FINAL BASIC ASSESSMENT REPORT

Basic Assessment for the proposed development of the up to 150 MW Padloper Solar PV Facility 2 (i.e., Padloper PV 2), as well as the proposed development of a 132 kV Overhead Power Line between the Padloper PV 2 and the proposed authorised Ishwati Emoyeni Collector Substation (i.e., Padloper EGI 2), and their associated infrastructure, near Murraysburg in the Western Cape Province



APPENDIX D.6:

Avifauna - Padloper PV 1-4

Holland & Associates
Environmental Consultants

Impact Assessments - Environmental Management Programs - Compliance Monitoring - Process Review

THE PROPOSED DEVELOPMENT OF THE PADLOPER SOLAR PHOTOVOLTAIC FACILITIES 1 – 4 AND ASSOCIATED INFRASTRUCTURE NEAR MURRAYSBURG IN THE NORTHERN CAPE AND WESTERN CAPE PROVINCES

Avian Species Specialist Assessment Report

SEPTEMBER 2023

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Abbreviations

AEWA:	Agreement on the Conservation of African-Eurasian Migratory Waterbirds
APLIC:	Avian Power Line Interaction Committee
BA:	Basic Assessment
BESS:	Battery Energy Storage System
BI:	Biodiversity Importance
CBA:	Critical Biodiversity Area
CBD:	Convention on Biological Diversity
CEO:	Contractor's Environmental Officer
CI:	Conservation Importance
CITES:	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS:	Conservation of Migratory Species of Wild Animals
CR:	Critically Endangered
DD:	Data Deficient
DEO:	Developer's Environmental Officer
DENC:	Northern Cape Department of Environmental Affairs and Nature Conservation
DFFE:	Department of Forestry, Fisheries and the Environment
DPM:	Developer's Project Manager
DSS:	Developer's Site Supervisor
EAP:	Environmental Assessment Practitioner
ECO:	Environmental Control Officer
EIA:	Environmental Impact Assessment
EMPr	Environmental Management Programme
EN:	Endangered
EOO:	Extent of Occurrence
FI:	Functional Integrity

GN: Government Notice

IKA: Index of Kilometric Abundance

IUCN: International Union for Conservation of Nature

MTS: Main Transmission Station

MW: Megawatt

NCBSP: Northern Cape Biodiversity Spatial Plan

NEMBA: National Environmental Management: Biodiversity Act 10 of 2004

NFEPA: National Freshwater Ecosystem Priority Areas

NEMA: National Environmental Management Act No. 107 of 1988

NT: Near-threatened

O&M: Operations and Maintenance

OHPL: Overhead Power Line

PAOI: Project Area of Influence

PV: Photo-voltaic

RR: Receptor Resilience

SA: South Africa

SABAP2: South African Bird Atlas Project 2

SANBI: South African National Biodiversity Institute

SCC: Species of Conservation Concern

SDM: Species Distribution Model

SEI: Site Ecological Importance

UNEP: United Nations Environment Programme

VU: Vulnerable

WEF: Wind Energy Facility

Glossary

Avifauna: taken to mean birds (class: Aves) of a specific area (region, habitat etc.) or time period;

Class: a principal taxonomic grouping that ranks above order and below phylum, such as Aves;

Critical Biodiversity Area (CBA): an area that must be maintained in a good ecological condition (natural or semi-natural state) in order to meet biodiversity targets. CBAs collectively meet biodiversity targets for all ecosystem types, as well as for species and ecological processes that depend on natural or semi-natural habitat that have not already been met in the protected area

network. CBAs are identified through a systematic biodiversity planning process in a configuration that is complementary, efficient and avoids conflict with other land uses where possible;

Cumulative impact: in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities;

Endemic or near-endemic: species where >70% of the population occurs in South Africa, or South Africa, Lesotho and Swaziland, as per Birdlife South Africa Checklist 2019;

Environmental Impact Assessment (EIA): a systematic process of identifying, assessing and reporting environmental impacts associated with an activity and includes basic assessments and scoping and environmental impact reporting (S&EIR) (see below for definition);

Extent of occurrence (EOO): the area contained within the shortest continuous imaginary boundary that can be drawn to encompass all the known, inferred or projected sites of present occurrence of a taxon, excluding cases of vagrancy; and in short is the species' contemporary distribution range;

IUCN Red List Categories and Criteria: the threatened species categories used in Red Data Books and Red Lists have been in place for almost 30 years. The International Union for Conservation of Nature (IUCN) Red List Categories and Criteria provide an easily and widely understood system for classifying species at high risks of global extinction, so as to focus attention on conservation measures designed to protect them;

IUCN Red List status: the conservation status of species, based on the IUCN Red List categories and criteria;

Migratory species: these are defined as per the National Environmental Management: Biodiversity Act 10 of 2004 (NEMBA) to mean the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant portion of whose members cyclically and predictably cross one or more national jurisdictional boundaries. Furthermore, this includes all species that are native to South Africa and are listed under the Convention on the Conservation of Migratory Species of Wild Animals (CMS) or the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA), with the exception of those species in respect of which South Africa has entered reservations;

Mitigation: means to anticipate and prevent negative impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible;

NEMA EIA Regulations: Environmental Impact Assessment Regulations, 2014 (as amended), in terms of Chapter 5 of NEMA;

Project Area of Influence (PAOI): The geographic area that the proposed development has potential impacts on avifauna;

Screening Tool Report: A report generated by the National web-based Screening Tool for the Project Area of Influence;

Receptor: in the context of impact assessments on biodiversity, receptors are environmental components (e.g. flora/fauna species/communities or habitat type) that may be affected, adversely or beneficially, by the proposed project activities within the project areas of influence (PAOI);

Red Data species: species listed as Near-threatened, Vulnerable, Endangered or Critically Endangered in the Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor *et al.* 2015) or on the IUCN Red List;

Species: a kind of animal, plant or other organism that does not normally interbreed with individuals of another kind, and includes as subsets, any subspecies, cultivar, variety, geographic race, strain, hybrid or geographically separate population;

Species distribution model (SDM): a probability surface representing relative habitat suitability for a species based on known occurrence records for this species and a suit of environmental predictor variables reflecting the ecological requirements of the species. SDMs can therefore be considered to represent the potential geographic distribution of a species based on habitat suitability. The term 'ecological niche model' is often also used interchangeably with SDM;

Species of Conservation Concern (SCC): includes all species that are assessed according to the IUCN Red List Criteria (iucnredlist.org) or in the Eskom Red Data Book of Birds of South Africa (Taylor et al 2015) as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Data Deficient (DD) or Near-threatened (NT), as well as range-restricted species which are not declining and are nationally listed as Rare or Extremely Rare or Critically Rare.

1 Introduction

1.1 Background

Padloper Solar PV (Pty) Ltd (Padloper Solar PV or the Applicant) is proposing to develop seven Solar Photovoltaic (PV) Facilities with a capacity of between 100 and 250 MW each and the associated infrastructure, and seven associated 132 kV overhead power lines (OHPL) to support the proposed solar PV facilities, near Murraysburg in the Western Cape and Northern Cape Provinces.

Holland & Associates Environmental Consultants (H&A) conducted the required avifaunal pre-application monitoring for an initial study area consisting of eleven proposed PV site alternatives in three clusters (Figure 1), in line with applicable regulations, protocols, and Best Practice Guidelines (Birdlife SA 2017).

Following the first seasonal (summer) survey the proposed development areas were reduced from eleven to seven sites for which a second (winter) survey was conducted, and a final monitoring report (Annexure A) was submitted in August 2022, following the winter survey.

The final avifauna monitoring report (Annexure A) summarises the methodologies and findings of the seasonal avifaunal pre-application monitoring conducted in line with Best Practice Guidelines, and the resulting avifaunal sensitivities, which informed the project design. The results of the monitoring are a suitable baseline for avifaunal specialist impact assessments, which assess the potential impacts of the proposed projects on avifauna.

This report is the avifaunal specialist impact assessment for the Basic Assessment (BA) process for the proposed construction and operation of the Padloper Solar PV Facilities 1 to 4 and their associated infrastructures. i.e., the Padloper Solar PV 1 with a capacity of up to 250 MW, the Padloper Solar PV 2 with a capacity of up to 150 MW, the Padloper Solar PV 3 with a capacity of up to 150 MW and the Padloper Solar PV 4 with a capacity of up to 150 MW, near Murraysburg in the Northern Cape and Western Cape Provinces (Figure 1).

1.2 The Legislative Framework

South African environmental legislation contains a plethora of environmentally related statutes, guidelines and protocols, many of which place onerous responsibilities on landowners, developers, environmental assessment practitioners (EAPs) and independent specialist consultants. The legislation considered most pertinent in the context of undertaking a legally compliant avifaunal assessment, is outlined in detail below.

1.2.1 The Convention on Biological Diversity, 1993

The Convention on Biological Diversity (CBD) is the international legal instrument for the conservation of biological biodiversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising from the utilisation of genetic resources that has been ratified by 196 nations[1]. The overall objective of the CBD is to encourage actions which will lead to a sustainable future. States have, in accordance with the Charter of the United Nations (UNs) and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction. Each contracting party shall, in accordance with its particular conditions and capabilities develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity, and integrate the conservation and sustainable use of biological diversity.

1.2.2 The Convention on the Conservation of Migratory Species of Wild Animals, 1983

The Convention on Migratory Species (CMS), also known as the Bonn Convention, is an environmental treaty of the United Nations that provides a global platform for the conservation and sustainable use of terrestrial, aquatic and avian migratory animals and their habitats.[2]

Parties that are range states of a migratory species listed as endangered shall endeavour to conserve, and where feasible and appropriate restore the habitats of the species which are of importance in removing the species from danger of extinction, and to prevent, remove, compensate or minimise as appropriate, the adverse effects of activities or obstacles that seriously impede or prevent the migration of the species, and to prevent, reduce or control factors that are endangering or are likely to further endanger the species.

[1] www.cbd.int
[2] www.cms.int

1.2.3 The Agreement on the Conservation of African-Eurasian Migratory Waterbirds, 1999

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[3].

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.

AEWA covers migratory waterbirds that are ecologically dependent on wetlands for at least a part of their annual life cycle. These include divers, grebes, pelicans, gannets, cormorants, herons and egrets, storks, ibises and spoonbills, flamingos, ducks, geese and swans, cranes and rails, waders, gulls, terns, skimmers, tropic and frigate birds, auks and the African Penguin.

All AEWA species cross international boundaries during their migrations and require good quality habitat for breeding as well as a network of suitable sites to support their annual journeys. International cooperation across their entire migratory range, as provided by AEWA, is therefore essential for the conservation and management of migratory waterbird populations and the habitats on which they depend.

1.2.4 Memorandum of Understanding on the Conservation of Migratory Birds of Prey in Africa and Eurasia

The Signatories agree 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.

1.2.5 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.

1.2.6 The Convention on the International trade in Endangered Species of Wild Flora and Fauna, Washington DC, 1973.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international agreement between governments to ensure that international trade in specimens of wild animals and plants does not threaten their survival.

1.2.7 The 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

[3] Unep-aewa.org

conservation; and (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

1.2.8 National Environmental Management Act, 1998 (Act No. 107 of 1998)

The National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA) is the legislative framework that gives effect to the environmental rights in the Constitution and sets out guiding principles that apply to organs of state that may affect the environment. One of the key principles of the NEMA is sustainable development and the precautionary approach. Regulations promulgated in terms of the NEMA that are relevant to this study are detailed below.

1.2.8.1 Environmental Impact Assessment Regulations, 2014, as amended

The Environmental Impact Assessment (EIA) Regulations 2014, as amended, set out requirements for the appointment of specialists, the general requirements of specialists, and the disqualification of specialists. Appendix 6 of the EIA Regulations, 2014, as amended sets out the Contents of Specialist Reports.

1.2.8.2 Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of Section 24(5) and (h) and 44 of the National Environmental Management Act, 1998, when applying for environmental authorisation.

On 20 March 2020 general requirements for the undertaking of site sensitivity verification and for protocols for the assessment and minimum report requirements of environmental impacts for environmental themes were prescribed in GN 320 of Government Gazette No. 43110. When the requirements for a protocol apply, the requirements of Appendix 6 of the EIA Regulations, 2014, as amended are replaced by these requirements.

On 30 October 2020 the "*Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species*." was published in GN 1150 of Government Gazette 43855*.* This protocol replaces Appendix 6 of the EIA Regulations, 2014, as amended, for the terrestrial animal species theme, which includes avian species.

This assessment was therefore conducted to meet the requirements of this protocol.

2 The Proposed Projects

The proposed projects will make use of solar PV technology to generate electricity from energy derived from the sun. The solar PV facilities will have a range of associated infrastructure, including, but not limited to, an on-site substation and Battery Energy Storage System (BESS) complex and will connect to the existing Gamma Main Transmission Substation (MTS) via the proposed authorised Ishwati Emoyeni Collector Substation and associated 132 kV OHPLs. The OHPLs do not form part of this assessment and are subject to separate BA processes which are also being undertaken by the Applicant.

The exact specifications of the proposed project components will only be determined during the detailed engineering phase prior to construction (subsequent to the issuing of an EA) should such an authorisation be granted for the proposed projects, but the information provided below is seen as the worst-case scenario for the projects. The detail provided was to give specialists as much information as possible to inform the identification and assessment of potential impacts.

The solar PV facilities will have the following project components (as a worst-case scenario for assessment):

Padloper PV 1-4		
Infrastructure	**Component**	**Dimensions / Specifications**
Solar PV	Type of technology	Solar Photovoltaic (PV) Technology
	Height of PV panels	Maximum of ± 4.5 m
	Capacity of the PV facility	Padloper PV 1: Up to 250 MW Padloper PV 2: Up to 150 MW Padloper PV 3: Up to 150 MW Padloper PV 4: Up to 150 MW
	Area of PV Array (i.e., proposed area occupied by PV Modules)	Padloper PV 1: 420 ha Padloper PV 2: 222 ha Padloper PV 3: 222 ha Padloper PV 4: 328 ha Note: The permanent fence line will run as close as possible to the solar array demarcation and substation area. Therefore, the PV array area and the total fenced area (i.e., the area that includes all associated infrastructure within the fenced off area of the PV facility) is anticipated to be similar.
	Technology mounting structure	The following technologies are being considered: Single Axis Tracking Structures (aligned north-south); Dual Axis Tracking (aligned east-west and north-south); Fixed Tilt Mounting Structures; Mono-facial Solar Modules; or Bifacial Solar Modules.
	Inverter-transformer stations	3.5 MW inverters will be located across the proposed project. The exact number of inverters are still to be confirmed however all inverter-transformers will be within the PV array.
	Area occupied by inverter-transformer stations and height	Inverter-transformer stations: 0.022 ha each The inverter stations will have a height of ± 3 m each. Note: This is excluding lightning rods. The rods are expected to extend 10 m high. Each inverter station will have 1 – 2 lightning rods.
Associated infrastructure		

Padloper PV 1-4		
Infrastructure	**Component**	**Dimensions / Specifications**
Temporary construction and laydown area	Construction camp area (ha)	1 - 4 ha Note: These areas will be rehabilitated after construction and will not be retained for the operational phase.
Main access roads Note: The existing road network will be used as far as practically possible and upgraded as needed.	Current width of access roads (m)	5 m
	Length of access roads (km)	Padloper PV 1: Approximately 10.2 km Padloper PV 2: Approximately 2.62 km Padloper PV 3: Approximately 2.35 km Padloper PV 4: Approximately 0.57 km
Internal roads Note: The existing road network will be used as far as practically possible and upgraded as needed.	Width of access roads (m)	5 m
	Length of roads (km)	Padloper PV 1: Approximately 12.91 km Padloper PV 2: Approximately 5.88 km Padloper PV 3: Approximately 8.17 km Padloper PV 4: Approximately 9.34 km The internal road network will be used to conduct security patrols and to access all the equipment (module cleaning and equipment maintenance).
Upgrading of existing access road/s Note: Where required for turning circle/bypass areas, however, access or internal roads may be up to 10 m to allow for larger component transport.	Yes / No	Yes. Existing roads will be used as far as practically achievable.
	Current width (m)	± 5 m
	Upgraded width (m)	± 8 m (6 m wide road surface with 1 m drain either side)
Internal transmission and/or distribution lines	All on-site medium voltage cabling (22 or 33 kV) will be buried to a maximum depth of 1.5 m.	
Site offices Including a warehouse/workshop and an operational and maintenance (O&M) control centre. The details provided in this section is for one site office.	Number of buildings	Site offices and O&M control centre will be located in one building. The workshop and storage area may be attached to the O&M control centre. All buildings will be located within the O&M complex/footprint.
	Maximum height (m)	Up to 10 m
	Footprint (m^2)	300 m^2
Guard houses Note: There will be 2 guardhouses at the proposed project site.	Maximum height (m)	Up to 3 m
	Footprint (m^2)	± 6 m x 6 m ± 36 m^2

Padloper PV 1-4		
Infrastructure	**Component**	**Dimensions / Specifications**
The details provided in this section is for one guard house.		
Ablution facilities Note: There will be 2 ablution facilities proposed project site, included in site offices and guardhouse footprints. The details provided in this section is for one ablution facility.	Maximum height (m)	Up to 10 m
	Footprint (m^2)	Staff lockers: ± 22 m x 11 m ± 242 m^2
Battery energy storage system (BESS)	Battery technology type	Lithium-ion, Sodium-ion, Solid State and Redox Flow technology types are being considered.
	Approx. footprint (ha)	± 5 ha
	Maximum height (m)	Up to 10 m
	Capacity	Padloper PV 1: 1 500 MWh Padloper PV 2: 900 MWh Padloper PV 3: 900 MWh Padloper PV 4: 900 MWh
On-site substation	A 132 kV facility substation complex will be located within the site, and will cover an area of approximately 2 ha and will have a height of up to 18 m.	
On site medium voltage cables or cable trays	Maximum depth (m)	Up to 1.5 m
	Capacity	22 or 33 kV
Water use requirements	Estimated quantity of water (litres) required for the construction phase	Padloper PV 1: 50 000 m3 per annum Padloper PV 2: 30 000 m3 per annum Padloper PV 3: 30 000 m3 per annum Padloper PV 4: 30 000 m3 per annum
	Estimated quantity of water (litres) required for the operational phase	Padloper PV 1: 12 000 m3 per annum Padloper PV 2: 8 000 m3 per annum Padloper PV 3: 8 000 m3 per annum Padloper PV 4: 8 000 m3 per annum
	Estimated quantity of water (litres) required for the decommissioning phase:	The exact amount of water required during this phase is unknown at this stage but expected to be similar to or less than that of the construction phase.
Construction period		Padloper PV 1: < 36 months Padloper PV 2: < 24 months Padloper PV 3: < 24 months Padloper PV 4: < 24 months

3 Methodology

The Terms of Reference (Annexure B) refer and include a detailed project description of the project that was assessed, as well as the impact assessment methodology used, as provided by the EAP for the project.

The methodology for this avian species specialist assessment is based on the *Birdlife SA Best Practice Guidelines for Birds & Solar Energy* (Birdlife SA 2017) ('the Birds & Solar Energy Guidelines), the "*Protocol for the Specialists Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species"* (GN No. 1150 of 30 October 2020) (the 'Protocol'), as well as the associated "*Species Environmental Assessment Guidelines"* (SANBI 2022) (the 'SANBI Guidelines') which the Protocol refers to.

The following data sources were used to inform this assessment:

- The Proposed Padloper Solar PV Facilities near Murraysburg in the Western Cape Province: Avian Pre-application Monitoring Report. (Albertyn, 2022). Site visits were conducted in March 2022 and July 2022;
- Vegetation Map of South Africa, Lesotho and Swaziland (South African National Biodiversity Institute (SANBI) 2018);
- Northern Cape Biodiversity Spatial Plan (Northern Cape Department of Environmental Affairs and Nature Conservation (DENC) 2016);
- National Freshwater Ecosystem Priority Areas (NFEPA);
- Terrestrial Ecosystem Threat Status and Protection Level (SANBI 2018);
- The Department of Forestry, Fisheries and the Environment (DFFE) National Web-based Screening Tool (hereafter referred to as the Screening Tool);
- South African Bird Atlas Project 2 (SABAP2) (Brooks and Ryan 2021);
- Important Bird and Biodiversity Areas (Birdlife South Africa);
- The 2015 Eskom Red Data Book of Birds (Taylor *et al.* 2015);
- The International Union for Red List of Threatened Species (www.iucnredlist.org)
- South Africa Protected Areas Database (DFFE 2022 Q2);
- South African Conservation Areas (DFFE 2022 Q2);
- Habitat Suitability Models (Birdlife SA 2021);
- Publicly available satellite imagery, elevation; and topographical data;
- Specialist's knowledge and experience in the immediate area;
- Avifaunal Specialist Report: Umsinde Emoyeni Wind Energy Facility Phase 1 & 2 and Associated Electrical Grid Connection Phase 1 & 2. Arcus Consultancy Services. 2015;
- Updated Avifaunal Impact Assessment Addendum to Avifaunal Specialist Report: Umsinde Emoyeni Wind Energy Facility Phase 1 & 2 and Associated Electrical Grid Connection Phase 1 & 2 Western Cape & Northern Cape. Arcus Consultancy Services. 2018;
- Amendment to the Avifaunal Impact Assessment Conducted for the Authorised Umsinde Emoyeni Phase 1 Wind Energy Facility near Murraysburg, Western Cape Province. Arcus Consultancy Services. 2020;
- Ishwati Emoyeni Wind Farm Avifaunal Impact Assessment. Wildskies 2014. In: Combined Environmental Impact Assessment for the proposed Ishwati Emoyeni Wind Energy Facility

and Supporting Eskom Transmission and Eskom Grid Connection Infrastructure near Murraysburg, Western Cape. Final Environmental Impact Assessment Report;
- Ishwati Emoyeni Wind Farm Amendment – Avifaunal Statement. Wildskies. 2021;
- Padloper Solar PV Cluster Aquatic and Terrestrial Ecological Screening Assessment. Enviro Sci 2022; and
- Proposed Development of the Grid connection and associated Infrastructure for the Emoyeni Wind Energy Facility – Terrestrial Biodiversity and Avifauna Assessment. The Biodiversity Company. 2022.

3.1 Defining the Project Area of Influence (PAOI)

The primary Project Area of Influence (PAOI) was considered to be the proposed development area footprint with a 2 km buffer around each PV area.

3.2 Site Sensitivity Verification

The Screening Tool was run for the PAOI for each of the four proposed sites. It identified the four sites as of low sensitivity under the avian theme. It must however be noted that the Screening Tool contains little information for the avian theme in areas outside of Renewable Energy Development Zones (REDZs) and this is thus not a reliable indication of the potential sensitivity of the site from an avifaunal perspective.

The national Web-based Screening Tool identified the PAOIs as of high sensitivity for avian SCC *Aquila verreauxii* (Verreaux's Eagle) and *Neotis ludwigii* (Ludwig's Bustard). This was confirmed by avifaunal pre-application monitoring (Annexures A and C).

The Site Sensitivity Verification confirmed the sensitivity of the sites as of high sensitivity with the presence of six SCC within the PAOI confirmed or likely and an avian species specialist assessment being required to be conducted for the proposed site, in line with the Protocol.

3.3 Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species (Taxon Aves)

The Protocol (GN 1150 of 30 October 2020) sets out the requirements for the assessment of impacts on terrestrial species (Table 1).

Table 1: Terrestrial Species Protocol Assessment Report Content Requirements (as per GN 1150 of 30 October 2020)

Clause	Requirement	Report
3.1.1	Contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the assessment including a curriculum vitae	Annexure D
3.1.2	A signed statement of independence by the specialist	Annexure D
3.1.3	A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment	Annexure C
3.1.4	A description of the methodology used to undertake the site sensitivity verification, impact assessment and site inspection, including equipment and modelling used where relevant	Annexure C
3.1.5	A description of the mean density of observations/number of sample sites per unit area and the site inspection observations	Annexure A

3.1.6	A description of the assumptions made and any uncertainties or gaps in knowledge or data	Section 3.6
3.1.7	Details of all SCC found or suspected to occur on site, ensuring sensitive species are appropriately reported	Annexure A
3.1.8	The online database name, hyperlink and record accession numbers for disseminated evidence of SCC found within the study area	Birdlasser /SABAP2
3.1.9	The location of areas not suitable for development and to be avoided during construction where relevant	Annexure A
3.1.10	A discussion of the cumulative impacts	Section 3.7 Section: 4.8.6 Section 4.9.8
3.1.11	Impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr)	Section 5
3.1.12	A reasoned opinion, based on the findings of the specialist assessment, regarding the acceptability or not of the development and if the development should receive approval or not, related to the specific theme being considered, and any conditions to which the opinion is subjected if relevant	Section 5
3.1.13	A motivation must be provided if there were any development footprints identified as per paragraph 3.2.12 above that were identified as having "low" or "medium" terrestrial animal species sensitivity and were not considered appropriate	N/A

3.4 Determining Site Ecological Importance

As per the Species Assessment guidelines (SANBI, 2021), the Site Ecological Importance (SEI) is a function of the Biodiversity Importance (BI) of the Impact Receptor (i.e. SCC or habitat of the SCC) and its resilience to impacts (Receptor Resilience, RR):

SEI = BI + RR (Table 2)

Table 2: Calculation of Site Ecological Importance (taken from SANBI 2021)

Site Ecological Importance		Biodiversity importance				
		Very high	High	Medium	Low	Very low
Receptor resilience	Very low	Very high	Very high	High	Medium	Low
	Low	Very high	Very high	High	Medium	Very low
	Medium	Very high	High	Medium	Low	Very low
	High	High	Medium	Low	Very low	Very low
	Very high	Medium	Low	Very low	Very low	Very low

Biodiversity importance in turn is a function of conservation importance (CI) and functional integrity (FI):

BI = CI + FI (Table 3)

Table 3: Calculation of Biodiversity Importance (taken from SANBI 2021)

Biodiversity Importance		Conservation importance				
		Very high	High	Medium	Low	Very low
Functional Integrity	Very high	Very high	Very high	High	Medium	Low
	High	Very high	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very low
	Low	Medium	Medium	Low	Low	Very low
	Very low	Medium	Low	Very low	Very low	Very low

3.4.1 Conservation Importance

Conservation importance is defined here as: *'The importance of a site for supporting biodiversity features of conservation concern present, e.g. populations of IUCN threatened and Near-threatened species (CR, EN, VU and NT), Rare species, range-restricted species, globally significant populations of congregatory species, and areas of threatened ecosystem types, through predominantly natural processes'* (Table 4).

Table 4: Conservation Importance Criteria as per Species Assessment Guidelines (SANBI 2021)

Conservation Importance	Fulfilling Criteria
Very high	Confirmed or highly likely occurrence of CR, EN, VU, or Extremely Rare or Critically Rare species that have a global EOO (Extent of Occurrence) of <10 km$^{2.}$. Any area of natural habitat of a CR ecosystem type or large area (>0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type. Globally significant populations of congregatory species (>10% of global population).
High	Confirmed of highly likely occurrence of CR, EN, VU species that have a global EOO of >10km^2. IUCN threatened species (CR, EN, VU) must be listed under any Criterion other than A. If listed as threatened only under Criterion A, include if there are less than 10 locations or <10 000 mature individuals remaining. Small area (>0.01% but < 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (>0.1%) of natural habitat of VU ecosystem type. Presence of Rare species. Globally significant populations of congregatory species (>1% but <10% of global population).
Medium	Confirmed or highly likely occurrence of NT species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. Any area of natural habitat of threatened ecosystems type with status of VU. Presence of range-restricted species. >50% of receptor contains natural habitat with potential to support SCC.
Low	No confirmed of highly likely populations of SCC.

	No confirmed or highly likely populations of range-restricted species. <50% of receptor contains natural habitat with limited potential to support SCC.
Very low	No confirmed and highly unlikely populations of SCC. No confirmed and highly unlikely populations of range-restricted species. No natural habitat remaining.

3.4.2 Functional Integrity

Functional integrity (FI) of the receptor is defined here as the receptors' current ability to maintain the structure and functions that define it, compared to its known or predicted state under ideal conditions. Simply stated, FI is: *'A measure of the ecological condition of the impact receptor as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts'* (Table 5).

Table 5: Functional Integrity Criteria as per Species Assessment Guidelines (SANBI 2021)

Functional integrity	Fulfilling Criteria
Very high	Very large (>100 ha) intact area for any conservation status of ecosystem type or > 5 ha for CR ecosystem types. High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches. No or minimal current negative ecological impacts with no signs of major past disturbances (e.g. ploughing).
High	Large (>20 ha but < 100 ha) intact area for any conservation status of ecosystem type or >10 ha for EN ecosystem types.
Medium	Medium (> 4 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types. Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches. Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential.
Low	Small (>1 ha but < 5 ha) area. Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy road network surrounds the area. Low rehabilitation potential.
Very low	Very small (<1 ha) area. No habitat connectivity except for flying species or flora with wind-dispersed seeds. Several major current negative ecological impacts.

3.4.3 Receptor Resilience

Receptor resilience (RR) is defined here as*: "The intrinsic capacity of the receptor to resist major damage from disturbance and/or to recover to its original state with limited or no human intervention'* (Table 6).

Table 6: Receptor Resilience Criteria as per Species Assessment Guidelines (SANBI 2021)

Resilience	Fulfilling Criteria
Very high	Habitat that can recover rapidly (~ less than 5 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a

Resilience	Fulfilling Criteria
	very high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a very high likelihood of returning to a site once the disturbance or impact has been removed.
High	Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed.
Medium	Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed.
Low	Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a low likelihood of returning to a site once the disturbance or impact has been removed.
Very low	Habitat that is unable to recover from major impacts, or species that are unlikely to remain at a site even when a disturbance or impact is occurring, or species that are unlikely to return to a site once the disturbance or impact has been removed.

3.4.4 Interpretation of Site Ecological Importance

Site Ecological Importance (Table 7) should be described in the above manner for each impact receptor within the PAOI and clearly mapped in relation to development activities and infrastructure, and interpreted in the context of the proposed development activities (Table 7).

Table 7: SANBI (2021) Guidelines for the Interpretation of Site Ecological Importance

SEI	Interpretation in relation to proposed development activities
Very high	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e. last remaining populations of species, last remaining good condition patches of ecosystems/ unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted; limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

3.5 The BirdLife SA Birds and Solar Energy Best Practice Guidelines

The Best Practice Guidelines are the guidelines that were followed for the pre-application avifaunal monitoring.

According to the Birds and Solar Energy Best Practice Guidelines an avifaunal impact assessment of solar power facilities should consist of the following stages:

- *Stage 1: Preliminary assessment to give an overview of the biological context, likely impacts and potential red flags to development, identify alternatives and determine the appropriate assessment regime.*
- *Stage 2: Data collection on which to base the impact assessment report, and to provide a baseline against which post-construction monitoring can be compared.*
- *Stage 3: Impact assessment.*
- *Stage 4: Post-construction monitoring, if required.*

The scope of the undertaken work presented in this report pertains to Stage 3 and recommendations for Stage 4 of the above. Please refer to Annexure A for completed reporting on Stages 1 and 2.

3.6 Assumptions and Limitations

It is assumed that all information provided by the Applicant and EAP is correct.

This report is based on data collected during a single multi-day summer and a single multi-day winter survey. While the timing of the surveys is deemed as ideal for winter and summer surveys, inter-annual variations, and inter-seasonal variations (spring and autumn) are not accounted for. A precautionary approach was therefore used in the assessment of impacts.

To date only one peer-reviewed paper on the effects of solar PV facilities on avian species in South Africa has been published (Visser *et al.* 2019). Therefore, much of the assessment is based on information gathered elsewhere in the world.

3.7 Impact Assessment Methodology

Potential impacts on avifauna were first identified through a literature review and desktop study, and further informed by site surveys conducted in March 2022 and July 2022. Impacts were then assessed using an impact assessment methodology supplied by the EAP (refer to Annexure B). For each impact, the nature (positive/negative), extent (spatial scale), magnitude duration (time scale), consequence (calculated numerically) and probability of occurrence is ranked and described. These criteria are used to ascertain the significance of the impact, firstly in the case of no mitigation and then with the most effective mitigation measure(s) in place. The impact methodology used is presented in Section B of Annexure B.

Cumulative impacts were assessed for past, existing and proposed projects within a 30 km radius of the projects (Table 8). Avifaunal reports were obtained for adjacent projects as far as possible. Refer to Section 3 above for a complete list of obtained reports.

