkop 132kV
90. Tweedracht 132kV
91. Jane Furse 132kV
92. Majeje Sub 132kV
93. Tabor Louis Trichardt 132kV
94. Riversong 88kV
95. Mamatsekele 132kV

96. Kabokweni 132kV
97. MDPP 400kV Botswana
98. Marble Hall NDP 132kV
99. Bokmakiere 132kV Substation and LILO lines
100. Styldrift 132kV
101. Taunus – Diepkloof 132kV
102. Bighorn NDP 132kV
103. Waterkloof 88kV
104. Camden – Theta 765kV
105. Dhuva – Minerva 400kV Diversion
106. Lesedi –Grootpan 132kV
107. Waterberg NDP
108. Bulgerivier – Dorset 132kV
109. Bulgerivier – Toulon 132kV
110. Nokeng-Fluorspar 132kV
111. Mantsole 132kV
112. Tshilamba 132kV
113. Thabamoopo - Tshebela – Nhlovuko 132kV
114. Arthurseat 132kV
115. Borutho 132kV MTS
116. Volspruit - Potgietersrus 132kV
117. Neotel Optic Fibre Cable Installation Project: Western Cape
118. Matla-Glockner 400kV
119. Delmas North 44kV
120. Houwhoek 11kV Refurbishment
121. Clau-Clau 132kV
122. Ngwedi-Silwerkrans 134kV
123. Nieuwehoop 400kV walk-through
124. Booysendal 132kV Switching Station
125. Tarlton 132kV
126. Medupi - Witkop 400kV walk-through
127. Germiston Industries Substation
128. Sekgame 132kV
129. Botswana – South Africa 400kV Transfrontier Interconnector
130. Syferkuil – Rampheri 132kV
131. Queens Substation and associated 132kV powerlines
132. Oranjemond 400kV Transmission line
133. Aries – Helios – Juno walk-down
134. Kuruman Phase 1 and 2 Wind Energy facilities 132kV Grid connection
135. Transnet Thaba 132kV

Bird Impact Assessment Studies for the following residential and industrial developments:

1. Lizard Point Golf Estate
2. Lever Creek Estates
3. Leloko Lifestyle Estates
4. Vaaloewers Residential Development
5. Clearwater Estates Grass Owl Impact Study
6. Somerset Ext. Grass Owl Study
7. Proposed Three Diamonds Trading Mining Project (Portion 9 and 15 of the Farm Blesbokfontein)
8. N17 Section: Springs To Leandra –"Borrow Pit 12 And Access Road On (Section 9, 6 And 28 Of The Farm Winterhoek 314 Ir)
9. South African Police Services Gauteng Radio Communication System: Portion 136 Of The Farm 528 Jq, Lindley.
10. Report for the proposed upgrade and extension of the Zeekoegat Wastewater Treatment Works, Gauteng.
11. Bird Impact Assessment for Portion 265 (a portion of Portion 163) of the farm Rietfontein 189-JR, Gauteng.
12. Bird Impact Assessment Study for Portions 54 and 55 of the Farm Zwartkop 525 JQ, Gauteng.

13. Bird Impact Assessment Study Portions 8 and 36 of the Farm Nooitgedacht 534 JQ, Gauteng.
14. Shumba's Rest Bird Impact Assessment Study
15. Randfontein Golf Estate Bird Impact Assessment Study
16. Zilkaatsnek Wildlife Estate
17. Regenstein Communications Tower (Namibia)
18. Avifaunal Input into Richards Bay Comparative Risk Assessment Study
19. Maquasa West Open Cast Coal Mine
20. Glen Erasmia Residential Development, Kempton Park, Gauteng
21. Bird Impact Assessment Study, Weltevreden Mine, Mpumalanga
22. Bird Impact Assessment Study, Olifantsvlei Cemetery, Johannesburg
23. Camden Ash Disposal Facility, Mpumalanga
24. Lindley Estate, Lanseria, Gauteng
25. Proposed open cast iron ore mine on the farm Lylyveld 545, Northern Cape
26. Avifaunal monitoring for the Sishen Mine in the Northern Cape as part of the EMPr requirements
27. Steelpoort CNC Bird Impact Assessment Study

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: Jake Mulvaney

Profession/Specialisation	:	Postdoctoral researcher/Avifaunal Specialist
Highest Qualification	:	PhD (Zoology)
Nationality	:	South African
Years of experience	:	0.5 years

Key Qualifications

Jake Mulvaney is a postdoctoral researcher in ornithology at Stellenbosch University. He is author and/or co-author of four academic papers involving bird population assessments and GIS modelling and is a licensed South African bird ringer. From 2021, he assists Chris van Rooyen Consulting with environmental impact assessments of wind and solar energy facility developments.
Key project experience

Key project experience

Bird Impact Assessment Studies and avifaunal monitoring for wind-powered generation facilities:

1. Highlands Wind Energy Facility, Dordrecht, Eastern Cape
2. Duiker Wind Energy Facility, Vredendal, Western Cape
3. Taaibosch Wind Energy Complex, Postmasburg, Northern Cape
4. Lunsklip Wind Energy Facility, Still Bay, Western Cape
5. Mukondeleli Wind Energy Facility, Secunda, Mpumalanga

Bird impact assessment studies for solar energy plants:

1. Taaibosch Solar Energy Complex, Postmasburg, Northern Cape
2. Vhuvhili Solar Energy Facility, Secunda, Mpumalanga

Bird Impact Assessment Studies for the following overhead line projects:

1. Hendrina North Grid Infrastructure, Hendrina, Mpumpalanga

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	:	22 years

Key Qualifications

Albert Froneman (*Pr.Sci.Nat*) has more than 22 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 (reg. nr 400177/09) with The South African Council for Natural Scientific Professions, specialising in Zoological Science.

Key project experience

Renewable Energy Facilities – avifaunal monitoring projects in association with Chris van Rooyen Consulting

1. Jeffrey's Bay Wind Farm – 12-months preconstruction avifaunal monitoring project
2. Oysterbay Wind Energy Project – 12-months preconstruction avifaunal monitoring project
3. Ubuntu Wind Energy Project near Jeffrey's Bay – 12-months preconstruction avifaunal monitoring project
4. Bana-ba-Pifu Wind Energy Project near Humansdorp – 12-months preconstruction avifaunal monitoring project
5. Excelsior Wind Energy Project near Caledon – 12-months preconstruction avifaunal monitoring project
6. Laingsburg Spitskopvlakte Wind Energy Project – 12-months preconstruction avifaunal monitoring project
7. Loeriesfontein Wind Energy Project Phase 1, 2 & 3 – 12-months preconstruction avifaunal monitoring project
8. Noupoort Wind Energy Project – 12-months preconstruction avifaunal monitoring project
9. Vleesbaai Wind Energy Project – 12-months preconstruction avifaunal monitoring project
10. Port Nolloth Wind Energy Project – 12-months preconstruction avifaunal monitoring project
11. Langhoogte Caledon Wind Energy Project – 12-months preconstruction avifaunal monitoring project
12. Lunsklip – Stilbaai Wind Energy Project – 12-months preconstruction avifaunal monitoring project
13. Indwe Wind Energy Project – 12-months preconstruction avifaunal monitoring project
14. Zeeland St Helena bay Wind Energy Project – 12-months preconstruction avifaunal monitoring project

