Proposed Development of the Kiara Photovoltaic (PV) 5 Solar Energy Facility – Avifauna Impact Assessment Lichtenburg, North West Province, South Africa

December 2022

CLIENT

Prepared by:

The Biodiversity Company

Cell: +27 81 319 1225

Fax: +27 86 527 1965

info@thebiodiversitycompany.com

www.thebiodiversitycompany.com

Report Name	**Proposed Development of the Kiara Photovoltaic (PV) 5 Solar Energy Facility – Avifauna Impact Assessment**
Report Contributor	**Anton Schultz**  Anton has birding experience across Southern Africa (including South Africa and all of its provinces) where he has recorded the majority of naturally occurring bird species on his big year in 2019. He is a member of the President Ridge bird club and a Monitor for the Roodekrans Black Eagle Project. He has worked with Birdlife South Africa to raise funds for the White-winged Flufftail project and is currently in the process of obtaining his FGASA NQF2. Anton is currently in his second year of a BSc. Ecology degree at the University of Pretoria.
Report Writer	**Leigh-Ann de Wet**  Ms Leigh-Ann de Wet is Pr. Nat. Sci. registered (400233/12) and has extensive experience in assessing terrestrial biodiversity. She obtained her MSc in Botany from Rhodes University. She has over 14 years' experience conducting terrestrial biodiversity assessments (including both flora and fauna as well as specialist avifauna) throughout Southern Africa, West and Central Africa and Madagascar. She has experience in all 9 provinces of South Africa with a particular interest in KZN flora, and avifauna.
Report Reviewer	**Ryno Kemp**  Ryno Kemp is Pr Sci Nat registered (117462/17) in Zoological Science and is finalising his PhD in Zoology from the University of Pretoria. Ryno is a qualified Avifauna specialist with just over a year's experience, three years of experience in conservation and more than eight years of scientific research experience across South Africa.
Report Reviewer	**Andrew Husted**  Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 13 years' experience in the environmental consulting field.
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.

DECLARATION

I, Leigh-Ann de Wet, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations, and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan, or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Leigh-Ann de Wet

Terrestrial Ecologist

The Biodiversity Company

December 2022

DECLARATION

I, Andrew Husted, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations, and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan, or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Andrew Husted

Ecologist

The Biodiversity Company

December 2022

Table of Contents

Tables

Figures

Document Guide

"Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Avifauna" gazetted 20 March 2020, published in Government Notice No. 320 with the relevance to this project as per the Bird and Wind- Energy Best -Practice Guideline (Birdlife SA).

Item	Pages	Comment
The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP)	ii	
Assessments are to be done in accordance with the Bird and Wind- Energy Best -Practice Guideline.	x	Regime 1 was needed
The project area and its characteristics which must be mapped including the extent, habitat, special features including topographical and water features, quarries, drainage lines, known breeding sites, existing uses of land, existing infrastructure such as powerlines and roads, and existing operational wind energy facilities within 30km of the site;	12-35	Section 3 from a desktop perspective Section 4 field assessment perspective
Target avifaunal species that are likely to occur on the preferred site and for which monitoring is required	27	Section 4.2, 4.3
The location of monitoring points	9	Section 2
Aspects to be monitored (for example, bird abundance and flight activity, presence of target species, proportion of flying time each target species spends at turbine rotor height, preferred flight paths, risk of identified target species to collision, areas for specific monitoring if any, etc.);	8	Section 2.3
Monitoring methodology for the abundance or activity monitoring and for direct observation or vantage point surveys, the latest version of the BirdLife South Africa Bird and Wind -Energy Best- Practice Guideline	8	Section 2.3
The assessment, as a minimum, must include the following aspects: • Discussion on bird abundance and movement within the site; • Discussion on presence of target or threatened species and their occurrence on the site at heights which could pose risks to collision; • Assessment of risk of identified target species to collision including the expected fatality rates of the target species based on a suitable model commonly used for risk determination, per species and for the site; • Identification and mapping where relevant, of any migratory or Preferential bird routes or corridors; • Where relevant, discussion on the risk of displacement • Where relevant, areas identified within the site as having a very high sensitivity for bird collision or displacement and in which the development should be avoided. These areas are to be mapped;	23-39	Section 4,5 and 6
A plan for post construction monitoring and reporting, which must include: • Timeframes and intervals for monitoring; • Any specific area for monitoring; • Methodology for searcher efficiency and scavenger removal; • Method for monitoring, i.e. transects or radial as well as extent of monitoring area; • Results of monitoring compared against expected fatality rates per target species as well as general species; • Reporting requirements, including organisations for submission of reports; • Years and intervals for monitoring to occur; and • All methods used to estimate bird numbers and movements	58	Section 9
Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae.	72	
A signed statement of independence by the specialist.	iii, iv	
A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment.	6	

A description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant.	6-11	
A description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations.	6	
A location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant).	-	Not relevant
Additional environmental impacts expected from the proposed development.	39-55	
Any direct, indirect and cumulative impacts of the proposed development.	39-55	
The degree to which impacts and risks can be mitigated.	39-55, 56-57	
The degree to which the impacts and risks can be reversed.	39-55, 56-57	
The degree to which the impacts and risks can cause loss of irreplaceable resources.	42	
Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr).	56-57	
A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not;	59	
Any conditions to which this statement is subjected	59	

1 Introduction

The Biodiversity Company (TBC) was appointed to undertake an Avifauna Impact Assessment as part of the environmental authorisation (EA) process for the proposed Kiara Solar Photovoltaic (PV) 5 project. Kiara PV5 is one of seven (7) located within Portion 2 of the farm Hollaagte 8 and the Remaining Extent of the farm Hollaagte No. 8. A separate Environmental Impact Assessment (EIA) is being prepared for each of the 7 facilities. The project is located approximately 16 km north east of Lichtenburg in the North-West Province within the Ditsobotla Local Municipality within the Ngaka Modiri Molema District Municipality (Figure 1-1).

The project area refers to the collection of 7 facilities being considered for the development, whereas a Project Area of Influence (PAOI) has been assigned for each individual facility.

The National Web based Environmental Screening Tool has characterised the Terrestrial Biodiversity Combined Sensitivity of the project area as “Very High”, Animal Species Theme Sensitivity as “Low” and Avifauna Theme Sensitivity as “High”. Accordingly, this assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations. 2014 (GNR 326, 7 April 2017) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The approach has taken cognisance of the recently published Government Notices (GN) 320 (20 March 2020) and GN 1150 (30 October 2020): “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 National Environmental Management Act, 1998, when applying for Environmental Authorisation” (Reporting Criteria).

This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making, as to the ecological viability of the proposed project.

1.1 Project Description

The proposed project is located north east of the town of Lichtenburg on the farm Hollaagte No. 8 and covers approximately 209 ha of undeveloped land (Figure 1-2). The infrastructure that will be established includes the following:

- PV modules and mounting structures;
- Inverters and transformers;
- Battery Energy Storage System (BESS);
- Site and internal access roads (up to 8 m wide);
- Site offices and maintenance buildings, including workshop areas for maintenance and storage;
- Temporary and permanent laydown area; and
- Facility substation.

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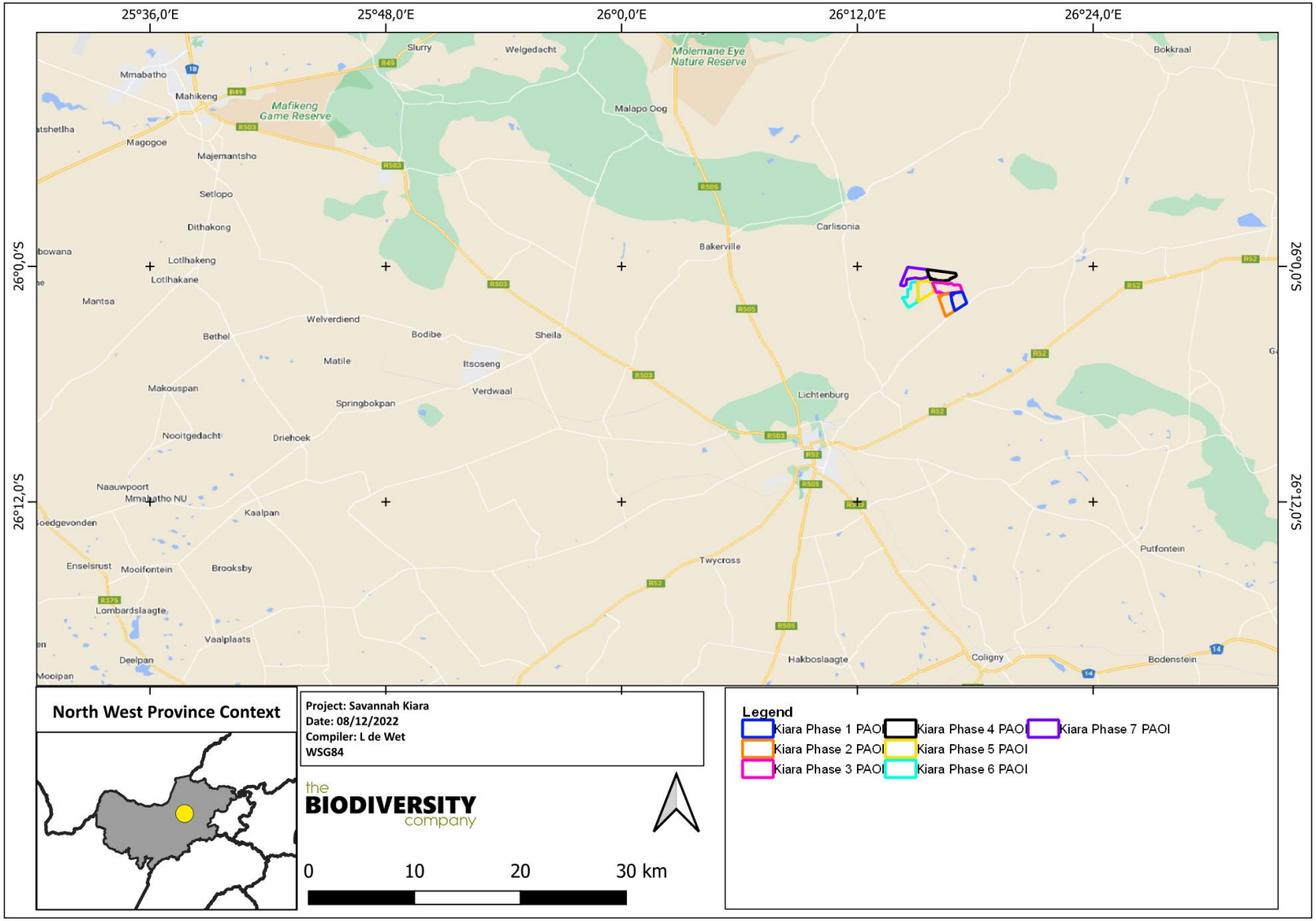

Figure 1-1Map illustrating the location of the PAOI in relation to the six other projects.