Table 8: Projects within a 30 km radius included in the cumulative assessment

Project name	Technology	Avifaunal report available
Proposed Umsinde Emoyeni Wind Energy Facility phase 2 and its associated electrical grid connection phase 2, Western and Northern Cape Provinces	Wind and OHPL	Yes
Proposed Umsinde Emoyeni Wind Energy Facility phase 1 and its associated electrical grid connection phase 1, Western and Northern Cape Provinces	Wind and OHPL	Yes
Proposed Ishwati Emoyeni Wind Energy Facility and supporting Eskom Transmission and Distribution Grid Connection Infrastructure near Murraysburg, Western Cape Province.	Wind and OHPL	Yes

Project name	Technology	Avifaunal report available
Proposed Development of the Mainstream Wind and Solar Energy Facility at Victoria West, Northern Cape Province	Wind and Solar PV	No
Proposed new 132 kV grid connection and associated infrastructure for the authorised Emoyeni Wind Energy facilities, near Murraysburg, Beaufort West and Ubuntu Local Municipalities and Central Karoo and Pixely Ka Seme District Municipalities	OHPL	Yes
Proposed Padloper Solar PV 1	Solar PV	Yes
Proposed Padloper Solar PV 2	Solar PV	Yes
Proposed Padloper Solar PV 3	Solar PV	Yes
Proposed Padloper Solar PV 4	Solar PV	Yes
Proposed Padloper Solar PV 5	Solar PV	Yes
Proposed Padloper Solar PV 6	Solar PV	Yes
Proposed Padloper Solar PV 7	Solar PV	Yes
Proposed Padloper OHPL and associated electrical grid infrastructure (EGI) 1	OHPL	Yes
Proposed Padloper OHPL and EGI 2	OHPL	Yes
Proposed Padloper OHPL and EGI 2	OHPL	Yes
Proposed Padloper OHPL and EGI 3	OHPL	Yes
Proposed Padloper OHPL and EGI 4	OHPL	Yes
Proposed Padloper OHPL and EGI 5	OHPL	Yes
Proposed Padloper OHPL and EGI 6	OHPL	Yes
Proposed Padloper OHPL and EGI 7	OHPL	Yes

4 Results

4.1 Regional Context

The proposed development sites are located north-east of the town of Murraysburg in the Northern Cape and Western Cape Provinces (Figure 1). The site falls within the Nama-Karoo Biome and Upper Karoo Bioregion. There are no Important Bird Areas within 50 km of the proposed development sites. The closest Protected Area is the Mountain Zebra Camdeboo Protected Area located approximately 12 km to the east of the Padloper PV 4 site (Figure 1), which is outside of the projects areas of influence and therefore not expected to be impacted by the proposed developments.

4.2 Local Context and Fieldwork Results

4.2.1 Padloper Solar PV 1

The site is located on an elevated plateau at approximately 1370 m above sea level in between the Bakenslip NFEPA River to the south and an unnamed NFEPA river to the north (Figure 2). The site itself does not contain any NFEPA wetlands or rivers and contains only two minor drainage lines. The terrain is relatively flat and uniform. The vegetation type of the entire site is mapped as Eastern Upper Karoo (Least Concern – SANBI 2018). Approximately two thirds of the site is mapped as a Critical Biodiversity Area (CBA) 2 in the Northern Cape Biodiversity Spatial

Plan (NCBSP) (Figure 2). It should be noted that the resolution of the NCBSP is at a relatively coarse scale in relation to the size of the site.

4.2.2 Padloper Solar PV 2

The Padloper Solar PV 2 site is located on a slight east-facing slope below a ridge to its western and northern boundary. No wetlands or rivers are located within the site boundary, and the site only contains short stretches of four minor drainage lines. The entire site is mapped as Eastern Upper Karoo vegetation type (Least Concern). A farm road runs through the development site. The site does not contain any CBAs (Figure 2).

4.2.3 Padloper Solar PV 3

The Padloper Solar PV 3 site is located in a relatively flat, low-lying area and does not contain any NFEPA wetlands or rivers, with a river running approximately 700 m to the south of its southern boundary. Five drainage lines fall within the site and a farm road dissects the site on an east-west axis. The entire site is mapped as Eastern Upper Karoo vegetation type (Least Concern). The site does not contain any CBAs (Figure 2).

4.2.4 Padloper Solar PV 4

The Padloper Solar PV 4 site consists of a largely flat area with a small hill in its western section. The site contains no NFEPA rivers and one artificial unchanneled valley bottom NFEPA wetland and two larger drainage lines and their tributaries. The majority of the site is mapped as Eastern Upper Karoo vegetation type (Least Concern), with the exception of the hill in the west of the site mapped as Upper Karoo Hardeveld (Least Concern). The site contains an area of approximately 158 ha of CBA1, with some small areas of CBA2 within that area (Figure 2).

4.3 General Sampling Conditions

The land use on the proposed sites is in line with the results of the Screening Tool. Sampling was conducted over two seasons over several days each, in good weather conditions.

4.3.1 Sampling effort

The sampling effort of two seasonal multi-day surveys conducted in summer (March) and winter (July) is considered adequate for the type and size of the development and the avifaunal sensitivity of the site. Sampling effort is in line with Regime 2 of the Best Practice Guidelines, the Species Assessment Guidelines and with the Terrestrial Species Protocol (GN 1150 of October 2020) which refers to the Species Environmental Assessment Guideline (SANBI 2021).

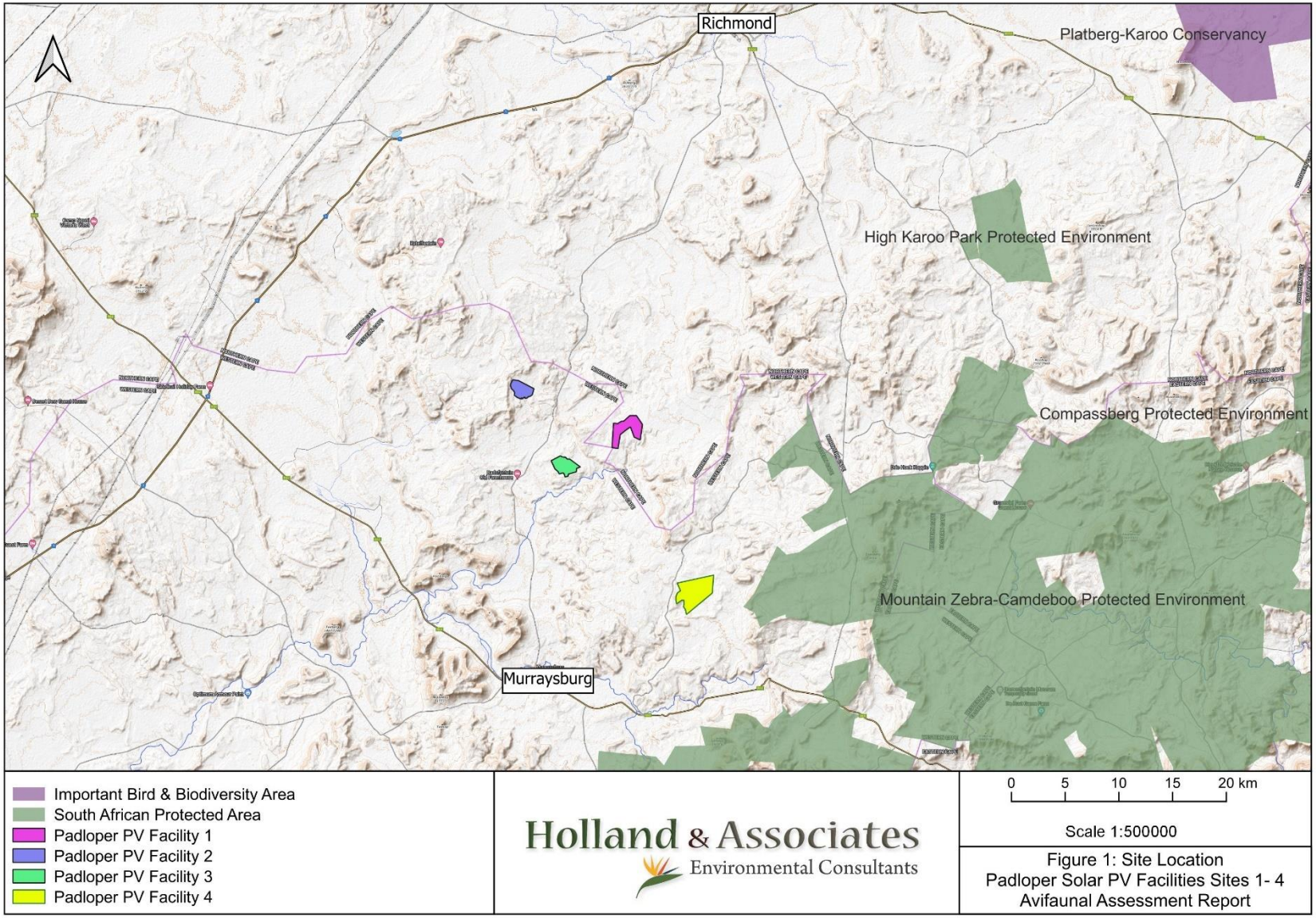


Figure 1: Site Location

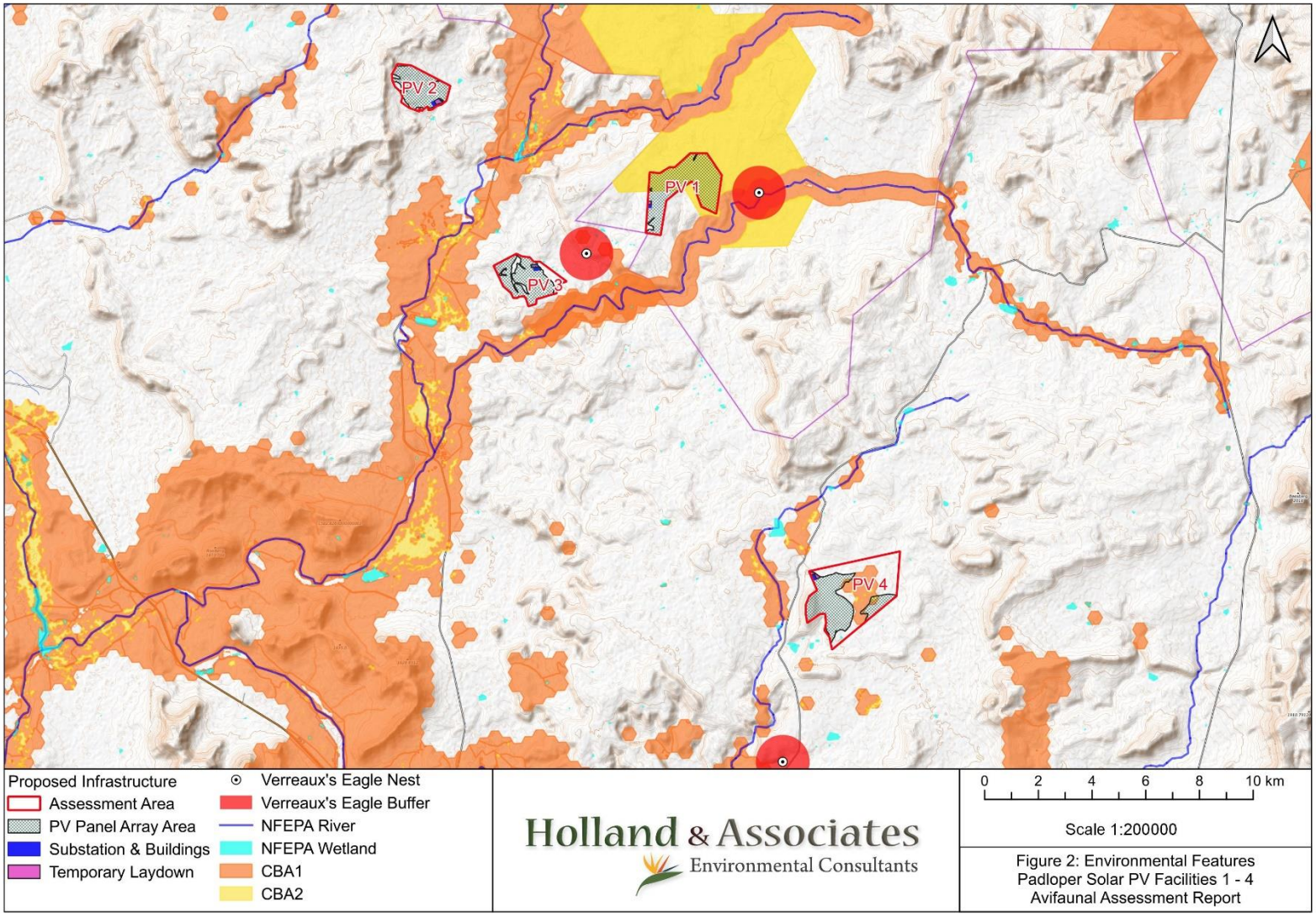


Figure 2: Environmental Features

4.4 Predicted and observed species, highlighting Species of Conservation Concern

The South African Bird Atlas Project 2 (SABAP2) has recorded 194 species, including 11 SCC within 19 pentads covering and adjacent to the study area, which potentially occur in the study area (Appendix A of Annexure A). During the summer and winter surveys a total of 107 species were recorded in the area, including six SCC and 15 endemic or near-endemic species (Table 9).

Walked transect results from the site and adjacent riverine area indicate a low average abundance of individuals (Index of Kilometric Abundance (IKA) = 19.5) and species (25 species) on the PV site, and a low average abundance (IKA 38.6) but high diversity (52 species) in the riverine area, which is not unexpected (Refer to Table 5 in Annexure A).

Table 9: Species of Conservation Concern, endemic and near-endemic bird species potentially occurring and recorded during the pre-application monitoring surveys

Common Name	Scientific Name	Red Data Status (Regional, Global)[4]	Endemism[5]	Summer	Winter	SABAP2
Ludwig's Bustard	*Neotis ludwigii*	EN, EN		x	X	X
Martial Eagle	*Polemaetus bellicosus*	EN, VU				X
Lanner Falcon	*Falco biarmicus*	VU, LC		x	X	X
Verreaux's Eagle	*Aquila verreauxii*	VU, LC		x	X	X
Secretarybird	*Sagittarius serpentarius*	VU, EN			X	X
Karoo Korhaan	*Heterotetrax vigorsii*	NT, LC			X	X
Blue Crane	*Grus paradisea*	NT, VU		x	X	X
African Rock Pipit	*Anthus crenatus*	NT, NT	SLS			X
European Roller	*Coracias garrulus*	NT, LC				X
Greater Flamingo	*Phoenicopterus roseus*	NT, LC				X
Ground Woodpecker	*Geocolaptes olivaceous*	LC, NT	SLS			X
Cape Weaver	*Ploceus capensis*		NE	x	X	X
Cape White-eye	*Zosterops virens*		NE	x	X	X
Fiscal Flycatcher	*Melaenornis silens*		NE		X	X
Grey Tit	*Melaniparus afer*		NE	x		X
Jackal Buzzard	*Buteo rufofuscus*		NE	x	X	X
Karoo Eremomela	*Eremomela gregalis*		NE	x	X	X
Karoo Lark	*Calendulauda albescens*		NE		X	X
Karoo Prinia	*Prinia maculosa*		NE	x	X	X

[4] LC: Least Concern; NT: Near-threatened; VU: Vulnerable; EN: Endangered
[5] E: Endemic; NE: near-endemic; SLS: South Africa, Lesotho & Swaziland

Common Name	Scientific Name	Red Data Status (Regional, Global)[4]	Endemism[5]	Summer	Winter	SABAP2
Karoo Thrush	*Turdus smithi*		NE	x	X	X
Large-billed Lark	*Galerida magnirostris*		NE	x	X	X
Namaqua Warbler	*Phragmacia substriata*		NE	x	X	X
Sickle-winged Chat	*Emarginata sinuata*		NE		X	X
Southern Double-collared Sunbird	*Cinnyris chalybeus*		NE	x	X	X
Pied Starling	*Lamprotornis bicolor*		SLS		X	X

Three Verreaux's Eagle nests were located during the pre-construction monitoring surveys near the PV Sites. One nest is located approximately 1.5 km from the site boundary to the east of the Padloper Solar PV 1 site, on a cliff in the Bakensklip river gorge. The second nest is located on a cliff at the edge of a plateau, approximately 1.2 km to the east of the Padloper Solar PV 2 and 2.4 km west of the Padloper Solar PV 1 site (Figure 2). The third nest is located approximately 4.6 km south-west of the Padloper Solar PV 4 site. No-development buffers of 1 km are recommended around these nests to protect the breeding birds from disturbance.

Based on the above results, Table 10 presents SCC confirmed or potentially occurring in the PAOI of the four PV Sites, as well as their probability of occurrence, and the reasons thereof. In total eleven SCC occur or potentially occur in the PAOI of the four sites with a medium or higher likelihood. Six of these are known or likely to occur on the PV Sites.

Table 10: Species of Conservation Concern potentially occurring in the PAOIs and their Probability of Occurrence (PoC)

Alphabetical Name	Scientific Name	Red Data Status[6]	Habitat Requirement (Hockey *et al*. 2005)	PoC	Reason for PoC
African Rock Pipit	*Anthus crenatus*	NT	Mountains, karoo hills, and escarpments, favouring open areas with rocky outcrops, grass clumps, and low bushes	Medium	Has been recorded in the region by SABAP2. The sites do not contain ideal habitat. Maintains territory year-round but was not recorded during pre-construction monitoring and male is easily detected by conspicuous call.
Blue Crane	***Grus paradisea***	**NT**	**Natural grasslands, wetlands, cultivated pastures, croplands**	**High**	**Was recorded in the area, in cultivated areas outside of the proposed development sites, but may also occur within any of the PV Sites.**
European Roller	*Coracias garrulus*	NT	Open woodlands, perching on open dead branches, telephone poles and powerlines. Bushy plains and dry savanna	Medium	Potentially suitable habitat on sites but vagrant to the area with a zero SABAP2 reporting rate for the pentad (one incidental record).
Greater Flamingo	*Phoenicopterus roseus*	NT	Breeds in saltpans. Inland dams, sewage treatment pans and river mouths.	Medium	Low reporting rate of 2.8 % by SABAP2 but has been seen by the specialist in the larger area, and may commute over the sites between suitable dams.
Ground Woodpecker	*Geocolaptes olivaceous*	NT	Rock and boulder-strewn slopes of hills and mountains, often frequenting road cuttings. Mostly in treeless grasslands and shrublands. Eroded gullies and derelict buildings. Excavates roosting and nesting holes in vertical earth banks.	Medium	Known to occur in the area and suitable habitat potentially present but only outside of the PV sites in the PAOI.
Karoo Korhaan	***Heterotetrax vigorsii***	**NT**	**Dwarf xerophytic shrublands of succulent Karoo and shrubby areas in Nama karoo, less abundant in grassy Nama karoo. Stony ground flat to undulating areas.**	**Confirmed**	**Recorded during pre-construction monitoring. The PV Sites all consist of ideal shrubby Nama karoo habitat for this species.**
Lanner Falcon	***Falco biarmicus***	**VU**	**Open grassland, open or cleared woodland near cliff or electricity pylons**	**High**	**Was recorded in the region during pre-construction monitoring and may occur on all the PV Sites as they contain suitable habitat.**

[6] http://speciesstatus.sanbi.org/

Alphabetical Name	Scientific Name	Red Data Status[6]	Habitat Requirement (Hockey *et al*. 2005)	PoC	Reason for PoC
Ludwig's Bustard	***Neotis ludwigii***	**EN**	**Favours semi-arid dwarf shrublands, also in arid savanna and fynbos**	**High**	**Was recorded in the area during pre-construction monitoring and all the PV Sites contain suitable habitat.**
Martial Eagle	***Polemaetus bellicosus***	**EN**	**Mostly open savanna and woodland on plains, semi-arid shrublands, rare in mountainous areas.**	**High**	**Is known to occur in the area, and forages widely.**
Secretarybird	*Sagittarius serpentarius*	EN	Open grassland, shrubland, open savanna.	Medium	Was recorded in the region during pre-construction monitoring and holds large territories. The habitat suitability of the sites is low (values of approximately <0.1 throughout on a scale of 0 – 0.9) (Birdlife SA 2021)
Verreaux's Eagle	***Aquila verreauxii***	**VU**	**Mountainous and rocky areas with large cliffs.**	**Confirmed**	**Confirmed nesting in the area and the PV Sites all lie within expected home range (Murgatroyd *et al.* 2016)**

4.4.1 Avifaunal habitats

Two avifaunal habitat types were identified for the PV sites: Karoo scrub and drainage line habitat.

4.4.1.1 Karoo scrub avifaunal habitat

This is a relatively uniform habitat in terms of plant species composition and abundance, and dominated by a small number of grass and fern species. The vegetation of the habitat was found by the ecological specialist to be in a fair condition, possibly due to the higher-than-normal rainfall that occurred in the region in the past two years (Colloty, 2022). This type of habitat supports several Species of Conservation Concern (SCC), including the SCC recorded in the study area Ludwig's Bustard (*Endangered*), Karoo Korhaan (*Near-threatened*), Blue Crane (*Near-threatened*), Lanner Falcon (*Vulnerable*), Verreaux's Eagle (*Vulnerable*) and Secretarybird (*Endangered*). Several endemic and near-endemic passerine species also occur here, such as Eastern Clapper Lark, Large-billed Lark, Karoo Eremomela, Karoo Lark, Karoo Prinia, Namaqua Warbler, Sickle-winged Chat and Pied Starling. The majority of the PV Site consists of this habitat (Figure 2).

4.4.1.2 Drainage lines avifaunal habitat

Drainage lines are characterised by taller riparian vegetation with small trees, than the surrounding Karoo scrub areas, and generally support a higher avifaunal abundance and diversity than the surrounding areas. The SCC listed in Section 4.4 above for Karoo scrub habitat may also occur here occasionally, but this habitat is more likely to be frequented by smaller passerine species. Endemic and near-endemic species recorded in the study area that prefer this habitat include Cape Weaver, Cape White-eye, Fiscal Flycatcher, Grey Tit and Southern Double-collared Sunbird. Only few and short drainage lines occur on the PV Sites (Figure 2).

4.5 Current impacts

The study area consists largely of a *Least threatened* vegetation type, in semi-intact condition, that is currently being used for low-intensity sheep grazing for a minimum of several decades, with few other anthropogenic influences such as farm roads, fences and resulting erosion.

4.6 Site Ecological Importance

The calculation of the Site Ecological Importance is presented in Table 11. Two avifaunal habitat types (Karoo scrub and drainage lines) were identified on the proposed developments.

The Conservation Importance for avian fynbos habitat and drainage line habitat was determined as Medium for all sites due to more than 50% of the receptor containing natural habitat with potential to support SCC.

The Functional Integrity of the karoo scrub habitat and drainage line habitat has been rated as High as the vegetation is semi-intact and has been utilised for sheep grazing for decades, but there is high habitat connectivity, limited road networks, and no signs of major past disturbance such as ploughing, apparent, for all sites.

The Receptor Resilience of the karoo scrub and drainage line habitat has been rated as Medium as a recovery to restore >75% of functionality is assumed to be slow, but possible with rehabilitation, over more than 10 years.

The resulting Site Ecological Importance rating was determined as Medium for all avifaunal habitats on all proposed development sites, which means that minimisation and restoration mitigation must be implemented and development activities of medium residual impact are acceptable if followed by restoration activities (SANBI 2022).

Table 11: Calculation of Site Ecological Importance

Habitat	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Karoo scrub	Medium	High	Medium	Medium	Medium
Drainage line / Wetland	Medium	High	Medium	Medium	Medium

4.7 Avifaunal Sensitivity

4.7.1 Padloper Solar PV 1

Based on the results of avifaunal pre-construction monitoring, i.e. the occurrence of SCC, but their low expected frequency of use of the sites, the overall low abundance and diversity of avifauna recorded, the proximity to the Verreaux's Eagle nests, and the CBA2 status of the majority of the site, the avifaunal sensitivity of the site is determined as Medium, in terms of the Best Practice Guidelines. This is mainly due to the majority of the site being mapped as a CBA2, however the site does not contain avifaunal habitat of particular importance and the habitat that would be lost from the proposed development is well represented in surrounding areas. No areas of high avifaunal sensitivity were identified within the assessment area that require avifaunal buffers.

4.7.2 . Padloper Solar PV 2

An area of high sensitivity of 200 m was identified surrounding a wetland which lies immediately outside of the site boundary. This 200 m buffer area has been excluded from the proposed development footprint. The remaining assessment area is of Low avifaunal sensitivity and does not contain any sensitive features for avifauna.

4.7.3 . Padloper Solar PV 3

Areas of high avifaunal sensitivity surrounding several NFEPA wetlands immediately outside of the site boundary were identified and the proposed development footprint excludes these areas. The remaining assessment area is of Low avifaunal sensitivity and does not contain any sensitive features for avifauna.

4.7.4 . Padloper Solar PV 4

The approximately 158 ha CBA1 and CBA2 areas within the site are considered to be of Medium avifaunal sensitivity and development should be avoided within these areas as much as possible.

This has been achieved by the proposed preferred alternative which covers an area of only approximately 11 ha of CBA1 and less than 3 ha of CBA2.

4.8 Description of identified Impacts and available mitigation measures applicable to the proposed Padloper PV 1-4 projects

The following potential impacts on avifauna by the proposed development were identified for the construction phase (IUCN 2021):

- Disturbance
- Habitat loss

The following potential impacts on avifauna by the proposed development were identified for the operational phase:

- Disturbance
- Collisions with PV panels
- Electrocutions and collisions on electrical infrastructure and fencing
- Barrier effects
- Cumulative impacts

The following potential impacts on avifauna by the proposed development were identified for the decommissioning phase:

- Disturbance
- Habitat loss

4.8.1 Disturbance

Disturbance during the construction, operational and decommissioning phases from construction / decommissioning and maintenance activities can negatively affect all avifauna on an individual or population level by increasing stress, decreasing food and habitat availability, causing displacement into potentially less suitable neighbouring environments, and ultimately potentially decreasing reproductive success (Bennun *et al.* 2021, Birdlife SA 2017). This is particularly true for resident breeding species, some of which are shy, secretive and not habituated to human activities. For this project, disturbance is of particular concern due to the confirmed occurrence of the SCC Ludwig's Bustard, Verreaux's Eagle, Blue Crane, Karoo Korhaan, Lanner Falcon and Secretarybird, which are all locally breeding residents.

4.8.1.1 Mitigation of disturbance:

Disturbance can be managed and mitigated at the design stage by avoiding important nesting, roosting and foraging areas of sensitive species during site selection and layout design. This has been achieved by the proposed development during the screening phase and the proposed layout avoids sensitive features and was informed by pre-construction monitoring results.

In order to ensure no SCCs are breeding within the proposed disturbance footprint prior to the commencement of construction or decommissioning activities, a walkthrough of the site must be conducted, as close as possible prior to the commencement of activities.

Operational phase disturbance can be minimised by demarcating the disturbance footprint, and minimising this to the development footprint as much as practically possible.

4.8.2 Habitat loss and displacement

Any transformation of vegetation leads to habitat loss for avian species utilising that vegetation, causing displacement into areas which are potentially less suitable or already occupied by competing individuals or species (Frid & Dill 2002, Percival 2005, Dwyer *et al.* 2018). The development of PV facilities can result in the complete loss of habitat equivalent to the development footprint size, as vegetation underneath the PV panels is generally entirely removed, and the land is transformed. Even if the vegetation beneath the proposed PV panels will not be removed entirely, it will need to be cut and maintained at a low level. Any available perches within the facility may be used as nesting and roosting substrate by some less sensitive species. Some bird species may therefore persist in the proposed development footprint, particularly smaller passerine species, however most avian species will be displaced from the area.

4.8.2.1 Mitigation of habitat loss:

Mitigation of habitat loss from construction of the facility is only marginally possible by retaining as much of the indigenous vegetation as possible beneath PV panels, and minimising the footprint of all associated infrastructure, including buildings, electrical infrastructure and the width and length of roads.

Before decommissioning an avifaunal walkthrough must identify any active nesting and breeding sites of SCC, that could have established throughout the lifetime of the facility, which must be protected until the breeding has concluded.

4.8.3 Collisions with PV panels and associated infrastructure

While not much research has been conducted in this regard, there is a hypothesis that some avian species, in particular waterbirds, may potentially be attracted by the reflective surfaces of solar PV panels, possibly mistaking them for water bodies, resulting in disorientation, injury or death from colliding with the panels. The proposed sites are however not located within any major known flyways. However, Greater Flamingo do occur in the region and could traverse the sites when commuting between inland dams and other waterbodies, and potentially be at risk. Additionally, glare or polarised lights may attract insects and thus insectivorous birds (Walston *et al*. 2016, Visser *et al*. 2019, Kosciuch *et al*. 2020). Predation or entrapment of birds injured from non-fatal panel collisions can also play a role in avian mortalities at PV plants (Kagan *et al*. 2014). Results from fatality monitoring at 10 PV plants in the USA over 13 years estimate an average annual fatality of 2.49 birds per MW per year (Kosciuch *et al.* 2020). Initial evidence however suggests that the collision risk posed by PV panels is likely to be low compared with that posed by transmission lines (Bennun *et al.* 2021).

The project description does not include any overhead powerlines that could pose a threat to collisions, as all cables will be buried.

Fencing associated with solar PV facilities sometimes includes perimeter double-fencing, in which birds can get trapped, or collide with (Visser *et al.* 2018). Few fence-related fatalities have however been reported at solar facilities with single-fence designs (Harvey *et al*. 2015)

4.8.3.1 Mitigation of collisions with PV panels

Mitigation measures to avoid collisions with PV panels are limited, but collisions can be reduced by site selection away from areas where birds congregate or known flyways, which the project has achieved, and by making the site otherwise unattractive to avifauna, i.e. by minimising any available perching and nesting structures, closing open water bodies, reducing attractive or disorientating lighting, and by implementing an operational monitoring programme with carcass searching (Bennun *et al.* 2021). The perimeter and internal fencing should consist of a single-fence design.

If unacceptably high levels of mortalities are recorded, adaptive mitigation measures such as deterrent devices may need to be considered.

4.8.4 Electrocutions

Large birds can be electrocuted or incur electric shock injuries when simultaneously contacting two uninsulated energised components of differing electric potential (phase-to-phase electrocution), or when contacting an uninsulated energised component and a path to ground (phase-to-ground- electrocution) (Dwyer 2006, APLIC 2006). Because electrocutions result from birds bridging air-gaps, larger birds with larger wingspans, such as Martial Eagle, are disproportionately affected (Slater *et al.* 2020). For the proposed project electrocutions could occur at the substation or within the facility at uninsulated electrical infrastructure.

4.8.4.1 Mitigation of electrocution and collisions with electrical infrastructure

Bird electrocutions can easily be prevented with bird-friendly pole design i.e. creating separation between conductors of differing electric potential, by placing insulation over conductors, or by redirecting birds to perch or nest away from conductors (APLIC 2006, Dwyer *et al.* 2017).

4.8.5 Barrier effects

Large areas of PV panels and associated infrastructure could potentially affect bird movements by acting as a barrier, for example due to cumulative impacts from several large PV facilities causing the loss of stopover sites for migratory birds along their flyway (Bennun *et al.* 2020) or due to disorientation, or avoidance of the area when flying.

4.8.5.1 Mitigation of barrier effects

The only realistic option to mitigate this impact is to select a site away from known migratory corridors and flyways between roosting and nesting areas. There are no major known migratory flyways in the region, as migrating birds generally disperse into the interior of South Africa, and no distinct flyways between roosting and nesting areas were identified during pre-construction monitoring. Mitigating this impact is not realistically possible once the facility has been built.

4.8.6 Cumulative impacts

Cumulative impacts are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

Cumulative impacts assessed include the combination of all the impacts discussed above for this project, which may be higher than the sum of impacts, as well as the associated Padloper PV facilities and associated electrical grid infrastructures. Cumulative impacts have been assessed for all known projects in an area of 30 km surrounding the proposed developments (Table 8). In addition to the Padloper PV Sites, one wind and solar energy facility (Mainstream Victoria West), and three further wind energy facilities (WEFs) (Ishwati WEF, Umsinde Wef and Khangela WEF), each with associated grid connection have been authorised in the cumulative assessment area. All of these facilities are to ultimately connect to the Gamma MTS.

4.8.6.1 Mitigation of cumulative impacts

The only real mitigation possible in order to minimise cumulative impacts, is for the Competent Authority to ensure only projects are authorised that are practically mitigatable to an acceptable level, and that do not lead to unacceptable negative impacts, including cumulative impacts, and to ensure the correct implementation of authorised EMPrs through compliance audits and enforcement.

4.9 Assessment of Impacts on Avifauna applicable to the proposed Padloper PV 1-4 projects

4.9.1 Construction and Decommissioning Phase Impact: Disturbance

The impact of disturbance on avifauna is negative and would affect the PAOI for the duration of the construction phases (24 - 36 months per PV facility which may run in parallel or sequentially) and decommissioning phases of the proposed developments. Some disturbance is definite to occur, but the impact will cease with the completion of the construction and decommissioning phase and is highly reversible. Avifauna would continue to be present on site but in a modified manner, if for example breeding SCC are affected. Therefore, the consequence was determined as moderate.

With mitigation the impact on breeding SCC can be made very unlikely, and the consequence can be reduced to slight, resulting in a very low impact significance.

4.9.2 Construction Phase Impact: Habitat Loss

The impact of habitat loss on avifauna is negative and would affect the sites directly and surrounding areas indirectly through displacement. Therefore, the spatial extent of the impact is rated as local. Habitat loss is definite to occur and may impact SCC. Reversibility is considered to be possible with rehabilitation to some degree, therefore irreversibility is rated as medium. The impact will persist for the lifetime of the facilities and is therefore rated as long-term. The habitat is largely of Least Concern, with much equivalent habitat remaining in surrounding areas, therefore irreplaceability is rated as low. The consequence of habitat loss for SCC is potentially severe if habitat loss occurs within breeding areas.

With implementation of the mitigated (preferred) site alternative, which excludes known SCC breeding areas, and an avifaunal pre-construction walkthrough the consequence to breeding SCC is reduced, but avifaunal habitat remains unavailable for foraging and future breeding activities. Therefore, the post-mitigation consequence is rated as substantial resulting in a moderate significance rating.