15. Wolseley Wind Energy Project – 12-months preconstruction avifaunal monitoring project
16. Renosterberg Wind Energy Project – 12-months preconstruction avifaunal monitoring project
17. De Aar – North (Mulilo) Wind Energy Project – 12-months preconstruction avifaunal monitoring project (2014)
18. De Aar – South (Mulilo) Wind Energy Project – 12-months bird monitoring
19. Namies – Aggenys Wind Energy Project – 12-months bird monitoring
20. Pofadder - Wind Energy Project – 12-months bird monitoring
21. Dwarsrug Loeriesfontein - Wind Energy Project – 12-months bird monitoring
22. Waaihoek – Utrecht Wind Energy Project – 12-months bird monitoring
23. Amathole – Butterworth Wind Energy Project – 12-months bird monitoring & EIA specialist study
24. De Aar and Droogfontein Solar PV Pre- and Post-construction avifaunal monitoring
25. Makambako Wind Energy Faclity (Tanzania) 12-month bird monitoring & EIA specialist study (Windlab)
26. R355 Wind Energy Facility 12-month bird monitoring (Mainstream)
27. Aletta Wind Energy Facility 12-month bird monitoring (Biotherm)
28. Maralla Wind Energy Facility 12-month bird monitoring (Biotherm)
29. Groenekloof Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mulilo)
30. Tsitsikamma Wind Energy Facility 24-months post-construction monitoring (Cennergi)
31. Noupoort Wind Energy Facility 24-months post-construction monitoring (Mainstream)
32. Kokerboom Wind Energy Facility 12-month bird monitoring & EIA specialist study (Business Venture Investments)
33. KurumanWind Energy Facility 12-month bird monitoring & EIA specialist study (Mulilo)
34. Mañhica Wind Energy Facility 12-month bird monitoring & EIA specialist study (Windlab)
35. Klipheuwel-Dassiefontein Wind Energy Facility, Caledon, Western Cape – Operational phase bird monitoring – Year 5 (Klipheuwel-Dassiefontein Wind Energy Facility)
36. Kwagga Wind Energy Facility, Beaufort West, 12-months pre-construction monitoring (ABO)
37. Pienaarspoort Wind Energy Facility, Touws River, Western Cape, 12-months pre-construction monitoring (ABO). Pofadder WEF 1 and 2 Wind Energy Facilities, Beaufort West, Western Cape, 12 months pre-construction monitoring (Genesis Eco-energy)
38. Duiker Wind Energy Facility, Vredendal, Western Cape 12 months pre-construction monitoring (ABO)
39. Perdekraal East Wind Energy Facility, Touws River, Western Cape, 18 months construction phase monitoring (Mainstream).
40. Swellendam Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (Veld Renewables)
41. Lombardskraal Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (Enertrag SA)
42. Mainstream Kolkies & Heuweltjies Wind Energy Facilities, Western Cape, 12-month pre-construction monitoring (Mainstream)
43. Great Karoo Wind Energy Facility, Northern Cape, 12-month pre-construction monitoring (African Green Ventures).
44. Mpumalanga & Gauteng Wind and Hybrid Energy Facilities (6x), pre-construction monitoring (Enertrag SA)
45. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (Enertrag SA)
46. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (ACED)
47. Nanibees North & South Wind Energy Facilities, Northern Cape, Screening Report (juwi)
48. Kappa Solar PV facility, Touwsrivier, Western Cape, pre-construction monitoring (Veroniva)
49. Sutherland Wind Energy Facilities, Northern Cape, Screening Report (WKN Windcurrent)
50. Pofadder Wind Energy Facility, Northren Cape, Screening Report (AtlanticEnergy)
51. Haga Haga Wind Energy Facility, Eastern Cape, Amendment Report (WKN Windcurrent)
52. Banken Wind Energy Facility, Northern Cape, Screening Report (Atlantic Energy)
53. Hartebeest Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (juwi).
54. Iphiko Wind Energy facilities, Laingsburg, Western Cape, screening and pre-construction monitoring (G7 Energies)

55. Kangnas Wind Energy Facility, Northern Cape, Operational Phase 2 years avifaunal monitoring (Mainstream)
56. Perdekraal East Wind Energy Facility, Northern Cape, Operational Phase 2 years avifaunal monitoring (Mainstream)
57. Aberdeen 1, 2 & Aberdeen Kudu (3&4) Wind Energy Facilities, Eastern Cape, 12- month pre-construction monitoring (Atlantic Renewable Energy Partners)
58. Loxton / Beaufort West Wind Energy Facilities, Northern Cape, 12-month pre-construction monitoring (Genesis Eco-Energy Developments)
59. Ermelo & Volksrust Wind Energy Facilities, Northern Cape, Screening Report (WKN Windcurrent)
60. Aardvark Solar PV facility, Copperton, Northern Cape, 12-month pre-construction monitoring (ABO)
61. Bestwood Solar PV facility, Kathu, Northern Cape, pre-construction monitoring (AMDA)
62. Boundary Solar PV facility, Kimberley, Northern Cape, Site sensitivity verification (Atlantic Renewable Energy Partners)
63. Excelsior Wind Energy Facility, Swellendam, Western Cape, Operational Phase 2 years avifaunal monitoring & implementation of Shut Down on Demand (SDOD) pro-active mitigation strategy (Biotherm)
64. De Aar cluster Solar PV facilities, De Aar, Western Cape, Site sensitivity verification (Atlantic Renewable Energy Partners)
65. Rinkhals Solar PV facilities, Kimberley, Northern Cape, Pre-construction monitoring (ABO)
66. Kolkies Sadawa Solar PV facilities, Touwsrivier, Western Cape, pre-construction monitoring (Mainstream)
67. Leeudoringstad Solar PV facilities, Leeudoringstad, North West, Pre-construction monitoring (Upgrade Energy)
68. Noupoort Umsobomvu Solar PV facilities, Noupoort, Northern Cape, Pre-construction monitoring (EDF Renewables)
69. Oya Solar PV facilities, Matjiesfontein, Western Cape, pre-construction monitoring (G7 Energies)
70. Scafell Solar PV facilities, Sasolburg, Free state, pre-construction monitoring (Mainstream)
71. Vrede & Rondawel Solar PV facilities, Kroonstad, Free state, pre-construction monitoring (Mainstream)
72. Gunstfontein Wind Energy Facilities, Sutherland, Northern Cape, additional pre-construction monitoring (ACED)
73. Ezelsjacht Wind Energy Facility, De Doorns, Western Cape, pre-construction monitoring (Mainstream)
74. Klipkraal Wind Energy Facility, Fraserburg, Northern Cape, avifaunal screening (Klipkraal WEF)
75. Pofadder Wind Energy Facility, Pofadder, Northern Cape, pre-construction monitoring (Atlantic Renewable Energy Partners)

Bird Impact Assessment studies and / or GIS analysis:

1. Aviation Bird Hazard Assessment Study for the proposed Madiba Bay Leisure Park adjacent to Port Elizabeth Airport.
2. Extension of Runway and Provision of Parallel Taxiway at Sir Seretse Khama Airport, Botswana Bird / Wildlife Hazard Management Specialist Study
3. Maun Airport Improvements Bird / Wildlife Hazard Management Specialist Study
4. Bird Impact Assesment Study - Bird Helicopter Interaction – The Bitou River, Western Cape Province South Africa
5. Proposed La Mercy Airport – Bird Aircraft interaction specialists study using bird detection radar to assess swallow flocking behaviour
6. KwaZulu Natal Power Line Vulture Mitigation Project – GIS analysis