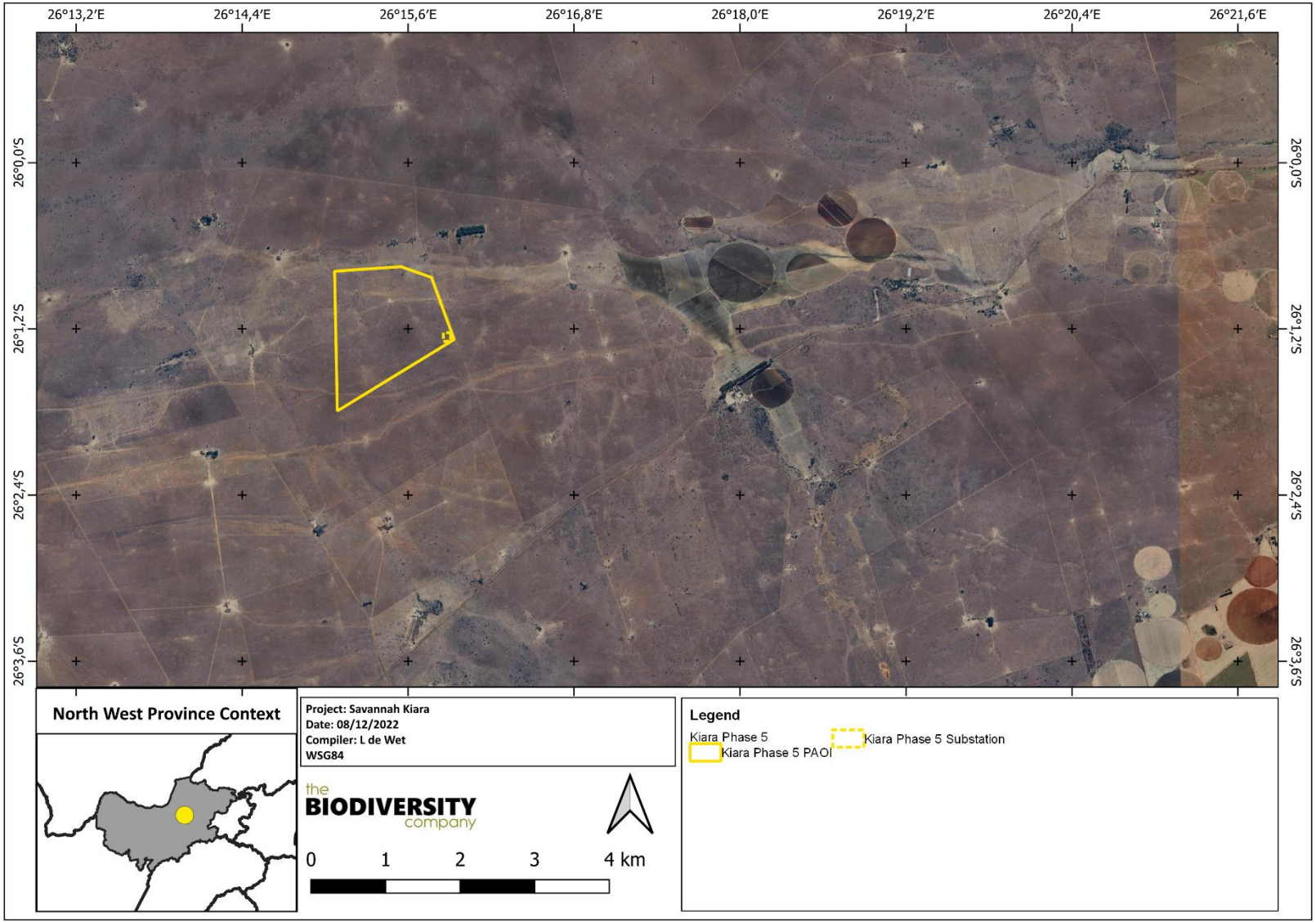

Figure 1-2: Map illustrating the layout of the PAOI

1.2 Terms of Reference

The assessment was achieved according to the 2014 EIA Regulations (Government Notice Regulation 982) in terms of the National Environmental Management Act (Act 107 of 1998) as amended (NEMA) (per the amendments to the Environmental Impact Assessment Regulations. 2014 (No. 326, 7 April 2017) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as well as best-practice guidelines and principles for avifaunal assessment within solar energy facilities as outlined by Birdlife South Africa.

The scope of the Avifauna Impact Assessment included the following:

- Desktop assessment to identify the relevant ecologically important geographical features within the PAOI and surrounding landscape;
- Desktop assessment to compile an expected species list and possible avifauna Species of Conservation Concern (SCC) (Figure 1-3) that potentially occur within the PAOI;
- Description of the baseline avifauna species and Functional Feeding Guild (FFG) composition assemblage within the PAOI;
- Delineate site sensitivity or sensitivities i.e., the Site Ecological Importance (SEI) within the context of the avifauna species assemblage of the PAOI;
- Identify the manner that the proposed development impacts the avifauna community and evaluate the level of risk of these potential impacts; and
- Provide mitigation measures to prevent or reduce the possible impacts.

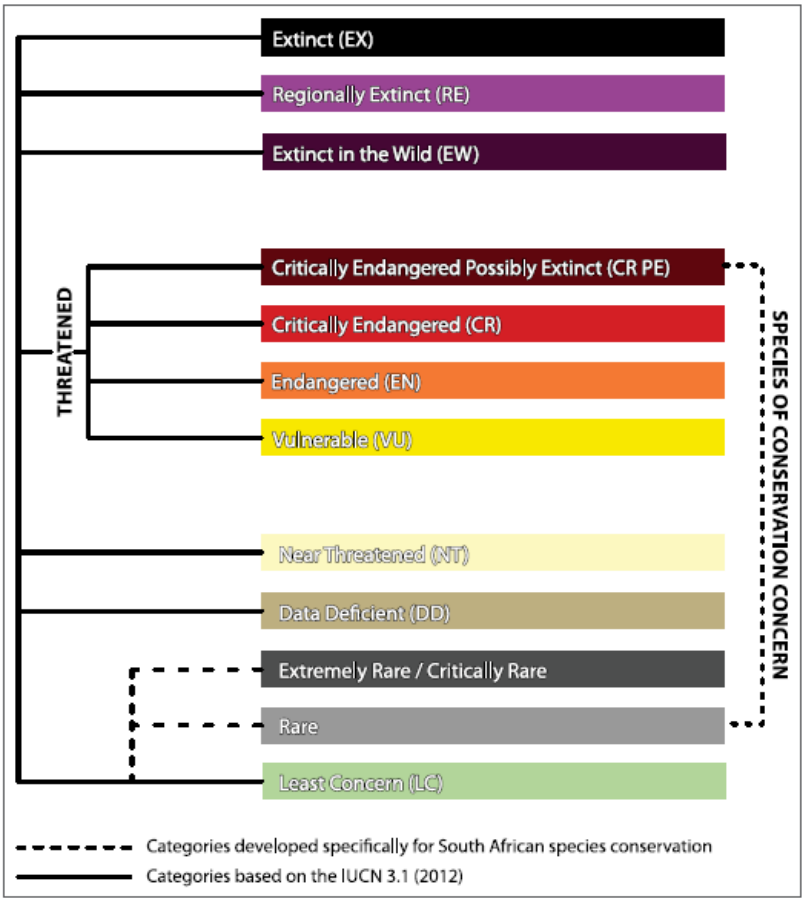

Figure 1-3 The different categories of Species of Conservation Concern modified from the IUCN's extinction risk categories. Source: SANBI (2020)

1.3 Key Legislative Requirements

The legislation, policies and guidelines listed below are applicable to the current project in terms of biodiversity and ecological support systems. The list below, although extensive, is not exhaustive and other legislation, policies and guidelines may apply in addition to those listed below (Table 1-1).

Table 1-1 A list of key legislative requirements and guidelines

Region	Legislation and Guidelines
International	Convention on Biological Diversity (CBD, 1993)
	The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)
	The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)
National	Constitution of the Republic of South Africa (Act No. 108 of 1996)
	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 National Environmental Management Act, 1998, GNR 320 of Government Gazette 43310 (March 2020)
	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 National Environmental Management Act, 1998, GNR 1150 of Government Gazette 43855 (October 2020)
	The National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management: :Biodiversity Act (Act No. 10 of 2004) (NEMBA), Threatened or Protected Species Regulations

	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989)
	National Protected Areas Expansion Strategy (NPAES)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Biodiversity Framework (NBF, 2009)
	National Spatial Biodiversity Assessment (NSBA)
	National Heritage Resources Act, 1999 (Act 25 of 1999)
	Alien and Invasive Species Regulations and Alien and Invasive Species List 2020, published under NEMBA
	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)
	White Paper on Biodiversity
	South African National Biodiversity Institute (SANBI). 2020. *Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa*. South African National Biodiversity Institute, Pretoria. Version 1.2020.
	Best practice guidelines for avifaunal impact studies at solar developments, compiled by BirdLife South Africa (BLSA) in 2017 (Jenkins *et al*., 2017)
Provincial	North-West Biodiversity Sector Plan of 2015 (READ,2015).