4.9.3 Operational Phase Impact: Disturbance

The operational phase impacts of disturbance will be restricted to activities associated with the maintenance and operation of the facilities and can potentially be local, long term and highly reversible with a low irreplaceability, as the impacts will cease with the decommissioning of the facilities. Disturbance during the operational phase can potentially lead to a moderate consequence if the facility is located near SCC breeding and foraging areas, but the likelihood of this occurring is considered unlikely. The significance of the impact was therefore rated as low.

As the site locations already avoid sensitive SCC breeding habitats, and if the disturbance footprint is minimised as far as possible to the development footprint, the extent can be lowered to site-specific, and the consequence can be lowered to slight, as SCC are unlikely to be affected. The impact significance is rated as very low with mitigation.

4.9.4 Operational Phase Impact: Collisions with PV Panels and Associated Infrastructure

The impact of collisions can result in injury or mortality which may, in the worst-case scenario affect a sensitive SCC on a regional population level. The extent was therefore rated regional, long-term, with low reversibility and potentially substantial consequence. The impact is however unlikely to occur, as available data indicates that collisions with PV panels are not a common occurrence. Therefore, the significance was rated as moderate without mitigation.

With placement of the activity outside of sensitive areas (avoidance mitigation) and making the sites unattractive to avifauna the likelihood can be reduced to very unlikely resulting in a low significance rating with mitigation.

4.9.5 Operational Phase Impact: Electrocutions and Collisions on Electrical Infrastructure

Electrocutions and collisions with electrical infrastructure results in injury or mortality which may, in the worst-case scenario, affect a sensitive SCC on a regional population level. The extent was therefore rated regional, long-term, with low reversibility and potentially substantial consequences. The probability of occurrence is rated as likely resulting in a moderate impact significance rating.

Electrocutions can be easily mitigated to extremely unlikely, resulting in a very low significance rating with mitigation.

4.9.6 Operational Phase Impact: Barrier effects

The barrier effect is negative, regional as it can affect migrating and nomadic species and long-term for the lifespan of the facility. The potential consequence is rated moderate and unlikely to occur resulting in a low impact significance rating before mitigation.

As the selected Preferred Alternative site avoids all sensitive avifaunal areas and is outside of known flyways the probability can be reduced to very unlikely, resulting in a low significance rating with mitigation.

4.9.7 Decommissioning phase impact: Habitat loss

During the lifetime of the facility some less sensitive avian species may become habituated to the facilities, and utilise the facilities as perching, roosting or nesting localities. Decommissioning therefore potentially results in habitat loss for these individuals. The affected species are unlikely to be SCC. This impact is therefore rated as negative site-specific, long-term, unlikely, highly reversible with low irreplaceability. The consequence is considered slight resulting in a very low significance rating.

Mitigation with an avifaunal pre-decommissioning walk-through and subsequent rehabilitation of vegetation should far outweigh the negative aspects of this impact, and result in a net positive status for avifauna with substantial consequence and high probability. The impact significance with mitigation is therefore rated as moderate positive.

4.9.8 Cumulative impacts

The impacts of the cumulative projects will be negative by making a larger area of avifaunal karoo scrub habitat unavailable to SCC between Murraysburg and Richmond. The proposed Padloper solar PV sites consist largely of the same habitat. However, due to the habitat type lost being a Least Concern vegetation type and still available sufficiently in surrounding areas in similar condition, the consequence of this impact is likely to be moderate.

There is also a potential for an increased barrier effect being created by the combination of the Padloper Solar PV projects, which would be a negative, regional, long-term impact. As these projects are not located on any major flyways, and the PV Sites are located in two sub-clusters more than 10 km apart, the probability of this occurring is unlikely, and the consequence would be slight.

Displacement from the Padloper Solar PV Sites towards higher risk areas, such as the authorised Umsinde and Khangela WEFs to the south-east, and the Ishwati WEF to the west, and the associated powerlines of all cumulative projects is a concern, as these areas, once constructed, will have similar habitat for displaced birds that may appear attractive, but is a high-risk area for turbine and powerline collisions. This is a negative, long-term impact of potentially substantial consequence, and likely to occur.

The overall cumulative impact is therefore rated as the highest rating from the above, i.e. negative, regional and long-term with a substantial consequence and a likely occurrence, resulting in a moderate impact significance. The individual contributions of the Padloper Solar PVs 1 - 4 to the cumulative impact in the 30 km radius is considered to be Low, i.e. the cumulative impact significance rating will remain unchanged regardless of the Padloper Solar PVs 1-4 being constructed or not.

4.10 Impact Assessment Table Padloper PV 1

Impact	**Impact Criteria**		**Significance and Ranking (Pre-Mitigation)**	**Potential Mitigation Measures**	**Significance and Ranking (Post-Mitigation)**	**Confidence Level**
CONSTRUCTION PHASE						
Disturbance and displacement of avifauna	**Status**	Negative	Moderate	Ensure that the layout avoids sensitive areas identified by the avifauna specialist. Note that the current layout assessed as part	Very low (5)	High
	Spatial Extent	Local				
	Duration	Medium				
	Consequence	Moderate				
	Probability	Likely				
	Reversibility	High				

Impact	Impact Criteria		Significance and Ranking (Pre-Mitigation)	Potential Mitigation Measures	Significance and Ranking (Post-Mitigation)	Confidence Level
	Irreplaceability	High		of the BA Process has already achieved this. Avifaunal Pre-construction walkthrough (EMPr)		
Habitat loss and displacement	**Status**	Negative	High	Ensure that the layout avoids sensitive areas identified by the avifauna specialist. Note that the current layout assessed as part of the BA Process has already achieved this. Avifaunal Pre-construction walkthrough (EMPr)	Moderate (3)	High
	Spatial Extent	Local				
	Duration	Long-term				
	Consequence	Severe				
	Probability	Very likely				
	Reversibility	Moderate				
	Irreplaceability	Low				
OPERATIONAL PHASE						
Disturbance	**Status**	Negative	Low	Ensure that the layout avoids sensitive areas identified by the avifauna specialist. Note that the current layout assessed as part of the BA Process has already achieved this. Minimisation of disturbance footprint to the	Very Low (5)	High
	Spatial Extent	Local				
	Duration	Long-term				
	Consequence	Moderate				
	Probability	Likely				
	Reversibility	High				
	Irreplaceability	Low				

Impact	Impact Criteria		Significance and Ranking (Pre-Mitigation)	Potential Mitigation Measures	Significance and Ranking (Post-Mitigation)	Confidence Level
				development footprint (EMPr)		
Collisions with PV Panels	**Status**	Negative	Moderate	Ensure that the layout avoids sensitive areas identified by the avifauna specialist. Note that the current layout assessed as part of the BA Process has already achieved this. Single-fence design (EMPr) Operational monitoring and carcass searching (EMPr)	Low (4)	Medium
	Spatial Extent	Regional				
	Duration	Long-term				
	Consequence	Substantial				
	Probability	Unlikely				
	Reversibility	Low				
	Irreplaceability	High				
Electrocutions	**Status**	Negative	Moderate	Insulation of all electrical infrastructure, and use of bird friendly designs as per Eskom Technical Standards (EMPr). Operational monitoring and carcass searching (EMPr)	Very low (5)	High
	Spatial Extent	Regional				
	Duration	Long-term				
	Consequence	Substantial				
	Probability	Likely				
	Reversibility	Low				
	Irreplaceability	High				
Barrier effects	**Status**	Negative	Low	Ensure that the layout avoids sensitive areas identified by the	Low (4)	Medium
	Spatial Extent	Regional				
	Duration	Long-term				

Impact	Impact Criteria		Significance and Ranking (Pre-Mitigation)	Potential Mitigation Measures	Significance and Ranking (Post-Mitigation)	Confidence Level
	Consequence	Moderate		avifauna specialist. Note that the current layout assessed as part of the BA Process has already achieved this.		
	Probability	Unlikely				
	Reversibility	High				
	Irreplaceability	Low				
DECOMMISSIONING PHASE						
Disturbance	**Status**	Negative	Moderate	Ensure that the layout avoids sensitive areas identified by the avifauna specialist. Note that the current layout assessed as part of the BA Process has already achieved this. Avifaunal Pre-decommissioning walkthrough (EMPr)	Very low (5)	High
	Spatial Extent	Local				
	Duration	Medium				
	Consequence	Moderate				
	Probability	Highly likely				
	Reversibility	High				
	Irreplaceability	Low				
Habitat Loss	**Status**	Negative	Very low	Avifaunal Pre-decommissioning walkthrough (EMPr) Rehabilitation of disturbed vegetation within the entire development footprint	Moderate (+)	Medium
	Spatial Extent	Site-specific				
	Duration	Long-term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	High				
	Irreplaceability	Low				

Impact	Impact Criteria		Significance and Ranking (Pre-Mitigation)	Potential Mitigation Measures	Significance and Ranking (Post-Mitigation)	Confidence Level
CUMULATIVE IMPACTS						
Cumulative	**Status**	Negative	Moderate	Implementation of EMPrs for all projects. Authorisation, auditing and enforcement (Competent Authority)	Moderate (3)	Medium
	Spatial Extent	Regional				
	Duration	Long-term				
	Consequence	Substantial				
	Probability	Likely				
	Reversibility	Medium				
	Irreplaceability	Low				

4.11 Padloper PV 1 Impact Assessment Conclusion

The Site Ecological Importance rating of Medium indicates that the site is potentially suitable for development if minimisation and restoration mitigation are implemented. Impacts of medium negative impact significance are acceptable, if followed by restoration activities (SANBI 2022).

The proposed development site avoids all areas identified as of high sensitivity during pre-application monitoring and is considered the preferred alternative site from an avifaunal perspective. The access road follows an existing farm road over its entire length and is also considered the best alternative location from an avifaunal perspective.

The impact assessment has identified potential impacts to avian species, most of which can be mitigated to a very low or low negative level. No residual impacts of high significance were identified for the proposed development.

Due to the footprint of the proposed development, approximately 420 ha of potential SCC habitat would be lost, and even with mitigation this impact is expected to be of medium negative significance for the SCCs that occur here (confirmed or high probability of occurrence). These are Blue Crane, Karoo Korhaan, Ludwig's Bustard, Lanner Falcon, Martial Eagle, and Verreaux's Eagle. However, due to these species having much surrounding equivalent habitat available, this loss of habitat is not deemed to have unacceptably high impacts on these species, if the recommended mitigation measures are implemented.

The cumulative impact of the proposed developments in a 30 km radius on avifauna is rated as of Moderate negative impact significance with and without mitigation. The contribution of the proposed development to the cumulative impact is considered to be relatively small, ie. the proposed Padloper Solar PV 1 development will not result in a change in impact significance for cumulative impacts.

The impact management actions and impact management outcomes (i.e. mitigation measures) presented in Table 12 must be included in the EMPr for the project, in order to achieve the residual impacts discussed above.

Based on the above results of the assessment, the proposed development is deemed acceptable from an avifaunal perspective, if all of the above mitigation measures are included for implementation in the EMPr.

4.12 Impact Assessment Table Padloper PV 2

Impact	Impact Criteria		Significance and Ranking (Pre-Mitigation)	Potential Mitigation Measures	Significance and Ranking (Post-Mitigation)	Confidence Level
CONSTRUCTION PHASE						
Disturbance and displacement of avifauna	**Status**	Negative	Moderate	Authorisation of Preferred Alternative (which avoids sensitive areas) Avifaunal Pre-construction walkthrough (EMPr)	Very low (5)	High
	Spatial Extent	Local				
	Duration	Medium				
	Consequence	Moderate				
	Probability	Likely				
	Reversibility	High				
	Irreplaceability	High				
Habitat loss and displacement	**Status**	Negative	High	Authorisation of Preferred Alternative (which avoids sensitive areas) Avifaunal Pre-construction walkthrough (EMPr)	Moderate (3)	High
	Spatial Extent	Local				
	Duration	Long-term				
	Consequence	Severe				
	Probability	Very likely				
	Reversibility	Moderate				
	Irreplaceability	Low				
OPERATIONAL PHASE						
Disturbance	**Status**	Negative	Low	Authorisation of Preferred Alternative	Very Low (5)	High
	Spatial Extent	Local				

Impact	Impact Criteria		Significance and Ranking (Pre-Mitigation)	Potential Mitigation Measures	Significance and Ranking (Post-Mitigation)	Confidence Level
	Duration	Long-term		(which avoids sensitive areas) Minimisation of disturbance footprint to the development footprint (EMPr)		
	Consequence	Moderate				
	Probability	Likely				
	Reversibility	High				
	Irreplaceability	Low				
Collisions with PV Panels	**Status**	Negative	Moderate	Authorisation of Preferred Site Alternative (which avoids sensitive areas) Single-fence design (EMPr) Operational monitoring and carcass searching (EMPr)	Low (4)	Medium
	Spatial Extent	Regional				
	Duration	Long-term				
	Consequence	Substantial				
	Probability	Unlikely				
	Reversibility	Low				
	Irreplaceability	High				
Electrocutions	**Status**	Negative	Moderate	Insulation of all electrical infrastructure, and use of bird friendly designs as per Eskom Technical Standards (EMPr). Operational monitoring and carcass searching (EMPr)	Very low (5)	High
	Spatial Extent	Regional				
	Duration	Long-term				
	Consequence	Substantial				
	Probability	Likely				
	Reversibility	Low				
	Irreplaceability	High				
Barrier effects	**Status**	Negative	Low	Ensure that the layout avoids sensitive areas identified by the avifauna specialist.	Low (4)	Medium
	Spatial Extent	Regional				
	Duration	Long-term				
	Consequence	Moderate				

Impact	Impact Criteria		Significance and Ranking (Pre-Mitigation)	Potential Mitigation Measures	Significance and Ranking (Post-Mitigation)	Confidence Level
	Probability	Unlikely		Note that the current layout assessed as part of the BA Process has already achieved this.		
	Reversibility	High				
	Irreplaceability	Low				
DECOMMISSIONING PHASE						
Disturbance	**Status**	Negative	Moderate	Ensure that the layout avoids sensitive areas identified by the avifauna specialist. Note that the current layout assessed as part of the BA Process has already achieved this. Avifaunal Pre-decommissioning walkthrough (EMPr)	Very low (5)	High
	Spatial Extent	Local				
	Duration	Medium				
	Consequence	Moderate				
	Probability	Highly likely				
	Reversibility	High				
	Irreplaceability	Low				
Habitat Loss	**Status**	Negative	Very low	Avifaunal Pre-decommissioning walkthrough (EMPr) Rehabilitation of disturbed vegetation within the entire development footprint	Moderate (+)	Medium
	Spatial Extent	Site-specific				
	Duration	Long-term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	High				
	Irreplaceability	Low				

Impact	Impact Criteria		Significance and Ranking (Pre-Mitigation)	Potential Mitigation Measures	Significance and Ranking (Post-Mitigation)	Confidence Level
CUMULATIVE IMPACTS						
Cumulative	**Status**	Negative	Moderate	Implementation of EMPrs for all projects. Authorisation, auditing and enforcement (Competent Authority)	Moderate (3)	Medium
	Spatial Extent	Regional				
	Duration	Long-term				
	Consequence	Substantial				
	Probability	Likely				
	Reversibility	Medium				
	Irreplaceability	Low				

4.13 Padloper PV 2 Impact Assessment Conclusion

The Site Ecological Importance rating of medium indicates that the site is potentially suitable for development if minimisation and restoration mitigation are implemented. Impacts of medium negative impact significance are acceptable, if followed by restoration activities (SANBI 2022).

The proposed development site avoids all areas identified as of high sensitivity during pre-application monitoring and is considered the preferred alternative site from an avifaunal perspective. The access road follows an existing farm road over its entire length and is also considered the best alternative location from an avifaunal perspective.

The impact assessment has identified potential impacts to avian species, most of which can be mitigated to a Very low or Low negative level. No residual impacts of high significance were identified for the proposed development.

Due to the footprint of the proposed development, approximately 222 ha of potential SCC habitat would be lost, and even with mitigation this impact is expected to be of Medium negative significance for the SCCs that occur here (confirmed or high probability of occurrence). These are Blue Crane, Karoo Korhaan, Ludwig's Bustard, Lanner Falcon, Martial Eagle, and Verreaux's Eagle. However, due to these species having much surrounding equivalent habitat available, this loss of habitat is not deemed to have unacceptably high impacts on these species if the recommended mitigation measures are implemented.

The cumulative impact of the proposed developments in a 30 km radius on avifauna is rated as of moderate negative impact significance with and without mitigation. The contribution of the proposed development to the cumulative impact is considered to be relatively small, ie. the proposed Padloper Solar PV 2 development will not result in a change in impact significance for cumulative impacts.

The impact management actions and impact management outcomes (i.e. mitigation measures) presented in Table 12 must be included in the EMPr for the project, in order to achieve the residual impacts discussed above.

Based on the above results of the assessment, the proposed development is deemed acceptable from an avifaunal perspective, if all of the above mitigation measures are included for implementation in the EMPr.

4.14 Impact Assessment Table Padloper PV 3

Impact	Impact Criteria		Significance and Ranking (Pre-Mitigation)	Potential Mitigation Measures	Significance and Ranking (Post-Mitigation)	Confidence Level
CONSTRUCTION PHASE						
Disturbance and displacement of avifauna	**Status**	Negative	Moderate	Ensure that the layout avoids sensitive areas identified by the avifauna specialist. Note that the current layout assessed as part of the BA Process has already achieved this. Avifaunal Pre-construction walkthrough (EMPr)	Very low (5)	High
	Spatial Extent	Local				
	Duration	Medium				
	Consequence	Moderate				
	Probability	Likely				
	Reversibility	High				
	Irreplaceability	High				
Habitat loss and displacement	**Status**	Negative	High	Ensure that the layout avoids sensitive areas identified by the avifauna specialist. Note that the current layout assessed as part of the BA Process has already achieved this.	Moderate (3)	High
	Spatial Extent	Local				
	Duration	Long-term				
	Consequence	Severe				
	Probability	Very likely				
	Reversibility	Moderate				
	Irreplaceability	Low				

Impact	Impact Criteria		Significance and Ranking (Pre-Mitigation)	Potential Mitigation Measures	Significance and Ranking (Post-Mitigation)	Confidence Level
				Avifaunal Pre-construction walkthrough (EMPr)		
OPERATIONAL PHASE						
Disturbance	**Status**	Negative	Low	Ensure that the layout avoids sensitive areas identified by the avifauna specialist. Note that the current layout assessed as part of the BA Process has already achieved this. Minimisation of disturbance footprint to the development footprint (EMPr)	Very Low (5)	High
	Spatial Extent	Local				
	Duration	Long-term				
	Consequence	Moderate				
	Probability	Likely				
	Reversibility	High				
	Irreplaceability	Low				
Collisions with PV Panels	**Status**	Negative	Moderate	Ensure that the layout avoids sensitive areas identified by the avifauna specialist. Note that the current layout assessed as part of the BA Process has already achieved this. Single-fence design (EMPr)	Low (4)	Medium
	Spatial Extent	Regional				
	Duration	Long-term				
	Consequence	Substantial				
	Probability	Unlikely				
	Reversibility	Low				
	Irreplaceability	High				

Impact	Impact Criteria		Significance and Ranking (Pre-Mitigation)	Potential Mitigation Measures	Significance and Ranking (Post-Mitigation)	Confidence Level
				Operational monitoring and carcass searching (EMPr)		
Electrocutions	**Status**	Negative	Moderate	Insulation of all electrical infrastructure, and use of bird friendly designs as per Eskom Technical Standards (EMPr). Operational monitoring and carcass searching (EMPr)	Very low (5)	High
	Spatial Extent	Regional				
	Duration	Long-term				
	Consequence	Substantial				
	Probability	Likely				
	Reversibility	Low				
	Irreplaceability	High				
Barrier effects	**Status**	Negative	Low	Ensure that the layout avoids sensitive areas identified by the avifauna specialist. Note that the current layout assessed as part of the BA Process has already achieved this.	Low (4)	Medium
	Spatial Extent	Regional				
	Duration	Long-term				
	Consequence	Moderate				
	Probability	Unlikely				
	Reversibility	High				
	Irreplaceability	Low				
DECOMMISSIONING PHASE						
Disturbance	**Status**	Negative	Moderate	Ensure that the layout avoids sensitive areas identified by the avifauna specialist.	Very low (5)	High
	Spatial Extent	Local				
	Duration	Medium				
	Consequence	Moderate				

Impact	Impact Criteria		Significance and Ranking (Pre-Mitigation)	Potential Mitigation Measures	Significance and Ranking (Post-Mitigation)	Confidence Level
	Probability	Highly likely		Note that the current layout assessed as part of the BA Process has already achieved this. Avifaunal Pre-decommissioning walkthrough (EMPr)		
	Reversibility	High				
	Irreplaceability	Low				
Habitat Loss	**Status**	Negative	Very low	Avifaunal Pre-decommissioning walkthrough (EMPr) Rehabilitation of disturbed vegetation within the entire development footprint	Moderate (+)	Medium
	Spatial Extent	Site-specific				
	Duration	Long-term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	High				
	Irreplaceability	Low				
CUMULATIVE IMPACTS						
Impacts?	**Status**	Negative	Moderate	Implementation of EMPrs for all projects. Authorisation, auditing & enforcement (Competent Authority)	Moderate (3)	Medium
	Spatial Extent	Regional				
	Duration	Long-term				
	Consequence	Substantial				
	Probability	Likely				
	Reversibility	Medium				
	Irreplaceability	Low				

4.15 Padloper PV 3 Impact Assessment Conclusion

The Site Ecological Importance rating of Medium indicates that the site is potentially suitable for development if minimisation and restoration mitigation are implemented. Impacts of medium negative impact significance are acceptable, if followed by restoration activities (SANBI 2022).

The proposed development site avoids all areas identified as of high sensitivity during pre-application monitoring and is considered the preferred alternative site from an avifaunal perspective. The access road follows an existing farm road over its entire length and is also considered the best alternative location from an avifaunal perspective.

The impact assessment has identified potential impacts to avian species, most of which can be mitigated to a Very low or Low negative level. No residual impacts of high significance were identified for the proposed development.

Due to the footprint of the proposed development, approximately 233 ha of potential SCC habitat would be lost, and even with mitigation this impact is expected to be of medium negative significance for the SCCs that occur here (confirmed or high probability of occurrence). These are Blue Crane, Karoo Korhaan, Ludwig's Bustard, Lanner Falcon, Martial Eagle, and Verreaux's Eagle. However, due to these species having much surrounding equivalent habitat available, this loss of habitat is not deemed to have unacceptably high impacts on these species, if the recommended mitigation measures are implemented.

The cumulative impact of the proposed developments in a 30 km radius on avifauna is rated as of moderate negative impact significance with and without mitigation. The contribution of the proposed development to the cumulative impact is considered to be relatively small, ie. the proposed Padloper Solar PV 3 development will not result in a change in impact significance for cumulative impacts.

The impact management actions and impact management outcomes (i.e. mitigation measures) presented in Table 12 must be included in the EMPr for the project, in order to achieve the residual impacts discussed above.

Based on the above results of the assessment, the proposed development is deemed acceptable from an avifaunal perspective, if all of the above mitigation measures are included for implementation in the EMPr.

4.16 Impact Assessment Table Padloper PV 4

Impact	**Impact Criteria**		**Significance and Ranking (Pre-Mitigation)**	**Potential Mitigation Measures**	**Significance and Ranking (Post-Mitigation)**	**Confidence Level**
CONSTRUCTION PHASE						
Disturbance and	**Status**	Negative	Moderate	Ensure that the layout avoids sensitive areas	Very low (5)	High
	Spatial Extent	Local				

Impact	Impact Criteria		Significance and Ranking (Pre-Mitigation)	Potential Mitigation Measures	Significance and Ranking (Post-Mitigation)	Confidence Level
displacement of avifauna	**Duration**	Medium		identified by the avifauna specialist. Note that the current layout assessed as part of the BA Process has already achieved this. Avifaunal Pre-construction walkthrough (EMPr)		
	Consequence	Moderate				
	Probability	Likely				
	Reversibility	High				
	Irreplaceability	High				
Habitat loss and displacement	**Status**	Negative	High	Ensure that the layout avoids sensitive areas identified by the avifauna specialist. Note that the current layout assessed as part of the BA Process has already achieved this. Avifaunal Pre-construction walkthrough (EMPr)	Moderate (3)	High
	Spatial Extent	Local				
	Duration	Long-term				
	Consequence	Severe				
	Probability	Very likely				
	Reversibility	Moderate				
	Irreplaceability	Low				
OPERATIONAL PHASE						
Disturbance	**Status**	Negative	Low	Ensure that the layout avoids sensitive areas identified by the avifauna specialist.	Very Low (5)	High
	Spatial Extent	Local				
	Duration	Long-term				
	Consequence	Moderate				
	Probability	Likely				

Impact	Impact Criteria		Significance and Ranking (Pre-Mitigation)	Potential Mitigation Measures	Significance and Ranking (Post-Mitigation)	Confidence Level
	Reversibility	High		Note that the current layout assessed as part of the BA Process has already achieved this. Minimisation of disturbance footprint to the development footprint (EMPr)		
	Irreplaceability	Low				
Collisions with PV Panels	**Status**	Negative	Moderate	Ensure that the layout avoids sensitive areas identified by the avifauna specialist. Note that the current layout assessed as part of the BA Process has already achieved this. Single-fence design (EMPr) Operational monitoring and carcass searching (EMPr)	Low (4)	Medium
	Spatial Extent	Regional				
	Duration	Long-term				
	Consequence	Substantial				
	Probability	Unlikely				
	Reversibility	Low				
	Irreplaceability	High				
Electrocutions	**Status**	Negative	Moderate	Insulation of all electrical infrastructure, and use of bird friendly designs as per Eskom Technical Standards (EMPr). Operational monitoring and	Very low (5)	High
	Spatial Extent	Regional				
	Duration	Long-term				
	Consequence	Substantial				
	Probability	Likely				
	Reversibility	Low				

Impact	Impact Criteria		Significance and Ranking (Pre-Mitigation)	Potential Mitigation Measures	Significance and Ranking (Post-Mitigation)	Confidence Level
	Irreplaceability	High		carcass searching (EMPr)		
Barrier effects	**Status**	Negative	Low	Ensure that the layout avoids sensitive areas identified by the avifauna specialist. Note that the current layout assessed as part of the BA Process has already achieved this.	Low (4)	Medium
	Spatial Extent	Regional				
	Duration	Long-term				
	Consequence	Moderate				
	Probability	Unlikely				
	Reversibility	High				
	Irreplaceability	Low				
DECOMMISSIONING PHASE						
Disturbance	**Status**	Negative	Moderate	Ensure that the layout avoids sensitive areas identified by the avifauna specialist. Note that the current layout assessed as part of the BA Process has already achieved this. Avifaunal Pre-decommissioning walkthrough (EMPr)	Very low (5)	High
	Spatial Extent	Local				
	Duration	Medium				
	Consequence	Moderate				
	Probability	Highly likely				
	Reversibility	High				
	Irreplaceability	Low				
Habitat Loss	**Status**	Negative	Very low	Avifaunal Pre-decommissioning walkthrough (EMPr) Rehabilitation of disturbed	Moderate (+)	Medium
	Spatial Extent	Site-specific				
	Duration	Long-term				

Impact	Impact Criteria		Significance and Ranking (Pre-Mitigation)	Potential Mitigation Measures	Significance and Ranking (Post-Mitigation)	Confidence Level
	Consequence	Slight		vegetation within the entire development footprint		
	Probability	Unlikely				
	Reversibility	High				
	Irreplaceability	Low				
CUMULATIVE IMPACTS						
Cumulative	**Status**	Negative	Moderate	Implementation of EMPrs for all projects. Authorisation, auditing and enforcement (Competent Authority)	Moderate (3)	Medium
	Spatial Extent	Regional				
	Duration	Long-term				
	Consequence	Substantial				
	Probability	Likely				
	Reversibility	Medium				
	Irreplaceability	Low				

4.17 Padloper PV 4 Impact Assessment Conclusion

The Site Ecological Importance rating of Medium indicates that the site is potentially suitable for development if minimisation and restoration mitigation are implemented. Impacts of Medium negative impact significance are acceptable, if followed by restoration activities (SANBI 2022).

The proposed development site avoids all areas identified as of high sensitivity during pre-application monitoring and is considered the preferred alternative site from an avifaunal perspective. The loss of medium sensitivity CBA habitat has been reduced from the initially proposed 158 ha to approximately 11 ha with the preferred alternative, which is considered a significant and acceptable avoidance and minimisation mitigation. The access road follows an existing farm road as far as possible, with approximately 300 m of new road being required.

The impact assessment has identified potential impacts to avian species, most of which can be mitigated to a Very low or Low negative level. No residual impacts of high significance were identified for the proposed development.

Due to the footprint of the proposed development, approximately 328.7 ha of potential SCC habitat would be lost, and even with mitigation this impact is expected to be of Medium negative significance for the SCCs that occur here (confirmed or high probability of occurrence). These are Blue Crane, Karoo Korhaan, Ludwig's Bustard, Lanner Falcon, Martial Eagle, and Verreaux's

Eagle. However, due to these species having much surrounding equivalent habitat available, this loss of habitat is not deemed to have unacceptably high impacts on these species, if the recommended mitigation measures are implemented.

The cumulative impact of the proposed developments in a 30 km radius on avifauna is rated as of Moderate negative impact significance with and without mitigation. The contribution of the proposed development to the cumulative impact is considered to be relatively small, ie. the proposed Padloper Solar PV 4 development will not result in a change in impact significance for cumulative impacts.

The impact management actions and impact management outcomes (i.e. mitigation measures) presented in Table 12 must be included in the Environmental Management Programme (EMPr) for the project, in order to achieve the residual impacts discussed above.

Based on the above results of the assessment, the proposed development is deemed acceptable from an avifaunal perspective, if all of the above mitigation measures are included for implementation in the EMPr.

Table 12: Impact management actions and outcomes to be included in the EMPr for each project

Impact Management Action	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
Demarcate disturbance footprint during construction, to the minimum practically possible to minimise disturbance and habitat loss. All areas outside of disturbance footprint are No Go areas.	Developer's Project Manager (DPM) / Developer Site Supervisor (DSS) / Developer Environmental Officer (dEO) / Contractor / Contractor's Environmental Officer (cEO)	Demarcate disturbance footprint with construction tape or other appropriate effective means.	Pre-construction phase	Environ-mental Control officer (ECO) cEO	Before commencement and monthly throughout construction phase	Disturbance footprint is clearly demarcated and areas outside of disturbance footprint are undisturbed.
Keep vegetation clearing within the development footprint to the minimum practically possible to minimise habitat loss. Indigenous vegetation which does not interfere with the development must be left undisturbed.	DSS dEO Contractor cEO	Demarcate clearance footprint with construction tape or other appropriate effective means.	Construction phase	ECO cEO	Before commencement and monthly throughout construction phase	Areas of indigenous vegetation are demarcated and undisturbed.
Breeding sites of any avian species as identified by an avifaunal specialist within the disturbance footprint must be kept intact and disturbance to breeding birds must be avoided.	dEO/cEO Avifaunal specialist	Avifaunal specialist to undertake an avifaunal walkthrough of the development footprint to identify any breeding sites. Identified breeding sites must be clearly indicated on a map of the site and all staff must be made aware of these areas. Any additional mitigation measures recommended by the avifaunal specialist are implemented.	Once-off within 6 weeks prior to commencement of Construction phase Once-off within 6 weeks prior to commencement of	ECO cEO	Monthly during construction phase	Avifaunal walkthrough report is kept on file. Map of breeding sites is displayed on site. Documentary/ photographic evidence of complying with any additional mitigation measures recommended by the

Impact Management Action	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
			Decommissioning phase			specialist in the walk-through report are provided.
Avifaunal specialist to train ECO, cEO / dEO and Operations & Maintenance (O&M team) in the identification of SCC potentially occurring on site.	ECO cEO / dEO Avifaunal contractor	Avifaunal specialist to undertake 1 hour training session with ECO and cEO / dEO on site prior to construction activities, and with O&M team prior to operational commencement.	Once-off prior to commencement of construction/ operation/ decommissioning phases	ECO cEO O&M team	Monthly during construction phase	Register of training sessions kept on file.
Breeding sites of SCC must be left intact and undisturbed.	cEO / dEO ECO Avifaunal specialist	Should SCC be found breeding within the disturbance footprint prior to or during construction or decommissioning all works within 1 km of the breeding site must be halted and an avifaunal specialist must be contacted for further instruction. Any resulting recommendation by the avifaunal specialist to protect the breeding SCC must be implemented. Breeding sites of SCC are to be clearly demarcated with construction tape as per the instruction of the avifaunal specialist. Should any SCC be found breeding within the site boundary at any point during operation of the facility, the area must be cordoned off as far as practically possible, and an avifaunal specialist must be contacted	Pre-construction, construction and decommissioning phase	dEO / cEO ECO	Ongoing Monthly	Avifaunal walkthrough report is kept on file. All breeding sites of SCC are clearly demarcated as per the instruction of the avifaunal specialist with photographic evidence provided. An avifaunal specialist's recommendation is on file for each breeding site. Documentary / photographic evidence of complying with any additional mitigation measures recommended by the avifaunal specialist is provided.