7. Perseus-Zeus Powerline EIA – GIS Analysis
8. Southern Region Pro-active GIS Blue Crane Collision Project.
9. Specialist advisor ~ Implementation of a bird detection radar system and development of an airport wildlife hazard management and operational environmental management plan for the King Shaka International Airport
10. Matsapha International Airport – bird hazard assessment study with management recommendations
11. Evaluation of aviation bird strike risk at candidate solid waste disposal sites in the Ekurhuleni Metropolitan Municipality
12. Gateway Airport Authority Limited – Gateway International Airport, Polokwane: Bird hazard assessment; Compile a bird hazard management plan for the airport
13. Bird Specialist Study - Evaluation of aviation bird strike risk at the Mwakirunge Landfill site near Mombasa Kenya
14. Bird Impact Assessment Study - Proposed Weltevreden Open Cast Coal Mine Belfast, Mpumalanga
15. Avian biodiversity assessment for the Mafube Colliery Coal mine near Middelburg Mpumalanga
16. Avifaunal Specialist Study - SRVM Volspruit Mining project – Mokopane Limpopo Province
17. Avifaunal Impact Assessment Study (with specific reference to African Grass Owls and other Red List species) Stone Rivers Arch
18. Airport bird and wildlife hazard management plan and training to Swaziland Civil Aviation Authority (SWACAA) for Matsapha and Sikhupe International Airports.Bird Impact Assessment Study - Proposed 60 year Ash Disposal Facility near to the Kusile Power Station
19. Avifaunal pre-feasibility assessment for the proposed Montrose dam, Mpumalanga
20. Bird Impact Assessment Study – Proposed ESKOM Phantom Substation near Knysna, Western Cape
21. Habitat sensitivity map for Denham's Bustard, Blue Crane and White-bellied Korhaan in the Kouga Municipal area of the Eastern Cape Province
22. Swaziland Civil Aviation Authority – Sikhuphe International Airport – Bird hazard management assessment
23. Avifaunal monitoring – extension of Specialist Study - SRVM Volspruit Mining project – Mokopane Limpopo Province
24. Avifaunal Specialist Study – Meerkat Hydro Electric Dam – Hope Town, Northern Cape
25. The Stewards Pan Reclamation Project – Bird Impact Assessment study
26. Airports Company South Africa – Avifaunal Specialist Consultant – Airport Bird and Wildlife Hazard Mitigation
27. Strategic Environmental Assessment For Gas Pipeline Development, CSIR
28. Avifaunal Specialist Assessment - Proposed monopole telecommunications mast – Roodekrans, Roodepoort, Gauteng (Enviroworks)
29. Gromis-Nama-Aggeneis 400kv Ipp Integration: Environmental Screening - Avifaunal Specialist Desktop Study
30. Melkspruit - Rouxville 132kV Distribution Line - Avifaunal Amendment and Walk-through Report
31. Gamma - Kappa 2nd 765kV transmission line – Avifaunal impact assessment GIS analysis

Geographic Information System analysis & maps:

1. ESKOM Power line Makgalakwena EIA – GIS specialist & map production
2. ESKOM Power line Benficosa EIA – GIS specialist & map production
3. ESKOM Power line Riversong EIA – GIS specialist & map production
4. ESKOM Power line Waterberg NDP EIA – GIS specialist & map production
5. ESKOM Power line Bulge Toulon EIA – GIS specialist & map production
6. ESKOM Power line Bulge DORSET EIA – GIS specialist & map production
7. ESKOM Power lines Marblehall EIA – GIS specialist & map production
8. ESKOM Power line Grootpan Lesedi EIA – GIS specialist & map production
9. ESKOM Power line Tanga EIA – GIS specialist & map production

10. ESKOM Power line Bokmakierie EIA – GIS specialist & mapproduction
11. ESKOM Power line Rietfontein EIA – GIS specialist & map production
12. Power line Anglo Coal EIA – GIS specialist & mapproduction
13. ESKOM Power line Camcoll Jericho EIA – GIS specialist & mapproduction
14. Hartbeespoort Residential Development – GIS specialist & map production
15. ESKOM Power line Mantsole EIA – GIS specialist & map production
16. ESKOM Power line Nokeng Flourspar EIA – GIS specialist & mapproduction
17. ESKOM Power line Greenview EIA – GIS specialist & mapproduction
18. Derdepoort Residential Development – GIS specialist & map production
19. ESKOM Power line Boynton EIA – GIS specialist & map production
20. ESKOM Power line United EIA – GIS specialist & map production
21. ESKOM Power line Gutshwa & Malelane EIA – GIS specialist & map production
22. ESKOM Power line Origstad EIA – GIS specialist & mapproduction
23. Zilkaatsnek Development Public Participation –map production
24. Belfast – Paarde Power line - GIS specialist & mapproduction
25. Solar Park Solar Park Integration Project Bird Impact Assessment Study – avifaunal GIS analysis.
26. Kappa-Omega-Aurora 765kV Bird Impact Assessment Report – Avifaunal GIS analysis.
27. Gamma – Kappa 2nd 765kV – Bird Impact Assessment Report – Avifaunal GIS analysis.
28. ESKOM Power line Kudu-Dorstfontein Amendment EIA – GIS specialist & map production.
29. ProposedHeilbron filling station EIA – GIS specialist & map production
30. ESKOM Lebatlhane EIA – GIS specialist & mapproduction
31. ESKOM Pienaars River CNC EIA – GIS specialist & mapproduction
32. ESKOM Lemara Phiring Ohrigstad EIA – GIS specialist & mapproduction
33. ESKOM Pelly-Warmbad EIA – GIS specialist & map production
34. ESKOM Rosco-Bracken EIA –GIS specialist & map production
35. ESKOM Ermelo-Uitkoms EIA – GIS specialist & map production
36. ESKOM Wisani bridge EIA – GIS specialist & map productionCity of Tswane – New bulkfeeder pipeline projects x3Map production
37. ESKOM Lebohang Substation and 132kV Distribution Power Line Project Amendment GIS specialist & map production
38. ESKOM Geluk Rural Powerline GIS & Mapping
39. Eskom Kimberley Strengthening Phase 4 Project GIS & Mapping
40. ESKOM Kwaggafontein - Amandla Amendment Project GIS & Mapping
41. ESKOM Lephalale CNC – GIS Specialist & Mapping
42. ESKOM Marken CNC – GIS Specialist & Mapping
43. ESKOM Lethabong substation and powerlines – GIS Specialist & Mapping
44. ESKOM Magopela- Pitsong 132kV line and new substation – GIS Specialist & Mapping
45. Vlakfontein Filling Station – GIS Specialist & Mapping - EIA
46. Prieska – Hoekplaas Solar PV & BESS - GIS Specialist & Mapping – EIA
47. Mulilo Total Hydra Storage (MTHS) De Aar - GIS Specialist & Mapping – EIA
48. Merensky Uchoba Powerline, Steelpoort - GIS Specialist & Mapping – EIA
49. Douglas Solar Part 2 Amendment – grid connection - GIS Specialist & Mapping – EIA

Professional affiliations

- South African Council for Natural Scientific Professions (SACNASP) registered Professional Natural Scientist (reg. nr 400177/09) – specialist field: Zoological Science. Registered since 2009.
- Southern African Wildlife Management Association - Member
- Zoological Society of South Africa - Member

APPENDIX 3: SPECIALIST STATEMENT OF INDEPENDENCE - attached

APPENDIX 4: PRE-CONSTRUCTION MONITORING PROTOCOL-TBC FSR

APPENDIX 5: BIRD HABITAT IN THE PAOI

Figure 1: Renosterveld Shrubland

Figure 2: Artificial dam

Figure 3: Agriculture

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Figure 5: Alien trees

Figure 6: A high voltage line running through the northern part of the PAOI, with a Martial Eagle nest (insert)