1.4 Assumptions and Limitations

The following assumptions and limitations should be noted for the assessment:

- Information relating to project activities, spatial data and infrastructure locations for the proposed development was obtained from information provided by the client. The potential impacts and recommendations described in this report apply specifically to the provided information;
- Although considerable time has been spent to ensure that information utilised in this report is verified. It is assumed that all third-party information utilised in the compilation of this report is correct at the time of compilation (e.g., spatial data, online databases, and species lists);
- The GPS used for the assessment is accurate to 5 metres and therefore any spatial features may be offset by this distance;
- The project area defined by the client was designated as the Project Area of Influence (PAOI); and
- The fieldwork component of the assessment comprised of a summer (wet season) survey conducted from the 30th November to the 3rd of December 2022.

2 Methods

The desktop assessment was principally undertaken using Geographic Information Software (GIS) to access the latest available spatial datasets in order to develop digital cartographs and species lists. These datasets and their date of publishing are provided below.

2.1 Ecologically Important Landscape Features

Existing ecologically relevant data layers were incorporated into a GIS to establish how the proposed development might interact with any ecologically important entities. Emphasis was placed around the following spatial datasets:

- National Biodiversity Assessment 2018 (Skowno *et al*, 2019) - The purpose of the National Biodiversity Assessment (NBA) is to assess the state of South Africa's biodiversity based on best available science, with a view to understanding trends over time and informing policy and decision-making across a range of sectors. The NBA deals with all three components of biodiversity: genes, species and ecosystems; and assesses biodiversity and ecosystems across terrestrial, freshwater, estuarine and marine environments. The two headline indicators assessed in the NBA are:
    - Ecosystem Threat Status – indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition.
    - Ecosystem Protection Level – indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. Not Protected, Poorly Protected or Moderately Protected ecosystem types are collectively referred to as under-protected ecosystems.
- Protected areas:
    - South Africa Protected Areas Database (SAPAD) and South Africa Conservation Areas Database (SACAD) (DEA, 2021) – The South African Protected Areas Database (SAPAD) and South Africa Conservation Areas Database (SACAD) contains spatial data for the conservation of South Africa. It includes spatial and attribute information for both formally protected areas and areas that have less formal protection. The database is updated on a continuous basis and forms the basis for the Register of Protected Areas which is a legislative requirement under the National Environmental Management: Protected Areas Act, Act 57 of 2003.
    - National Protected Areas Expansion Strategy (NPAES) (SANBI, 2010) – The National Protected Area Expansion Strategy (NPAES) provides spatial information on areas that are suitable for terrestrial ecosystem protection. These focus areas are large, intact and unfragmented and are therefore, of high importance for biodiversity, climate resilience and freshwater protection.
- North West Biodiversity Sector Plan - The spatial component of the Biodiversity Sector Plan is based on systematic biodiversity planning undertaken by North West Economic Development, Environment, Conservation and Tourism (DEDECT).The purpose of a Biodiversity Sector Plan is to inform land use planning, environmental assessments, land and water use authorisations, as

well as natural resource management, undertaken by a range of sectors whose policies and decisions impact on biodiversity. This is done by providing a map of biodiversity priority areas, referred to as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), with accompanying land use planning and decision-making guidelines (READ, 2015).

- Important Bird and Biodiversity Areas (BirdLife South Africa, 2015) – Important Bird and Biodiversity Areas (IBAs) constitute a global network of over 13 500 sites, of which 112 sites are found in South Africa. IBAs are sites of global significance for bird conservation, identified through multi-stakeholder processes using globally standardised, quantitative and scientifically agreed criteria; and

- Hydrological Setting:

    - South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (Van Deventer *et al,* 2018) – A South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was established during the National Biodiversity Assessment of 2018. It is a collection of data layers that represent the extent of river and inland wetland ecosystem types as well as pressures on these systems.

    - Strategic Water Source Areas (SWSAs) (Le Maitre *et al*, 2018) – SWSAs are defined as areas of land that supply a quantity of mean annual surface water runoff in relation to their size and therefore, contribute considerably to the overall water supply of the country. These are key ecological infrastructure assets and the effective protection of surface water SWSAs areas is vital for national security because a lack of water security will compromise national security and human wellbeing.

    - National Freshwater Ecosystem Priority Area (NFEPA) (Nel *et al.,* 2011) – The NFEPA database provides strategic spatial priorities for conserving the country's freshwater ecosystems and associated biodiversity as well as supporting sustainable use of water resources.

2.2 Species Lists

The following resources were consulted during the desktop assessment and for the compilation of the expected species list:

- Hockey *et al*. (2005), Roberts Birds of Southern Africa (seventh end.). The primary source for species identification, geographic range, and life history information;

- Sinclair and Ryan (2010), Birds of Africa. Secondary source for identification;

- South African Bird Atlas Project (SABAP 2). Full protocol atlassing data from relevant pentads used to construct expected species list; and

- Taylor *et al*. (2015), Eskom Red Data Book of Birds of South Africa, Lesotho, and Swaziland. Used for conservation status, nomenclature, and taxonomical ordering.

2.3 Field Assessment

The fieldwork component of the assessment comprised of a summer (wet season) survey conducted from the 30th November to the 3rd of December 2022. Sampling consisted of standardized point counts as well as random diurnal incidental surveys. Standardised point counts (Buckland *et al*, 1993) were conducted to gather data on the species composition and relative abundance of species within the broad habitat types identified. The standardized point count technique was utilised as it was demonstrated to

outperform line routes (Cumming & Henry, 2019). Each point count was run over a 10 min period. The horizontal detection limit was set at 150 m. At each point the observer would document the date, start time, and end time, habitat, numbers of each species, detection method (seen or heard), behaviour (perched or flying) and general notes on habitat and nesting suitability for conservation important species. To supplement the species inventory with cryptic and illusive species that may not be detected during the rigid point count protocol, diurnal and nocturnal incidental searches were conducted. This involved the opportunistic sampling of species between point count periods, random meandering and road cruising. Effort was made to cover all the different habitat types within the limits of time and access (Figure 2-1). Areas outside of the PAOI at water sources were included in the point counts to ensure these species are taken into account.

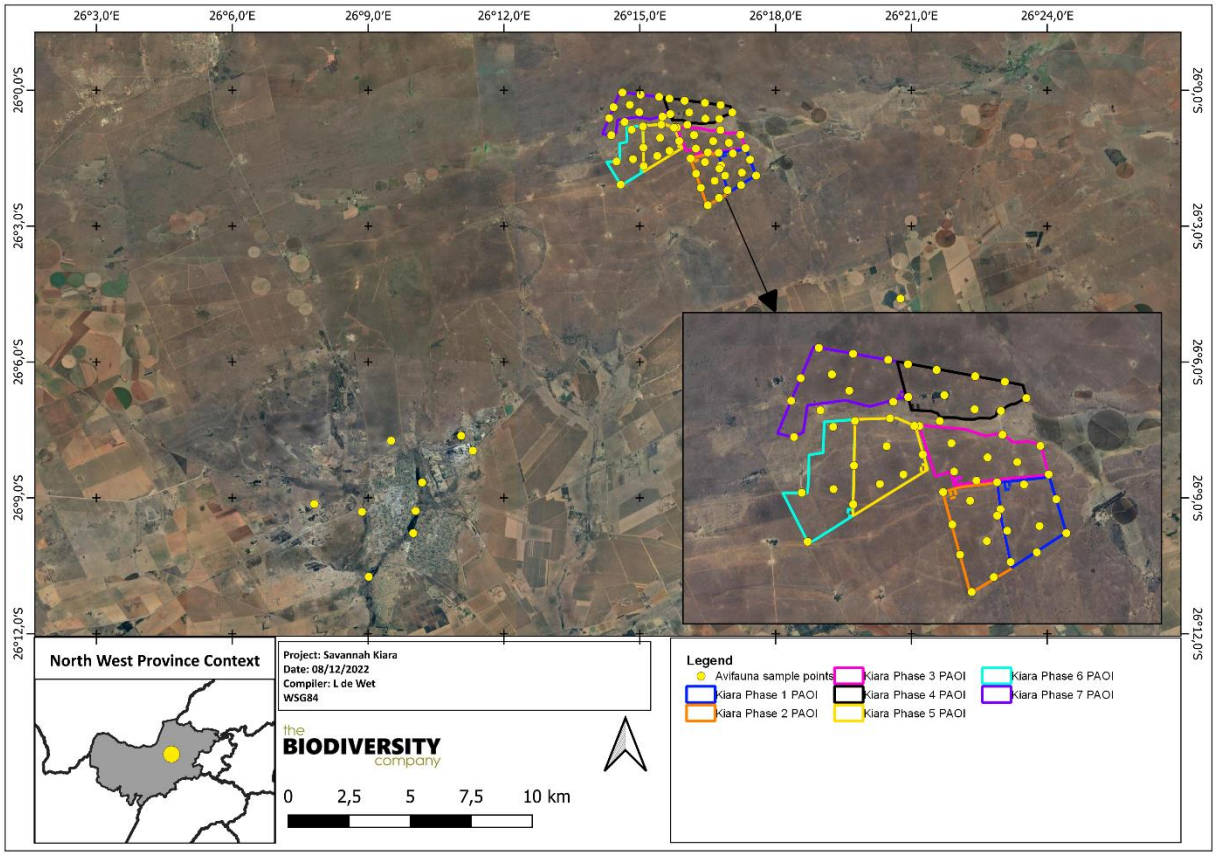

Figure 2-1 Map illustrating the field survey area and locations of standardised point counts for the PAOI.

2.3.1 Data Analysis

The analyses described below only used the data collected from the standardised point counts. See Appendix B for the point count data.

Point count data was arranged into a matrix with point count samples in rows and species in columns. The table formed the basis of the various subsequent statistical analyses. This data was first used to distinguish similarities / differences in the species composition between the two identified avifaunal habitats, the matrix was converted into a Bray-Curtis dissimilarity matrix. The data was subject to fourth-root transformation to downscale the contribution of very abundant species while upscaling the influence of less abundant species. However, the effect was negligible and ultimately the raw data proved more informative. Thirdly, raw count data was converted to relative abundance values and used to establish dominant species and calculate the diversity of each habitat. The Shannon Diversity Index (H') was the

metric used to estimate diversity. Lastly, present, and potentially occurring species were assigned to 13 major trophic guilds loosely based on the classification system developed by González-Salazar *et al.* (2014). Species were first classified by their dominant diet (carnivore, herbivore, granivore, frugivore, nectarivore, omnivore), then by the medium upon/within which they most frequently forage (ground, water, foliage, air) and lastly by their activity period (nocturnal or diurnal).