Impact Management Action	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		within 7 days for further instruction.				
Identify actual impacts on avifauna and any additional mitigation measures required.	DPM Avifaunal specialist	A Post-construction monitoring plan is developed by an avifaunal specialist in line with Best Practice Guidelines applicable at the time of commencement of the operational phase. Post-construction monitoring, according to this plan must commence as soon as the facility becomes operational. Any additional mitigation measures recommended in the post-construction monitoring reports by the avifaunal specialist must be implemented. All SCC fatalities must be photographed, recorded and identified (with the assistance of an avifaunal specialist if required). and reported to Birdlife SA energy@birdlife.co.za.	Once prior to commencement of operational phase From commencement of operational phase for the duration identified in the post-construction monitoring plan. Ongoing	ECO O&M team	Once off at commencement. Monthly	A post-construction monitoring plan is on file for implementation. Post-construction monitoring reports as set out in the post-construction monitoring plan are on file. Documentary / photographic evidence of compliance including with any additional mitigation measures recommended by the avifaunal specialist.
Minimal risk of avian mortalities.	DPM	Minimise outdoor lighting needed to operate the facility to the maximum extent practicable. Minimise perching opportunities within the facility by installing anti-perching devices, netting or other deterrents wherever possible All electrical infrastructure is to be of bird-friendly insulated design in line with the latest Eskom Technical Standards.	Design / pre-construction, construction, operation and decommissioning phases	ECO O&M team	Once-off at commencement Quarterly	Documentary / photographic evidence of compliance.

Impact Management Action	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		Bury all low and medium voltage powerlines. All fencing must be of a single-fence design to avoid avian species getting trapped between double-fencing. All water reservoirs and open water must be covered with netting or mesh to avoid birds drowning. No chemicals detrimental to the health of animal species are to be used for the cleaning of the PV panels.				

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Annexure A: Pre-application Monitoring Report for the Proposed Padloper PV Facilities (previously named Sprinkaan Solar PV Facilities)

Holland & Associates
Environmental Consultants

Impact Assessments - Environmental Management Programs - Compliance Monitoring - Process Review

THE PROPOSED SPRINKRAAN SOLAR PV FACILITIES NEAR MURRAYSBURG IN THE WESTERN CAPE PROVINCE

Avian Pre-application Monitoring Report

AUGUST 2022

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1 Introduction

Emoyeni Project Management (Pty) Ltd are interested in developing solar photo-voltaic (PV) facilities near Murraysburg in the Western and Northern Cape Province.

The initial study area consisted of eleven proposed PV sites in three clusters (Figure 1). Anja Albertyn of Holland and Associates was appointed as the Avifaunal Specialist, to conduct the required avifaunal pre-application monitoring, in line with applicable regulations, protocols, and Best Practice Guidelines (Birdlife SA 2017[1]).

Following the first seasonal (summer) survey the proposed development areas were reduced to seven sites (Figure 1) for which a second (winter) survey was conducted.

This final monitoring report summarises the methodologies and findings of the seasonal monitoring conducted in line with Best Practice Guidelines, and the resulting avifaunal sensitivities, in order to inform the project design and as a suitable baseline study for an avifaunal specialist impact assessment, if the project should proceed.

1.1 The BirdLife SA Birds and Solar Energy Best Practice Guidelines

The Best Practice Guidelines are the guidelines that were followed for the pre-application avifaunal monitoring.

According to the Birds and Solar Energy Best Practice Guidelines an avifaunal impact assessment of solar power facilities should consist of the following stages:

- *Stage 1: Preliminary Assessment to give an overview of the biological context, likely impacts and potential red flags to development, identify alternatives and determine the appropriate assessment regime.*
- *Stage 2: Data Collection on which to base the impact assessment report, and to provide a baseline against which post-construction monitoring can be compared.*
- *Stage 3: Impact Assessment.*
- *Stage 4: Post-construction monitoring, if required.*

The scope of the undertaken work presented in this report pertains to Stage 1 and 2 of the above. The amount of data to be collected (the avian assessment regime) is prescribed by the guidelines, depending on the technology type, the size of the proposed development and the avifaunal sensitivity of the area. (Table 1).

The Best Practice Guideline further states:

> *(2) For multi-phased projects, the aggregate footprint of all the phases should be used. At 3 ha per MW, Small = < 10 MW, Medium = 10-50 MW, Large = > 50MW.*
>
> *(3) The avifaunal sensitivity is based on the number of priority species present, or potentially present, the regional, national or global importance of the affected area for these species (both individually and collectively), and the perceived susceptibility of these species (both individually and collectively) to the anticipated impacts of development.*

[1] Best Practice Guidelines: Birds & Solar Energy – Guidelines for assessing and monitoring the impact of solar power generating facilities on bird in southern Africa. Compiled by AR Jenkins, S. Ralston-Paton and H.A. Smit-Robinson. January 2017

For example, an area would be considered to be of high avifaunal sensitivity if one or more of the following is found (or suspected to occur) within the broader impact zone: 1) avifaunal habitat (e.g. a wetlands, nesting or roost sites) of regional or national significance, 2) a population of a priority species that is of regional or national significance, and/or 3) a bird movement corridor that is of regional or national significance, and 4) a protected area and/ or Important Bird and Biodiversity Area.

An area would be considered to be of medium avifaunal sensitivity if it does not qualify as high avifaunal sensitivity, but one or more of the following is found (or suspected to occur) within the broader impact zone 1) avifaunal habitat (e.g. a wetland, nesting or roost sites) of local significance, 2) a locally significant population of a priority species, 3) a locally significant bird movement corridor.

An area would be considered to be of low avifaunal sensitivity if it is does not meet any of the above criteria. that Regime 1 may be applied to some large sites, but only in instances where there is abundant existing data to support the assessment of low sensitivity.

(4) Regime 1 may be applied to some large sites, but only in instances where there is abundant existing data to support the assessment of low sensitivity.

Table 1: Avian Assessment Regimes for Solar Energy Projects (Jenkins *et al.* 2017)

Type of technology	Size	Avifaunal Sensitivity		
		Low	Medium	High
All except CSP power tower	Small (<30 ha)	Regime 1[2]	Regime 1	Regime 2[3]
	Medium (30-150 ha)	Regime 1	Regime 2	Regime 2
	Large (>150 ha)	Regime 2	Regime 2	Regime 3[4]
CSP power tower	All	Regime 3		

2 Methodology

A 3 km buffer surrounding the proposed sites was considered as the project's area of influence (the study area). A desktop study was conducted of the study area in order to determine the avian assessment regime to be employed.

2.1 Desktop Study

The following information was used to conduct the required desktop study for the site sensitivity verification:

- Vegetation Map of South Africa, Lesotho and Swaziland (South African National Biodiversity Institute (SANBI) 2018)
- Northern Cape Biodiversity Spatial Plan (Northern Cape Department of Environmental Affairs and Nature Conservation (DENC) 2016)
- Western Cape Biodiversity Spatial Plan (Cape Nature 2017)

[2] Regime 1: One site visit (peak season): minimum 1 – 5 days
[3] Regime 2: Pre- and post-construction: minimum 2-3 days over 6 months (including peak season); carcass searches
[4] Regime 3: Pre- and post-construction: minimum 4-5 days x 4-8 days over 12 months, carcass searches

- National Freshwater Ecosystem Priority Areas (NFEPA);
- Terrestrial Ecosystem Threat Status and Protection Level (SANBI 2018);
- The Department of Forestry, Fisheries and the Environment (DFFE) National Web-based Screening Tool;
- South African Bird Atlas Project 2 (SABAP2) (Brooks and Ryan 2021)
- Important Bird and Biodiversity Areas (Birdlife South Africa);
- The 2015 Eskom Red Data Book of Birds (Taylor et al. 2015)
- The International Union for Red List of Threatened Species (www.iucnredlist.org)
- South Africa Protected Areas Database (DEA 2019);
- South African Conservation Areas (DEA 2019);
- Habitat Suitability Models (Birdlife SA 2021)
- Publicly available satellite imagery, elevation; and topographical data
- Specialist's knowledge and experience in the immediate area.

The desktop study determined that the area can be considered as of medium sensitivity in terms of Section 1.1 and Sampling Regime 2 was applied.

2.2 Pre-application Monitoring Surveys

As per Sampling Regime 2 of the Best Practice Guidelines two seasonal surveys were conducted within a period of 6 months, including peak seasons for priority species (summer and winter).

A first seasonal (summer) pre-application monitoring survey was conducted on eleven sites over nine days from 28 February to 8 March 2022. The proposed project scope was then reduced following the first seasonal survey due to engineering and other specialist results to seven sites whish were surveyed in a second (winter) survey conducted over 6 days from 6 – 11 July 2022.

During the summer survey fourteen walked transects (WT1 – WT14) with a length of approximately 1000 m each (if possible) were sampled three times each (Figure 1, Table 2). During the winter survey ten walked transects on the remaining PV sites were surveyed.

All birds seen on a transect were recorded, including number, behaviour, age and sex if possible, and environmental variables (wind, cloud cover, visibility, temperature, rain).

Table 2: Walked Transect Survey Details (summer survey details in green font, winter survey details in blue font, greyed out rows were not sampled further in winter)

Ref	Transect Start Coordinate	Transect End Coordinate	Transect Length	Date and Time of Transect 'Walk-down'
WT1	-31.946826; 23.91462	-31.940754; 23.922335	1 020 m	**28/02/2022 09:58** **01/03/2022 07:11** **01/03/2022 16:34** **07/07/2022 08:40** **09/07/2022 09:55** **11/07/2022 07:25**
WT2	-31.933516; 23.903938	-31.925454; 23.898907	1 008 m	01/03/2022 08:17

Ref	Transect Start Coordinate	Transect End Coordinate	Transect Length	Date and Time of Transect 'Walk-down'
				01/03/2022 17:26 02/03/2022 11:48 07/07/2022 10:39 09/07/2022 08:39 11/07/2022 08:18
WT3	-31.894044; 23.869882	-31.888936; 23.860717	1 048 m	01/03/2022 11:00 02/03/2022 09:37 02/03/2022 15:28 07/07/2022 12:29 09/07/2022 11:38 11/07/2022 09:24
WT4	-31.89272; 23.908646	-31.900175; 23.913569	978 m	01/03/2022 12:22 02/03/2022 07:35 02/03/2022 14:21 07/07/2022 14:48 09/07/2022 13:29 11/07/2022 10:35
WT5	-31.94508; 23.893279	-31.904725; 23.899679	965 m	01/03/2022 16:00 02/03/2022 06:18 03/03/2022 16:28 07/07/2022 07:21 09/07/2022 07:29
WT6	-31.754355; 23.842713	-31.76347; 23.842212	1 068 m	03/03/2022 09:32 04/03/2022 09:52 04/03/2022 13:20 06/07/2022 15:23 08/07/2022 12:59 11/07/2022 15:20
WT7	-31.764713; 23.879619	-31.773672; 23.879941	1 004 m	03/03/2022 13:04 04/03/2022 07:09 04/03/2022 10:52
WT8	-31.764021; 23.88095	-31.757743; 23.873392	1 497 m	03/03/2022 11:33

Ref	Transect Start Coordinate	Transect End Coordinate	Transect Length	Date and Time of Transect 'Walk-down'
				04/03/2022 07:45 04/03/2022 11:31 06/07/2022 13:05 11/07/2022 12:45
WT9	-31.782584; 23.782704	-31.789243; 23.788341	1 021 m	05/03/2022 08:05 06/03/2022 06:48 07/03/2022 09:30 08/07/2022 07:13 08/07/2022 16:09 10/07/2022 07:31
WT10	-31.799477; 23.822966	-31.807183; 23.81711	1 016 m	05/03/2022 10:04 06/03/2022 15:04 07/03/2022 10:44
WT11	-31.808786; 23.855612	-31.808802; 23.855604	990 m	05/03/2022 10:04 06/03/2022 15:04 07/03/2022 10:44
WT12	-31.741614; 23.778216	-31.742348; 23.784462	1 020 m	05/03/2022 11:38 06/03/2022 08:17 07/03/2022 12:38 06/07/2022 08:03 10/07/2022 14:08
WT13	-31.721526; 23.756542	-31.717635; 23.746588	1 002 m	06/03/2022 11:27 06/03/2022 16:59 07/03/2022 07:34 06/07/2022 10:05 08/07/2022 15:04 10/07/2022 13:14
WT14	-31.722916; 23.535136	-31.722835; 23.535136	1 001 m	07/03/2022 14:01 08/03/2022 09:34 08/03/2022 11:05

Five driven transects (DT1 – DT5) with a length ranging from 7.1 km to 12.5 km were sampled twice during the summer survey (Table 3). Three driven transects (DT1, DT2 and DT3) were sampled twice and DT4 was sampled once during the winter survey (due to road conditions). All target species were recorded and mapped. Target species for driven transects were all Species of Conservation, large terrestrial species and raptors.

Table 3: Driven Transect Survey Details (summer survey details in green font, winter survey details in blue font, greyed out rows were not sampled further in winter)

Ref	Transect Start Coordinate	Transect End Coordinate	Transect Length	Date and Time Transect Driven
DT1	-31.950483; 23.916308	-31.909665; 23.864248	11 675 m	**01/03/2022 09:09 – 10:16** **02/03/2022 10:22 – 11:27** **07/07/2022 11:33 – 12:39** **09/07/2022 10:54 – 11:57**
DT2	-31.876868; 23.939967	-31.898607; 23.891719	7 145 m	**01/03/2022 13:18 – 13:47** **02/03/2022 08:37 – 09:15** **07/07/2022 13:42 – 14:19** **09/07/2022 12:28 – 13:08**
DT3	-31.770226; 23.875055	-31.770068; 23.87508	8 943 m	**04/03/2022 08:54 – 09:49** **04/03/2022 12:22 – 13:14** **06/07/2022 14:26 – 15:17** **11/07/2022 13:50 – 15:18**
DT4	-31.802758; 23.845421	-31.782035; 23.754344	12 529 m	**05/03/2022 13:10 – 13:43** **06/03/2022 09:01 – 09:02** **08/07/2022 10:17 – 11:36**
DT5	-31.786344; 23.508164	-31.78646; 23.508049	8 670 m	**08/03/2022 09:02 – 09:39** **08/03/2022 12:09 – 12:54**

Three focal sites (FS1 – FS3), two dams and a Verreauxs' Eagle nest were located during the summer survey with all birds present, and environmental variables recorded during one visit. (Table 4). Two additional Verreauxs' Eagle nests were located and added as focal sites during the winter survey.

Table 4: Focal Site Survey Details

Ref	Coordinate	Type	Date & Time Visited
FS1	-31.935598; 23.90682	Dam	28/02/2022 12:11
FS2	-31.773696; 23.813044	Verreauxs' Eagle nest	05/03/2022 09:07

Ref	Coordinate	Type	Date & Time Visited
FS3	-31.794882; 23.745874	Dam	05/03/2022 15:37
FS4	-31.944887; 23.890184	Verreauxs' Eagle nest	09/07/2022 14:54 11/07/2022 17:48
FS5	-31.754312; 23.880852	Verreauxs' Eagle nest	11/07/2022 14:31

In addition to the above, all raptors and Species of Conservation Concern were recorded incidentally throughout the survey, with their GPS coordinates and details, and a checklist of all bird species encountered during the survey was kept (Appendix A).

2.3 Avifaunal Sensitivity

Priority Species were defined as species with a Red Data listing of regionally or globally Near-threatened or higher, endemic and near-endemic species, and range-restricted species.

A preliminary avifaunal sensitivity map of the Project Area of Influence (PAOI) was developed which considers the following features and buffers:

- Nests and roosts
- 200 m NFEPA Wetlands and River Buffer (High sensitivity)
- Critical Biodiversity Areas
- Topography
- Habitat Suitability

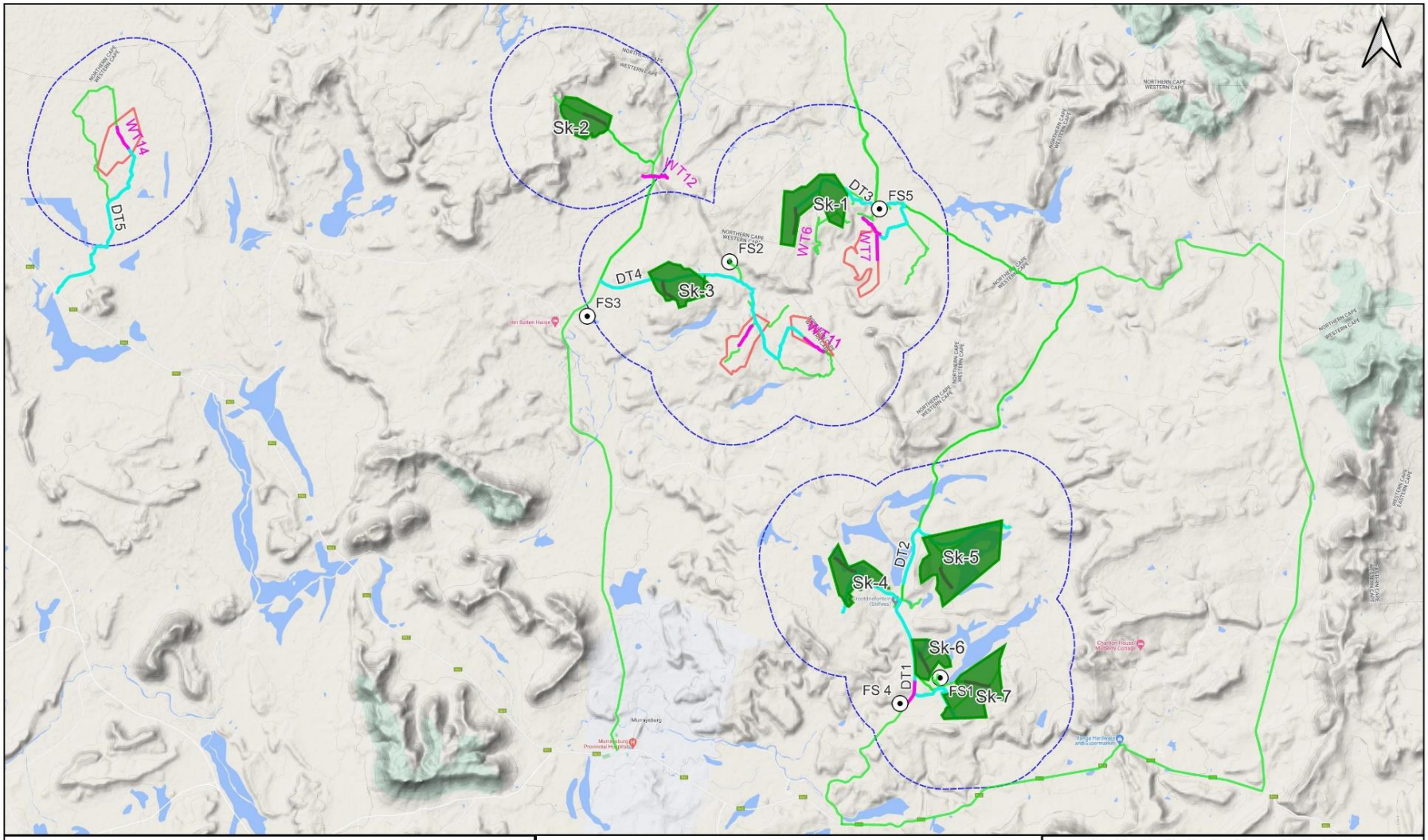


Figure 1: Survey Locations
Sprinkaan Solar PV
Avifaunal Pre-application Monitoring

3 Results & Discussion

3.1 Walked Transect Results

A total of 107 species of birds were recorded on walked transects during two seasonal surveys (Table 5). This is a relatively average number of species compared to other sites considered for photo-voltaic facilities in South Arica. The Index of Kilometric Abundance (IKA = birds per km) ranged from 17.02 (Sk-4) to 206.46 at Sk-3. The high IKA at Sk-3 was due to an observation of large flocks of Wattled Starling passing through and cannot be considered typical for the specific site.

Table 5: Walked Transect Results

Walked Transects	Recorded Bird Individuals										Number of Species Recorded
Reference	Summer Survey 1	Summer Survey 2	Summer Survey 3	Summer Total	Winter Survey 1	Winter Survey 2	Winter Survey 3	Winter Total	Total Survey Distance (m)	IKA (birds per km)	
WT1 (Sk-7)	14	62	53	129	64	36	127	227	6120	58.17	33
WT2 (Sk-6)	57	22	9	88	14	9	50	73	6048	26.62	25
WT3 (Sk-4)	28	21	19	68	7	10	22	39	6288	17.02	22
WT4 (Sk-5)	16	55	43	114	6	2	18	25	5868	23.69	19
WT5 (Sk-6)	58	215	58	320	58	204		262	4825	120.62	55
WT6 (Sk-1)	14	22	21	57	38	22	8	68	6408	19.51	25
WT7	14	22	24	60					3012	19.9	14
WT8 (Sk-1)	24	105	49	178	63	48		111	7485	38.61	52
WT9 (Sk-3)	43	60	33	139	188	727		915	5105	206.46	36
WT10	17	46	42	105					3048	34.4	14
WT11	19	35	30	84					2970	28.2	15
WT12 (Sk-2-3)	108	120	166	394	79	82		161	5100	108.82	59
WT13 (Sk-2)	27	40	56	123	29	10	7	46	6012	28.11	27

WT14	39	28	37	104					3003	34.6	18
											107

3.2 Driven Transect Survey Results

A total of ten target species (large terrestrial species, raptors, and Species of Conservation Concern) were recorded during driven transect surveys (Table 6). The results show a relatively low abundance and distribution of large terrestrial species and raptors in the survey area. Large flocks of Blue Crane were observed in winter, following heavy rainfalls in the area.

Table 6: Driven Transect Results

Driven Transects	**Recorded Target Species (individuals)**			
Ref	**First Summer Survey**	**Second Summer Survey**	**First Winter Survey**	**Second Winter Survey**
DT1 (Sk-4, Sk-5, Sk-6, Sk-7)	Common Buzzard (1); Ludwig's Bustard (5)	Verreauxs' Eagle (2)	Blue Crane (45); Rock Kestrel (1);	Blue Crane (60); Ludwig's Bustard (1); Rock Kestrel (1);
DT2 (Sk-4, Sk-5)	Blue Crane (2); Karoo Korhaan (1)	Karoo Korhaan (2); Verreauxs' Eagle (1)	Blue Crane (4); Pale Chanting Goshawk (1); Rock Kestrel (1);	Verreauxs' Eagle (1)
DT3 (Sk-1)	Northern Black Korhaan (1); Karoo Korhaan (2); Pale Chanting Goshawk (1)	0	Karoo Korhaan (3); Southern Black Korhaan (7);	Jackal Buzzard (2); Northern Black Korhaan (1);
DT4 (Sk-3)	Karoo Korhaan (4)	Karoo Korhaan (2); Pale Chanting Goshawk (1)	Jackal Buzzard (1); Karoo Korhaan (5);	Jackal Buzzard (1); Karoo Korhaan (9); Ludwig's Bustard (1); Verreauxs' Eagle (1)
DT5	Blue Crane (1)	Jackal Buzzard (1)		
Total target species recorded				**10 species**

3.3 Focal Site Survey Results

Three focal sites were identified in the study area and surveyed once during summer (Table 7) and two additional sites (Verreauxs' Eagle nests) were identified and surveyed during winter (Table 8). Twenty-six Blue Crane were observed near the dam in summer at Focal Site 1, but none were observed in winter. This dam is mapped as a NFEPA wetland and has been buffered by 200 m.

Focal Site 2, 4 and 5 are Verreauxs' Eagle nests on cliffs. All nests were active during the winter survey. A 1 km No-Go area is required to protect the nests from disturbance (Figure 3).

At Focal Site 3 a moderate number of waterfowl and water-associated species were recorded for the area during summer and winter, none of which are Species of Conservation Concern. The dam is located approximately 3 km from the nearest proposed PV field, and while it appears to be of local significance for waterbirds, waterbirds utilising the dam are not expected to be significantly impacted by the proposed developments. Large flocks of over 2000 Wattled Starling were observed roosting near the dam on one of two occasions, and this dam may therefore be of local significance for this nomadic species that moves in response to insect availability.

Table 7: Summer Survey - Focal Site Survey Results

Ref	Target species
FS1 (Dam)	Blue Crane (26); Egyptian Goose (2); South African Shelduck (2)
FS2 (Nest)	Verreauxs' Eagle (1); Rock Kestrel (1)
FS3 (Dam)	South African Shelduck (40); Egyptian Goose (35); Yellow-billed Duck (15); African Sacred Ibis (30), White-breasted Cormorant (6); Grey Heron (2); Little Grebe (6); Glossy Ibis (1); Blacksmith Lapwing (2)

Table 8: Winter Survey - Focal Site Survey Results

Ref	Target species	
	First Winter Survey	Second Winter Survey
FS1 (Dam)	African Fish Eagle (1); African Pipit (1); Egyptian Goose (5); Rock Kestrel (1); South African Shelduck (2); Three-banded Plover (1);	Familiar Chat (2); South African Shelduck (2); Three-banded Plover (1);
FS2 (Nest)	Rock Kestrel (4)	Verreauxs' Eagle (2)
FS3 (Dam)	Cape Sparrow (50); Egyptian Goose (10); Lesser Swamp Warbler (2); Little Grebe (4); Red-knobbed Coot (14); South African Shelduck (2); Southern Red Bishop (50); Wattled Starling (2000)	Egyptian Goose (8); Little Grebe (5); Pied Crow (1); Red-knobbed Coot (62); Ring-necked Dove (1); South African Shelduck (2); Wattled Starling (11); White-faced Whistling Duck (2); Yellow-billed Duck (7)
FS4 (Nest)	Rock Kestrel (1); Verreauxs' Eagle (1)	Verreauxs' Eagle (1)
FS5 (Nest)	Verreauxs' Eagle (2)	n/a

3.4 Incidental Results

During the summer survey 26 incidental observations of 15 target species were recorded and during the winter survey 50 observations of 16 target species were recorded (Table 9).

Table 9: Incidental Observation Results

Species	Number of observations Summer	Number of birds Summer	Number of observations Winter	Number of birds Winter
African Fish Eagle	0	0	1	1
African Harrier-Hawk	2	2	0	0
Black Sparrowhawk	1	1	0	0
Blue Crane	2	4	17	175
Burchell's Courser	1	2	0	0
Cape Eagle-Owl	1	1	0	0
Common Buzzard	2	2	0	0
European Honey Buzzard	0	0	1	1
Gabar Goshawk	1	1	1	1
Jackal Buzzard	2	3	5	8
Karoo Korhaan	2	4	6	11
Lanner Falcon	2	4	1	1
Ludwig's Bustard	3	11	3	16
Northern Black Korhaan	2	2	2	7
Pale Chanting Goshawk	3	3	4	5
Pied Starling	0	0	1	1
Rock Kestrel	1	1	1	1
Secretarybird	0	0	1	1
Southern Black Korhaan	0	0	2	2
Verreauxs' Eagle	1	2	2	3

The locations of incidental observations recorded during the summer and winter surveys are presented in Figure 2. It must be noted that results are of the location from which the observation was made from, and the results are skewed towards access roads to survey areas, and are indicative only.

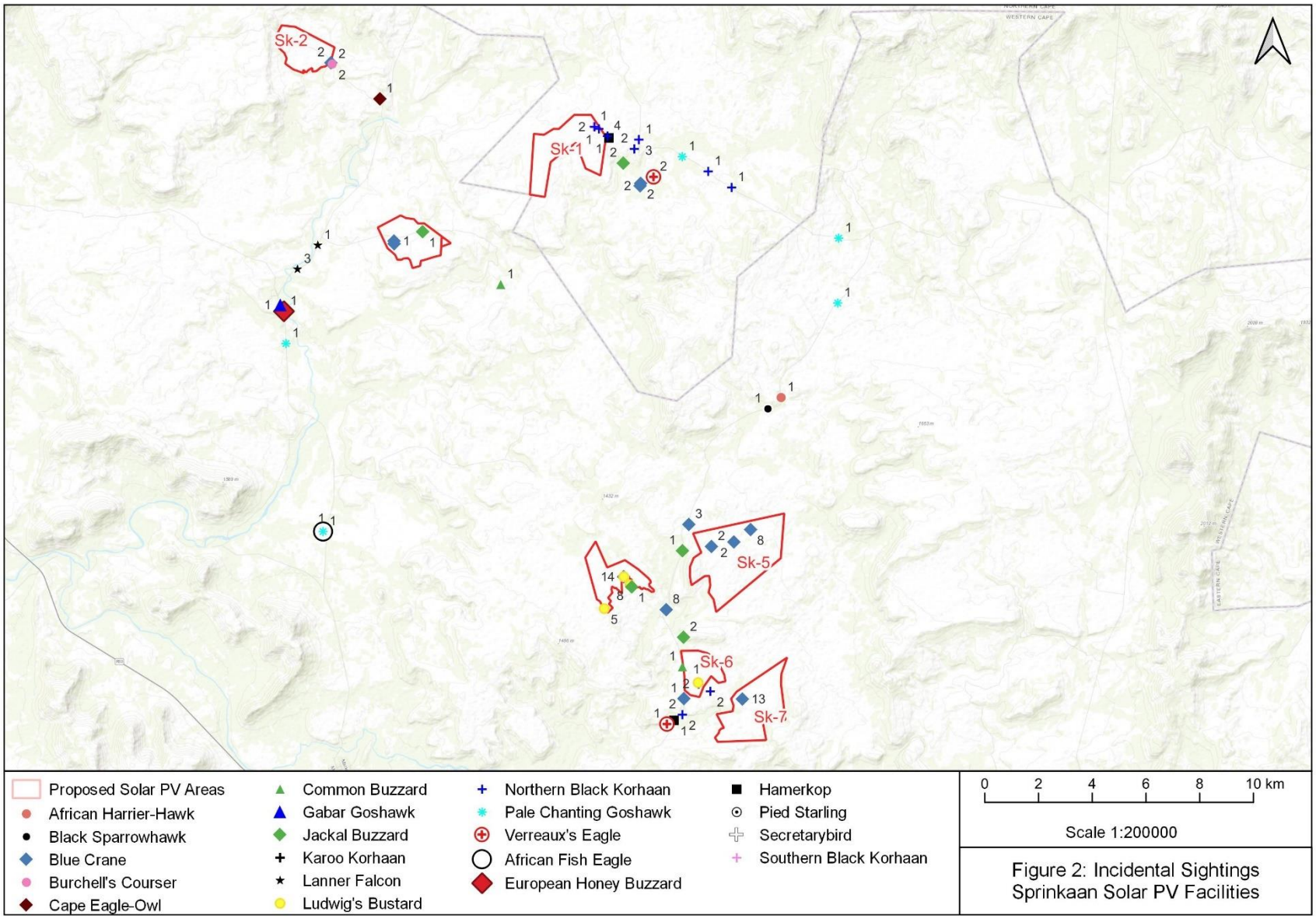


Figure 2: Incidental Sightings
Sprinkaan Solar PV Facilities

3.5 Avifauna

The South African Bird Atlas Project 2 (SABAP2) has recorded 194 species, including 11 species of Conservation Concern (SCC) within 19 pentads covering and adjacent to the study area, which potentially occur in the study area (**Appendix A**). During the summer and winter survey a total of 107 species were recorded, including seven SCC and 15 endemic or near-endemic species (**Table 10**).

Table 10: Species of Conservation Concern, endemic and near-endemic bird species during the pre-application monitoring surveys (Priority Species)

Common Name	Scientific Name	Red Data Status (Regional, Global)[5]	Endemism[6]	Summer	Winter
Eastern Clapper Lark	*Mirafra fasciolata*	, LC		x	x
Ludwig's Bustard	*Neotis ludwigii*	EN, EN		x	x
Karoo Korhaan	*Eupodotis vigorsii*	NT, LC			x
Blue Crane	*Grus paradisea*	NT, VU		x	x
Lanner Falcon	*Falco biarmicus*	VU, LC		x	x
Verreauxs' Eagle	*Aquila verreauxii*	VU, LC		x	x
Secretarybird	*Sagittarius serpentarius*	VU, VU			x
Cape Weaver	*Ploceus capensis*		NE	x	x
Cape White-eye	*Zosterops virens*		NE	x	x
Fiscal Flycatcher	*Melaenornis silens*		NE		x
Grey Tit	*Melaniparus afer*		NE	x	
Jackal Buzzard	*Buteo rufofuscus*		NE	x	x
Karoo Eremomela	*Eremomela gregalis*		NE	x	x
Karoo Lark	*Calendulauda albescens*		NE		x
Karoo Prinia	*Prinia maculosa*		NE	x	x
Karoo Thrush	*Turdus smithi*		NE	x	x
Large-billed Lark	*Galerida magnirostris*		NE	x	x
Namaqua Warbler	*Phragmacia substriata*		NE	x	x
Sickle-winged Chat	*Emarginata sinuata*		NE		x
Southern Double-collared Sunbird	*Cinnyris chalybeus*		NE	x	x
Pied Starling	*Lamprotornis bicolor*		SLS		x

3.6 Vegetation and Spatial Biodiversity Plans

From a mapped threatened ecosystem perspective, the majority of the remaining proposed PV Sites are entirely mapped as Eastern Upper Karoo (Least Concern), with a small section of Sk-5

[5] LC: Least Concern; NT: Near-threatened; VU: Vulnerable; EN: Endangered
[6] E: Endemic; NE: near-endemic; SLS: South Africa, Lesotho & Swaziland

mapped as Upper Karoo Hardeveld (Least Concern), used for small livestock grazing. The study area also includes sections of Southern Karoo Riviere (Least Concern).