APPENDIX 6: SABAP2 AND PRE-CONSTRUCTION SPECIES LIST FOR THE BROADER AREA

NT = Near threatened, VU = Vulnerable, EN = Endangered, LC = Least Concern

Species name	Scientific name	Full protocol	Ad hoc protocol	Global Red List status	Regional Red List status
Bokmakierie	*Telophorus zeylonus*	84.15	28.33	LC	LC
Hamerkop	*Scopus umbretta*	6.10	3.33	LC	LC
Mallard	*Anas platyrhynchos*	3.66	0.00	LC	LC
Neddicky	*Cisticola fulvicapilla*	6.10	1.67	LC	LC
Secretarybird	*Sagittarius serpentarius*	1.22	0.00	EN	VU
Bar-throated Apalis	*Apalis thoracica*	4.88	0.00	LC	LC
Pied Avocet	*Recurvirostra avosetta*	3.66	1.67	LC	LC
Acacia Pied Barbet	*Tricholaema leucomelas*	12.20	0.00	LC	LC
Cape Batis	*Batis capensis*	2.44	0.00	LC	LC
European Bee-eater	*Merops apiaster*	3.66	1.67	LC	LC
Southern Red Bishop	*Euplectes orix*	36.59	13.33	LC	LC
Yellow Bishop	*Euplectes capensis*	3.66	0.00	LC	LC
Southern Boubou	*Laniarius ferrugineus*	4.88	0.00	LC	LC
Cape Bulbul	*Pycnonotus capensis*	31.71	6.67	LC	LC
Cape Bunting	*Emberiza capensis*	93.90	28.33	LC	LC
Lark-like Bunting	*Emberiza impetuani*	7.32	1.67	LC	LC
Common Buzzard	*Buteo buteo*	3.66	1.67	LC	LC
Jackal Buzzard	*Buteo rufofuscus*	40.24	16.67	LC	LC
Black-headed Canary	*Serinus alario*	28.05	3.33	LC	LC
Brimstone Canary	*Crithagra sulphurata*	4.88	0.00	LC	LC
Cape Canary	*Serinus canicollis*	21.95	11.67	LC	LC
Forest Canary	*Crithagra scotops*	1.22	0.00	LC	LC
Protea Canary	*Crithagra leucoptera*	3.66	0.00	NT	NT
White-throated Canary	*Crithagra albogularis*	34.15	11.67	LC	LC
Yellow Canary	*Crithagra flaviventris*	78.05	33.33	LC	LC
Ant-eating Chat	*Myrmecocichla formicivora*	1.22	1.67	LC	LC
Familiar Chat	*Oenanthe familiaris*	64.63	21.67	LC	LC
Karoo Chat	*Emarginata schlegelii*	26.83	13.33	LC	LC
Sickle-winged Chat	*Emarginata sinuata*	43.90	8.33	LC	LC
Grey-backed Cisticola	*Cisticola subruficapilla*	81.71	35.00	LC	LC
Levaillant's Cisticola	*Cisticola tinniens*	12.20	3.33	LC	LC
Zitting Cisticola	*Cisticola juncidis*	1.22	0.00	LC	LC
Red-knobbed Coot	*Fulica cristata*	29.27	6.67	LC	LC
Reed Cormorant	*Microcarbo africanus*	14.63	3.33	LC	LC

Species name	Scientific name	Full protocol	Ad hoc protocol	Global Red List status	Regional Red List status
White-breasted Cormorant	*Phalacrocorax lucidus*	3.66	1.67	LC	LC
Blue Crane	*Grus paradisea*	43.90	21.67	VU	NT
Long-billed Crombec	*Sylvietta rufescens*	14.63	0.00	LC	LC
Cape Crow	*Corvus capensis*	37.80	11.67	LC	LC
Pied Crow	*Corvus albus*	65.85	26.67	LC	LC
Diederik Cuckoo	*Chrysococcyx caprius*	1.22	0.00	LC	LC
Klaas's Cuckoo	*Chrysococcyx klaas*	2.44	0.00	LC	LC
African Darter	*Anhinga rufa*	2.44	0.00	LC	LC
Cape Turtle Dove	*Streptopelia capicola*	53.66	20.00	LC	LC
Laughing Dove	*Spilopelia senegalensis*	17.07	3.33	LC	LC
Namaqua Dove	*Oena capensis*	8.54	0.00	LC	LC
Red-eyed Dove	*Streptopelia semitorquata*	13.41	0.00	LC	LC
Rock Dove	*Columba livia*	10.98	5.00	LC	LC
Fork-tailed Drongo	*Dicrurus adsimilis*	1.22	0.00	LC	LC
African Black Duck	*Anas sparsa*	3.66	0.00	LC	LC
Maccoa Duck	*Oxyura maccoa*	1.22	0.00	EN	NT
Yellow-billed Duck	*Anas undulata*	42.68	10.00	LC	LC
African Fish Eagle	*Haliaeetus vocifer*	2.44	0.00	LC	LC
Booted Eagle	*Hieraaetus pennatus*	23.17	23.33	LC	LC
Martial Eagle	*Polemaetus bellicosus*	7.32	0.00	EN	EN
Verreaux's Eagle	*Aquila verreauxii*	30.49	6.67	LC	VU
Spotted Eagle-Owl	*Bubo africanus*	8.54	0.00	LC	LC
Western Cattle Egret	*Bubulcus ibis*	2.44	1.67	LC	LC
Karoo Eremomela	*Eremomela gregalis*	0.00	1.67	LC	LC
Yellow-bellied Eremomela	*Eremomela icteropygialis*	2.44	0.00	LC	LC
Lanner Falcon	*Falco biarmicus*	4.88	0.00	LC	VU
Southern Fiscal	*Lanius collaris*	68.29	16.67	LC	LC
Greater Flamingo	*Phoenicopterus roseus*	1.22	0.00	LC	NT
African Paradise Flycatcher	*Terpsiphone viridis*	0.00	1.67	LC	LC
Fairy Flycatcher	*Stenostira scita*	6.10	0.00	LC	LC
Fiscal Flycatcher	*Melaenornis silens*	15.85	5.00	LC	LC
Grey-winged Francolin	*Scleroptila afra*	15.85	1.67	LC	LC
Egyptian Goose	*Alopochen aegyptiaca*	75.61	35.00	LC	LC
Spur-winged Goose	*Plectropterus gambensis*	10.98	1.67	LC	LC
Pale Chanting Goshawk	*Melierax canorus*	50.00	16.67	LC	LC
Cape Grassbird	*Sphenoeacus afer*	4.88	0.00	LC	LC
Black-necked Grebe	*Podiceps nigricollis*	1.22	0.00	LC	LC