2.4 Site Ecological Importance

The different habitat types within the assessment area were delineated and identified based on observations during the field assessment as well as available satellite imagery. These habitat types were assigned Ecological Importance (EI) categories based on their ecological integrity, conservation value, the presence of species of conservation concern and their ecosystem processes.

Site Ecological Importance (SEI) is a function of the Biodiversity Importance (BI) of the receptor (e.g., SCC, the vegetation/fauna community or habitat type present on the site) and Receptor Resilience (RR) (its resilience to impacts) as follows.

BI is a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor as follows. The criteria for the CI and FI ratings are provided in Table 2-1 and Table 2-2, respectively.

Table 2-1 Summary of Conservation Importance criteria

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 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 an EN ecosystem type. Globally significant populations of congregatory species (> 10% of global population).
High	Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km^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 populations 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 ecosystem type with status of VU. Presence of range-restricted species. > 50% of receptor contains natural habitat with potential to support SCC.
Low	No confirmed or 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.

Table 2-2 Summary of Functional Integrity criteria

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 disturbance.
High	Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types. Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts with no signs of major past disturbance and good rehabilitation potential.
Medium	Medium (> 5 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 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 used road network surrounds the area. Low rehabilitation potential. Several minor and major current negative ecological impacts.
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.

BI can be derived from a simple matrix of CI and FI as provided in Table 2-3.

Table 2-3 Matrix used to derive Biodiversity Importance from Functional Integrity and Conservation Importance

Biodiversity Importance (BI)		Conservation Importance (CI)				
		Very high	**High**	**Medium**	**Low**	**Very low**
Functional Integrity (FI)	**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

The fulfilling criteria to evaluate RR are based on the estimated recovery time required to restore an appreciable portion of functionality to the receptor as summarised in Table 2-4.

Table 2-4 Summary of Receptor Resilience criteria

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 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.

Subsequent to the determination of the BI and RR, the SEI can be ascertained using the matrix as provided in Table 2-5.

Table 2-5 Matrix used to derive Site Ecological Importance from Receptor Resilience and Biodiversity Importance

Site Ecological Importance		Biodiversity Importance				
		Very high	**High**	**Medium**	**Low**	**Very low**
Receptor Resilience (RR)	**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

Interpretation of the SEI in the context of the proposed development activities is provided in Table 2-6.

Table 2-6 Guidelines for interpreting Site Ecological Importance in the context of the proposed development activities

Site Ecological Importance	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.

The SEI evaluated for each taxon can be combined into a single multi-taxon evaluation of SEI for the assessment area. Either a combination of the maximum SEI for each receptor should be applied, or the SEI may be evaluated only once per receptor but for all necessary taxa simultaneously. For the latter, justification of the SEI for each receptor is based on the criteria that conforms to the highest CI and FI, and the lowest RR across all taxa.

3 Receiving Environment

3.1 Desktop Spatial Assessment

The following features describes the general area and habitat, this assessment is based on spatial data that are provided by various sources such as the provincial environmental authority and SANBI. The desktop analysis and their relevance to this project are listed in Table 3-1.

Table 3-1 Desktop spatial features examined.

Desktop Information Considered	Relevance	Section
Conservation Plan	Relevant: The project area overlaps with an ESA area/	3.1.1
Protected Areas (SAPAD & SACAD)	Relevant: The PAOI is located approximately 1.2 km from the Marico Biosphere Reserve and approximately 4 km from the Rall Broers Private Nature Reserve	3.1.2
Important Bird and Biodiversity Areas	Irrelevant: The PAOI is located approximately 80 km away from any IBA areas.	-
Coordinated Avifaunal Road count	Irrelevant: There are no CAR routes near to the project area	3.1.3
Coordinated Waterbird Count	Irrelevant: There are no Coordinated Waterbird Count Areas near to the project area	3.1.4
Aquatic habitat	Irrelevant: No water resources are present within the PAOI	3.1.5
Strategic Transmission Corridors	Relevant: The POAI lies within an EGI corridor	3.1.6
REDZ	Irrelevant: The project does not overlap with a REDZ zone.	3.1.7
Renewable energy projects in the area (REEA)	Relevant: There are several projects in progress in the nearby vicinity	3.1.7

3.1.1 Biodiversity Sector Plan

The North West Economic Development, Environment, Conservation and Tourism (DEDECT) as custodian of the environment in the North West, is the primary implementing agent of the Biodiversity Sector Plan. The spatial component of the Biodiversity Sector Plan is based on systematic biodiversity planning undertaken by DEDECT. The purpose of a Biodiversity Sector Plan is to inform land use planning, environmental assessments, land and water use authorisations, as well as natural resource management, undertaken by a range of sectors whose policies and decisions impact on biodiversity. This is done by providing a map of biodiversity priority areas, referred to as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), with accompanying land use planning and decision-making guidelines (READ, 2015).

Figure 3-1 shows the project area superimposed on the Terrestrial CBA map. The PAOI overlaps with an ESA area.

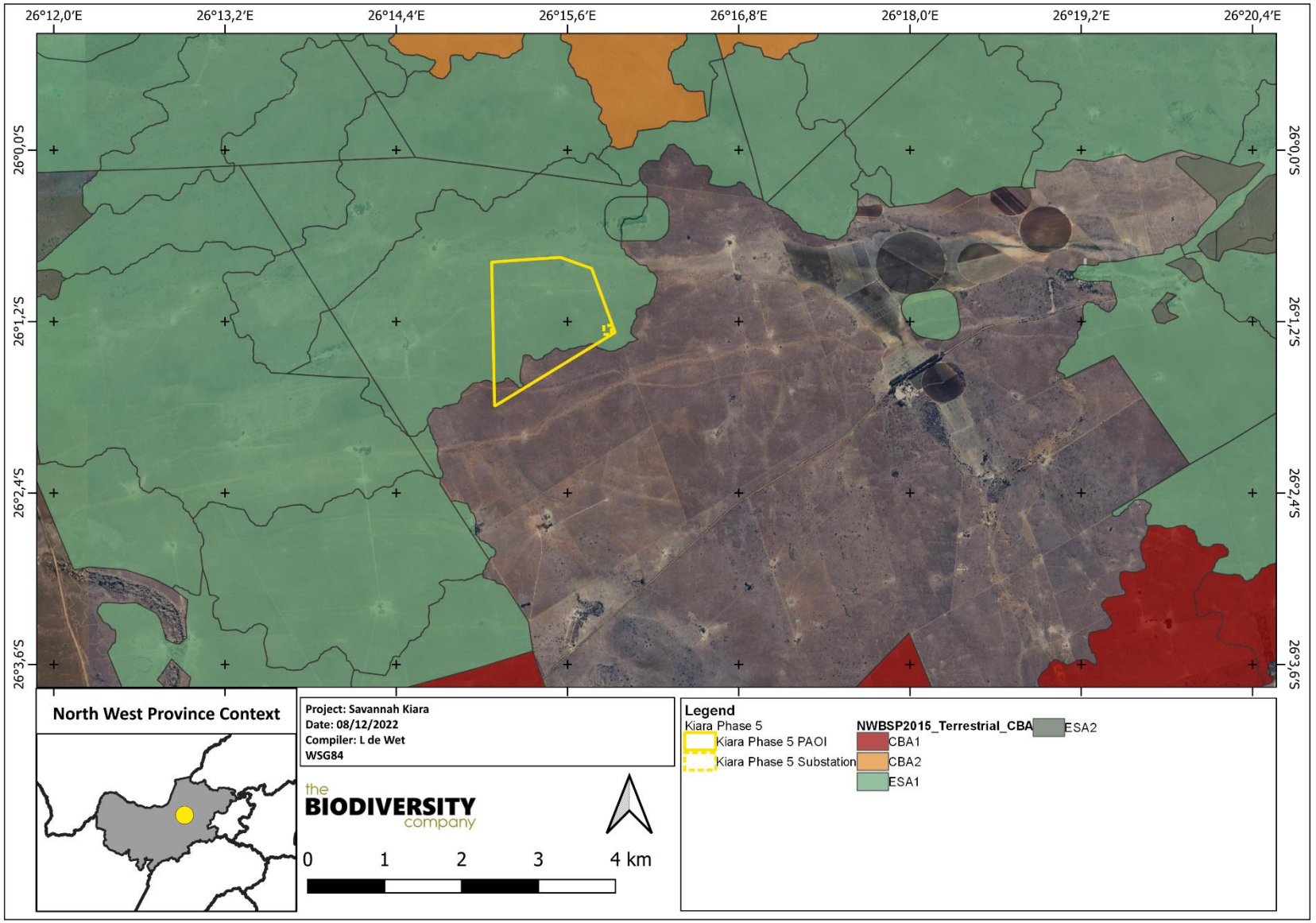

Figure 3-1 Map illustrating the location of Critical Biodiversity Areas proximal to the Area of Influence

3.1.2 Protected Areas

According to the protected area spatial datasets from SAPAD (2021), the proposed PV development is not located within any protected areas (Figure 3-2). However, the PAOI is located approximately 1.2 km from the Marico Biosphere Reserve and approximately 4 km from the Rall Broers Private Nature Reserve.