Sites Sk-2, Sk-3, Sk-4, Sk-5, Sk-6 and Sk-7 fall within the Western Cape Province, while Site Sk-1 falls within the Northern Cape Province.

Critical Biodiversity Areas (CBAs) are required to meet biodiversity targets for ecosystems, species and ecological processes, as identified in systematic biodiversity plans, and must be maintained in a good ecological condition (natural or semi-natural state). CBAs collectively meet biodiversity targets for all ecosystem types, as well as for species and ecological processes that depend on natural or semi-natural habitat that have not already been met in the protected area network (SANBI 2020). According to the Birds and Solar Energy Guidelines *'If development is considered in natural habitat, development should be located outside Critical Biodiversity Areas and Ecological Support Areas, as identified in a bioregional plan or biodiversity sector plan'.*

Sk-5 contains a significant area of CBA 1, and Sk-6 also contains an area of CBA 1, as mapped by the Western Cape Biodiversity Spatial Plan (Cape Nature 2017), and development is generally not supported in these areas according to the Best Practice Guidelines (Figure 2). Results from pre-application monitoring have however determined that these areas are not of a higher avifaunal sensitivity, and development could be considered here from an avifaunal perspective. Sk-5 and Sk-6 also contain some small areas of CBA 2 associated with the CBA1 areas. The remaining sites in the Western Cape are not mapped as CBAs and are therefore preferred for development.

The majority of Sk-1 is mapped as a CBA2 (NCDENC 2016), however walked and driven transect results (WT6, WT7, DT3) showed a relatively low avifaunal abundance and diversity, and the site does not contain any avifaunal habitat particular to the site not found in surrounding areas. Therefore, development within this CBA2 is acceptable from an avifaunal perspective.

3.7 Avifaunal Sensitivity

The avifaunal sensitivity of the seven proposed PV Sites in terms of the Best Practice Guidelines classification as described in Section 1 is presented in Table 11**.** The survey did not find the study area to contain any avifaunal habitat of national or regional significance, and none of the sites are classified as of high sensitivity.

One site (Sk-2) was found to be of low avifaunal sensitivity, four sites (Sk-1, Sk-3, Sk-6 and Sk-7) were found to be of medium avifaunal sensitivity. Sk-5 is considered to be of largely medium sensitivity but contains an area of high sensitivity (NFEPA wetland buffer), and was therefore classified as medium-high.

Table 11: Preliminary Avifaunal Sensitivity of the proposed PV Sites in Terms of Best Practice Guidelines

Site	Avifaunal Sensitivity	Reasons
Sk-1	Medium	315 ha of CBA2 (NCSBP) fall within Sk-1 site but relatively low avifaunal diversity & abundance with no important avifaunal habitats were found to be present. A Verreauxs' Eagle nest is located approximately 1.5 km from SK-1 site boundary.
Sk-2	Low	The Sk-2 site and majority of surrounding areas appear to not contain any sensitive features of local importance to avifauna.
Sk-3	Medium	A Verreauxs' Eagle (*Vulnerable*) nest is located approximately 1.3 km from the Sk-3 site boundary. A dam of local importance approximately 2.5 km from Sk-3 site boundary.
Sk-4	Medium	Parts of the Sk-4 site were utilised by flocks of Blue Crane and Ludwig's Bustard following rain fall events in the winter survey, which could be of local importance to these species.
Sk-5	Medium-high	A NFEPA wetland buffer of high sensitivity is located within the Sk-5 site which should be excluded from development. Approx. 160 ha of CBA1 within PV site does not contain important avifaunal habitat not found in surrounding areas, but Blue Crane were recorded incidentally within and outside of the CBA1 area in the north of the Sk-5 site.
Sk-6	Medium	The Sk-6 site contains an area of approx. 19 ha of CBA1 which does not consist of any important avifaunal habitat not found in surrounding areas. A Verreauxs' Eagle nest is located approximately 1.4 km from the Sk-6 site boundary. A locally important dam is located 500 m south of the Sk-6 site.
Sk-7	Medium	The Sk-7 site does not contain any CBA areas. It is located approximately 1.8 km from a Verreaux's Eagle nest and approximately 600 m from a locally important dam. Sk-7 had a relatively high abundance and diversity of birds.

4 Conclusion

Avifaunal pre-application monitoring confirmed the occurrence of seven Species of Conservation Concern within the study area. Therefore, an avian species specialist impact assessment will be required for the proposed development, in line with relevant gazetted protocols. No 'red flags' have been identified during the surveys and the site boundaries largely already avoid areas of high avifaunal sensitivity and no-go areas. The final layout should take identified avifaunal buffers (Figure 3) into consideration. If all No-Go areas and areas of high sensitivity are avoided by the development footprint, there is no reason that the project should not proceed to the impact assessment phase. The following mitigation measures are likely to be required for inclusion in the Environmental Management Programme for the project:

- Vegetation clearing within the development footprint, including underneath the PV panels must be in line with the recommendations of the vegetation specialist and kept to the practically and safe possible minimum.
- The footprint of disturbance must be kept to a minimum surrounding the development footprint, during construction and demarcated. Construction activities must be limited to the proposed development footprint as much as possible.
- Non-SCC ground nesting birds must be allowed to passively vacate the area if they are encountered during construction.
- An avian species specialist must train the ECO in the identification of the SCCs (identified as potentially present in the area in this report), and the presence, location and behaviour thereof during any site visits must be reported to the avian species specialist following each site visit.
- A walkthrough of the site should be conducted by the ECO for the project within 30 days prior to any activities taking place, to confirm that no avian SCC are breeding within the development footprint. If any potential breeding activity of suspected avian SCC is observed, this must be reported, with photographic evidence, if possible, to an avian species specialist prior to any construction activities occurring.
- Should any SCC be found breeding within the development footprint at any point during construction, all works within 250 m of the breeding site must be halted, and the avian species specialist must be contacted for further instruction.
- All electrical infrastructure to be of bird-friendly insulated design in line with the latest Eskom Technical Standards.
- Minimise perching opportunities within the facility by installing anti-perching devices, netting or other deterrents where required.
- Minimise outdoor lighting needed to operate the facility to the maximum extent practicable.
- Install line markers along the entire length of all overhead powerlines.
- Bury low and medium voltage powerlines wherever practically possible.
- Minimise the length of all overhead powerlines.
- All fencing must be of a single-fence design to avoid avian species getting trapped between double-fencing.
- All water reservoirs and open water must be covered with netting or mesh to avoid birds drowning.
- Any fatalities of SCC must be reported by the environmental manager to the consulting specialist, Birdlife SA, and the Competent Authority.
- No chemicals detrimental to the health of animal species are to be used for the cleaning of the PV panels.
- Should any SCC be found breeding within the site boundary at any point during operation of the facility, the area must be cordoned off and the avian species specialist must be contacted for further instruction.

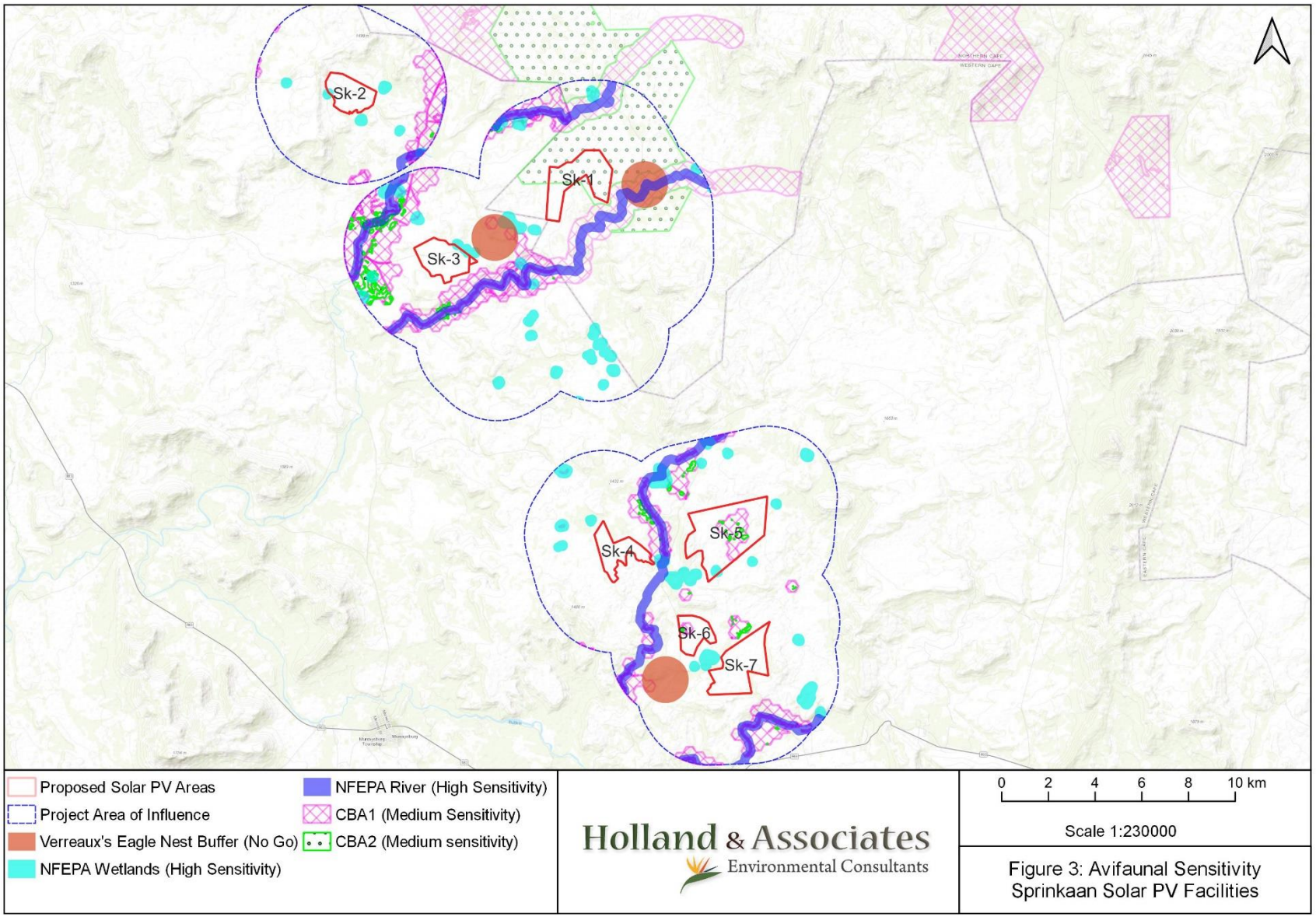


Figure 3: Avifaunal Sensitivity Sprinkaan Solar PV Facilities

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Appendix A: List of Observed and Potential Bird Species

Common Name	Scientific Name	Red Data (Regional, Global)	Endemic	Survey	SAPAP2 Reporting Rate
Acacia Pied Barbet	*Tricholaema leucomelas*			x	53.5
African Black Duck	*Anas sparsa*				9.9
African Black Swift	*Apus barbatus*				1.4
African Darter	*Anhinga rufa*				0.0
African Fish Eagle	*Haliaeetus vocifer*			x	7.0
African Harrier-Hawk	*Polyboroides typus*			x	1.4
African Hoopoe	*Upupa africana*			x	25.4
African Palm Swift	*Cypsiurus parvus*				0.0
African Paradise Flycatcher	*Terpsiphone viridis*			x	1.4
African Pipit	*Anthus cinnamomeus*			x	43.7
African Red-eyed Bulbul	*Pycnonotus nigricans*			x	69.0
African Reed Warbler	*Acrocephalus baeticatus*				21.1
African Rock Pipit	*Anthus crenatus*	NT, LC	SLS		5.6
African Sacred Ibis	*Threskiornis aethiopicus*			x	21.1
African Snipe	*Gallinago nigripennis*				1.4
African Spoonbill	*Platalea alba*				9.9
African Stonechat	*Saxicola torquatus*			x	18.3
Alpine Swift	*Tachymarptis melba*			x	12.7
Ant-eating Chat	*Myrmecocichla formicivora*			x	67.6
Barn Swallow	*Hirundo rustica*			x	39.4
Black-chested Prinia	*Prinia flavicans*				1.4
Black-crowned Night Heron	*Nycticorax nycticorax*				1.4
Black-eared Sparrow-Lark	*Eremopterix australis*		NE		1.4
Black-headed Canary	*Serinus alario*		NE		19.7
Black-headed Heron	*Ardea melanocephala*				9.9
Blacksmith Lapwing	*Vanellus armatus*				36.6
Black-throated Canary	*Crithagra atrogularis*				33.8
Black-winged Kite	*Elanus caeruleus*				11.3
Black-winged Stilt	*Himantopus himantopus*				12.7
Blue Crane	*Grus paradisea*	NT, VU		x	39.4
Bokmakierie	*Telophorus zeylonus*			x	64.8
Booted Eagle	*Hieraaetus pennatus*				1.4
Brown-hooded Kingfisher	*Halcyon albiventris*				1.4

Common Name	Scientific Name	Red Data (Regional, Global)	Endemic	Survey	SAPAP2 Reporting Rate
Brown-throated Martin	*Riparia paludicola*			x	43.7
Buffy Pipit	*Anthus vaalensis*				2.8
Cape Bunting	*Emberiza capensis*			x	32.4
Cape Canary	*Serinus canicollis*				2.8
Cape Crow	*Corvus capensis*			x	4.2
Cape Eagle-Owl	*Bubo capensis*			x	0
Cape Penduline Tit	*Anthoscopus minutus*			x	16.9
Cape Robin-chat	*Cossypha caffra*			x	52.1
Cape Shoveler	*Spatula smithii*				5.6
Cape Sparrow	*Passer melanurus*			x	78.9
Cape Teal	*Anas capensis*				1.4
Cape Turtle Dove	*Streptopelia capicola*			x	62.0
Cape Wagtail	*Motacilla capensis*			x	63.4
Cape Weaver	*Ploceus capensis*		NE	x	8.5
Cape White-eye	*Zosterops virens*		NE	x	42.3
Capped Wheatear	*Oenanthe pileata*				4.2
Cardinal Woodpecker	*Dendropicos fuscescens*				1.4
Chat Flycatcher	*Melaenornis infuscatus*			x	19.7
Chestnut-vented Warbler	*Curruca subcoerulea*			x	53.5
Cinnamon-breasted Warbler	*Euryptila subcinnamomea*		NE		1.4
Common Buzzard	*Buteo buteo*			x	8.5
Common Greenshank	*Tringa nebularia*				5.6
Common Moorhen	*Gallinula chloropus*				9.9
Common Ostrich	*Struthio camelus*				1.4
Common Quail	*Coturnix coturnix*			x	1.4
Common Swift	*Apus apus*				1.4
Common Waxbill	*Estrilda astrild*				32.4
Crowned Lapwing	*Vanellus coronatus*			x	2.8
Desert Cisticola	*Cisticola aridulus*			x	7.0
Diederik Cuckoo	*Chrysococcyx caprius*				12.7
Double-banded Courser	*Rhinoptilus africanus*	LC,			5.6
Dusky Sunbird	*Cinnyris fuscus*				25.4
Eastern Clapper Lark	*Mirafra fasciolata*	, LC		x	46.5
Egyptian Goose	*Alopochen aegyptiaca*			x	57.7
European Bee-eater	*Merops apiaster*				16.9
European Roller	*Coracias garrulus*	NT, LC			0.0

Common Name	Scientific Name	Red Data (Regional, Global)	Endemic	Survey	SAPAP2 Reporting Rate
Fairy Flycatcher	*Stenostira scita*		NE	x	38.0
Familiar Chat	*Oenanthe familiaris*			x	70.4
Fiscal Flycatcher	*Melaenornis silens*		NE	x	46.5
Fork-tailed Drongo	*Dicrurus adsimilis*			x	9.9
Gabar Goshawk	*Micronisus gabar*			x	2.8
Giant Kingfisher	*Megaceryle maxima*				4.2
Glossy Ibis	*Plegadis falcinellus*			x	4.2
Greater Flamingo	*Phoenicopterus roseus*	NT, LC			2.8
Greater Honeyguide	*Indicator indicator*				1.4
Greater Kestrel	*Falco rupicoloides*			x	1.4
Greater Striped Swallow	*Cecropis cucullata*			x	56.3
Grey Heron	*Ardea cinerea*			x	19.7
Grey Tit	*Melaniparus afer*		NE	x	8.5
Grey-backed Cisticola	*Cisticola subruficapilla*			x	56.3
Grey-backed Sparrow-lark	*Eremopterix verticalis*				26.8
Grey-winged Francolin	*Scleroptila afra*		SLS		4.2
Ground Woodpecker	*Geocolaptes olivaceus*	LC, NT	SLS		1.4
Hadada Ibis	*Bostrychia hagedash*			x	50.7
Hamerkop	*Scopus umbretta*			x	14.1
Helmeted Guineafowl	*Numida meleagris*			x	29.6
Horus Swift	*Apus horus*				4.2
House Sparrow	*Passer domesticus*			x	16.9
Jackal Buzzard	*Buteo rufofuscus*		*NE*	x	23.9
Kalahari Scrub Robin	*Cercotrichas paena*				1.4
Karoo Chat	*Emarginata schlegelii*			x	19.7
Karoo Eremomela	*Eremomela gregalis*		NE	x	7.0
Karoo Korhaan	*Eupodotis vigorsii*	NT, LC		x	50.7
Karoo Lark	*Calendulauda albescens*		NE	x	1.4
Karoo Long-billed Lark	*Certhilauda subcoronata*			x	35.2
Karoo Prinia	*Prinia maculosa*		NE	x	84.5
Karoo Scrub Robin	*Cercotrichas coryphoeus*			x	84.5
Karoo Thrush	*Turdus smithi*		NE	x	29.6
Kittlitz's Plover	*Charadrius pecuarius*				4.2
Lanner Falcon	*Falco biarmicus*	VU, LC		x	1.4
Large-billed Lark	*Galerida magnirostris*		NE	x	11.3
Lark-like Bunting	*Emberiza impetuani*			x	74.6

Common Name	Scientific Name	Red Data (Regional, Global)	Endemic	Survey	SAPAP2 Reporting Rate
Laughing Dove	*Spilopelia senegalensis*			x	42.3
Layard's Warbler	*Curruca layardi*			x	19.7
Lesser Honeyguide	*Indicator minor*				2.8
Lesser Kestrel	*Falco naumanni*				1.4
Lesser Swamp Warbler	*Acrocephalus gracilirostris*			x	23.9
Levaillant's Cisticola	*Cisticola tinniens*				25.4
Little Grebe	*Tachybaptus ruficollis*			x	12.7
Little Stint	*Calidris minuta*				1.4
Little Swift	*Apus affinis*				22.5
Long-billed crombec	*Sylvietta rufescens*			x	25.4
Ludwig's Bustard	*Neotis ludwigii*	EN, EN		x	12.7
Malachite Kingfisher	*Corythornis cristatus*			x	18.3
Malachite Sunbird	*Nectarinia famosa*			x	14.1
Martial Eagle	*Polemaetus bellicosus*	EN, VU			1.4
Mountain Wheatear	*Myrmecocichla monticola*			x	35.2
Namaqua Dove	*Oena capensis*			x	12.7
Namaqua Sandgrouse	*Pterocles namaqua*				7.0
Namaqua Warbler	*Phragmacia substriata*		NE	x	46.5
Neddicky	*Cisticola fulvicapilla*			x	21.1
Nicholson's Pipit	*Anthus nicholsoni*				28.2
Northern Black Korhaan	*Afrotis afraoides*			x	11.3
Orange River White-eye	*Zosterops pallidus*				1.4
Pale Chanting Goshawk	*Melierax canorus*			x	16.9
Pale-winged Starling	*Onychognathus nabouroup*			x	21.1
Pearl-breasted Swallow	*Hirundo dimidiata*				1.4
Pied Avocet	*Recurvirostra avosetta*				2.8
Pied Crow	*Corvus albus*			x	87.3
Pied Kingfisher	*Ceryle rudis*			x	5.6
Pied Starling	*Lamprotornis bicolor*		SLS	x	77.5
Pink-billed Lark	*Spizocorys conirostris*				0.0
Pin-tailed Whydah	*Vidua macroura*			x	14.1
Plain-backed Pipit	*Anthus leucophrys*			x	0.0
Pririt Batis	*Batis pririt*			x	16.9
Quailfinch	*Ortygospiza atricollis*				7.0
Red-billed Quelea	*Quelea quelea*				22.5
Red-billed Teal	*Anas erythrorhyncha*				5.6

Common Name	Scientific Name	Red Data (Regional, Global)	Endemic	Survey	SAPAP2 Reporting Rate
Red-capped Lark	*Calandrella cinerea*			x	12.7
Red-eyed Dove	*Streptopelia semitorquata*			x	29.6
Red-faced Mousebird	*Urocolius indicus*			x	28.2
Red-headed Finch	*Amadina erythrocephala*			x	7.0
Red-knobbed coot	*Fulica cristata*			x	11.3
Red-winged Starling	*Onychognathus morio*			x	36.6
Reed Cormorant	*Microcarbo africanus*				15.5
Rock Dove	*Columba livia*				0.0
Rock Kestrel	*Falco rupicolus*			x	35.2
Rock Martin	*Ptyonoprogne fuligula*				49.3
Rufous-eared Warbler	*Malcorus pectoralis*			x	74.6
Sabota Lark	*Calendulauda sabota*				23.9
Scaly-feathered Weaver	*Sporopipes squamifrons*			x	7.0
Secretarybird	*Sagittarius serpentarius*	VU, VU		x	1.4
Short-toed Rock Thrush	*Monticola brevipes*				2.8
Sickle-winged Chat	*Emarginata sinuata*		*NE*	x	29.6
South African Cliff Swallow	*Petrochelidon spilodera*		BNE		1.4
South African Shelduck	*Tadorna cana*			x	43.7
Southern Black Korhaan	*Afrotis afra*			x	
Southern Fiscal	*Lanius collaris*			x	54.9
Southern Double-collared Sunbird	*Cinnyris chalybeus*		NE	x	19.7
Southern Grey-headed Sparrow	*Passer diffusus*				25.4
Southern Masked Weaver	*Ploceus velatus*			x	80.3
Southern Pochard	*Netta erythrophthalma*				2.8
Southern Red Bishop	*Euplectes orix*			x	50.7
Southern Tchagra	*Tchagra tchagra*		NE		4.2
Speckled Mousebird	*Colius striatus*			x	5.6
Speckled Pigeon	*Columba guinea*			x	49.3
Spike-heeled Lark	*Chersomanes albofasciata*			x	35.2
Spotted Eagle-Owl	*Bubo africanus*				4.2
Spotted flycatcher	*Muscicapa striata*				1.4
Spotted Thick-knee	*Burhinus capensis*				7.0

Common Name	Scientific Name	Red Data (Regional, Global)	Endemic	Survey	SAPAP2 Reporting Rate
Spur-winged Goose	*Plectropterus gambensis*			x	18.3
Squacco Heron	*Ardeola ralloides*				1.4
Three-banded Plover	*Charadrius tricollaris*			x	43.7
Tractrac Chat	*Emarginata tractrac*			x	1.4
Verreaux's Eagle	*Aquila verreauxii*	VU, LC		x	19.7
Wattled Starling	*Creatophora cinerea*			x	21.1
Western Cattle Egret	*Bubulcus ibis*			x	1.4
Whiskered Tern	*Chlidonias hybrida*				2.8
White Stork	*Ciconia ciconia*				1.4
White-backed Mousebird	*Colius colius*			x	52.1
White-necked Raven	*Corvus albicollis*			x	53.5
White-rumped Swift	*Apus caffer*			x	14.1
White-throated Canary	*Crithagra albogularis*			x	54.9
White-throated Swallow	*Hirundo albigularis*			x	21.1
Woolly-necked Stork	*Ciconia episcopus*				0.0
Yellow Canary	*Crithagra flaviventris*			x	4.2
Yellow-bellied Eremomela	*Eremomela icteropygialis*			x	54.9
Yellow-billed Duck	*Anas undulata*			x	25.4
Zitting Cisticola	*Cisticola juncidis*			x	1.4

Annexure B: Terms of Reference

UPDATED TERMS OF REFERENCE FOR SPECIALIST STUDIES FOR THE BASIC ASSESSMENTS FOR THE PROPOSED DEVELOPMENT OF THE SEVEN 100 TO 350 MW PADLOPER SOLAR PHOTOVOLTAIC (PV) FACILITIES AND 132 kV OVERHEAD POWERLINES AND ASSOCIATED ELECTRICAL GRID INFRASTRUCTURE (EGI), NEAR MURRAYSBURG IN THE WESTERN AND NORTHERN CAPE PROVINCE.

Date:

Internal Version 3 (Sent to Specialists): May 2023

Prepared by:

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Prepared for:

Jaana-Maria Ball and African Clean Energy Developments (Pty) Ltd (ACED)

Name of the Overall Project:

Basic Assessment Processes for the Proposed Development of the 7 x Solar Photovoltaic (PV) Facilities of between 100 and 350 MW generation capacity each (known as the Padloper Solar PV Cluster) and the associated 7 x 132 kV overhead power lines and associated Electrical Grid Infrastructure (EGI) near Murraysburg in the Western and Northern Cape Provinces.

Names of the Individual Projects: Solar Photovoltaic Facilities	**Project 1**	Basic Assessment for the proposed construction and operation of the up to 200 MW Padloper Solar Photovoltaic Facility 1 and associated infrastructure (i.e., Padloper Solar 1) near Murraysburg in the Northern Cape Province
	Project 2	Basic Assessment for the proposed construction and operation of the up to 100 MW Padloper Solar Photovoltaic Facility 2 and associated infrastructure (i.e., Padloper Solar 2), near Murraysburg in the Western Cape Province
	Project 3	Basic Assessment for the proposed construction and operation of the up to 100 MW Padloper Solar Photovoltaic Facility 3 and associated infrastructure (i.e., Padloper Solar 3), near Murraysburg in the Western Cape Province
	Project 4	Basic Assessment for the proposed construction and operation of the up to 350 MW Padloper Solar Photovoltaic Facility 4 and associated infrastructure (i.e., Padloper Solar 5), near Murraysburg in the Western Cape Province
	Project 5	Basic Assessment for the proposed construction and operation of the up to 125 MW Padloper Solar Photovoltaic Facility 5 and associated infrastructure (i.e., Padloper Solar 5), as well as the proposed development of a 132 kV Electrical Grid Infrastructure between the Padloper Solar 4 and the proposed Padloper Solar 5, near Murraysburg in the Western Cape Province
	Project 6	Basic Assessment for the proposed construction and operation of the up to 100 MW Padloper Solar Photovoltaic Facility 6 and associated infrastructure (i.e., Padloper Solar 6), as well as the proposed development of a 132 kV Electrical Grid Infrastructure between the Padloper Solar 4 and the proposed Padloper Solar 6, near Murraysburg in the Western Cape Province
	Project 7	Basic Assessment for the proposed construction and operation of the up to 125 MW Padloper Solar Photovoltaic Facility 7 and associated infrastructure (Padloper Solar 7), as well as the proposed development of a 132 kV Electrical Grid Infrastructure between the Padloper Solar 6 and the proposed Padloper Solar 7, near Murraysburg in the Western Cape Province
Associated Power line and Electrical Grid Infrastructure	**Project 8**	Basic Assessment for the proposed development of a 132 kV Overhead Power line and associated Electrical Grid Infrastructure (EGI) between the proposed Padloper Solar 1 and the proposed authorised Ishwati Emoyeni Substation (i.e., Padloper EGI 1), near Murraysburg in the Northern Cape and Western Cape Provinces
	Project 9	Basic Assessment for the proposed development of a 132 kV Overhead Power line and associated Electrical Grid Infrastructure (EGI) between the proposed Padloper Solar 2 and the proposed authorised Ishwati Emoyeni Substation (i.e., Padloper EGI 2) from the Padloper Solar Photovoltaic Facility 2 to the Eskom Gamma Main Transmission Substation, near Murraysburg in the Western Cape Province
	Project 10	Basic Assessment for the proposed development of a 132 kV Overhead Power line and associated Electrical Grid Infrastructure (EGI) between the proposed Padloper Solar Facility 2 and the proposed Padloper Solar Facility 3 (i.e., Padloper EGI 3), near Murraysburg in the Western Cape Province
	Project 11	Basic Assessment for the proposed development of a 132 kV Overhead Power line and associated Electrical Grid Infrastructure (EGI) between the proposed Padloper Solar 4 and the proposed authorised Ishwati Emoyeni Substation (i.e., Padloper EGI 4), near Murraysburg in the Northern Cape and Western Cape Provinces

1. Introduction

The purpose of this Terms of Reference (ToR) for the Specialists is to provide a consistent and up-to-date approach to the specialist studies that are required as part of the Basic Assessments (BAs) being conducted for the projects mentioned above. This will enable efficient review and collation of the specialist studies into the BA Reports, in accordance with the latest requirements of the 2014 National Environmental Management Act, 1998 (Act No. 107 of 1998, as amended) (NEMA) Environmental Impact Assessment (EIA) Regulations (as amended).

The Specialist ToR consists of the following sections:

- Section A: Project Description
- Section B: Impact Assessment Methodology
- Section C: Cumulative Impact Assessment
- Section D: Specific Issues to be addressed in each Specialist Study

Please consider the following two important aspects when undertaking your specialist studies:

1. The Project Developer, African Clean Energy Developments (Pty) Ltd (ACED), is currently undertaking a BA process for the Electrical Grid Infrastructure (EGI) for the Umsinde and Khangela Wind Farms and have completed the specialist assessments for the Wind Farm overhead line (OHL) corridor. Please note that the proposed Padloper PV EGI has been planned to run parallel with the Wind Farm OHL as much as possible.

   Given that the Wind Farm OHL corridor has already been assessed, please highlight if there is any way to capitalize on this for the current BAs. It may therefore not be necessary to re-assess a corridor that has recently been assessed by a full suite of specialists. We will make the specialist mapping and reports available to you.

2. ACED holds an existing Environmental Authorisation (EA) for the grid connection required between the Ishwati substation (refer to the “NC OHL Route for Walkthrough….”) and the Gamma MTS. Three 132 kV OHLs are authorised between Ishwati and Gamma. Therefore, in the context of the current Padloper Solar Facility BA processes, only the proposed powerlines connecting the Padloper Solar Facilities must be assessed. However, the above context should be considered in your assessments.

Section A: Project Description

1. Generic Project Description

The Project Applicant, Padloper Solar (Pty) Ltd (hereinafter referred to as "Padloper Solar" or "the Applicant")[1], is proposing to develop 7 x Solar Photovoltaic (PV) Facilities with a capacity of between 100 and 350 MW each and the associated infrastructure, and the associated 7 x 132 kV overhead power lines and associated Electrical Grid Infrastructure (EGI) near Murraysburg in the Western and Northern Cape Provinces. Each solar PV facility will have a range of associated infrastructure, including, but not limited to, an on-site substation and Battery Energy Storage System (BESS) complex and will connect to the existing Gamma Main Transmission Substation (MTS) via dedicated 132 kV overhead power lines.

The proposed solar PV facilities and overhead power lines will be constructed on the following farm portions:

Affected Farm portion	SG Code	Padloper (Pd) Solar Facilities 1 - 7							Overhead Powerline Route
		Pd 1	Pd 2	Pd 3	Pd 4	Pd 5	Pd 6	Pd 7	
Portion 7 of Farm Klipplaat No. 109	C06300000000010900007	✓							✓
Remainder of Farm Riet Poort No.9	C05200000000000900000		✓						✓
Portion 1 of Farm Klipplaat No. 109	C06300000000010900001			✓					✓
Portion 4 of Farm Klipplaat No. 109	C06300000000010900004								✓
Portion 6 of Farm Klipplaat No. 109	C06300000000010900006								✓
Portion 3 of Farm Angora No. 26	C05200000000002600003					✓			✓
Portion 2 of Farm Angora No. 26	C05200000000002600002								✓
Portion 4 of Farm Angora No. 26	C05200000000002600004								✓
Portion 7 of Farm Angora No. 26	C05200000000002600007						✓	✓	✓
Remainder of Farm No.8	C05200000000000800000								✓
Remainder of Farm No.6	C05200000000000600000								✓
Portion 2 of Farm No.6	C05200000000000600002								✓
Portion 4 of Farm No.7	C05200000000000700004								✓
Remainder of Farm No.7	C05200000000000700000								✓
Portion 2 of Farm No.7	C05200000000000700002								✓
Portion 5 of Farm Klein Los Kop No. 5	C05200000000000500005								✓
Remainder of Farm Schietkuil No. 3	C05200000000000300000								✓

Note that the specialists have assessed the full extent of the farm portions listed above for the proposed PV and 132 kV Overhead powerlines and associated EGI infrastructure. This has informed the buildable areas and sensitivity mapping. Refer to Figure 1 locality map of the proposed sites.

[1]It is important to note that Padloper Solar (Pty) Ltd is the Project Applicant, whereas African Clean Energy Developments (Pty) Ltd (ACED) is the Project Developer.