Species name	Scientific name	Full protocol	Ad hoc protocol	Global Red List status	Regional Red List status
Great Crested Grebe	*Podiceps cristatus*	3.66	1.67	LC	LC
Little Grebe	*Tachybaptus ruficollis*	15.85	3.33	LC	LC
Sombre Greenbul	*Andropadus importunus*	4.88	0.00	LC	LC
Common Greenshank	*Tringa nebularia*	6.10	0.00	LC	LC
Helmeted Guineafowl	*Numida meleagris*	15.85	0.00	LC	LC
Black Harrier	*Circus maurus*	18.29	1.67	EN	EN
African Harrier-Hawk	*Polyboroides typus*	4.88	3.33	LC	LC
Black-headed Heron	*Ardea melanocephala*	31.71	10.00	LC	LC
Grey Heron	*Ardea cinerea*	21.95	8.33	LC	LC
Greater Honeyguide	*Indicator indicator*	1.22	0.00	LC	LC
Lesser Honeyguide	*Indicator minor*	2.44	0.00	LC	LC
African Hoopoe	*Upupa africana*	4.88	0.00	LC	LC
African Sacred Ibis	*Threskiornis aethiopicus*	13.41	3.33	LC	LC
Hadada Ibis	*Bostrychia hagedash*	50.00	28.33	LC	LC
Greater Kestrel	*Falco rupicoloides*	1.22	0.00	LC	LC
Rock Kestrel	*Falco rupicolus*	64.63	23.33	LC	LC
Pied Kingfisher	*Ceryle rudis*	1.22	0.00	LC	LC
Black-winged Kite	*Elanus caeruleus*	13.41	0.00	LC	LC
Yellow-billed Kite	*Milvus aegyptius*	1.22	1.67	LC	LC
Southern Black Korhaan	*Afrotis afra*	35.37	20.00	VU	VU
Blacksmith Lapwing	*Vanellus armatus*	51.22	8.33	LC	LC
Crowned Lapwing	*Vanellus coronatus*	3.66	1.67	LC	LC
Agulhas Long-billed Lark	*Certhilauda brevirostris*	1.22	0.00	LC	NT
Cape Clapper Lark	*Mirafra apiata*	20.73	3.33	LC	LC
Karoo Lark	*Calendulauda albescens*	21.95	10.00	LC	LC
Karoo Long-billed Lark	*Certhilauda subcoronata*	13.41	1.67	LC	LC
Large-billed Lark	*Galerida magnirostris*	70.73	26.67	LC	LC
Red-capped Lark	*Calandrella cinerea*	39.02	10.00	LC	LC
Spike-heeled Lark	*Chersomanes albofasciata*	2.44	1.67	LC	LC
Cape Longclaw	*Macronyx capensis*	1.22	0.00	LC	LC
Brown-throated Martin	*Riparia paludicola*	3.66	1.67	LC	LC
Rock Martin	*Ptyonoprogne fuligula*	52.44	8.33	LC	LC
Common Moorhen	*Gallinula chloropus*	7.32	0.00	LC	LC
Red-faced Mousebird	*Urocolius indicus*	13.41	3.33	LC	LC
Speckled Mousebird	*Colius striatus*	8.54	0.00	LC	LC
White-backed Mousebird	*Colius colius*	37.80	15.00	LC	LC
Common Ostrich	*Struthio camelus*	14.63	8.33	LC	LC
Western Barn Owl	*Tyto alba*	0.00	1.67	LC	LC
Speckled Pigeon	*Columba guinea*	65.85	16.67	LC	LC
African Pipit	*Anthus cinnamomeus*	15.85	3.33	LC	LC

Species name	Scientific name	Full protocol	Ad hoc protocol	Global Red List status	Regional Red List status
Nicholson's Pipit	*Anthus nicholsoni*	8.54	0.00	LC	LC
Plain-backed Pipit	*Anthus leucophrys*	1.22	0.00	LC	LC
Common Ringed Plover	*Charadrius hiaticula*	2.44	0.00	LC	LC
Kittlitz's Plover	*Charadrius pecuarius*	14.63	0.00	LC	LC
Three-banded Plover	*Charadrius tricollaris*	37.80	6.67	LC	LC
Southern Pochard	*Netta erythrophthalma*	2.44	0.00	LC	LC
Karoo Prinia	*Prinia maculosa*	90.24	35.00	LC	LC
Common Quail	*Coturnix coturnix*	3.66	1.67	LC	LC
Red-billed Quelea	*Quelea quelea*	2.44	0.00	LC	LC
White-necked Raven	*Corvus albicollis*	65.85	20.00	LC	LC
Cape Robin-Chat	*Cossypha caffra*	24.39	8.33	LC	LC
Cape Rockjumper	*Chaetops frenatus*	4.88	0.00	NT	NT
Namaqua Sandgrouse	*Pterocles namaqua*	14.63	3.33	LC	LC
Common Sandpiper	*Actitis hypoleucos*	1.22	0.00	LC	LC
Wood Sandpiper	*Tringa glareola*	2.44	0.00	LC	LC
Karoo Scrub Robin	*Cercotrichas coryphoeus*	84.15	35.00	LC	LC
Streaky-headed Seedeater	*Crithagra gularis*	8.54	1.67	LC	LC
South African Shelduck	*Tadorna cana*	59.76	26.67	LC	LC
Cape Shoveler	*Spatula smithii*	8.54	0.00	LC	LC
Cape Siskin	*Crithagra totta*	10.98	0.00	LC	LC
Cape Sparrow	*Passer melanurus*	82.93	33.33	LC	LC
House Sparrow	*Passer domesticus*	39.02	5.00	LC	LC
Southern Grey-headed Sparrow	*Passer diffusus*	1.22	0.00	LC	LC
Grey-backed Sparrow-Lark	*Eremopterix verticalis*	14.63	3.33	LC	LC
Black Sparrowhawk	*Accipiter melanoleucus*	1.22	0.00	LC	LC
Rufous-breasted Sparrowhawk	*Accipiter rufiventris*	3.66	3.33	LC	LC
African Spoonbill	*Platalea alba*	6.10	0.00	LC	LC
Cape Spurfowl	*Pternistis capensis*	45.12	8.33	LC	LC
Common Starling	*Sturnus vulgaris*	29.27	6.67	LC	LC
Pale-winged Starling	*Onychognathus nabouroup*	4.88	0.00	LC	LC
Pied Starling	*Lamprotornis bicolor*	74.39	23.33	LC	LC
Red-winged Starling	*Onychognathus morio*	15.85	1.67	LC	LC
Black-winged Stilt	*Himantopus himantopus*	13.41	6.67	LC	LC
Little Stint	*Calidris minuta*	12.20	0.00	LC	LC
African Stonechat	*Saxicola torquatus*	54.88	18.33	LC	LC
Cape Sugarbird	*Promerops cafer*	18.29	1.67	LC	LC