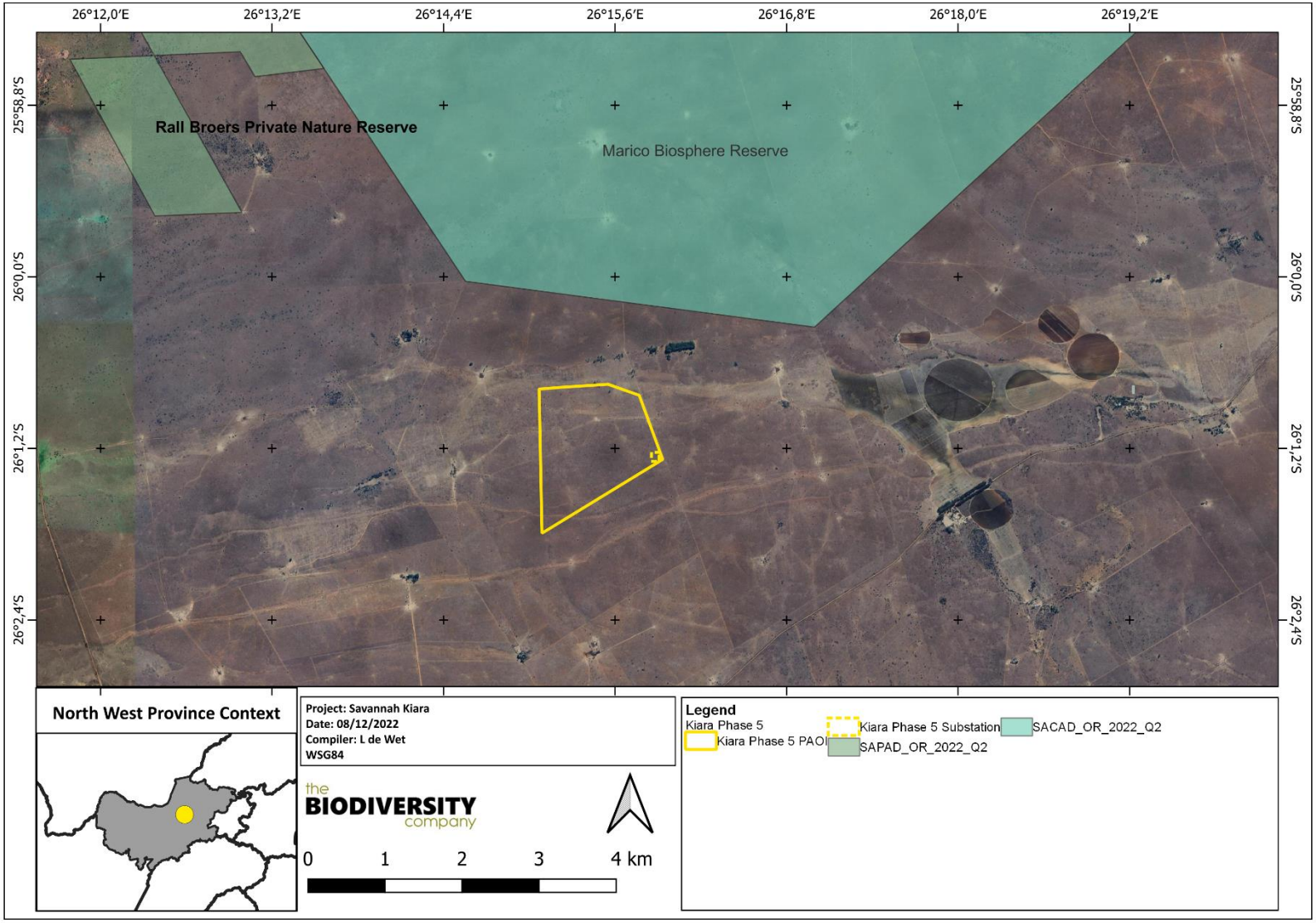

Figure 3-2 Map illustrating the location of Protected Areas proximal to the PAOI

3.1.3 Coordinated Avifaunal Roadcount (CAR)

The Animal Demographic Unit (ADU)/Cape bird club pioneered avifaunal roadcount of larger birds in 1993 in South Africa. Originally it was started to monitor the Blue Crane *Grus paradiseus* and Denham's/Stanley's Bustard *Neotis denhami*. Today it has been expanded to the monitoring of 36 species of large terrestrial birds (cranes, bustards, korhaans, storks, Secretarybird (*Sagittarius serpentarius*) and Southern Bald Ibis (*Geronticus calvus*)) along 350 fixed routes covering over 19 000 km. Twice a year, in midsummer (the last Saturday in January) and midwinter (the last Saturday in July), roadcounts are carried out using this standardised method. These counts are important for the conservation of these larger species that are under threat due to loss of habitat through changes in land use, increases in crop agriculture and human population densities, poisoning as well as man-made structures like powerlines. With the prospect of wind and solar farms to increase the use of renewable energy sources monitoring of these species is most important (CAR, 2020). There are no CAR routes near the project area.

3.1.4 Coordinated Waterbird Count

The ADU launched the Coordinated Waterbird Counts (CWAC) project in 1992 as part South Africa's commitment to International waterbird conservation. Regular mid-summer and mid-winter censuses are done to determine the various features of water birds including population size, how waterbirds utilise water sources and determining the heath of wetlands. For a full description of CWAC please refer to http://cwac.birdmap.africa/about.php. There are no Coordinated Waterbird Count Areas near to the project area.

3.1.5 Hydrological Context

The proposed development is not located within a SWSA.

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was released with the National Biodiversity Assessment (NBA) 2018. Ecosystem threat status (ETS) of ecosystem types is based on the extent to which each river ecosystem type had been altered from its natural condition. Ecosystem types are categorised as CR, EN, VU or LT. Critically Endangered, EN and VU ecosystem types collectively referred to as 'threatened' (Van Deventer *et al*., 2019; Skowno *et al*., 2019). No wetlands or rivers are present within the study area (Figure 3-3).

The National Freshwater Ecosystem Priority Areas (NFEPAs) (Driver *et al*., 2011) spatial data has been incorporated in the above mentioned SAIIAE spatial data set. They are included here as the database is intended to be conservation support tools and are envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act (NEM:BA) biodiversity goals (Nel *et al.,* 2011). The NFEPA spatial layer indicates that there are no NFEPA rivers or wetlands associated with the project site (Figure 3-4).

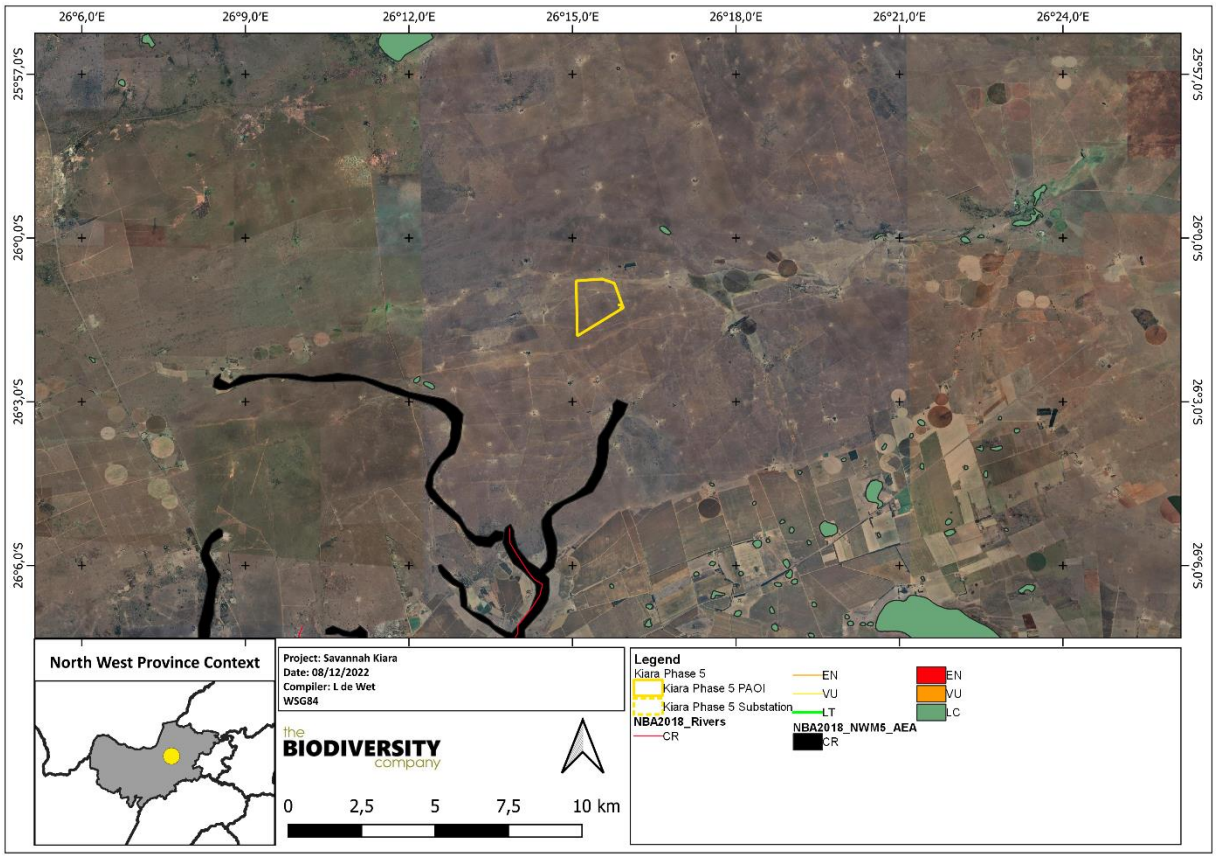

Figure 3-3 The PAOI in relation to the water resources (NBA 2018)