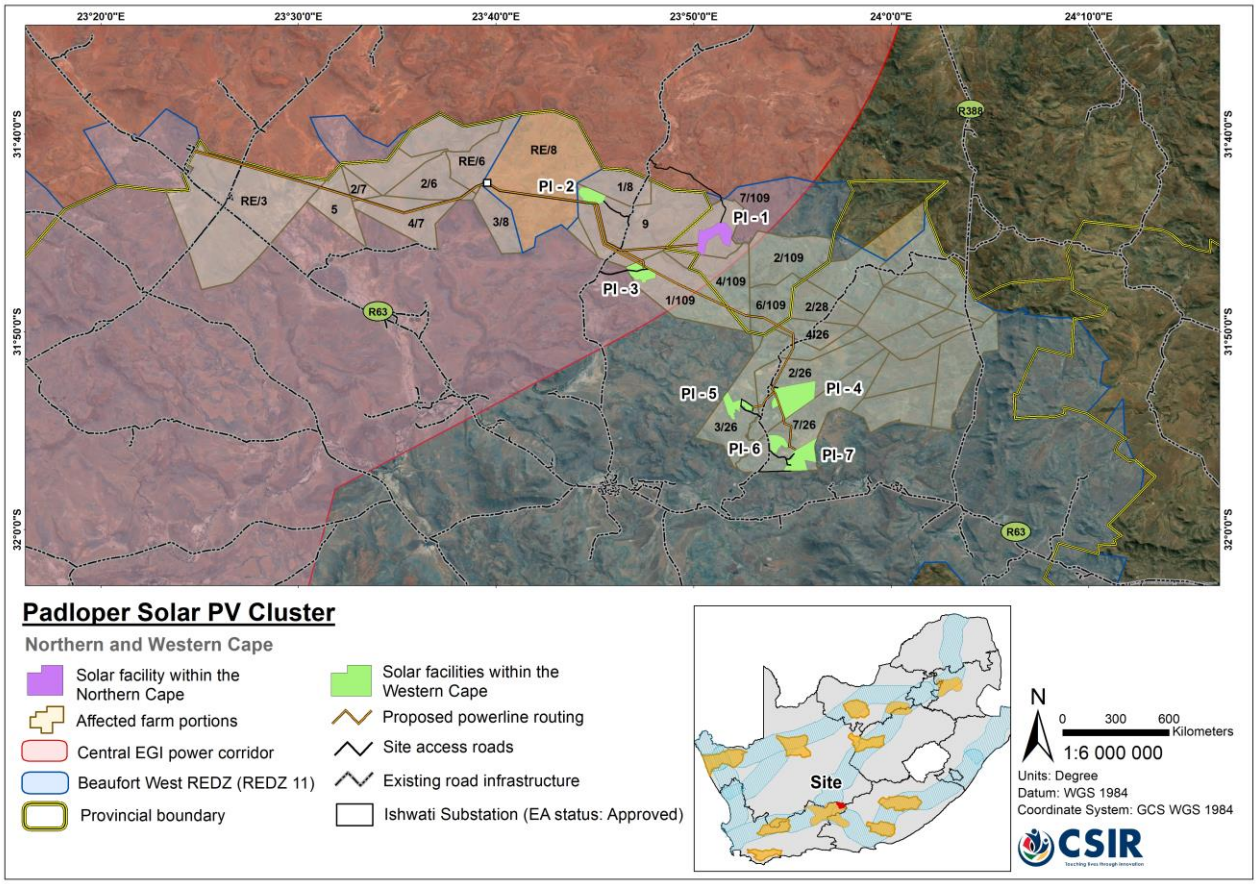


Figure 1: Location of the affected farm portions on which the proposed seven Padloper Solar PV Facilities will be constructed. These entire farm portions (outlined in brown) are the study area for the PV Facilities, including access roads.

The proposed solar PV and EGI projects will consist of the components listed below. **It is important to note at the outset that the exact specifications of the proposed project components will only be determined during the detailed engineering phase prior to construction (subsequent to the issuing of an EA), should such an authorisation be granted for the proposed projects, but that the information provided below is seen as the worst-case scenario for the projects. The detail provided is to give specialists as much information as possible to inform the identification and assessment of potential impacts. It is however important to note that these specifications are subject to change as the BA process progresses. Any changes will be communicated to the specialists to update their specialist assessments and reports accordingly.**

The Solar PV Facilities will have the following project components:

PV Facilities	
Component	**Description / dimensions**
Height of PV panels	Maximum of ± 4.5m.
MW of each PV Facility	Padloper Solar 1: Up to 200 MW Padloper Solar 2: Up to 100 MW Padloper Solar 3: Up to 100 MW Padloper Solar 4: Up to 350 MW Padloper Solar 5: Up to 125 MW Padloper Solar 6: Up to 100 MW Padloper Solar 7: Up to 125 MW
Area of PV Array	Proposed area occupied by PV panel arrays: Padloper Solar 1: 429 ha (Total developable area: ± 420 ha) Padloper Solar 2: 249 ha (Total developable area: ± 222 ha) Padloper Solar 3: 293 ha (Total developable area: ± 233 ha) Padloper Solar 4: 747 ha (Total developable area: ±y 329 ha) Padloper Solar 5: 250 ha (Total developable area: ± 202 ha) Padloper Solar 6: 182 ha (Total developable area: ± 119 ha) Padloper Solar 7: 433 ha (Total developable area: ± 241 ha) Note that the total developable area referred to above includes all associated infrastructure within the fenced off area of the PV facility.
Number of inverters required	Preliminary number of 3.5 MW inverters across all the projects: 330
Area occupied by inverter-transformer stations and on-site substation and height	Inverter-Transformer stations: 0.022 ha each x 165 stations = 3.63 ha. The inverter stations will have a height of ± 3 m each (Excluding lightning rods. The lightning rods are expected to extend 10 m high. Each inverter station will have 1 – 2 lightning rods). A facility substation complex at **all seven PV facilities.** The on-site substation will be approximately 2 ha and will have a height of up to 18 m, thereby covering a total area of 14 ha. Note that the construction of Eskom substations only applies to **PV 1, 2, 3, and 4**. The Eskom substations will range between approximately 1.55 ha and 2.2 ha, thereby covering a total area of 7.98 ha.
Capacity of on-site substation	132 kV
Area occupied by both permanent and construction laydown areas	Temporary Laydown: up to 22 ha in total. There is one temporary laydown area proposed at each PV Facility (ranging from approximately 1 ha to 4 ha). Please note that the temporary laydown areas will be rehabilitated after construction and will not be retained for the operational phase.
Length of internal roads	Preliminary internal roads: ± 78 km long x 5 m wide = 39 ha (Note: This is rough estimate and will be confirmed during the final design phase of the

PV Facilities		
Component	**Description / dimensions**	
	projects prior to commencing construction).	
Width of internal roads	Width: ± 4 – 5 m	
Upgrading of existing access road/s	Yes. Existing roads will be used as far as practically achievable.	
	Current width (m): ± 5 m	
	Upgraded width (m): ± 8 m (6m wide road surface with 1m drain either side)	
Site access points	Proposed to be on the Western side of Development areas, from existing farm road running further North (refer to attached KMZ file). Specialists are required to assess a 100 m wide corridor, i.e., 50 m on either side of the centreline, within which the 8 m wide road will be located. This will allow a bit of flexibility for future micro-siting.	
Internal transmission and/or distribution lines	All on-site medium voltage cabling (22 or 33kV) will be buried to a maximum depth of 1.5 m. Please refer to the separate section below for the 132 kV overhead lines within the PV areas.	
Site offices There will be 1 site office at each PV Facility which will include a warehouse/workshop and an operational and maintenance (O&M) control center. The details provided in this section is for one site office.	Number of buildings:	± 1
	Maximum height (m):	Up to 10 m
	Footprint (m²):	300 m²
Guard houses There will be 2 guardhouses facilities at each PV Facility. The details provided in this section is for one guard house.	Maximum height (m):	Up to 3 m
	Footprint (m²):	Guard house and security: ± 6 m x 6 m ± 36 m²
Ablution facilities There will be 2 ablution facilities at each PV Facility included in site offices and guardhouse footprints. The details provided in this section is for one ablution facility	Maximum height (m):	Up to 10m
	Footprint (m²):	Staff lockers: ± 22 m x 11 m ± 242 m²
Battery storage	Battery technology type:	Lithium-ion technology
	Approx. footprint (ha):	± 5ha

PV Facilities		
Component	**Description / dimensions**	
Each PV Facility will include 1 BESS facility. It is proposed that the BESS will be located at the project substation site and laydown area	Maximum height (m):	Up to 10 m
	Capacity:	Padloper PV 1: 200 MW (1 200 MWh) Padloper PV 2: 100 MW (600 MWh) Padloper PV 3: 100 MW (600 MWh) Padloper PV 4: 350 MW (2 100 MWh) Padloper PV 5: 125 MW (750 MWh) Padloper PV 6: 100 MW (600 MWh) Padloper PV 7: 125 MW (750 MWh)
Underground low voltage cables or cable trays	Maximum depth (m):	Up to 1.5 m
Water use requirements (per project)	Estimated quantity of water (litres) required for the construction phase:	Construction: ± 10,000 m^3 per project over a ± 18-month construction period. The largest site Padloper Solar PV 4 comprising 350 MW) will use up to ~50 000 m^3 per year during construction.
	Estimated quantity of water (litres) required for the operational phase:	Operation: ± 5,000 m^3 per annum per project for a minimum of 20-year operational lifespan of the solar energy facility. ~15 000m^3 per year during operations for the Padloper Solar PV 4 project (comprising 350 MW).
	Estimated quantity of water (litres) required for the decommissioning phase:	Unknown
	Where will the water be sourced from e.g., borehole, dam, river, municipal, etc.:	In order of priority: i) A borehole drilled on site, which will be subject to complete geohydrological testing and the necessary water use authorisation obtained (as applicable). The need for a Water Use Licence (WUL) will be avoided and General Authorisaton abstraction volumes will be adhered to as far as possible. ii) The Local Municipality (LM) - Specific arrangements will be agreed with the LM in a Service Level Agreement (SLA). Most likely the water will be either trucked in, or otherwise made available for collection at their Water Treatment Plant via a metered standpipe. iii) Investigation into a third-party water supplier which may include a nearby mine or other private services company.
Construction Period (months):	± 12 - 18 months per project (projects may be constructed in parallel).	

The following applies to all 7 x over-head power lines:

EGI Projects	
Component	**Description**
Foundation	The type of terrain will determine the choice of foundation. The size of the footprint area will range from 0.6 m x 0.6 m to 1.5 m x 1.5 m. The minimum working area required around a structure position is 20 m x 20 m.
Pylon	132 kV steel monopole or lattice towers
Tower type	Self-supporting and Angle Strain towers
Height	17.4 - 21 m
Span length	200, 250 or 375 m
Servitude width	A 400 m wide corridor (i.e., 200 m on either side of centreline) for all the overhead power lines listed above to be assessed by specialists, in order to identify sensitivities and features that need to be avoided.
Additional Information	• EGI 1 to 4: To be handed over to Eskom post EA (should EA be granted) therefore separate applications will be submitted for these power lines. • The overhead power lines connecting Padloper Solar 5 -7 to Padloper 4 will be retained by ACED and therefore do not require a separate EA. The assessment of these powerlines will be included in the respective Solar facility assessments.

The assessment area for the specialists includes the above-mentioned affected farm portions to identify sensitivities and features that need to be avoided and to identify potential buildable areas. The specialists are required to assess the total study area and the entire 400 m wide corridors for the power lines and infrastructure upgrades to generate sensitivity maps that will be used to identify the best locations for the PV areas and power lines. The location of the proposed facilities and the citing of the project infrastructure within the assessed larger study areas will be informed by the recommendations of the specialists and field work.

Depending on which projects win preferred bidder status in the Renewable Energy Independent Power Producer Procurement Program (REIPPPP) (i.e., the issuing of a Power Purchase Agreement (PPA) from the Department of Mineral Resources and Energy (DMRE)) or a private procurement process, the number of power lines may be changed/reduced **(however all corridors and lines must be assessed based on the worst-case scenario).**

2. Specialist Reporting Requirements

In terms of the NEMA and the 2014 NEMA EIA Regulations, as amended, in Government Gazette 40772 and Government Notice (GN) R326, R327, R325 and R324 on 7 April 2017, the proposed projects will be subject to BA Processes. The requirements for Specialist Studies are specified in **Appendix 6 of the 2014 NEMA EIA Regulations, as amended**, as well as the **Assessment Protocols that were published on 20 March 2020, in Government Gazette 43110, GN 320, and on 30 October 2020, in Government Gazette 43855, GN 1150**. These protocols stipulate 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 the NEMA, when applying for EA.

The Assessment Protocols in GN 320 include the following sections:

- **Part A**: This includes the Site Sensitivity Verification Requirements where a Specialist Assessment is required but no Specific Assessment Protocol has been prescribed. The current use of the land and the environmental sensitivity of the site under consideration identified by the Department of Forestry, Fisheries and the Environment (DFFE) Screening Tool, where determined, must be verified and confirmed by undertaking a Site Sensitivity Verification (SSV). A Site Sensitivity Verification must be compiled and included as an appendix to the Specialist Assessment. Where there are no sensitivity layers on the Screening Tool for a particular Specialist Assessment, then this must be stated in the actual Specialist Assessment. For example, as at July 2022, there are no sensitivity layers on the Screening Tool for Socio-Economic and Traffic features. The Specialist Assessment must comply with Appendix 6 of the 2014 NEMA EIA Regulations, as amended.
- **Part B**: This includes the Site Sensitivity Verification Requirements and Reporting Requirements where a Specialist Assessment is required and a specific Assessment Protocol has been prescribed. The following protocols are prescribed:
    - **Agriculture**: Site Sensitivity Verification Report required and specific Assessment Protocol to be followed. This applies to all onshore wind and/or solar PV energy activities requiring EA;
    - **Terrestrial Biodiversity**: Site Sensitivity Verification Report required and specific Assessment Protocol to be followed. This applies to all relevant activities requiring EA;
    - **Aquatic Biodiversity**: Site Sensitivity Verification Report required and specific Assessment Protocol to be followed. This applies to all relevant activities requiring EA;
    - **Noise**: Site Sensitivity Verification Report required and specific Assessment Protocol to be followed. This applies to all relevant activities requiring EA;
    - **Defense**: Site Sensitivity Verification Report required and specific Assessment Protocol to be followed. This applies to all relevant activities requiring EA (the CSIR will address this); and
    - **Civil Aviation**: Site Sensitivity Verification Report required and specific Assessment Protocol to be followed. This applies to all relevant activities requiring EA (the CSIR will address this).

GN 1150 prescribes 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 EA. GN 1150 includes a protocol for the specialist assessment and minimum report content requirements for environmental impacts on a) terrestrial animal species and b) terrestrial plant species. The requirements of these protocols apply from the date of publication (i.e., from 30 October 2020). Therefore, these protocols are applicable to the projects.

Since the proposed Solar PV facilities and EGI are located within the same geographical area and constitute the same type of activity, an integrated Public Participation Process (PPP) is proposed to be undertaken for the proposed projects.

Combination request

A combination request for PV-EGI pairs 1 to 4 will be submitted to the DFFE in terms of Regulation 11 of the 2014 NEMA EIA Regulations, as amended. Should the above approach be deemed acceptable by the DFFE, a combined process will be followed with one combined BA report being compiled for each PV-EGI pair comprising of separate sections pertaining to the PV and EGI components as well as separate impact assessment table. This combined process will yield two separate EAs (should they be granted). (A schematic diagram of the above approach is provided below - Figure 2).

Combined reports for PV-EGI pairs 5 to 7 will also be compiled, however the overhead power lines connecting Padloper Solar 5 -7 to Padloper 4 will be retained by ACED and therefore do not require separate EAs. These reports will therefore follow GN145.

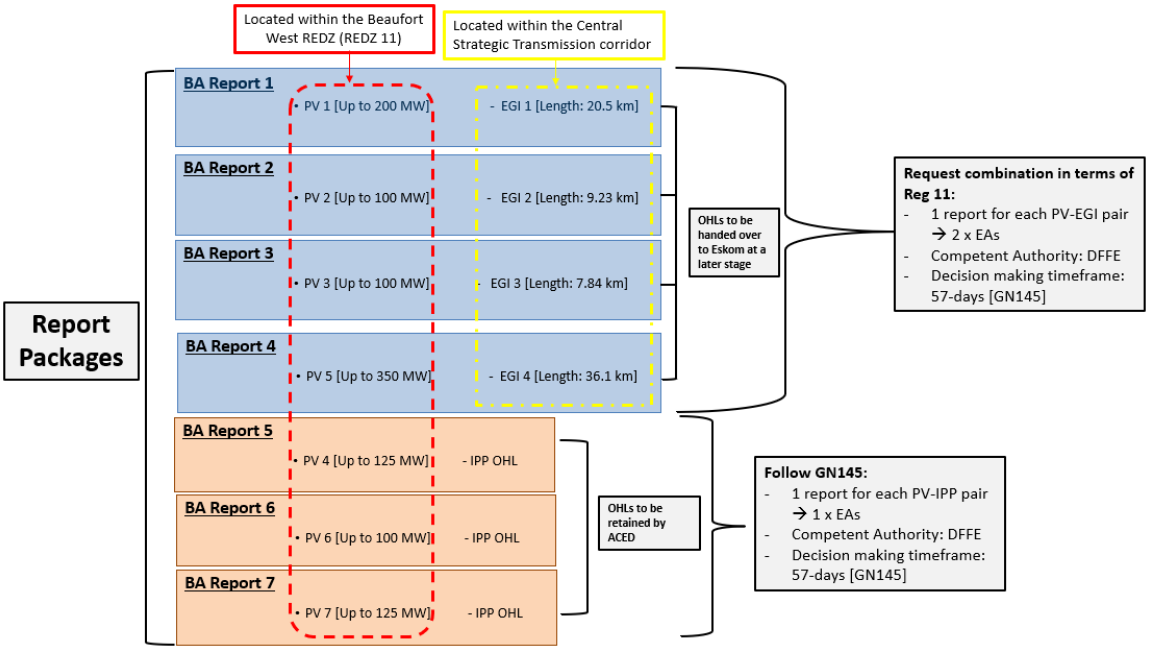


Figure 2. Schematic overview of the reporting structing, should DFFE grant the combination request for PV-EGI pairs 1 to 4.

In the event that the combination request for PV-EGI pairs 1 to 4 is granted by the DFFE, the specialists will be required to produce the following reports (subject to change depending on the outcome of the combination request and discussions with DFFE), unless otherwise agreed on with the EAP:

- **Report 1:** 1 x combined specialist report for Projects 1 to 4 (i.e., addresses Padloper Solar PV facilities 1 to 4 and associated infrastructure),
- **Report 2:** 1 x combined specialist report for Projects 8 to 11 (i.e., addresses all four 132 kV overhead power lines associated with PV 1 to 4 to be handed over to Eskom at a later stage) [2],
- **Report 3**: 1 x combined specialist report for Projects 5 to 7 (i.e., addresses Padloper Solar PV facilities 5, 6, and 7 and associated infrastructure), and
- **Report 4:** 1 x combined specialist report for the overhead power lines connecting Padloper Solar 5 -7 to Padloper 4

As noted above, the specialist assessments will comply with Appendix 6 of the 2014 NEMA EIA Regulations (as amended), or the Assessment Protocols published in GN R320 on March 2020; or the Assessment Protocols published in GN R1150 on October 2020. The BESS Risk Assessment and Geotechnical Assessment will serve as technical reports, and the aforementioned legislation will thus not be applicable.

[2] The Socio-Economic, Traffic, Geohydrology and Risk Assessments for BESSs are not required to assess projects 8-11.

Specialist Assessment/Theme	Appendix 6 and Part A of GN 320	Part B of GN 320	GN 1150	Technical	PV Reports Required		EGI Reports Required	
					1-4	5-7		
Agriculture and Soils		X			X	X	X	X
Terrestrial Biodiversity, Terrestrial Plant and Terrestrial Species		X	X		X	X	X	X
Aquatic Biodiversity and Species		X			X	X	X	X
Avifauna Assessment			X		X	X	X	X
Visual Impact Assessment	X				X	X	X	X
Heritage Impact Assessment	X				X	X	X	X
Palaeontology Assessment	X				X	X	X	X
Socio-Economic Assessment (PV only)	X				X	X		
Traffic Impact Assessment (PV only)	X				X	X		
BESS Risk Assessment (PV only)				X	X	X		
Geotechnical Assessment (PV only) (to be confirmed by DFFE)				X	X	X		
Geohydrology (PV only)	X				X	X		

The specialists will be required to commence with their studies as soon as possible. The specialists will be required to undertake their studies in two phases:

- **Phase 1**: Initially, the specialists will be requested to conduct a complete survey (i.e., field work) of the larger study area (i.e., entire farm portions for the PV areas and 400 m wide corridors for the overhead lines) to identify sensitive environmental areas or features that need to be flagged and avoided, which will be used to inform the project layout. Where applicable, the specialists must ensure that all requirements of the Assessment Protocols published in GN 320 and GN1150, where applicable, are addressed. However, as per the pre-construction monitoring requirements, the Avifauna Specialist will be required to undertake more than one survey over a 6-month period if necessary. After the site visit, the specialists must provide sensitivity maps that will be used to determine the project layout.
  ***This Phase has been completed by the specialist team**.
- **Phase 2**: Once the project layout is identified, and buildable area is confirmed, the specialists will commence with the report compilation (**structure and number of reports has been confirmed above**).
  ***This Phase is currently underway**

The Specialist invoicing schedule is based on the above phasing. Appointment letters have been provided to each Specialist and includes the recommended invoicing scheduling. ACED will be responsible for contracting the Specialists and settling the invoices, while the CSIR will liaise with and manage the Specialist team.

A first order draft of the high-level specialist impact assessment reports and detailed specialist impact assessment reports (v1) will be compiled by the Specialists, which will be reviewed by CSIR and ACED, and the Specialists will be required to address comments raised in that review. Thereafter, the Specialists will be required to compile a second order draft of the high-level specialist impact assessment reports and detailed specialist impact assessment reports (v2) that

will be incorporated into the Draft BA Reports, which will be released for a 30-day public comment period.

Following this public comment period, the Specialists will be required to address comments raised during this commenting period where applicable, and thereafter compile a third order draft of the detailed specialist impact assessment reports (v3) that will be incorporated into the Final BA Report, which will be released for a 30-day public comment period.

The CSIR will provide the specialists with the report templates to be used, where necessary. *Note the earlier comment about the Socio-Economic and Traffic specialists to only provide a statement as to why a SSV cannot be undertaken and included as an appendix to their impact assessment report.*

The reports must also assess cumulative impacts from all the Padloper Solar PV projects proposed by the Project Applicant (Padloper Solar (Pty) Ltd), and additional solar PV and wind energy projects that may still be identified as having received a positive EA or which have lodged an application with the Competent Authority (CA) at the start of these BA processes, i.e., by May 2023. Refer to Section C of this ToR, which provides additional information on this assessment requirement.

3. Environmental Screening and Sensitivity Mapping

The CSIR will provide KMZ files of the project areas to be assessed (attached to this ToR) as well as the KMZs that were developed as part of the fatal flaw assessment for the projects.

In Government Gazette 42561, GN 960 dated 5 July 2019, the DFFE published the compulsory requirement to submit a report generated from the national web based environmental screening tool (Screening Tool), as contemplated in Regulation 16(1)(b)(v) of the 2014 NEMA EIA Regulations (as amended), when submitting an Application for EA in terms of Regulations 19 and 21 of the 2014 NEMA EIA Regulations (as amended). The requirement became compulsory on 4 October 2019 (i.e., within 90 days of the publication of the GN 960). The Screening Tool can be accessed at: https://screening.environment.gov.za/screeningtool/

Based on the outcome of the screening tool report, the information must be verified using previous studies, resources and site visits (where needed). Thereafter, the specialists must provide an updated sensitivity map for each of the projects. These sensitivity maps must include four tiers of sensitivity (i.e., very high, high, moderate and low sensitivity). A rationale must be provided as to how these sensitivity classes were allocated for the site. In addition, “no go” areas must be identified and mapped clearly, with a supporting explanation provided.
These maps will be used to guide the identification of the power line routes and infrastructure layouts, and potential micro-siting that may occur during the detailed engineering design phase of the project, if the project receives a positive EA and progresses to detailed design. The specialists are to apply the assumption that if the project siting is adjusted but remains within an area of the same sensitivity and the same project envelope, then the impact significance rating and

associated management actions remain the same. However, if the micro-siting results in the project footprint intruding onto areas with higher sensitivity rating, then the specialists will be requested to re-assess the significance ratings, which will entail an EA amendment process (should this occur post-EA).

4. Specialist Studies Commissioned

Specialists should contact each other if there are 'knock-on'/ 'cross-over' impacts from one specialist study to another or any queries on links between studies. For example, sometimes there is a need for cross-referencing between the Visual Impact Assessment and the consideration of impacts on cultural landscapes in the Heritage Impact Assessment.

The list of specialist studies commissioned for each BA Project, authors and contact details are provided below:

Specialist Study	Specialist Company	Specialist Name	Contact Details
Agriculture and Soils	Private	Johann Lanz	johann@johannlanz.co.za +27 (0)82 927 9018
Visual Impact Assessment	SLR Consulting	Kerry Schwartz	klschwartz@slrconsulting.com +27 (0)82 469 5850
Heritage Impact Assessment	ASHA Consulting	Dr Jayson Orton	jayson@asha-consulting.co.za +27 (0)83 272 3225
Palaeontology Assessment	Banzai Environmental Pty Ltd	Elize Butler	elizebutler002@gmail.com +27 (0)84 447 8759
Terrestrial Biodiversity and Species	Enviro-Sci	Brian Colloty	bcolloty@gmail.com +27 (0)83 498 3299
Aquatic Biodiversity and Species			
Avifauna Assessment	Holland & Associates Environmental Consultants	Anja Albertyn	anja@hollandandassociates.net +27 (0)76 265 8933
Socio-Economic Assessment	Independent Economic Researchers	Dr Hugo van Zyl	hugo@independentecon.co.za +27 (0)82 578 4148
Geohydrology Assessment	GEOSS South Africa	Hardy Luttig	hluttig@geoss.co.za
Geotechnical Assessment	GEOSS South Africa	Hardy Luttig	hluttig@geoss.co.za
Traffic Impact Assessment	SiVEST	Ntuthuko Hlanguza	NtuthukoH@sivest.com
BESS Risk Assessment	ISHECON	Debbie Mitchell	mitchelld@ishecon.co.za +27 (0)82 428 8844

5. Timelines for Specialist Studies

The following updated schedule applies:

Task / Milestone	Due Date
Appointment of specialists by ACED	Completed
Specialists to submit revised Draft Specialist Impact Assessment Reports (including SSV Reports, detailed impact assessments) for review and comment by EAP and Project Applicant.	26 June 2023 (or earlier where possible)
Specialists to address comments from EAP and Project Applicant, if and where needed, and submit the second order revised Draft Specialist Impact Assessment Reports for inclusion in the Draft BA Reports, as well as the Draft Scoping Report and Draft EIA Reports to be released for public comment.	7 July 2023 (or earlier where possible)
Specialists to address comments on **Report 3 and 4** from I&APs, if and where needed, and submit **Final Specialist Impact Assessment Reports 3 and 4** for inclusion in the Final BA Reports to be submitted to national DFFE for decision-making	Between 13 July and 14 August 2023
Specialists to address comments on **Report 1 and 2** from I&APs, if and where needed, and submit **Final Specialist Impact Assessment Reports 1 and 2** for inclusion in the Final BA Reports to be submitted to national DFFE for decision-making	Between 24 July and 23 August 2023

Section B: Impact Assessment Methodology and EMPr Requirements

The identification of potential impacts includes impacts that may occur during the construction, operational and decommissioning phases of the proposed development. The assessment of impacts includes direct, indirect as well as cumulative impacts. In order to identify potential impacts (both positive and negative) it is important that the nature of the proposed activity is well understood so that the impacts associated with the activity can be understood. The process of identification and assessment of impacts must include:

- Determining the current environmental conditions in sufficient detail so that there is a baseline against which impacts can be identified and measured;
- Determining future changes to the environment that will occur if the activity does not proceed;
- Gaining an understanding of the activity in sufficient detail to understand its consequences; and the
- Identification of significant impacts which are likely to occur if the activity is undertaken.

The impact assessment methodology has been aligned with the requirements for BA Reports.

The BA Report requirements stipulated in Appendix 1 (3) (j) of the 2014 NEMA EIA Regulations, as amended, states the following:

- *"A BA Report must contain the information that is necessary for the Competent Authority to consider and come to a decision on the application, and must include an assessment of each identified potentially significant impact and risk, including –*
    - *(i) cumulative impacts;*
    - *(ii) the nature, significance and consequences of the impact and risk;*
    - *(iii) the extent and duration of the impact and risk;*
    - *(iv) the probability of the impact and risk occurring;*
    - *(v) the degree to which the impact and risk can be reversed;*
    - *(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and*
    - *(vii) the degree to which the impact and risk can be mitigated".*

Terminology used in impact assessment can overlap. To avoid ambiguity, please note the following clarifications (that are based on NEMA and the EIA Regulations):

- *The term environment is understood to have a broad interpretation that includes both the natural (biophysical) environment and the socio-economic environment. The term socio-ecological system is also used to describe the natural and socio-economic environment and the interactions amongst these components.*
- *Significance = Consequence x Probability, which means that significance is equivalent to risk.*
- *The impact can have a positive or negative status. The significance of a negative impact may be called a risk, and the significance of a positive impact may be called an opportunity.*

The following principles are to underpin the application of this methodology:

- *Transparent and repeatable process - specialists are to describe the thresholds and limits they apply in their assessment, wherever possible.*
- *Adapt parameters to context (where justified) – the methodology proposes some thresholds (e.g. for spatial extent, in Step 3 below), however, if the nature of the impact requires a different definition of the categories of spatial extent, then this can be provided and described.*
- *Combination of a quantitative and qualitative assessment – where possible, specialists are to provide quantitative assessments (e.g. areas of habitat affected, decibels of noise, number of jobs), however, it is recognised that not all impacts can be quantified, and then qualitative assessments are to be provided.*

As per DEA Guideline 5: Assessment of Alternatives and Impacts the following methodology is to be applied to the prediction and assessment of impacts. Potential impacts should be rated in terms of the direct, indirect and cumulative:

- **Direct impacts** are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.

- **Indirect impacts** of an activity are indirect or induced changes that may occur as a result of the activity. These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.
- **Cumulative impacts** are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts. Refer to Section C of this ToR for the approach to assessing the cumulative impacts of surrounding projects.

The impact assessment methodology must include the following aspects:

- ***Step 1**:* **Nature of impact** - this reviews the type of effect that a proposed activity will have on the environment and should include "what will be affected and how?"

- ***Step 2**: **Status** - Whether the impact/risk on the overall environment will be:*
  - *Positive - environment overall will benefit from the impact/risk;*
  - *Negative - environment overall will be adversely affected by the impact/risk; or*
  - *Neutral - environment overall not be affected.*

- ***Step 3**: **Qualitatively** determine the **consequence** of the impact/risk by identifying the **a) SPATIAL EXTENT; b) DURATION; c) REVERSIBILITY; AND d) IRREPLACEABILITY**.*

  - ***A) Spatial extent** – The size of the area that will be affected by the impact/risk:*
    - *Site specific;*
    - *Local (<10 km from site);*
    - *Regional (<100 km of site);*
    - *National; or*
    - *International (e.g. Greenhouse Gas emissions or migrant birds).*

  - ***B) Duration** – The timeframe during which the impact/risk will be experienced:*
    - *Very short term (instantaneous);*
    - *Short term (less than 1 year);*
    - *Medium term (1 to 10 years);*
    - *Long term (the impact will cease after the operational life of the activity (i.e., the impact or risk will occur for the project duration)); or*
    - *Permanent (mitigation will not occur in such a way or in such a time span that the impact can be considered transient (i.e., the impact will occur beyond the project decommissioning)).*

  - ***C) Reversibility** of the Impacts - the extent to which the impacts/risks are reversible assuming that the project has reached the end of its life cycle (decommissioning phase):*

        - *High reversibility of impacts (impact is highly reversible at end of project life i.e., this is the most favourable assessment for the environment);*
        - *Moderate reversibility of impacts;*
        - *Low reversibility of impacts; or*
        - *Impacts are non-reversible (impact is permanent, i.e., this is the least favourable assessment for the environment).*

    - ***D) Irreplaceability** of Receiving Environment/Resource Loss caused by impacts/risks – the degree to which the impact causes irreplaceable loss of resources assuming that the project has reached the end of its life cycle (decommissioning phase):*
        - *High irreplaceability of resources (project will destroy unique resources that cannot be replaced, i.e., this is the least favourable assessment for the environment);*
        - *Moderate irreplaceability of resources;*
        - *Low irreplaceability of resources; or*
        - *Resources are replaceable (the affected resource is easy to replace/rehabilitate, i.e., this is the most favourable assessment for the environment).*

Some of the criteria are quantitative (e.g. spatial extent and duration) and some may be described in a quantitative or qualitative manner (e.g. reversibility and irreplaceability). The specialist then combines these criteria in a qualitative manner to determine the **consequence**.