Species name	Scientific name	Full protocol	Ad hoc protocol	Global Red List status	Regional Red List status
Malachite Sunbird	*Nectarinia famosa*	60.98	13.33	LC	LC
Orange-breasted Sunbird	*Anthobaphes violacea*	15.85	1.67	LC	LC
Southern Double-collared Sunbird	*Cinnyris chalybeus*	36.59	8.33	LC	LC
Barn Swallow	*Hirundo rustica*	25.61	8.33	LC	LC
Greater Striped Swallow	*Cecropis cucullata*	43.90	10.00	LC	LC
Pearl-breasted Swallow	*Hirundo dimidiata*	3.66	0.00	LC	LC
White-throated Swallow	*Hirundo albigularis*	6.10	6.67	LC	LC
African Black Swift	*Apus barbatus*	4.88	0.00	LC	LC
Alpine Swift	*Tachymarptis melba*	18.29	6.67	LC	LC
Little Swift	*Apus affinis*	3.66	1.67	LC	LC
White-rumped Swift	*Apus caffer*	10.98	3.33	LC	LC
Southern Tchagra	*Tchagra tchagra*	6.10	0.00	LC	LC
Cape Teal	*Anas capensis*	9.76	1.67	LC	LC
Red-billed Teal	*Anas erythrorhyncha*	18.29	1.67	LC	LC
Spotted Thick-knee	*Burhinus capensis*	13.41	0.00	LC	LC
Cape Rock Thrush	*Monticola rupestris*	8.54	0.00	LC	LC
Karoo Thrush	*Turdus smithi*	6.10	0.00	LC	LC
Olive Thrush	*Turdus olivaceus*	3.66	0.00	LC	LC
Sentinel Rock Thrush	*Monticola explorator*	8.54	0.00	NT	LC
Cape Penduline Tit	*Anthoscopus minutus*	30.49	3.33	LC	LC
Grey Tit	*Melaniparus afer*	1.22	1.67	LC	LC
Cape Wagtail	*Motacilla capensis*	69.51	21.67	LC	LC
African Reed Warbler	*Acrocephalus baeticatus*	2.44	0.00	LC	LC
Chestnut-vented Warbler	*Curruca subcoerulea*	10.98	1.67	LC	LC
Layard's Warbler	*Curruca layardi*	12.20	0.00	LC	LC
Lesser Swamp Warbler	*Acrocephalus gracilirostris*	3.66	0.00	LC	LC
Little Rush Warbler	*Bradypterus baboecala*	0.00	1.67	LC	LC
Namaqua Warbler	*Phragmacia substriata*	3.66	0.00	LC	LC
Rufous-eared Warbler	*Malcorus pectoralis*	26.83	10.00	LC	LC
Common Waxbill	*Estrilda astrild*	45.12	11.67	LC	LC
Cape Weaver	*Ploceus capensis*	51.22	18.33	LC	LC
Southern Masked Weaver	*Ploceus velatus*	32.93	5.00	LC	LC
Capped Wheatear	*Oenanthe pileata*	37.80	13.33	LC	LC
Mountain Wheatear	*Myrmecocichla monticola*	28.05	6.67	LC	LC
Cape White-eye	*Zosterops virens*	14.63	3.33	LC	LC
Pin-tailed Whydah	*Vidua macroura*	1.22	0.00	LC	LC

Species name	Scientific name	Full protocol	Ad hoc protocol	Global Red List status	Regional Red List status
Cardinal Woodpecker	*Dendropicos fuscescens*	4.88	0.00	LC	LC
Ground Woodpecker	*Geocolaptes olivaceus*	10.98	1.67	NT	LC
Black Stork	*Ciconia nigra*	0.00	0.00	LC	VU
Black-chested Snake Eagle	*Circaetus pectoralis*	0.00	0.00	LC	LC
Black-eared Sparrow-Lark	*Eremopterix australis*	0.00	0.00	LC	LC
Common Swift	*Apus apus*	0.00	0.00	LC	LC
Double-banded Courser	*Rhinoptilus africanus*	0.00	0.00	LC	LC

APPENDIX 7: ASSESSMENT CRITERIA

1. ENVIRONMENTAL IMPACT ASSESSMENT (EIA) METHODOLOGY

The Environmental Impact Assessment (EIA) Methodology assists in evaluating the overall effect of a proposed activity on the environment. Determining of the significance of an environmental impact on an environmental parameter is determined through a systematic analysis.

1.1 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale (i.e., site, local, national, or global), whereas intensity is defined by the severity of the impact e.g., the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in **Table 1**.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

1.2 Impact Rating System

The impact assessment must take account of the nature, scale, and duration of effects on the environment and whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the various project stages, as follows:

- Planning
- Construction
- Operation
- Decommissioning.

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

1.2.1 Rating System Used to Classify Impacts

The impacts of the proposed project (during the Construction, Operation and Decommissioning phases) are to be
assessed and rated according to the methodology described below, which was developed by SLR to align with the
requirements of the EIA Regulations, 2014 (as amended). Specialists will be required to make use of the impact rating matrix provided by SLR (in Excel format) for this purpose.

The criteria used to assess both the impacts and the method of determining the significance of the impacts is outlined in Appendix 6 Tables 1-4). This method complies with the method provided in the EIA guideline document (GN. 654 of 2010). Part A provides the definitions of the criteria and the approach for determining impact consequence (combining intensity, extent, and duration). In Part B, a matrix is applied to determine this impact consequence. In Part C, the consequence rating is considered together with the probability of occurrence

to determine the overall significance of each impact. Lastly, the interpretation of the impact significance is provided in Part D.

Appendix 6 Table 1: Definitions of assessment criteria

PART A: DEFINITIONS AND CRITERIA		
Determination of CONSEQUENCE		**Consequence is a function of intensity, spatial extent, and duration**
Determination of SIGNIFICANCE		**Significance is a function of consequence and probability**
Criteria for ranking of the INTENSITY of environmental impacts	**Very High**	Severe change, disturbance or degradation caused to receptors. Associated with severe consequences. May result in severe illness, injury, or death. Targets, limits, and thresholds of concern continually exceeded. Substantial intervention will be required.
	High	Prominent change, or large degree of modification, disturbance or degradation caused to receptors, or which may affect a large proportion of receptors, possibly entire species, or community.
	Medium	Moderate change, disturbance or discomfort caused to receptors and/or which may affect a moderate proportion of receptors.
	Low	Minor (slight) change, disturbance or nuisance caused to receptors which is easily tolerated without intervention, or which may affect a small proportion of receptors.
	Very Low	Negligible change, disturbance or nuisance caused to receptors which is barely noticeable or may have minimal effect on receptors or affect a limited proportion of the receptors.
Criteria for ranking the DURATION of impacts	**Very Short-term**	The duration of the impact will be < 1 year or may be intermittent.
	Short-term	The duration of the impact will be between 1 - 5 years
	Medium-term	The duration of the impact will be Medium-term between, 5 to 10 years.
	Long-term	Long term, between 10 and 20 years. (Likely to cease at the end of the operational life of the activity)
	Permanent	The duration of the impact will be permanent
Criteria for ranking the EXTENT of impacts	**Site**	Impact is limited to the immediate footprint of the activity and immediate surrounds within a confined area.

	Local	Impact is confined to within the project site / area and its nearby surroundings.
	Regional	Impact is confined to the region, e.g., coast, basin, catchment, municipal region, district, etc.
	National	Impact may extend beyond district or regional boundaries with national implications.
	International	Impact extends beyond the national scale or may be transboundary.

Appendix 6 Table 2: Determination of impact consequence

PART B: DETERMINING CONSEQUENCE						
		EXTENT				
		Site	Local	Regional	National	International
Intensity- Very Low						
DURATION	Permanent	**Low**	**Low**	**Medium**	**Medium**	**High**
	Long-term	**Low**	**Low**	**Low**	**Medium**	**Medium**
	Medium-term	**Very Low**	**Low**	**Low**	**Low**	**Medium**
	Short-term	**Very low**	**Very Low**	**Low**	**Low**	**Low**
	Very Short-term	**Very low**	**Very Low**	**Very Low**	**Low**	**Low**
Intensity -Low						
DURATION	Permanent	**Medium**	**Medium**	**Medium**	**High**	**High**
	Long-term	**Low**	**Medium**	**Medium**	**Medium**	**High**
	Medium-term	**Low**	**Low**	**Medium**	**Medium**	**Medium**
	Short-term	**Low**	**Low**	**Low**	**Medium**	**Medium**
	Very Short-term	**Very low**	**Low**	**Low**	**Low**	**Medium**
Intensity- Medium						
DURATION	Permanent	**Medium**	**High**	**High**	**High**	**Very High**
	Long-term	**Medium**	**Medium**	**Medium**	**High**	**High**
	Medium-term	**Medium**	**Medium**	**Medium**	**High**	**High**
	Short-term	**Low**	**Medium**	**Medium**	**Medium**	**High**
	Very Short-term	**Low**	**Low**	**Low**	**Medium**	**Medium**
Intensity -High						