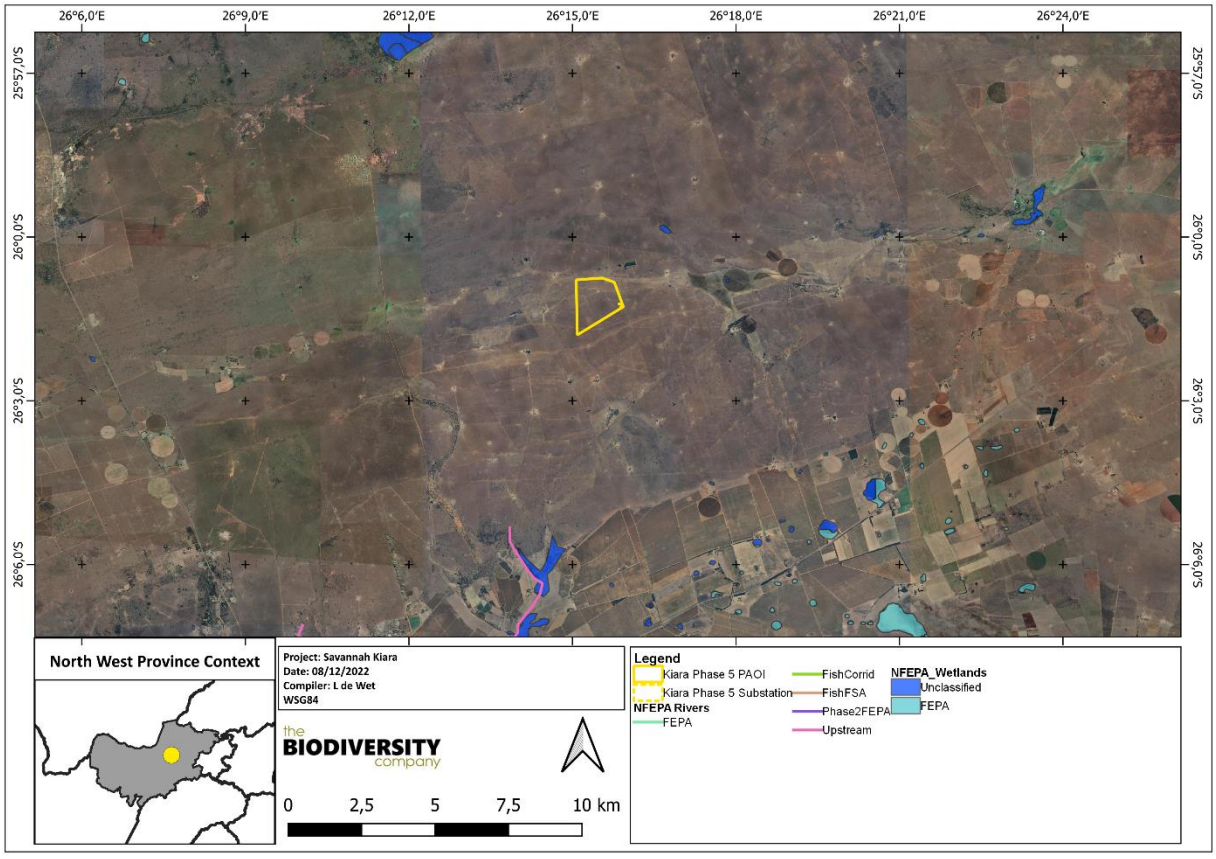

Figure 3-4 The PAOI in relation to the NFEPA wetlands and rivers

3.1.6 Strategic Transmission Corridors (EGI)

On the 16 February 2018 minister Edna Molewa published Government Notice No. 113 in Government Gazette No. 41445 which identified 5 strategic transmission corridors important for the planning of electricity transmission and distribution infrastructure as well as procedure to be followed when applying for environmental authorisation for electricity transmission and distribution expansion when occurring in these corridors.

On 29 April 2021, Minister Barbara Dallas Creecy published Government Notice No. 383 in Government Gazette No. 44504, which expanded the eastern and western transmission corridors and gave notice of the applicability of the application procedures identified in Government Notice No. 113, to these expanded corridors. More information on this can be obtained from https://egis.environment.gov.za/egi.

The PAOI is located within an EGI corridor (Figure 3-5).

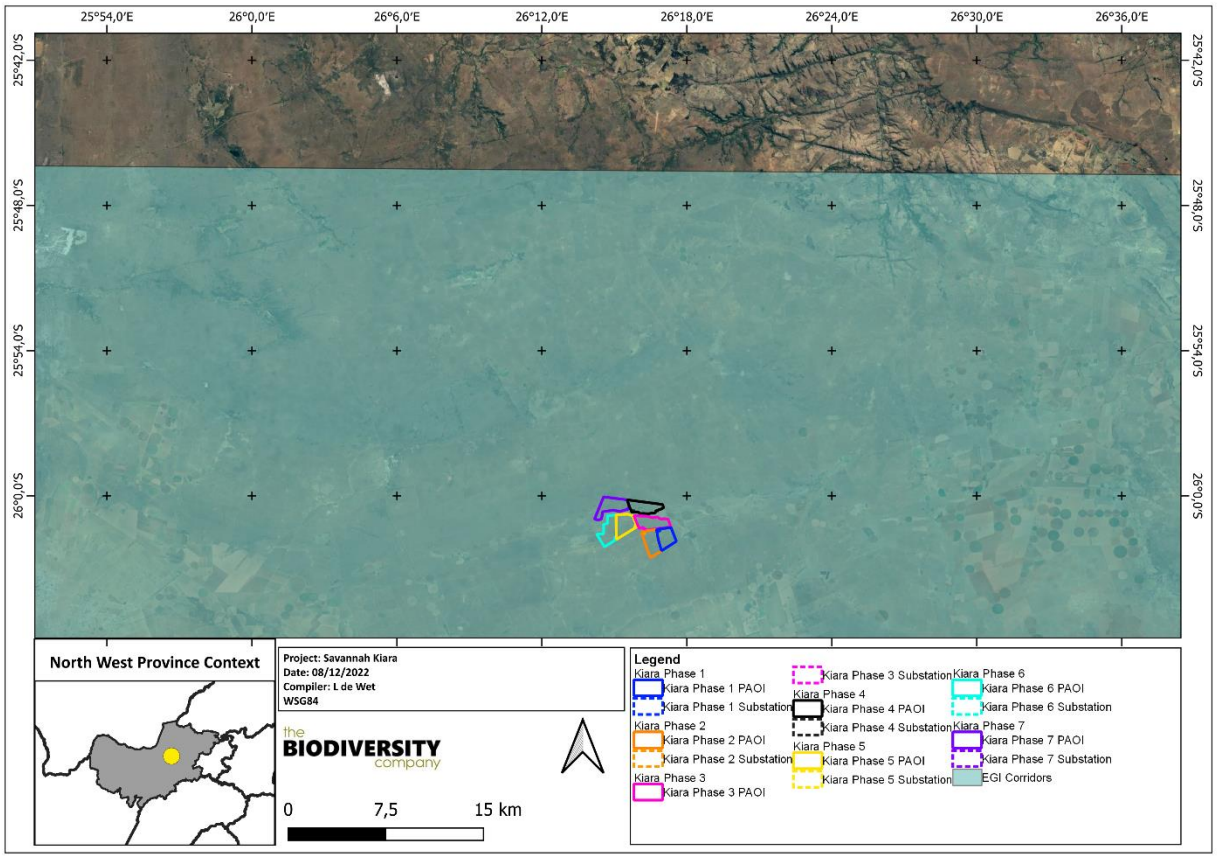

Figure 3-5 The PAOI in relation to EGI corridors

3.1.7 Renewable Energy Development Zones (REDZ)

In 2018 the Government Notice No. 114 in Government Gazette No. 41445 was published where 8 renewable energy development zones important for the development of large scale wind and solar photovoltaic facilities were identified. In 2021 an additional 3 sites were included. The REDZs were identified through the undertaking of 2 Strategic Environmental Assessments. More detailed information can be obtained from https://egis.environment.gov.za/redz. Information here includes the Government Notice No. 142, 144 and 145 in Government Gazette No. 44191 that specifies the procedures to be followed when applying for environmental authorisation for electricity transmission or distribution infrastructure for large-scale wind and solar photovoltaic energy facilities in these REDZs.

The project does not occur within a REDZ area.

The Renewable Energy Database (http://egis.environment.gov.za/), shows that there are several approved projects to the west of the project area and one to the south, another project to the west is in process (Figure 3-6). This increases the overall cumulative impact on the avifauna in the area.

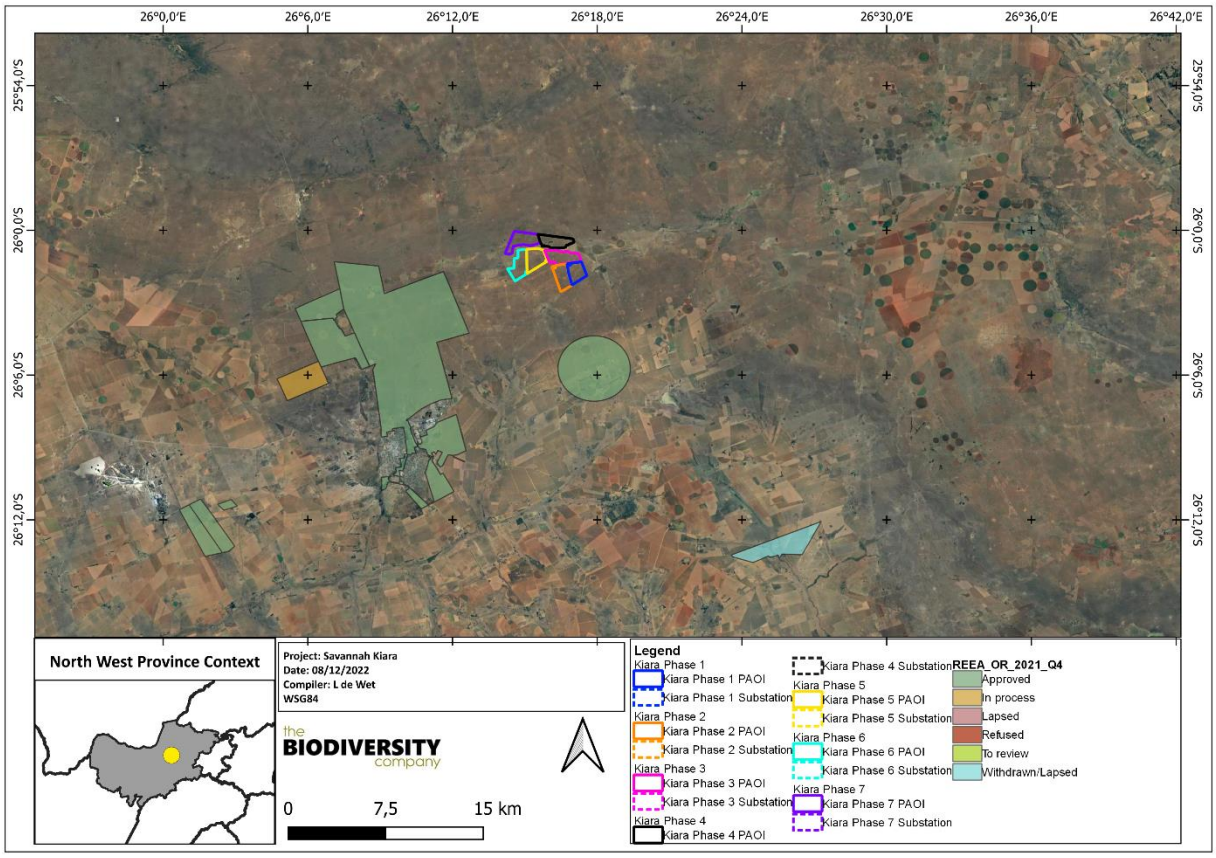

Figure 3-6 The Renewable Energy Development Zone and Database associated with the PAOI