The consequence terms ranging from slight to extreme must be calibrated per Specialist Study so that there is transparency and consistency in the way a risk/impact is measured. For example, from a biodiversity and ecology perspective, the consequence ratings could be defined according to a reduction in population or occupied area in relation to Species of Conservation Concern (SCC) status, ranging from slight consequence for defined areas of Least Concern, to extreme consequence for defined areas that are Critically Endangered. For example, from a social perspective, a slight consequence could refer to small and manageable impacts, or impacts on small sections of the community; a moderate consequence could refer to impacts which affect the bulk of the local population negatively or may produce a net negative impact on the community; and an extreme consequence could refer to impacts which could result in social or political violence or institutional collapse.

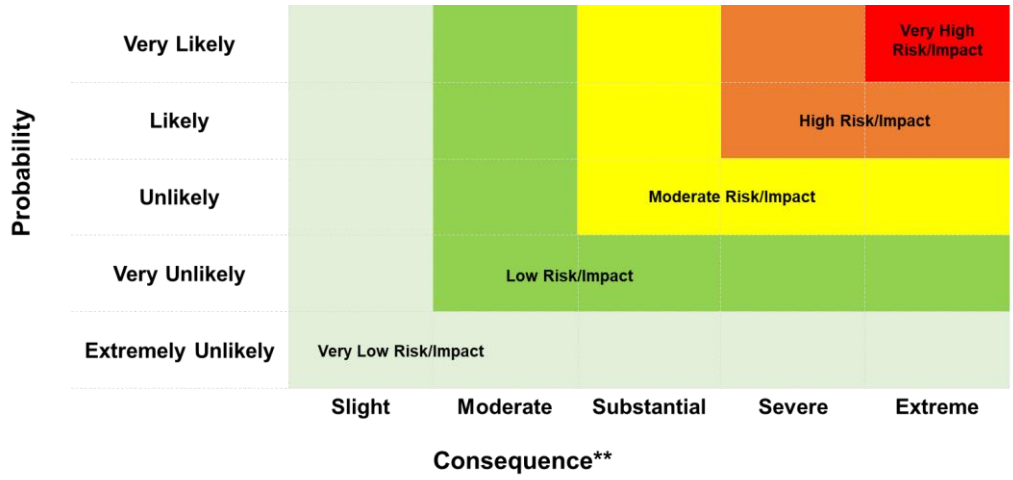
- **Consequence** – The anticipated consequence of the risk/impact is generally defined as follows:
    - Extreme (extreme alteration of natural or socio-economic systems, patterns or processes, i.e., where environmental or socio-economic functions and processes are altered such that they permanently cease);
    - Severe (severe alteration of natural or socio-economic systems, patterns or processes, i.e., where environmental or socio-economic functions and processes are altered such that they temporarily or permanently cease);
    - Substantial (substantial alteration of natural or socio-economic systems, patterns or processes, i.e., where environmental or socio-economic functions and processes are altered such that they temporarily or permanently cease;

- Moderate (notable alteration of natural or socio-economic systems, patterns or processes, i.e., where the natural or socio-economic environment continues to function but in a modified manner; or
- Slight (negligible and transient alteration of natural or socio-economic systems, patterns or processes, i.e., where natural systems/environmental or socio-economic functions, patterns, or processes are not affected in a measurable manner, or if affected, that effect is transient and the system recovers).

- **Step 4**: Rate the **probability** of the impact/risk using the criteria below:

  - **Probability** – The probability of the impact/risk occurring:
    - Extremely unlikely (little to no chance of occurring);
    - Very unlikely (<30% chance of occurring);
    - Unlikely (30-50% chance of occurring)
    - Likely (51 – 90% chance of occurring); or
    - Very Likely (>90% chance of occurring regardless of prevention measures).

- **Step 5**: Use both the **consequence** and **probability** to determine the **significance** of the identified impact/risk (qualitatively as shown in Figure 1). Significance definitions and rankings are provided below:



[Qualitatively determined based on Spatial Extent, Duration, Reversibility and Irreplaceability]

Figure 3. Guide to assessing risk/impact significance as a result of consequence and probability.

- ***Significance*** *– Will the impact cause a notable alteration of the environment?*
  - *Very low (the risk/impact may result in very minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);*
  - *Low (the risk/impact may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);*

- *Moderate (the risk/impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated);*
- *High (the risk/impact will result in major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making); and*
- *Very high (the risk/impact will result in very major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making (i.e., the project cannot be authorised unless major changes to the engineering design are carried out to reduce the significance rating)).*

With the implementation of mitigation measures, the residual impacts/risks are ranked as follows in terms of significance:

- *Very low = 5;*
- *Low = 4;*
- *Moderate = 3;*
- *High = 2; and*
- *Very high = 1.*

The specialists must provide a written supporting motivation of the assessment ratings provided.

- ***Step 6**: Determine the **Confidence Level** – The degree of confidence in predictions based on available information and specialist knowledge:*
  - *Low;*
  - *Medium; or*
  - *High.*

The above assessment must be described in the text (with clear explanation provided on the rationale for the allocation of significance ratings) and summarised in an impact assessment table in a similar manner as shown in the example below (Table 1). Table 1 is to be used by the specialists for the rating of impacts.

Table 1: Table for rating of impacts

Impact	***Impact Criteria***		***Significance and Ranking (Pre-Mitigation)***	***Potential mitigation measures***	***Significance and Ranking (Post-Mitigation)***	***Confidence Level***
CONSTRUCTION PHASE						
Habitat and species loss as a result of clearance of vegetation for the PV Facility	***Status***	*Negative*	*Moderate (3)*	*Plant search and rescue (EMPr)*	*Low (4)*	*Medium*
	Spatial Extent	*Site Specific*				
	Duration	*Long-term*				
	Consequence	*Substantial*				
	Probability	*Very likely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Moderate*				
OPERATIONAL PHASE						

	Status					
	Spatial Extent					
	Duration					
	Consequence					
	Probability					
	Reversibility					
	Irreplaceability					
DECOMMISSIONING PHASE						
	Status					
	Spatial Extent					
	Duration					
	Consequence					
	Probability					
	Reversibility					
	Irreplaceability					

Other aspects to be taken into consideration in the assessment of impact significance are:

- Impacts will be evaluated for the construction, operational and decommissioning phases of the development. The assessment of impacts for the decommissioning phase will be brief, as there is limited understanding at this stage of what this might entail. The relevant rehabilitation guidelines and legal requirements applicable at the time will need to be applied;
- The impact evaluation will, where possible, take into consideration the cumulative effects associated with this and other facilities/projects which are either developed or in the process of being developed in the local area (refer to Section C);
- The impact assessment will attempt to quantify the magnitude of potential impacts (direct and cumulative effects) and outline the rationale used. Where appropriate, national standards are to be used as a measure of the level of impact;
- Impacts should be assessed for all layouts and project components;
- **IMPORTANT NOTE**: Impacts should be described both before and after the proposed mitigation and management measures have been implemented. The assessment of the potential impact “before mitigation” should take into consideration all management actions that are already part of the project design (which are a given). The assessment of the potential impact “after mitigation” should take into consideration any additional management actions proposed by the specialist, to minimise negative or enhance positive impacts.

Impacts will then be collated into an Environmental Management Programme (EMPr) and these will include the following:

- Management actions and monitoring of the impacts;
- Negative impacts and mitigation measures to avoid or reduce negative impacts; and
- Positive impacts and enhancement measures where possible.

A generic EMPr was compiled for the development and expansion of (a) overhead electricity transmission and distribution infrastructure; and (b) substation infrastructure for the transmission and distribution of electricity. On 2 March 2018, these two Generic EMPrs were gazetted in

Government Gazette 41473, GN 162 and GN 163, for public comment for a period of 45 days. On 22 March 2019, these two Generic EMPrs were gazetted for implementation in Government Gazette 42323, GN 435. Since the project components also include power lines and substations, the gazetted EMPrs for power lines and substations need to be complied with.

A template for the EMPr input will be provided to the specialists by the CSIR, and it will comply with the 2014 NEMA EIA Regulations (as amended) and the Generic EMPrs for power lines and substations (where applicable).

The EMPr will consist of the following:

- EMPr for the PV Facility and all other infrastructure, excluding the power line and substation.
- EMPr for the power line (This will include confirmation that the pre-approved template in Part B of the Generic EMPr will be complied with and the completion of a site-specific EMPr if required).
- EMPr for the substation (This will include confirmation that the pre-approved template in Part B of the Generic EMPr will be complied with and the completion of a site-specific EMPr if required).
- Annexures that include the pre-approved power line and substation EMPr.

Section C: Cumulative Impact Assessment

Given that there are several renewable energy projects proposed and in existence in the local vicinity of the proposed Padloper Solar PV projects, it is important to define a consistent approach to the assessment of cumulative effects by the specialists.

The CSIR will provide a list of projects that need to be considered in the cumulative impact assessment.

The approach for this project is that the specialists must include **all renewable energy projects** within a **30 km radius that have received an EA or have submitted an application at the time of starting this project (i.e. by May 2023)**. It is assumed that each renewable energy project consists of an EGI component.

The specialists are requested to please inform the CSIR of any wind or solar projects within 30 km of the project sites that have received an EA or had their Application for EA rejected by the DFFE or have applications which are in process.

Please also consider the proposed Padloper Solar PV and EGI projects (subject of this ToR) in the cumulative impact assessment.

Section D: Specific Issues to be Addressed in each Specialist Study

This section provides the **specific issues** to be addressed by each specialist in their study for each project. The specialists should also add any key issues from their experience.

As noted in Section A of this ToR, the first phase of the specialist input is to undertake complete site work and provide a sensitivity map of the sensitive features on site that need to be considered in the placement of the infrastructure (i.e., layout determination). Once the project layout is confirmed, then the second phase of the specialist input must be provided i.e., the specialist must provide their report based on the reporting requirements noted below and the templates provided by the CSIR. All site work must be undertaken once off during Phase 1, where applicable.

1. Agriculture and Soils

- Comply with the Assessment Protocols that were published on 20 March 2020, in Government Gazette 43110, GN 320. This specifically includes the Agriculture Protocol that applies to all onshore wind and/or solar PV energy activities requiring EA. This protocol replaces the requirements of Appendix 6 of the 2014 NEMA EIA Regulations (as amended).
- Provide a Site Sensitivity Verification Report based on the requirements documented in the Assessment Protocols published on 20 March 2020, in Government Gazette 43110, GN 320. It is understood that verification undertaken by other specialists or the EAP can be used by the Agricultural Specialist in this regard. No site visit has been allowed for this study. In the site sensitivity verification, the Agricultural Specialist will refer to the site visit by the EAP or other specialists and include a current photograph(s) of the site, showing its vegetation / cultivation status. The specialist will also use aerial photography to identify the level of sensitivity assigned to the project area on the Screening Tool, and to verify and confirm this sensitivity and land-use and either compile an Agro-Ecosystem Specialist Report or Compliance Statement.
- Provide inputs to the Draft BA Report to include a description of the affected environment and environmental sensitivities, key legislation, key issues and detailed assessment of impacts. A template for such inputs will be provided by the CSIR.
- Provide an Agro-Ecosystem Specialist Report or Compliance Statement based on the requirements documented in the Assessment Protocols published on 20 March 2020, in Government Gazette 43110, GN 320.
- The Specialist Assessment and/or Compliance Statement must also be in adherence to any additional relevant legislation and guidelines that may be deemed necessary. A suitable report template will be compiled with input from the specialist and the CSIR. In addition, it must comply with the 2014 NEMA EIA Regulations, as amended), where applicable.
- Provide sensitivities in KMZ or similar GIS format.
- Provide review input on the preferred infrastructure layout following the sensitivity analysis and layout identification.

- Describe and map soil types (soil forms), soil characteristics (soil depth, soil colour, limiting factors, and clay content of the top and sub soil layers), and degradation and erodibility of soils etc. to the extent necessary to inform this assessment.
- The assessment is to be based on existing information and professional experience and previous field work conducted by the specialist, as considered necessary and in accordance with relevant legislated requirements. The assessment must also consider the maps generated by the National Screening Tool.
- Identify any protocols, legal and permit requirements relating to soil and agricultural potential impacts that are relevant to this project and the implications thereof.
- Provide recommendations with regards to potential monitoring programmes.
- Determine mitigation and/or management measures which could be implemented to as far as possible reduce the effect of negative impacts and enhance the effect of positive impacts. Also identify best practice management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts. This must be included in the EMPr.
- Incorporate and address all review comments made by the Project Team (CSIR and Project Applicant) during the various revisions of the specialist report.
- Incorporate and address all issues and concerns raised by Stakeholders, Competent Authority, I&APs and the public during the Public Participation Process (where relevant and applicable).
- Review the Generic EMPr for 1) Power Lines and 2) Substations (GN 435) and confirm if there are any specific environmental sensitivities or attributes present on the site and any resultant site specific impact management outcomes and actions that are not included in the pre-approved generic EMPr (Part B – Section 1). If so, provide a list of these specific impact management outcomes and actions based on the format of the report template provided by the CSIR.

2. Visual

- Comply with the Assessment Protocols that were published on 20 March 2020, in Government Gazette 43110, GN 320. This specifically includes Part A, which provides the Site Sensitivity Verification Requirements where a Specialist Assessment is required but no Specific Assessment Protocol has been prescribed.
- Provide a Site Sensitivity Verification Report based on the requirements documented in the Assessment Protocols published on 20 March 2020, in Government Gazette 43110, GN 320.
- Compile a Visual Impact Assessment (VIA) in compliance with Appendix 6 of the 2014 NEMA EIA Regulations (as amended). The Specialist Assessment must also be in adherence to any additional relevant legislation and guidelines that may be deemed necessary. It must also comply with the report templates provided by the CSIR.
- Provide inputs to the Draft BA Report to include a description of the affected environment and environmental sensitivities, key legislation, key issues and detailed assessment of impacts. A template for such inputs will be provided by the CSIR.
- The specialist must undertake a site visit in order to identify the level of sensitivity assigned to the project area on the Screening Tool, and to verify and confirm this sensitivity and land-use,

as well as to comply with the requirements of Part A of the Assessment Protocols published on 20 March 2020, in Government Gazette 43110, GN 320.

- Determine, describe and map the baseline environmental condition and sensitivity of the study area. Specify set-backs or buffers, and provide clear reasons for these recommendations.
- Provide sensitivities in KMZ or similar GIS format.
- Provide review input on the preferred infrastructure layout following the sensitivity analysis and layout identification.
- The report must describe the visual character of the local area. Any significant visual features or visual disturbances should be identified and mapped, as well as any sensitive visual receptors within the proposed project area or within viewsheds of the projects.
- Visual character and visual absorption capacity should be described.
- Viewsheds for various elements of the proposed development should be calculated, defined and presented, and the varying sensitivities of these viewsheds must be highlighted.
- Mapping of visual sensitivity of the site will require consideration of visual receptors outside the site, and sensitivity to development on the site for potentially affected visual receptors of "very high" sensitivity.
- Assessment to be based on a site visit, visual modelling, and a photographic survey of the surrounding region from which the landscape and visual baselines can be prepared. The assessment must also consider the maps generated by the National Screening Tool.
- Identify and assess the potential direct, indirect and cumulative impacts of the proposed development on the receiving environment from a visual perspective. Impact significance must be rated both without and with mitigation, and must cover the construction, operational and decommissioning phases of the project. The Impact Assessment Methodology must follow that contained in Section B of this ToR, as provided by the CSIR.
- Schematic portrayals of the visual impact of the proposed project infrastructure on the different viewsheds identified must be presented. All impacts should be considered under varying conditions as appropriate to the study i.e., day, night, clear weather, cloudy weather etc.
- Maps depicting viewsheds/line of sight across the site should be generated and included in the reports. These maps should indicate current viewsheds/visual landscape/obstructions as well as expected visual impacts during the construction, operational and decommissioning phases of the proposed development.
- Identify any protocols, legal and permit requirements that are relevant to this project and the implications thereof.
- Provide recommendations with regards to potential monitoring programmes.
- Determine mitigation and/or management measures which could be implemented to as far as possible reduce the effect of negative impacts and enhance the effect of positive impacts. Also identify best practice management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts. This must be included in the EMPr.
- Incorporate and address all review comments made by the Project Team (CSIR and Project Applicant) during the various revisions of the specialist report.

- Incorporate and address all issues and concerns raised by Stakeholders, Competent Authority, I&APs and the public during the Public Participation Process (where relevant and applicable).
- Review the Generic EMPr for 1) Power Lines and 2) Substations (GN 435) and confirm if there are any specific environmental sensitivities or attributes present on the site and any resultant site specific impact management outcomes and actions that are not included in the pre-approved generic EMPr (Part B – Section 1). If so, provide a list of these specific impact management outcomes and actions based on the format of the report template provided by the CSIR.

3. Heritage: Archaeology and Cultural Landscape

- Comply with the Assessment Protocols that were published on 20 March 2020, in Government Gazette 43110, GN 320. This specifically includes Part A, which provides the Site Sensitivity Verification Requirements where a Specialist Assessment is required but no Specific Assessment Protocol has been prescribed.
- Provide a Site Sensitivity Verification Report based on the requirements documented in the Assessment Protocols published on 20 March 2020, in Government Gazette 43110, GN 320.
- Compile a Heritage Impact Assessment in compliance with Appendix 6 of the 2014 NEMA EIA Regulations, as amended. The Specialist Assessment must also be in adherence to any additional relevant legislation and guidelines that may be deemed necessary. It must also comply with the report templates provided by the CSIR.
- Provide inputs to the Draft BA Report to include a description of the affected environment and environmental sensitivities, key legislation, key issues and detailed assessment of impacts. A template for such inputs will be provided by the CSIR.
- The specialist must undertake a site visit in order to identify the level of sensitivity assigned to the project area on the Screening Tool, and to verify and confirm this sensitivity and land-use.
- Determine, describe and map the baseline environmental condition and sensitivity of the study area. Specify set-backs or buffers, and provide clear reasons for these recommendations.
- Provide sensitivities in KMZ or similar GIS format.
- Provide review input on the preferred infrastructure layout following the sensitivity analysis and layout identification.
- Describe and map the heritage and features of the site and surrounding area. This is to be based on desktop reviews, fieldwork, available databases and findings from other heritage studies in the area, where relevant. Include reference to the grade of heritage feature and any heritage status the feature may have been awarded. The assessment must also consider the maps generated by the National Screening Tool.
- Map heritage sensitivity for the site. Clearly show any “no-go” areas in terms of heritage (i.e., “very high” sensitivity), and provide recommended buffers or set-back distances. Indicate which very high sensitivity areas are regarded as complete no-go areas.
- Identify and assess the potential direct, indirect and cumulative impacts of the proposed development on the full scope of heritage features, including archaeology, palaeontology and the cultural-historical landscape, as required by heritage legislation. Impact significance must

be rated both without and with mitigation, and must cover the construction, operational and decommissioning phases of the project. The Impact Assessment Methodology must follow that contained in Section B of this ToR, as provided by the CSIR.

- Liaise with the relevant authorities (i.e., South African Heritage Resources Agency, Heritage Western Cape etc.) in order to obtain a letter of approval, comments or a Permit in terms of National Heritage Resources Act, 1999 (Act No. 25 of 1999), including Regulations issued thereunder, as necessary.
- Provide recommendations with regards to potential monitoring programmes.
- Determine mitigation and/or management measures which could be implemented to as far as possible reduce the effect of negative impacts and enhance the effect of positive impacts. Also identify best practice management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts. This must be included in the EMPr.
- Incorporate and address all review comments made by the Project Team (CSIR and Project Applicant) during the various revisions of the specialist report.
- Incorporate and address all issues and concerns raised by Stakeholders, Competent Authority, I&APs and the public during the Public Participation Process (where relevant and applicable).
- Review the Generic EMPr for 1) Power Lines and 2) Substations (GN 435) and confirm if there are any specific environmental sensitivities or attributes present on the site and any resultant site-specific impact management outcomes and actions that are not included in the pre-approved generic EMPr (Part B – Section 1). If so, provide a list of these specific impact management outcomes and actions based on the format of the report template provided by the CSIR.

4. Palaeontology

- Comply with the Assessment Protocols that were published on 20 March 2020, in Government Gazette 43110, GN 320. This specifically includes Part A, which provides the Site Sensitivity Verification Requirements where a Specialist Assessment is required but no Specific Assessment Protocol has been prescribed.
- Provide a Site Sensitivity Verification Report based on the requirements documented in the Assessment Protocols published on 20 March 2020, in Government Gazette 43110, GN 320.
- Compile a Palaeontological Impact Assessment in compliance with Appendix 6 of the 2014 NEMA EIA Regulations (as amended). The Specialist Assessment must also be in adherence to any additional relevant legislation and guidelines that may be deemed necessary. It must also comply with the report templates provided by the CSIR.
- Provide inputs to the Draft BA Report to include a description of the affected environment and environmental sensitivities, key legislation, key issues and detailed assessment of impacts. A template for such inputs will be provided by the CSIR.
- The specialist must undertake a site visit in order to identify the level of sensitivity assigned to the project area on the Screening Tool, and to verify and confirm this sensitivity and land-use.
- Determine, describe and map of the baseline environmental condition and sensitivity of the study area. Specify set-backs or buffers, and provide clear reasons for these recommendations.

- Provide sensitivities in KMZ or similar GIS format.
- Provide review input on the preferred infrastructure layout following the sensitivity analysis and layout identification.
- Prepare and undertake a study on the palaeontology and fossil heritage within the proposed project area, based on:
    - Site visit;
    - Review of all relevant palaeontological and geological literature, including geological maps and previous reports,
    - Location and examination of fossil collections from the study area (e.g. museums), and
    - Data on the proposed development (e.g. location of footprint, depth and volume of bedrock excavation envisaged).
- Describe the type and location of known palaeontology and fossil heritage sites in the study area, and characterize all items that may be affected by the proposed project.
- Note fossils and associated sedimentological features of palaeontological relevance (photos, maps, aerial or satellite images, and stratigraphic columns).
- Evaluate the potential for occurrence of palaeontology and fossil heritage features within the study area.
- Identify and rate potential direct, indirect and cumulative impacts of the proposed project on the palaeontology and fossil heritage during the construction, operational and decommissioning phases of the project. Study the cumulative impacts of the project by considering the impacts of existing renewable energy plants within the area (as well as those proposed), together with the impact of the proposed project. Impact significance must be rated both without and with mitigation. The Impact Assessment Methodology must follow that contained in Section B of this ToR, as provided by the CSIR.
- Identify any protocols, legal and permit requirements that relevant to this project and the implications thereof.
- Provide recommendations and suggestions regarding fossil heritage management on site, including conservation measures, as well as promotion of local fossil heritage (e.g. for public education, schools) to ensure that the impacts are limited.
- Provide recommendations with regards to potential monitoring programmes.
- Determine mitigation and/or management measures which could be implemented to as far as possible reduce the effect of negative impacts and enhance the effect of positive impacts. Also identify best practice management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts. This must be included in the EMPr.
- Incorporate and address all review comments made by the Project Team (CSIR and Project Applicant) during the various revisions of the specialist report.
- Incorporate and address all issues and concerns raised by Stakeholders (i.e., SAHRA), Competent Authority, I&APs and the public during the Public Participation Process (where relevant and applicable).
- Review the Generic EMPr for 1) Power Lines and 2) Substations (GN 435) and confirm if there are any specific environmental sensitivities or attributes present on the site and any resultant site-specific impact management outcomes and actions that are not included in the pre-approved generic EMPr (Part B – Section 1). If so, provide a list of these specific impact

management outcomes and actions based on the format of the report template provided by the CSIR.

5. Terrestrial Biodiversity and Species

- Comply with the Assessment Protocols that were published on 20 March 2020, in Government Gazette 43110, GN 320. This specifically includes the Terrestrial Biodiversity Protocol that applies to all activities requiring EA. This protocol replaces the requirements of Appendix 6 of the 2014 NEMA EIA Regulations (as amended).
- Comply with the Assessment Protocols that were published on 30 October 2020, in Government Gazette 43855, GN 1150. This specifically includes the protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species and terrestrial plant species. This protocol replaces the requirements of Appendix 6 of the 2014 NEMA EIA Regulations (as amended).
- Provide a Site Sensitivity Verification Report based on the requirements documented in the Assessment Protocols published on 20 March 2020, in Government Gazette 43110, GN 320, and 30 October 2020, in Government Gazette 43855, GN 1150.
- Provide a Terrestrial Biodiversity and Species Specialist Report or Compliance Statement based on the requirements documented in the Assessment Protocols published on 20 March 2020, in Government Gazette 43110, GN 320, and 30 October 2020, in Government Gazette 43855, GN 1150. All necessary taxa specialists must be appointed, as required by the Species Protocol (excluding Avifauna).
- The Specialist Assessment and/or Compliance Statement must also be in adherence to any additional relevant legislation and guidelines that may be deemed necessary. It must also comply with the report templates provided by the CSIR. In addition, it must comply with the 2014 NEMA EIA Regulations (as amended), where applicable. Provide information as captured in the quote dated February 2021.
- Provide inputs to the Draft BA Report to include a description of the affected environment and environmental sensitivities, key legislation, key issues and detailed assessment of impacts. A template for such inputs will be provided by the CSIR.
- The specialist must undertake a site visit in order to identify the level of sensitivity assigned to the project area on the Screening Tool, and to verify and confirm this sensitivity and land-use and either compile a Terrestrial Biodiversity and Species Specialist Report or Compliance Statement, as documented in the Assessment Protocols published on 20 March 2020, in Government Gazette 43110, GN 320, and 30 October 2020, in Government Gazette 43855, GN 1150.
- Determine, describe and map of the baseline environmental condition and sensitivity of the study area. Specify set-backs or buffers, and provide clear reasons for these recommendations. Also map the extent of disturbance and transformation of the site.
- Provide sensitivities in KMZ or similar GIS format.
- Provide review input on the preferred infrastructure layout following the sensitivity analysis and layout identification.
- The report must also describe the terrestrial ecology features of the project area, with focus on features that are potentially impacted by the proposed project. The description should

include the major habitat forms within the study site, giving due consideration to terrestrial ecology (flora) and terrestrial ecology (fauna).
- Consider seasonal changes and long-term trends, such as due to climate change.
- Identify any species of special concern or protected species on site (e.g. protected tree species).
- The assessment is to be based on existing information, national and provincial databases, and professional experience and field work conducted by the specialist, as considered necessary and in accordance with relevant legislated requirements. The assessment must also consider the maps generated by the National Screening Tool.
- Identify and assess the potential direct, indirect and cumulative impacts of the proposed development on terrestrial biodiversity and species. Impact significance must be rated both without and with mitigation, and must cover the construction, operational and decommissioning phases of the project. The Impact Assessment Methodology must follow that contained in Section B of this ToR, as provided by the CSIR.
- Identify any protocols, legal and permit requirements that are relevant to this project and the implications thereof.
- Provide recommendations with regards to potential monitoring programmes.
- Determine mitigation and/or management measures which could be implemented to as far as possible reduce the effect of negative impacts and enhance the effect of positive impacts. Also identify best practice management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts. This must be included in the EMPr.
- Incorporate and address all review comments made by the Project Team (CSIR and Project Applicant) during the various revisions of the specialist report.
- Incorporate and address all issues and concerns raised by Stakeholders (e.g. DFFE Biodiversity and Conservation, WESSA, EWT etc.), CA, I&APs and the public during the Public Participation Process (where relevant and applicable).
- Review the Generic EMPr for 1) Power Lines and 2) Substations (GN 435) and confirm if there are any specific environmental sensitivities or attributes present on the site and any resultant site-specific impact management outcomes and actions that are not included in the pre-approved generic EMPr (Part B – Section 1). If so, provide a list of these specific impact management outcomes and actions based on the format of the report template provided by the CSIR.

6. Aquatic Biodiversity

- Comply with the Assessment Protocols that were published on 20 March 2020, in Government Gazette 43110, GN 320. This specifically includes the Aquatic Biodiversity Protocol that applies to all activities requiring EA. This protocol replaces the requirements of Appendix 6 of the 2014 NEMA EIA Regulations, as amended.
- Provide a Site Sensitivity Verification Report based on the requirements documented in the Assessment Protocols published on 20 March 2020, in Government Gazette 43110, GN 320.
- Provide an Aquatic Biodiversity and Species Specialist Report or Compliance Statement based on the requirements documented in the Assessment Protocols published on 20 March 2020, in Government Gazette 43110, GN 320.

- The Specialist Assessment and/or Compliance Statement must also be in adherence to any additional relevant legislation and guidelines that may be deemed necessary. It must also comply with the report templates provided by the CSIR. In addition, it must comply with the 2014 NEMA EIA Regulations (as amended), where applicable.
- Provide inputs to the Draft BA Report to include a description of the affected environment and environmental sensitivities, key legislation, key issues and detailed assessment of impacts. A template for such inputs will be provided by the CSIR.
- The specialist must undertake a site visit in order to identify the level of sensitivity assigned to the project area on the Screening Tool, and to verify and confirm this sensitivity and land-use and either compile an Aquatic Biodiversity and Species Specialist Report or Compliance Statement, as documented in the Assessment Protocols published on 20 March 2020, in Government Gazette 43110, GN 320.
- Determine, describe and map the baseline environmental condition and sensitivity of the study area. Specify set-backs or buffers, and provide clear reasons for these recommendations. Also map the extent of disturbance and transformation of the site.
- Provide sensitivities in KMZ or similar GIS format.
- Provide review input on the preferred infrastructure layout following the sensitivity analysis and layout identification.
- The report must also describe the aquatic ecology features of the project area, with focus on features that are potentially impacted by the proposed project. The description should include the major habitat forms within the study site, giving due consideration to aquatic ecology (flora), aquatic ecology (fauna), and freshwater ecosystems/wetlands.
- Consider seasonal changes and long-term trends, such as due to climate change.
- Identify any species of special concern or protected species on site.
- The assessment is to be based on existing information, national and provincial databases and professional experience and field work conducted by the specialist, as considered necessary and in accordance with relevant legislated requirements. The assessment must also consider the maps generated by the National Screening Tool.
- Identify and assess the potential direct, indirect and cumulative impacts of the proposed development on aquatic biodiversity and species. Impact significance must be rated both without and with mitigation, and must cover the construction, operational and decommissioning phases of the project. The Impact Assessment Methodology must follow that contained in Section B of this ToR, as provided by the CSIR.
- Identify and delineate wetlands that may occur on the site, using the relevant protocols established.
- Compile a Risk Matrix (Appendix A to GN R509 of 2016) and determine if a Water Use License (WUL) is required and if so, determine the requirements thereof.
- Identify any additional protocols, legal and permit requirements that are relevant to this project and the implications thereof.
- Provide recommendations with regards to potential monitoring programmes.
- Determine mitigation and/or management measures which could be implemented to as far as possible reduce the effect of negative impacts and enhance the effect of positive impacts. Also identify best practice management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts. This must be included in the EMPr.

- Incorporate and address all review comments made by the Project Team (CSIR and Project Applicant) during the various revisions of the specialist report.
- Incorporate and address all issues and concerns raised by Stakeholders, Competent Authority, I&APs and the public during the Public Participation Process (where relevant and applicable).
- Review the Generic EMPr for 1) Power Lines and 2) Substations (GN 435) and confirm if there are any specific environmental sensitivities or attributes present on the site and any resultant site-specific impact management outcomes and actions that are not included in the pre-approved generic EMPr (Part B – Section 1). If so, provide a list of these specific impact management outcomes and actions based on the format of the report template provided by the CSIR.

7. Avifauna

- Comply with the Assessment Protocols that were published on 30 October 2020, in Government Gazette 43855, GN 1150. This specifically includes the protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species. This protocol replaces the requirements of Appendix 6 of the 2014 NEMA EIA Regulations (as amended).
- Provide a Site Sensitivity Verification Report based on the requirements documented in the Assessment Protocols published on 30 October 2020, in Government Gazette 43855, GN 1150.
- Compile an Avifaunal Impact Assessment in compliance with the Terrestrial Animal Species protocol published on 30 October 2020, in Government Gazette 43855, GN 1150. The Specialist Assessment must also be in adherence to any additional relevant legislation and guidelines that may be deemed necessary. This includes the latest Birdlife South Africa (BLSA) Guidelines for Solar PV. It must also comply with the report templates provided by the CSIR.
- Provide inputs to the Draft BA Report to include a description of the affected environment and environmental sensitivities, key legislation, key issues and detailed assessment of impacts. A template for such inputs will be provided by the CSIR.
- The specialist must undertake a site visit in order to identify the level of sensitivity assigned to the project area on the Screening Tool, and to verify and confirm this sensitivity and land-use, as well as undertake four seasonal surveys over a period of 12 months in accordance with the latest BLSA guideline for Solar PV developments (i.e., Regime 2)
- Determine, describe and map the baseline environmental condition and sensitivity of the study area in terms of avifaunal features such as habitat use, roosting, feeding and nesting/breeding. Specify set-backs or buffers, and provide clear reasons for these recommendations.
- Provide sensitivities in KMZ or similar GIS format.
- Provide review input on the preferred infrastructure layout following the sensitivity analysis and layout identification.