DURATION	Permanent	**High**	**High**	**High**	**Very High**	**Very High**
	Long-term	**Medium**	**High**	**High**	**High**	**Very High**
	Medium-term	**Medium**	**Medium**	**High**	**High**	**High**
	Short-term	**Medium**	**Medium**	**Medium**	**High**	**High**
	Very Short-term	**Low**	**Medium**	**Medium**	**Medium**	**High**
Intensity - Very High						
DURATION	Permanent	**High**	**High**	**Very High**	**Very High**	**Very High**
	Long-term	**High**	**High**	**High**	**Very High**	**Very High**
	Medium-term	**Medium**	**High**	**High**	**High**	**Very High**
	Short-term	**Medium**	**Medium**	**High**	**High**	**High**
	Very Short-term	**Low**	**Medium**	**Medium**	**High**	**High**
		Site	Local	Regional	National	International
		EXTENT				

Appendix 6 Table 3: Determining the impact significance

PART C: DETERMINING SIGNIFICANCE						
PROBABILITY (to exposure of events)	Definite / Continuous	**Very Low**	**Low**	**Medium**	**High**	**Very High**
	Probable	**Very Low**	**Low**	**Medium**	**High**	**Very High**
	Possible / frequent	**Very Low**	**Very Low**	**Low**	**Medium**	**High**
	Conceivable	**Insignificant**	**Very Low**	**Low**	**Medium**	**High**
	Unlikely / improbable	**Insignificant**	**Insignificant**	**Very Low**	**Low**	**Medium**
		Very Low	Low	Medium	High	Very High
		CONSEQUENCE				

Appendix 6 Table 4: Interpretation of significance key

PART D: INTERPRETATION OF SIGNIFICANCE		
Very High -	Very High +	Represents a key factor in decision-making. In the case of adverse effects, the impact would be considered a fatal flaw unless mitigated to lower significance.
High -	High +	These beneficial or adverse effects are considered to be very important considerations and are likely to be material for the decision-making process. In the case of negative impacts, substantial mitigation will be required.
Medium -	Medium +	These beneficial or adverse effects may be important but are not likely to be key decision-making factors. The cumulative effects of such issues may become a decision-making issue if leading to an increase in the overall adverse effect on a particular resource or receptor. In the case of negative impacts, mitigation will be required.
Low -	Low +	These beneficial or adverse effects may be raised as localised issues. They are unlikely to be critical in the decision-making process but could be important in the subsequent design of the project. In the case of negative impacts, some mitigation is likely to be required.
Very Low -	Very Low +	These beneficial or adverse effects will not have an influence on the decision, neither will they need to be taken into account in the design of the project. In the case of negative impacts, mitigation is not necessarily required.
Insignificant		Any effects are beneath the levels of perception and inconsequential, therefore not requiring any consideration.

APPENDIX 8: SITE SENSITIVITY VERIFICATION SEF

SITE VERIFICATION REPORT
(IN TERMS OF PART B OF THE ASSESSMENT PROTOCOLS PUBLISHED IN GN 320 ON 20 MARCH 2020 AND GN 43855 ON 30 OCTOBER 2020)

1. Introduction

In accordance with Appendix 6 of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) Environmental Impact Assessment (EIA) Regulations of 2014, a site verification visit has been undertaken to the proposed Solar Energy Facility (SEF) in order to confirm the current land use and environmental sensitivity of the proposed project area and Project Area of Impact (PAOI) as identified by the National Web-Based Environmental Screening Tool (Screening Tool).

2. Site sensitivity verification

The following methods and sources were used to compile this report:

- The project site concerns the land properties upon which the development will occur, occupying an extent of approximately 370 hectares.
- The project area of impact (PAOI) of the proposed SEF was defined as a 5km buffer zone around surrounding the land parcels making up the project site, with an extent of approximately 4312 hectares.
- Bird distribution data of the South African Bird Atlas 2 (SABAP 2) was obtained from the University of Cape Town, to ascertain which species occurs within the broader area of four pentad grid cells each within which the proposed projects are situated. A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8 × 7.6 km. To get a more representative impression of the birdlife, a consolidated data set was obtained for a total of 9 pentads which intersect with the development area, hereafter referred to as '**the broader area'**, detailed in **Table 1** below. From 2007-present, a total of 82 full protocol lists (i.e., surveys of at least two hours each) have been completed for this area. In addition, 60 *ad hoc* protocol lists (i.e., surveys lasting less than two hours but still yielding valuable data) have been completed. The SABAP2 data was therefore regarded as a reliable reflection of the avifauna which occurs in the area, but the data was also supplemented by data collected during the site surveys and general knowledge of the area and bird and habitat associations.
- Solar priority species were defined as follows:
  - South African Red Data species: High conservation significance
  - South African endemics and near-endemics: High conservation significance
  - Raptors: High conservation significance. Raptors are at the top of the food chain and play a key role in their ecosystems. When populations of birds of prey go down, then the numbers of their prey species go up, creating an imbalance in the ecosystem.
  - Waterbirds: Evidence indicate that waterbirds may be particularly susceptible to collisions with solar arrays due to the so-called lake effect, caused by the reflection of the sun of the smooth surface of solar panels.
- The national threatened status of all wind priority species was determined with the use of the most recent edition of the Red Data Book of Birds of South Africa (Taylor et al., 2015), and the latest authoritative summary of southern African bird biology (Hockey et al., 2005).
- The global threatened status of all priority species was determined by consulting the (2022.1) International Union for Conservation of Nature (IUCN) Red List of Threatened Species (http://www.iucnredlist.org/).
- A classification of the vegetation habitat ecotypes within the PAOI was obtained from the National Vegetation Map (2018) from the South African National Biodiversity Institute (SANBI) BGIS map viewer (http://bgisviewer.sanbi.org/) (Mucina & Rutherford, 2006; SANBI, 2018). The PAOI is the area where the primary impacts on avifauna are expected and includes the land parcels where the project will be located.

- Avifaunal habitat usage within the PAOI by birds was informed by the Atlas of Southern African Birds 1 (SABAP 1) (Harrison et al., 1997a, 1997b).
- Land-cover and land-use within the PAOI was determined using the 2018 South African national land-cover surveys jointly conducted by the Department of Environmental Affairs, and the Department of Rural Development and Land Reform (DEA & DALRRD, 2019).
- The Important Bird Areas of Southern Africa (Marnewick et al., 2015) was consulted for information on potentially relevant Important Bird Areas (IBAs).
- Satellite imagery (Google Earth ©2022) was used to view the PAOI and broader area on a landscape level and to help identify sensitive bird habitat.
- The 2022 South Africa Protected Areas Database compiled by the Department of Environment, Forestry and Fisheries (DFFE) was used to identify Nationally Protected Areas, National Protected Areas Expansion Strategy (NPAES) near the PAOI (DFFE, 2022).
- The Department of Forestry, Fisheries, and the Environment (DFFE) National Screening Tool was used to determine the assigned avian sensitivity of the PAOI.
- Data collected during previous site visits to the broader area was also considered as far as habitat classes and the occurrence of priority species are concerned.