3.2 South African Bird Atlas Project 2

Based on the South African Bird Atlas Project, Version 2 (SABAP2) database, 247 bird species have the potential to occur in the vicinity of the assessment area. The full list of potential bird species is provided in Appendix A, the list was compiled from all the pentads (12) along the project area (255_2605, 2550_2615, 2600_2605, 2555_2620, 2600_2620, 2555_2610, 2605_2605, 2605_2610, 2605_2620, 2600_2605, 2605_2605 and 2605_2610). Of the potential bird species, fourteen (14) species are listed as SCC either on a regional or global scale (Table 3-2). The risks of collisions with powerlines, fences, electrocutions and habitat loss for the species of conservation concern is also indicated below. These risks are based on literature by EWT and Eskom on the association between birds and powerlines, Jenkins *et al*, 2017 and Birdlife, 2015.

Table 3-2 List of bird SCC that are expected to occur in close vicinity to the assessment area and their risk rating.

Scientific name	Common name	Conservation Status		Likelihood of Occurrence	Collisions	Electrocutions	Disturbance/Habitat Loss
		Regional (SANBI, 2016)	IUCN (2021)				
Calidris ferruginea	Sandpiper, Curlew	LC	NT	Low			
Coracias garrulus	Roller, European	NT	LC	Moderate			
Falco biarmicus	Falcon, Lanner	VU	LC	High	X	X	
Falco vespertinus	Flacon, Red-footed	NT	NT	Moderate	X		
Glareola nordmanni	Pratincole, Black-winged	NT	NT	Low			
Gyps africanus	Vulture, White-backed	CR	CR	High	X	X	X
Gyps coprotheres	Vulture, Cape	EN	EN	Confirmed	X	X	X
Oxyura maccoa	Duck, Maccoa	NT	VU	Low			
Phoenicopterus minor	Flamingo, Lesser	NT	NT	Low	X		X
Phoenicopterus ruber	Flamingo, Greater	NT	LC	Confirmed	X		X
Polemaetus bellicosus	Eagle, Martial	EN	EN	Moderate	X	X	X
Rostratula benghalensis	Painted-snipe, Greater	NT	LC	Low			
Sagittarius serpentarius	Secretarybird	VU	EN	Moderate	X		X
Torgos tracheliotos	Vulture, Lappet-faced	EN	EN	High	X	X	X

Calidris ferruginea (Curlew Sandpiper) is migratory species which breeds on slightly elevated areas in the lowlands of the high Arctic, and may be seen in parts of South Africa during winter. During winter, the species occurs at the coast, but also inland on the muddy edges of marshes, large rivers and lakes (both saline and freshwater), irrigated land, flooded areas, dams and saltpans (IUCN, 2017). Due to the absence of these habitat types within the project area the likelihood of occurrence of this species was rated as low.

Coracias garrulous (European Roller) is a winter migrant from most of South-central Europe and Asia occurring throughout sub-Saharan Africa (IUCN, 2017). The European Roller has a preference for bushy plains and dry savannah areas (IUCN, 2017). There is habitat present for this species within the project area and the likelihood of occurrence is moderate.

Falco biarmicus (Lanner Falcon) is native to South Africa and inhabits a wide variety of habitats, from lowland deserts to forested mountains (IUCN, 2017). They may occur in groups up to 20 individuals but have also been observed solitary. Their diet is mainly composed of small birds such as pigeons and francolins. Due to the presence of suitable habitat in the area, the likelihood of occurrence is rated as high.

Falco vespertinus (Red-footed Falcon) is known to breed from eastern Europe and northern Asia to north-western China, heading south in the non-breeding season to southern Angola and southern Africa. Within southern Africa it is locally uncommon to common in Botswana, northern Namibia, central Zimbabwe and the area in and around Gauteng, South Africa (Hockey et al, 2005). The habitat it generally prefers is open habitats with scattered trees, such as open grassy woodland, wetlands, forest fringes and croplands. Many of these habitats are present in the project area and thus the likelihood of occurrence is rated as moderate.

Glareola nordmanni (Black-winged Pratincole) is a migratory species which is listed as NT both globally and regionally. This species has a very large range, breeding mostly in Europe and Russia, before migrating to southern Africa. Overall population declines of approximately 20% for this species are suspected (IUCN, 2017). This species generally occurs near water and damp meadows, or marshes overgrown with dense grass. Due to its migratory nature, this species will only be present in South Africa for a few months during the year and will not breed locally. Due to the lack of suitable habitat within the project area, the likelihood of occurrence for this species is low.

Gyps africanus (White-backed Vulture) is listed as CR both regionally and globally. It occurs in Africa south of the Sahel and is widespread in southern Africa. This is a resident bird with long distance movement and occurs in lightly wooded arid savanna including Mopane woodland and does not occur in forests, true deserts and usually absent within the karoo. This species roosts at night usually in tall acacias as well as on power pylons. It is a scavenger generally feeding on large carcasses. Due to the proximity to a vulture restaurant, the likelihood of occurrence of this species is high.

Gyps coprotheres (Cape Vulture) is listed as Endangered (EN) on both a regional and global scale. Cape Vultures are long-lived carrion-feeders specialising on large carcasses, they fly long distances over open country, although they are usually found near steep terrain, where they breed and roost on cliffs (IUCN, 2017). This species has been recorded from the project area.

Oxyura maccoa (Maccoa Duck) has a large northern and southern range, South Africa is part of its southern distribution. During the species' breeding season, it inhabits small temporary and permanent inland freshwater lakes, preferring those that are shallow and nutrient-rich with extensive emergent vegetation such as reeds (*Phragmites spp*.) and cattails (*Typha spp*.) on which it relies for nesting (IUCN, 2017). The likelihood of occurrence of this species in the project area was rated as low due to the absence of suitable habitat.

Phoenicopterus minor (Lesser Flamingo) is listed as NT on a global and regional scale whereas *Phoenicopterus roseus* (Greater Flamingo) is listed as NT on a regional scale only. Both species have

similar habitat requirements and the species breed on large undisturbed alkaline and saline lakes, salt pans or coastal lagoons, usually far out from the shore after seasonal rains have provided the flooding necessary to isolate remote breeding sites from terrestrial predators and the soft muddy material for nest building (IUCN, 2017). Due to the absence of its preferred habitat within the project area, the likelihood of occurrence is low however, this species is highly likely to occur in the proximal water resource habitat.

Phoenicopterus roseus (Greater Flamingo) is listed as NT on a regional scale only. This species breed on large undisturbed alkaline and saline lakes, salt pans or coastal lagoons, usually far out from the shore after seasonal rains have provided the flooding necessary to isolate remote breeding sites from terrestrial predators and the soft muddy material for nest building (IUCN, 2017). This species has been recorded within the water resources habitat in proximity to the project site.

Polemaetus bellicosus (Martial Eagle) is listed as EN on a regional scale and VU on a global scale. This species has an extensive range across much of sub-Saharan Africa, but populations are declining due to deliberate and incidental poisoning, habitat loss, reduction in available prey, pollution and collisions with power lines (IUCN, 2017). It inhabits open woodland, wooded savanna, bushy grassland, thorn-bush and, in southern Africa, more open country and even sub-desert (IUCN, 2017). With the presence of suitable habitat in the project area but an absence of large trees for roosting and nesting this species may only use the site for foraging and thus there is a moderate chance of this species occurring.

Rostratula benghalensis (Greater Painted-snipe) shows a preference for recently flooded areas in shallow lowland freshwater temporary or permanent wetland, it has a wide range of these freshwater habitats which they occur in, in this case, sewage pools, reservoirs, mudflats overgrown with marsh grass which is not present within the project area, hence the likelihood of occurrence is low.

Sagittarius serpentarius (Secretarybird) occurs in sub-Saharan Africa and inhabits grasslands, open plains, and lightly wooded savanna. It is also found in agricultural areas and sub-desert (IUCN, 2017). The majority of the study area comprises grassland, with large areas of open plains suitable for the occurrence of this species. Likelihood of occurrence is rated as moderate due to the presence of suitable habitat.

Torgos tracheliotus (Lappet-faced Vulture) is listed as EN, both on a regional and global level. Only a small, very rapidly declining population remains, owing primarily to poisoning and persecution, as well as ecosystem alterations (IUCN, 2017). The species inhabits dry savanna, arid plains, deserts and open mountain. It ranges widely when foraging and is mainly a scavenger, feeding predominantly on any large carcasses or their remains. This rare species is likely to be resident within the project area due to the presence of the vulture restaurant. Thus, the likelihood of occurrence is high.

4 Field Assessment Results

4.1 Avifauna Species

Sixty-eight (68) bird species were recorded in and around the PAOI with 61 species recorded from point counts and a 7 species recorded as incidental sightings (Figure 4-3). The assessment areas can be seen in Figure 4-1. The full list of species recorded in point samples, their threat status, guild and location observed is shown in Appendix B. The full species list, including incidental sightings, can be seen in Appendix C. A portion of the avifauna species recorded from the study area can be seen in Figure 4-3. Two SCC were recorded from the sample sites (not within the project area): Greater Flamingo (*Phoenicopterus ruber*) and Cape Vulture (*Gyps coprotheres*).