- Describe the affected environment from an avifaunal perspective, including consideration of the surrounding habitats and avifaunal features (e.g. Ramsar sites, Critical Bird Areas, wetlands, migration routes, feeding, roosting & nesting areas, etc.).
- Describe and map bird habitats on the site, based on on-site monitoring, desk-top review, collation of available information, studies in the local area and previous experience. The assessment must also consider the maps generated by the National Screening Tool.
- Identify and assess the potential direct, indirect and cumulative impacts of the proposed development on avifauna, including impacts that may be seasonal or diurnal, or linked to specific species and their feeding, roosting or nesting habitats and habits. Impact significance must be rated both without and with mitigation, and must cover the construction, operational and decommissioning phases of the project. The Impact Assessment Methodology must follow that contained in Section B of this ToR, as provided by the CSIR.
- Identify any protocols, legal and permit requirements that are relevant to this project and the implications thereof.
- Provide recommendations with regards to potential monitoring programmes.
- Determine mitigation and/or management measures which could be implemented to as far as possible reduce the effect of negative impacts and enhance the effect of positive impacts. Also identify best practice management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts. This must be included in the EMPr.
- Incorporate and address all review comments made by the Project Team (CSIR and Project Applicant) during the various revisions of the specialist report.
- Incorporate and address all issues and concerns raised by Stakeholders, Competent Authority, I&APs and the public during the Public Participation Process (where relevant and applicable).
- Review the Generic EMPr for 1) Power Lines and 2) Substations (GN 435) and confirm if there are any specific environmental sensitivities or attributes present on the site and any resultant site-specific impact management outcomes and actions that are not included in the pre-approved generic EMPr (Part B – Section 1). If so, provide a list of these specific impact management outcomes and actions based on the format of the report template provided by the CSIR.

8. Socio-Economic Assessment[3]

- Comply with the Assessment Protocols that were published on 20 March 2020, in Government Gazette 43110, GN 320. This specifically includes Part A, which provides the Site Sensitivity Verification Requirements where a Specialist Assessment is required but no Specific Assessment Protocol has been prescribed. As at May 2021, there are no sensitivity layers on the Screening Tool for Socio-Economic features, and as such the site verification process must document this and provide any additional feedback as necessary.
- Compile a Socio-Economic Assessment in compliance with Appendix 6 of the 2014 NEMA EIA Regulations, as amended. The Specialist Assessment must also be in adherence to any

[3] Not applicable to the EGI projects.

additional relevant legislation and guidelines that may be deemed necessary. It must also comply with the report templates provided by the CSIR.

- Provide inputs to the Draft BA Report to include a description of the affected environment and environmental sensitivities, key legislation, key issues and detailed assessment of impacts. A template for such inputs will be provided by the CSIR.
- Undertake a site inspection to identify the site-specific sensitivities from a socio-economic perspective, and include interviews with key informants to inform the studies.
- Undertake the collection of both primary and secondary data. The former involves a site visit and interviews with the local government authorities and affected landowners and similar sensitive receptors. The latter encompasses the collection and review of relevant policies, local and provincial strategic documents, and statistics presented by Stats SA and Quantec.
- Provide review input on the preferred infrastructure layout following the sensitivity analysis and layout identification.
- Describe the socio-economic context of the study area, focusing on aspects that are potentially affected by a solar PV project, and taking into consideration the current situation as well as the trends, the local planning (Integrated Development Plans (IDPs) and Spatial Development Frameworks (SDFs)), other developments in the area. The study should look more broadly than the individual land parcels on which the proposed projects will developed, as most, if not all, of the anticipated social impacts may be experienced in the urban areas nearest to the proposed project.
- Apply a variety of appropriate options for sourcing information, such as review of analogous studies, available databases and social indicators, and use of interviews with key affected parties such as local communities, local landowners and government officials (local and regional) etc.
- The socio-economic study does not lend itself to providing a spatially based sensitivity map. Therefore, instead, the study could provide a simplified schematic mapping of the links between the project actions (i.e., interventions) and the receiving social environment (i.e., the socio-ecological system), which may occur at a local, provincial or national scale, and showing how these links can be optimized to enhance benefits and minimize negative impacts.
- Consider social issues such as potential in-migration of job seekers, opportunities offered by training and skills development, phasing of employment over the duration of the REIPPPP program, cumulative effects with other REIPPPP projects in the local area, implications for local planning and resource use.
- Evaluate the implications of the social investment programme associated with REIPPPP projects on the local socio-economic context.
- Identify and assess the potential direct, indirect and cumulative impacts of the proposed development on the receiving environment from a socio-economic perspective. For example, identify and assess potential social benefits and costs as a result of the proposed development, and including the estimated direct employment opportunities. Impact significance must be rated both without and with mitigation, and must cover the construction, operational and decommissioning phases of the project. The Impact Assessment Methodology must follow that contained in Section B of this ToR, as provided by the CSIR.

- Identify any protocols, legal and permit requirements that are relevant to this project and the implications thereof.
- Provide recommendations with regards to potential monitoring programmes.
- Determine mitigation and/or management measures which could be implemented to as far as possible reduce the effect of negative impacts and enhance the effect of positive impacts. Also identify best practice management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts. This must be included in the EMPr.
- Incorporate and address all review comments made by the Project Team (CSIR and Project Applicant) during the various revisions of the specialist report.
- Incorporate and address all issues and concerns raised by Stakeholders, Competent Authority, I&APs and the public during the Public Participation Process (where relevant and applicable).
- Review the Generic EMPr for 2) Substations (GN 435) and confirm if there are any specific environmental sensitivities or attributes present on the site and any resultant site-specific impact management outcomes and actions that are not included in the pre-approved generic EMPr (Part B – Section 1). If so, provide a list of these specific impact management outcomes and actions based on the format of the report template provided by the CSIR.

9. Traffic Assessment[4]

- Comply with the Assessment Protocols that were published on 20 March 2020, in Government Gazette 43110, GN 320. This specifically includes Part A, which provides the Site Sensitivity Verification Requirements where a Specialist Assessment is required but no Specific Assessment Protocol has been prescribed. As at May 2021, there are no sensitivity layers on the Screening Tool for traffic features, and as such the site verification process must document this and provide any additional feedback as necessary.
- Compile a Traffic Assessment in compliance with Appendix 6 of the 2014 NEMA EIA Regulations (as amended). The Specialist Assessment must also be in adherence to any additional relevant legislation and guidelines that may be deemed necessary. It must also comply with the report templates provided by the CSIR.
- Provide inputs to the Draft BA Report to include a description of the affected environment and environmental sensitivities, key legislation, key issues and detailed assessment of impacts. A template for such inputs will be provided by the CSIR.
- Undertake a site visit to gather relevant information in terms of access, road conditions etc.
- Provide review input on the preferred infrastructure layout following the sensitivity analysis and layout identification.
- Describe the traffic and transportation context of the study area, focusing on aspects that are potentially affected by a solar PV project. The study should look more broadly than the individual land parcels on which the proposed projects will developed, as most, if not all, of the anticipated traffic impacts may be experienced on the road network nearest to the proposed project.

[4] Not applicable to the EGI projects.

- Determine and describe the baseline transport and traffic condition of the study areas. Specify setbacks where required and provide clear reasons for these recommendations.
- Consider traffic issues such as impact on the road network, congestion etc. during construction and operational phases.
- Identify and assess the potential direct, indirect and cumulative impacts of the proposed development on the receiving environment from a traffic perspective. The Impact Assessment Methodology must follow that contained in Section B of this ToR, as provided by the CSIR.
- Identify any protocols, legal and permit requirements that are relevant to this project and the implications thereof.
- Determine mitigation and/or management measures which could be implemented to as far as possible reduce the effect of negative impacts and enhance the effect of positive impacts. Also identify best practice management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts. This must be included in the EMPr.
- Incorporate and address all review comments made by the Project Team (CSIR and Project Applicant) during the various revisions of the specialist report.
- Incorporate and address all issues and concerns raised by Stakeholders, Competent Authority, I&APs and the public during the Public Participation Process (where relevant and applicable).
- Review the Generic EMPr for Substations (GN 435) and confirm if there are any specific environmental sensitivities or attributes present on the site and any resultant site-specific impact management outcomes and actions that are not included in the pre-approved generic EMPr (Part B – Section 1). If so, provide a list of these specific impact management outcomes and actions based on the format of the report template provided by the CSIR.

10. BESS Risk Assessment[5]

- Provide inputs to the Draft BA Report to include a description of the affected environment and environmental sensitivities, key legislation, key issues and detailed assessment of impacts. A template for such inputs will be provided by the CSIR.
- Obtain technical information, information for the solar facilities and the proposed BESS, as well as photos of the proposed locations, GPS coordinates etc. Gather all relevant Safety Health and Environmental (SHE) information e.g. locations, surroundings, topography, types of activities surrounding the sites, vulnerable receptors (based on Google Earth and information provided from other specialist reports), material listings (details of the types of batteries), inventories (battery sizes and numbers), design drawings (possible layouts), process conditions, maps, weather data, key operating instructions, emergency procedures (if available).
- Conduct telephonic/e-mail/virtual meeting discussions with operations and design staff to identify hazards and agree risk assessment terms of reference, e.g. the risk matrix to be used.
- Identify potential SHE hazardous events associated with the installation, during construction, operation and eventual decommissioning.

[5] Not applicable to the EGI projects.

- Using a suitable risk assessment matrix dimension each of the hazardous events in terms of potential consequences and likelihood. From this determine the raw risk and determine which items may need further attention. Suggest risk reduction measures that should typically be applied, e.g. National Standards, best practices, monitoring requirements. Preventative measures will be to reduce the likelihood and mitigative measures to reduce the consequences. Calculate, and document, the residual risks. Determine if any of the risks require additional risk reduction measures, e.g. separation distances from vulnerable receptors.
- Compile a high-level qualitative Risk Assessment in adherence to any additional relevant legislation and guidelines that may be deemed necessary. It must also comply with the report templates provided by the CSIR.
- The assessment must include identification, analysis and evaluation of risks associated with the preferred battery type (e.g. Lithium-Ion Battery). It must cover the construction, operation and decommissioning phases, and must be based on a qualitative analysis. The analysis must identify hazards and hazardous events and be structured and presented according to a recognised risk assessment methodology. The analysis must identify vulnerable receptors (e.g. who is exposed to the risks), and identify applicable national and international standards that should be applied (where relevant) in order to mitigate risks.
- Undertake cumulative impact modelling of 7 BESS (7 PV projects x 1 BESS per project) to inform best placement from a fire / spill / explosion perspective. If necessary, determine if certain consequence aspects can be quantified e.g. fires, explosions, toxic smoke (if applicable).
- Provide review input on the preferred infrastructure layout following the sensitivity analysis and layout identification.
- Describe the risk-related context of the study area, focusing on aspects that are potentially affected by battery storage as part of a Solar PV project.
- Identify and assess the potential direct, indirect and cumulative impacts of the proposed development on the receiving environment from a risk perspective associated with battery storage.
- Identify any protocols, legal and permit requirements that are relevant to this project and the implications thereof.
- Provide recommendations with regards to potential monitoring programmes.
- Determine mitigation and/or management measures which could be implemented to as far as possible reduce the effect of negative impacts and enhance the effect of positive impacts. Also identify best practice management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts. This must be included in the EMPr.
- Incorporate and address all review comments made by the Project Team (CSIR and Project Applicant) during the various revisions of the specialist report.
- Incorporate and address all issues and concerns raised by Stakeholders, Competent Authority, I&APs and the public during the Public Participation Process (where relevant and applicable).

11. Geohydrology Assessment[6]

- Comply with the Assessment Protocols that were published on 20 March 2020, in Government Gazette 43110, GN 320. This specifically includes Part A, which provides the Site Sensitivity Verification Requirements where a Specialist Assessment is required but no Specific Assessment Protocol has been prescribed. As at March 2022, there are no sensitivity layers on the Screening Tool for geohydrological features, and as such the site verification process must document this and provide any additional feedback as necessary.
- Obtain data for all the project sites (i.e., obtain data from the National Groundwater Archive (and associated groundwater use databases) and internal information databases (which includes information relevant to the area)). Obtain data from the local Department of Water and Sanitation (DWS) monitoring boreholes. Obtain relevant geological maps and geohydrological maps, as well as relevant groundwater reports.
- The specialist must undertake a site visit in order to identify the level of sensitivity relating to geohydrology, and to complete a hydrocensus (i.e., visit boreholes in the area and measure yields and water quality (pH, EC, TDS and RP) for each of the 7 PV sites. The hydrocensus will extend for a radius of 1 km from each of the PV facilities study area.
- Analyse the hydrocensus data using geohydrological and spatial analysis methods to address the project objectives.
- Provide inputs that include a description of the affected environment and environmental sensitivities, key legislation and key issues/impacts/risks to be addressed. Document the results of the fieldwork and hydrocensus, including provision of a shapefile indicating areas of concern.
- Compile a Geohydrology Impact Assessment in compliance with Appendix 6 of the 2014 NEMA EIA Regulations (as amended) and Part A of the Assessment Protocols published in GN 320. The Specialist Assessment must also be in adherence to any additional relevant legislation and guidelines that may be deemed necessary, as applicable. It must also comply with the report template provided by the CSIR.
- Determination, description and mapping of the baseline environmental condition and sensitivity of the study area relating to geohydrology (including hydrogeological characterisation of aquifers (types, sensitivity, vulnerability), and groundwater (quality, quantity, use, potential for industrial or domestic use) in the area surrounding the proposed development. Specify set-backs or buffers, and provide clear reasons for these recommendations. This environmental screening will inform each project layout (the layouts can only be determined after this initial screening or mapping is undertaken). The initial screening process is required to further refine the focus areas and identify developable areas.
- Provide sensitivities in KMZ or similar GIS format.
- Provide review input on the preferred infrastructure layout following the sensitivity analysis and layout identification.
- Identify relevant permits that may be required.

[6] Not applicable to the EGI projects.

- Identify significant features or disturbances within the proposed project area and define any environmental risks in terms of geohydrology and the proposed project infrastructure.
- Confirm what type of authorisation or license is required to make use of the ground water.
- Identify and assess the potential direct, indirect and cumulative impacts of the proposed development geohydrology. Impact significance must be rated both without and with mitigation, and must cover the construction, operational and decommissioning phases of the project. The Impact Assessment Methodology to be followed will be provided by the CSIR.
- Provide recommendations with regards to potential monitoring programmes.
- Determine mitigation and/or management measures which could be implemented to as far as possible reduce the effect of negative impacts and enhance the effect of positive impacts. Also identify best practice management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts.
- Review the Generic EMPr for Substations (GN 435) and confirm if there are any specific environmental sensitivities or attributes present on the site and any resultant site-specific impact management outcomes and actions that are not included in the pre-approved generic EMPr (Part B – Section 1). If so, provide a list of these specific impact management outcomes and actions based on the format of the report template provided by the CSIR. This will apply to substations at the proposed projects.
- Incorporate and address all review comments made by the Project Team (CSIR and Project Applicant) during the various revisions of the specialist reports.

12. Geotechnical Assessment[7]

- Comply with the Assessment Protocols that were published on 20 March 2020, in Government Gazette 43110, GN 320. As at July 2022, there are no sensitivity layers on the Screening Tool for geohydrological features, and as such the site verification process must document this and provide any additional feedback as necessary.
- Provide inputs to the Draft BA Report to include a description of the affected environment and environmental sensitivities, key legislation, key issues and detailed assessment of impacts. A template for such inputs will be provided by the CSIR.
- Obtain technical information, information for the solar facilities as well as photos of the proposed locations, GPS coordinates etc. Gather all relevant geotechnical information e.g. locations, surroundings, topography, types of activities surrounding the sites, vulnerable receptors (based on Google Earth and information provided from other specialist reports), design drawings (possible layouts) and maps.
- Obtain all data relevant to the project (i.e.,, previous geotechnical reports), and conduct a search of the internal GEOSS database (including relevant information pertinent to the site). Review/acquire geological, geotechnical, and hydrogeological maps for the area. Review any reports that have been compiled for the study area. Compile a project GIS.
- Determine whether problem soils and/or geohazards are present across the site.

[7] Not applicable to the EGI projects.

- Evaluate the geological and geotechnical conditions and their influence on the founding conditions.
- Assess potential uses for materials present on-site and possible incorporation of such materials in construction activities.
- Delineate geological features of interest, e.g. steep slopes, outcrops, faults, lineaments, and/or steep slopes, that may have an impact on the development.
- Assess the influence of the groundwater on construction and development.
- Document the results obtained in a preliminary geotechnical desktop report in adherence to any additional relevant legislation and guidelines that may be deemed necessary. The report must provide information guiding future geotechnical investigations required for the proposed solar cluster development.
- The assessment must include identification, analysis and evaluation of geotechnical risks associated with the proposed development activities. It must cover the construction, operation and decommissioning phases.
- Provide review input on the preferred infrastructure layout following the sensitivity analysis and layout identification.
- Describe the risk-related context of the study area.
- Identify and assess the potential direct, indirect and cumulative impacts of the proposed development on the receiving environment from a geotechnical perspective.
- Identify any protocols, legal and permit requirements that are relevant to this project and the implications thereof.
- Determine mitigation and/or management measures which could be implemented to as far as possible reduce the effect of negative impacts and enhance the effect of positive impacts. Also identify best practice management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts. This must be included in the EMPr.
- Incorporate and address all review comments made by the Project Team (CSIR and Project Applicant) during the various revisions of the specialist report.
- Incorporate and address all issues and concerns raised by Stakeholders, Competent Authority, I&APs and the public during the Public Participation Process (where relevant and applicable).

Annexure C: Site Sensitivity Verification Report for the Padloper PV Sites

On 20 March 2020, in Government Gazette No. 43110 (GN 320) the Minister of Environment, Forestry and Fisheries prescribed general requirements for undertaking site sensitivity verification and for protocols for the assessment and minimum report requirements of environmental impacts for environmental themes for activities requiring environmental authorisations. When the requirements of a protocol apply, they replace the requirements of Appendix 6 of the EIA Regulations, 2014, as amended.

On 30 October 2020 the "Protocol for the Specialists Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species" (GN No. 1150 of 30 October 2020), was published which replaces the requirements of Appendix 6 of the EIA Regulations.

The National web-based Screening Tool was run for the PAOIs for the proposed developments. The Screening Tool Report identified all four PAOI as of low sensitivity under the avian theme. It must however be noted that the National web-based Screening Tool contains little information for the avian theme in areas outside of Renewable Energy Development Zones and this is thus not a reliable indication of the potential sensitivity of the site from an avifaunal perspective.

The Screening Tool Report identifies all four PAOI as of high sensitivity for the avian species of conservation concern (SCC) Ludwig's Bustard (*Neotis ludwigii*), and Verreaux's Eagle (*Aquila verreauxii)* in terms of the terrestrial animal species theme (which includes avian species).

Pre-construction avifaunal monitoring was conducted in the study area over a period of 9 days in March 2022 and over 6 days in July 2022. The presence of Verreaux's Eagle (*Vulnerable*) was confirmed within the PAOI, with three active nests being found within the PAOI, more than 1 km outside of the proposed development footprint. Verreaux's Eagle are a territorial species with territories that surround their nests, which are not necessarily in the centre of their territory, with an estimated average home range size of 27.7. ± 14.5 km^2.[7]

The presence of Ludwig's Bustard (*Endangered*) was also confirmed. In addition, the following SCC were confirmed within the PAOI that were not identified by the Screening Tool: Blue Crane (*Near-threatened*), Karoo Korhaan (*Near-threatened*), Secretarybird (*Endangered*) and Lanner Falcon (*Vulnerable*). The avifaunal specialist has been working in the study area on adjacent projects since 2014, and is also aware of a Martial Eagle (*Endangered*) nest located approximately 2 km outside of the PAOI.

Due to the mobile nature of avian species, it must be assumed by applying the precautionary principle, that all species identified in the combined PAOI for the Padloper PV Facilities could potentially occur or pass through each of the proposed Padloper Solar PV facility sites.

Therefore, the sensitivity of all four solar PV sites (i.e., Padloper PV 1-4) as allocated by the Screening Tool has been confirmed as being of high sensitivity, and an avian species specialist impact assessment is required for all four projects.

[7] Murgatroyd M, Underhill LG, Bouten W, Amar A (2016) Ranging Behaviour of Verreaux's Eagles during the Pre-Breeding Period Determined through the Use of High Temporal Resolution Tracking. PLoS ONE 11(10): e0163378. doi:10.1371/journal.pone.0163378

Annexure D: Specialist's Declaration and CV

forestry, fisheries
& the environment

Department:
Forestry, Fisheries and the Environment
REPUBLIC OF SOUTH AFRICA

Private Bag X447, Pretoria, 0001, Environment House, 473 Steve Biko Road, Pretoria, 0002 Tel: +27 12 399 9000, Fax: +27 86 625 1042

SPECIALIST DECLARATION FORM – AUGUST 2023

Specialist Declaration form for assessments undertaken for application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

REPORT TITLE

Basic Assessment for the proposed development of the Padloper Solar PV Facility 2 and associated infrastructure (i.e., Padloper PV 2), near Murraysburg in the Western Cape Province

Kindly note the following:

1. This form must always be used for assessment that are in support of applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting, where this Department is the Competent Authority.
2. This form is current as of August 2023. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.dffe.gov.za/documents/forms.
3. An electronic copy of the signed declaration form must be appended to all Draft and Final Reports submitted to the department for consideration.
4. The specialist must be aware of and comply with '*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 the act, when applying for environmental authorisation - GN 320/2020)*', where applicable.

1. SPECIALIST INFORMATION

Title of Specialist Assessment	Avian Species Assessment
Specialist Company Name	Holland Group (Pty) Ltd
Specialist Name	Anja Isabel Albertyn
Specialist Identity Number	7707261021185
Specialist Qualifications:	MSc Zoology (Ornithology)
Professional affiliation/registration:	SACNASP 400037/16
Physical address:	459 West River Road, Seafield/Kleinemonde 6172, Eastern Cape
Postal address:	4 Central Building Apartments, Central Square, Pinelands, 7405
Postal address	As Above
Telephone	046 675 1056
Cell phone	076 265 8933
E-mail	anja@hollandandassociates.net

2. DECLARATION BY THE SPECIALIST

I, Anja Isabel Albertyn declare that –

- I act as the independent specialist in this application;
- I am aware of the procedures and requirements for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (NEMA), 1998, as amended, when applying for environmental authorisation which were promulgated in Government Notice No. 320 of 20 March 2020 (i.e. "the Protocols") and in Government Notice No. 1150 of 30 October 2020.
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing –
  - any decision to be taken with respect to the application by the competent authority; and;
  - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 48 and is punishable in terms of section 24F of the NEMA Act.

Anja Albertyn

Signature of the Specialist

Holland Group (Pty) Ltd

Name of Company:

21 Sep 2023

Date

W/O C van Rensburg
0448463-1
SUID-AFRIKAANSE POLISIEDIENS
CHARGE OFFICE
2023 -09- 21
PORT ALFRED
SOUTH AFRICAN POLICE SERVICE

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, _ Anja Isabel Albertyn_____, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Anja Albertyn

Signature of the Specialist

Holland Group (Pty) Ltd

Name of Company

21 20 September 2023

Date

W/O C van Rensburg
0448463-1

Click or tap here to enter text.

Signature of the Commissioner of Oaths

SUID-AFRIKAANSE POLISIEDIENS
CHARGE OFFICE
2023 -09- 21
PORT ALFRED
SOUTH AFRICAN POLICE SERVICE

Click or tap to enter a date.

Date

Holland & Associates
Environmental Consultants

Impact Assessments - Environmental Management Programs - Compliance Monitoring - Process Review

ANJA ISABEL ALBERTYN

neé Terörde, in Germany 1977
RSA permanent resident

CURRICULUM VITAE

Anja Albertyn is an avifaunal specialist and environmental consultant with a Master of Science in Zoology specialising in Ornithology from the Percy FitzPatrick Institute for African Ornithology at the University of Cape Town, a Bachelor of Science (Honours) in Zoology, and a Bachelor of Science in Botany and Zoology. With over 13 years of experience as an environmental consultant, Anja has worked on a wide range of projects including wind and solar energy facilities, transmission lines, electrical infrastructure, housing developments, water use license applications, effluent treatment technology testing, and aquaculture management.

Anja is a registered Professional Natural Scientist (Ecological Science: 400037/16) with the South African Council for Natural Scientific Professions (SACNASP), and an active member of the South African affiliate of the International Association for Impact Assessment (IAIAsa). She is also a selected member of the Birds and Renewable Energy Specialist Group (BARESG), demonstrating her expertise in the intersection of avifauna and renewable energy facilities.

Anja has been involved in avifaunal monitoring since 2004 and has been conducting avifaunal pre- and post-construction monitoring and assessments for renewable energy facilities and electrical grid infrastructure since 2012, having acted as lead specialist for avifaunal impact assessments, avifaunal feasibility studies and bird specialist reports on a large number of projects. She has compiled basic, scoping & environmental impact assessment reports, environmental management plans, and environmental authorisation amendment applications, as well as a large number of avifaunal specialist reports.

Anja has a particular interest in birds and the ecology of estuarine birds in particular, having published eight scientific papers on this topic to date.

PROFESSIONAL EXPERIENCE

2019 – present	**Avifaunal Specialist and Environmental Consultant** *Holland & Associates Environmental Consultants, Tokai / Port Alfred*
2017-2019	**Avifauna Specialist & Environmental Consultant** *Arcus Consultancy Services South Africa, Cape Town*
2013 - 2017	**Ecology Consultant (Avifauna)** *Arcus Consultancy Services South Africa, Cape Town*

Postnet Suite 108, Private Bag X12, Tokai, 7966, South Africa
Mobile 076 265 8933 ~ e-mail: anja@hollandandassociates.net
Web: www.hollandandassociates.net

2011 - 2013 **Avifaunal Monitoring Services**
Self-employed, Cape Town

2011 - 2013 **Project Manager and UX Designer (part-time)**
the binary family, Cape Town / Berlin

2009 - 2011 **Researcher**
Anchor Environmental Consultants, Tokai

2005 - 2008 **Director & Co-founder**
Fishriver Horse Safaris, Port Alfred

2002 - 2003 **Assistant Camp Manager**
Mashatu Game Reserve, Tuli Block, Botswana

1999 - 2002 **Wildlife Research Assistant**
Centre for Wildlife Management, Pretoria / Mashatu Game Reserve, Botswana

ACADEMIC QUALIFICATIONS

- *Department of Environmental Science, Rhodes University, 2015:* Introduction to Environmental Impact Assessment Procedure **Short Course** *(Highly competent)*
- *Percy FitzPatrick Institute, University of Cape Town, 2006-2009:* Zoology (Ornithology), **Master of Science**
- *Rhodes University, 2005-2006:* **Bachelor of Science Zoology** (**Honours**)
- *University of South Africa, 2002 – 2004:* **Bachelor of Science Zoology & Botany** (*cum laude*)
- *Heinrich-Heine Universität, Düsseldorf, Germany, 1999 – 2002,* Biology, Vordiplom

PROJECT EXPERIENCE

Avifaunal Pre-application Monitoring & Specialist Impact Assessments for Wind Energy Facilities (WEFs) and associated electrical grid infrastructure (EGI)

- Proposed WEF Balfour, Mpumalanga
- Proposed Utrecht WEF, KwaZulu-Natal
- Proposed Carissa WEF, Western Cape
- Proposed Ugie WEF, Eastern Cape
- Authorised Soutrivier North, Central & South WEFs and EGIs, Victoria West
- Proposed Brandberg WEF, Laingsburg
- Proposed Kabbo WEF, Victoria West
- Authorised Kap Vley WEF, Kleinzee
- Authorised Paulputs WEF, Pofadder
- Authorised Highlands North, Central & South WEFs and EGIs, Somerset East
- Proposed Kleinberg WEF Mossel Bay
- Proposed WEF Pofadder, Northern Cape
- Proposed Aggeneys WEF
- Proposed WEF Loxton, Northern Cape
- Proposed Riebeek East WEF
- Proposed WEF Gqeberha, Eastern Cape
- Kolkies WEF Touw's River
- Karee WEF Touw's River
- Authorised Komsberg WEFs, Sutherland
- Grassridge II WEF, Addo, Eastern Cape
- Proposed WEF Elliot, Eastern Cape
- Proposed WEF Indwe, Eastern Cape
- Proposed Koingnaas WEF
- Proposed Richtersveld WEF
- Namakwaland WEF, Northern Cape
- Authorised Springbok WEF

Avifaunal Post-construction Monitoring for Wind Energy Facilities:

- West Coast 1 WEF, Western Cape
- Hopefield WEF, Western Cape
- Gouda WEF, Western Cape

Avifaunal Pre-application Monitoring & Specialist Impact Assessments for Solar Energy Facilities and associated Electrical Grid Infrastructure

- Megora Solar PV, Murraysburg
- Groene Rivier Solar PV, Malmesbury
- Sol Platz Solar PV Facility, Bloemfontein
- Padloper Solar PV, Murraysburg
- Paarde Valley PV2 Solar Energy Facility
- Steenbok 1 and 2 Solar PV Facilities and EGIs, Bloemfontein, Free State
- Notsi 1 – 5 Solar PV Facilities, and EGIs Dealesville, Free State
- Soutrivier Solar PV, Victoria West
- SPV Renfields Solar PV Facility Hopefield
- Hive Energy Solar PV, Gqeberha, EC
- Parsons PV Power Park, Gqeberha, EC
- Hive Energy Solar Project, Gqeberha, EC
- Bokpoort Solar Farm, Groblershoop, NC
- Metsimatala CSP Facility, NC
- Avifaunal Impact Assessment 132 kV Mbumbu-Tsakani Powerline

Avian Species Specialist Impact Assessments, Compliance Statements & Specialist Studies

- Expansion of the town of Aggeneys, NC
- Residential development on Erf 21281 Mossel Bay
- Velddrif Saltworks Closure Plan, WC
- Billy Kloppers Agricultural Developments
- Lingenfelder Agricultural Developments
- LIV Village Development, Makhanda, EC
- Umsinde WEF EMPr
- Khangela WEF EMPr
- Indigo Fruit Farm Agricultural Expansions, Ashton, WC
- Mossel Bay Zipline EMPr Avian Study
- Arlington Mixed-Use Development, Gqeberha, EC
- Kweek Kraal Agricultural Expansion, Citrusdal, WC
- Doornkloof Dam and Agricultural Expansion, Swellendam
- De Wilgen Agricultural Expansion, Ashton
- Welgegund Agricultural Expansion, Robertson
- Jan Rabie Dam Enlargement Robertson
- Auriga Thermal Power Plant Saldanha Bay
- Vortum Gas Cycle Turbine in Saldanha Bay
- Avifaunal Walkthrough, Robben Island PV, Western Cape

<u>Avian Feasibility Studies and Specialist Nest Surveys</u>

- Avifaunal Feasibility Assessment, 2 Confidential WEFs, Western Cape
- Avifaunal Feasibility Assessment, 6 Confidential WEFs, Eastern Cape
- Avifaunal Feasibility Assessment, 6 Confidential WEFs, Northern Cape
- Canal Walk Wetlands Avifauna Study, Cape Town
- Review and mitigation strategy design for birds at the Kinangob Wind Park, Kenya

<u>Lead Environmental Consultant</u>

- De Zwartland Werf Stormwater Detention Pond Basic Assessment Process, Malmesbury
- Paarde Valley PV2 Grid Connection Basic Assessment Process, De Aar, NC

- Paarde Valley PV2 Amendment Application Process, De Aar, NC
- Bernheim Agricultural Expansion, Robertson, Basic Assessment Process
- Kransvlei Agricultural Expansions, Scoping & EIA Process, WC
- Melkboomfontein Agricultural Expansions, Citrusdal S24G Process
- Wasplaas Dam, Paarl, S24G Application
- Brandwagt Agricultural Expansion, Robertson, Basic Assessment Process
- Bruwers Agricultural Expansions, Basic Assessment Process
- Ouplaas Dam Enlargement, Greyton, S24G Process
- Boekenhoutskloof Agricultural Expansion, Hermanus, Basic Assessment Process
- Malmesbury Mall & Hospital, WC, Basic Assessment Process
- Malmesbury Mall & Hospital, WC, Part 1 Amendment
- Namaquasfontein Skool Dam, WC, Section 24G Application
- De Molen Dam, WC, Section 24G Application, De Molen Dam, WC
- Oude Schuur Agricultural Developments, Worcester, Scoping & EIA Process
- Highlands WEFs, Eastern Cape, Scoping & EIA Process
- Phezukomoya WEF, Noupoort, Scoping & EIA Process
- San Kraal WEF, Noupoort, Scoping & EIA Process

SCIENTIFIC PUBLICATIONS & CONFERENCES

Albertyn-Terörde A, Allan DG, Ralston-Paton S, Simmons R, Smallie J, Smit-Robinson H & van Zyl A. **2023**. Reflections from South Africa. Lessons from over a decade of addressing wind energy's impacts on birds in Southern Africa. *7th Conference on Wind Energy and Wildlife Impacts – CWW 2023, Sibenik, Croatia.*

Cowley, PD, Terörde, AI & Whitfield, AK. **2018**. Birds as major predators of fishes in a small estuary: does this influence the nursery area concept for estuary-associated fish species? *African Zoology* 52: 147-154

Maree, BA, Cowley, PD, Naesje, TF Childs, A-R, Terörde, AI & Thorstad, EB. **2016**. Influence of prey abundance and abiotic factors on the long-term home-range and movement dynamics of spotted grunter *Pomadasys commersonnii* in an intermittently open estuary. *African Journal of Marine Science* 2016: 1-10

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