- The following sources were used to determine the investigation protocol that is required for the project sites:
  - Procedures for the Assessment and Minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of NEMA when applying for Environmental Authorisation (Gazetted October 2020).
  - Guidelines for the Implementation of the Terrestrial Flora & Terrestrial Fauna Species Protocols for EIAs in South Africa produced by the SANBI on behalf of the Department of Environment, Forestry and Fisheries (2020).
  - The BirdLife South Africa (BLSA) Guidelines for assessing and monitoring the impact of solar power generating facilities on birds in southern Africa. (Jenkins, et al., 2017) (hereafter referred to as the 'Solar Guidelines') were consulted to determine the level of survey effort that is required.
- The main source of information on the avifaunal diversity and abundance for the site verification was the pre-construction avifaunal monitoring programme that is being implemented at the proposed Ezelsjacht Wind Energy Facility and includes the PAOI of the SEF. Surveys have been completed to date in the following time periods:
  - 01 to 06 July 2021
  - 29 September to 10 October 2021
  - 04 to 09 January 2022
  - 04 to 11 March 2022
  - 01 to 06 May 2022

3. Outcome of site surveys

3.1.1 Natural environment

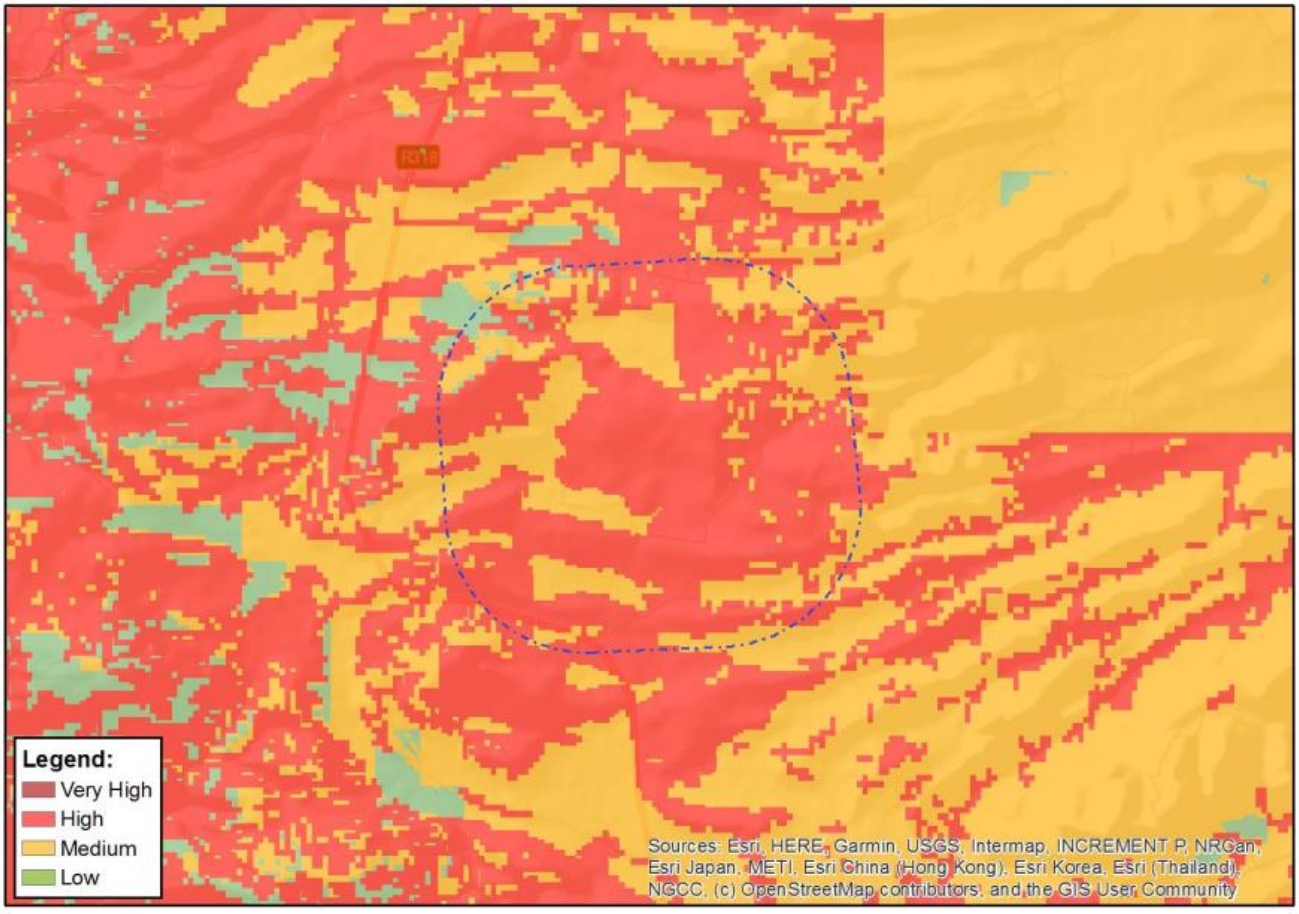
The Ezelsjacht SEF PAOI is situated within mountainous terrain, with rugged slopes, ridges and ravines surrounding the PAOI. The Project Site itself positioned with comparably gentler slopes within a broad valley between mountains flanking the PAOI. There are several minor drainage lines intersecting the PAOI, which are all non-perennial streams that originate from the local mountains.

The PAOI has drier Mediterranean climate seasonality, experiencing warm, dry summers and mildly cold, wet winters (https://www.meteoblue.com/, accessed October 2022). The mean temperatures range 33°C (January) to 5°C (July). The mean annual precipitation is 267 mm. Rainfall seasonality is relatively low within the PAOI, ranging from 14mm during the drier summer months to 35mm during the late autumn/winter months.
The PAOI is situated in the Western Fynbos-Renosterverld Bioregion of the Fynbos Biome (SANBI, 2018), represented here as by Matjiesfontein Shale Renosterveld with Matjiesfontein Quartzite along ridgeline slopes

(Rebelo et al., 2006; SANBI, 2018). Renosterveld vegetation is the dominant natural habitat over much of the PAOI (Rebelo et al., 2006; SANBI, 2018), and this is characterized as “open to medium dense leptophyllous shrubland with a medium dense matrix of short divaricate shrubs, dominated by renosterbos” (Rebelo et al., 2006). The bioregions within the PAOI form part of the Cape Floristic Region, a recognised Centre of Endemism within South Africa (Van Wyk & Smith, 2001).

1.1.1 DFFE Screening Tool

The PAOI contains confirmed habitat for the species of conservation concern (SCC) as defined in the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020). The screening tool classifies the PAOI as **Medium and High** sensitivity for Black Harrier (Globally and Regionally Endangered), Martial Eagle (Globally and Regionally Endangered), Southern Black Korhaan (Globally and Regionally Vulnerable) and Verreaux’s Eagle (Regionally Vulnerable).



Appendix 8 Figure 1: The classification of the PAOI according to the avian theme for terrestrial animal species theme in the DFFE National Screening Tool. Medium and High sensitivity is linked to Black Harrier (*Circus maurus*), Martial Eagle (*Polemaetus bellicosus*), Southern Black Korhaan (*Afrotis afra*), and Verreaux’s Eagle *(Aquila verreauxii*).

4. Conclusion

The occurrence of SCC was confirmed during the integrated pre-construction monitoring programme for the overlapping Ezelsjacht WEF PAOI, with observations of the above four SCC listed in the screening tool recorded during pre-construction monitoring. Other Red List species were also during preconstruction monitoring include Black Stork (Globally Least Concern, Regionally Vulnerable), Blue Crane (Globally Vulnerable, Regionally Near Threatened), Lanner Falcon (Globally Least Concern, Regionally Vulnerable), Secretarybird (Globally Endangered, Regionally Vulnerable). Based on the field surveys to date, a classification of **High sensitivity** for avifauna for the whole PAOI would be appropriate.