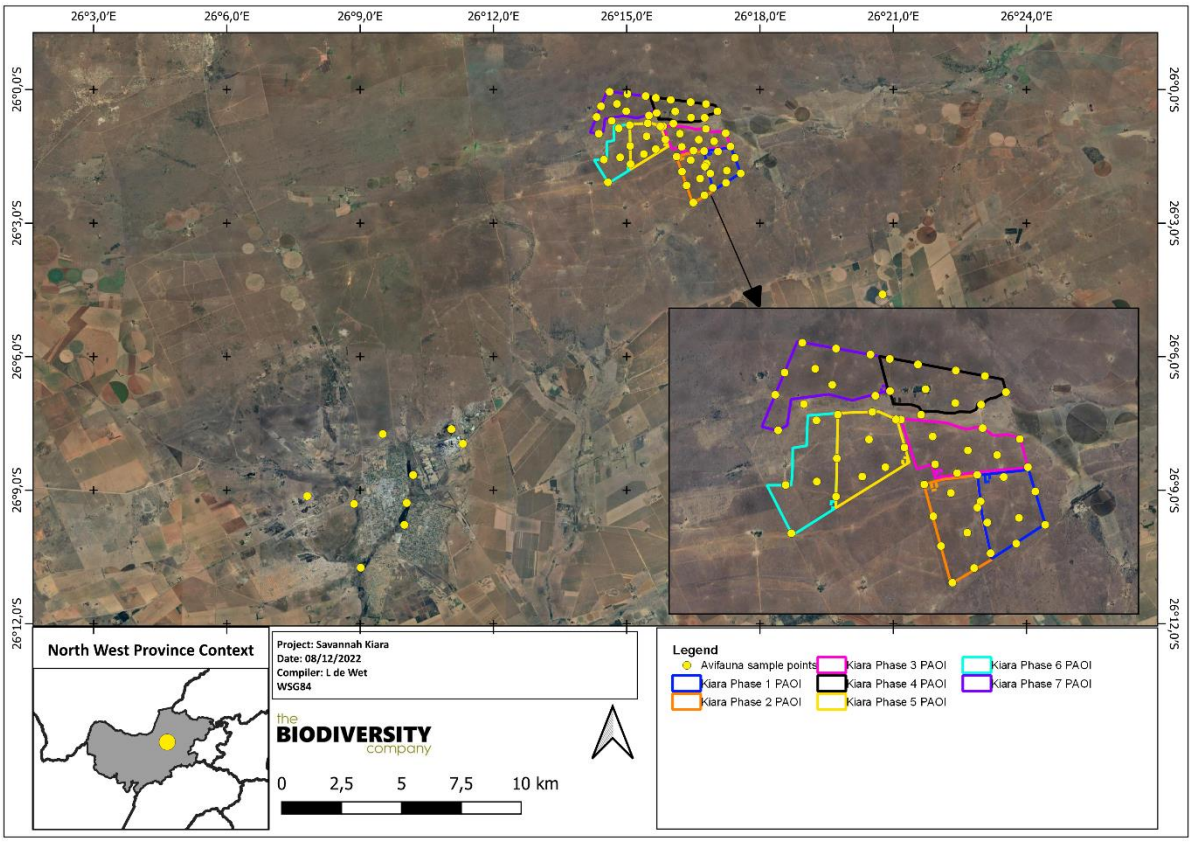

Figure 4-1 Map illustrating the location of sample points

4.1.1 Dominant species

The table below provides a list of the dominant species together with the frequency with which each species appeared in the point count samples. The data shows that the Red-knobbed Coot (*Fulica cristata*), Greater Flamingo (*Phoenicopterus ruber*) and Red-billed Teal (*Anas erythrorhyncha*) were the most common species recorded in point counts.

Table 4-1 ***Dominant avifaunal species within the assessment area as defined as those species whose relative abundances cumulatively account for more than 74% of the overall abundance shown alongside the frequency with which a species was detected among point counts.***

Scientific Name	Common Name	relative abundance	frequency
Fulica cristata	Red-knobbed Coot	0,098	38,462
Phoenicopterus ruber	Greater Flamingo	0,055	7,692
Anas erythrorhyncha	Red-billed Teal	0,055	7,692
Vanellus armatus	Blacksmith Lapwing	0,055	7,692
Ploceus velatus	Southern Masked Weaver	0,049	38,462
Afrotis afraoides	Northern Black Korhaan	0,038	53,846
Cisticola aridulus	Desert Cisticola	0,038	53,846
Cisticola tinniens	Levaillant's Cisticola	0,033	46,154
Myrmecocichla formicivora	Ant-eating Chat	0,033	30,769
Euplectes orix	Southern Red Bishop	0,027	38,462
Prinia flavicans	Black-chested Prinia	0,027	38,462
Acrocephalus gracilirostris	Lesser Swamp Warbler	0,022	30,769
Gallinula chloropus	Common Moorhen	0,022	30,769
Bostrychia hagedash	Hadada Ibis	0,022	30,769
Scleroptila gutturalis	Orange River Francolin	0,022	15,385
Corvus albus	Pied Crow	0,022	30,769
Passer melanurus	Cape Sparrow	0,016	15,385
Spilopelia senegalensis	Laughing Dove	0,016	23,077
Acridotheres tristis	Common Myna	0,016	23,077
Chrysococcyx caprius	Diederik Cuckoo	0,016	23,077
Cisticola textrix	Cloud Cisticola	0,016	23,077
Cisticola juncidis	Zitting Cisticola	0,016	23,077
Crithagra atrogularis	Black-throated Canary	0,011	15,385
Prinia subflava	Tawny-flanked Prinia	0,011	15,385
Streptopelia semitorquata	Red-eyed Dove	0,011	15,385

4.1.2 Trophic Guilds

Trophic guilds are defined as a group of species that exploit the same class of environmental resources in a similar way (González-Salazar *et al,* 2014). The guild classification used in this assessment is as per González-Salazar *et al* (2014); they divided avifauna into 13 major groups based on their diet, habitat, and main area of activity. The analysis of the major avifaunal guilds reveals that the species composition during the survey was dominated by insectivores, followed by insectivores and omnivores (Figure 4-2). The feeding groups is a healthy mix of species and illustrates the largely undisturbed nature of the assessment area.

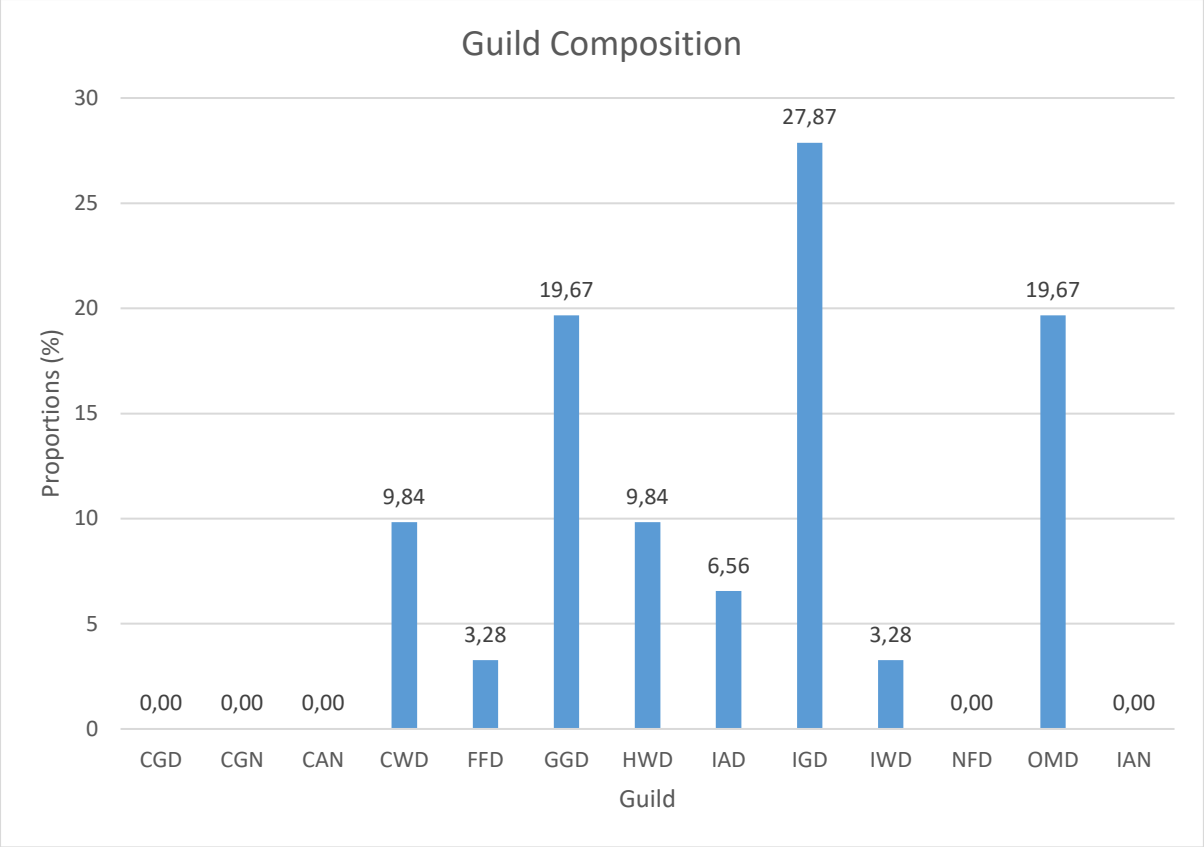

Figure 4-2 ***Avifaunal trophic guilds for the survey. CGD, carnivore ground diurnal; CGN, carnivore ground nocturnal, CAN, carnivore air nocturnal, CWD, carnivore water diurnal; FFD, frugivore foliage diurnal; GGD, granivore ground diurnal; HWD, herbivore water diurnal; IAD, insectivore air diurnal; IGD, insectivore ground diurnal; IWD, insectivore water diurnal; NFD, nectivore foliage diurnal; OMD, omnivore multiple diurnal; IAN, Insectivore air nocturnal.***

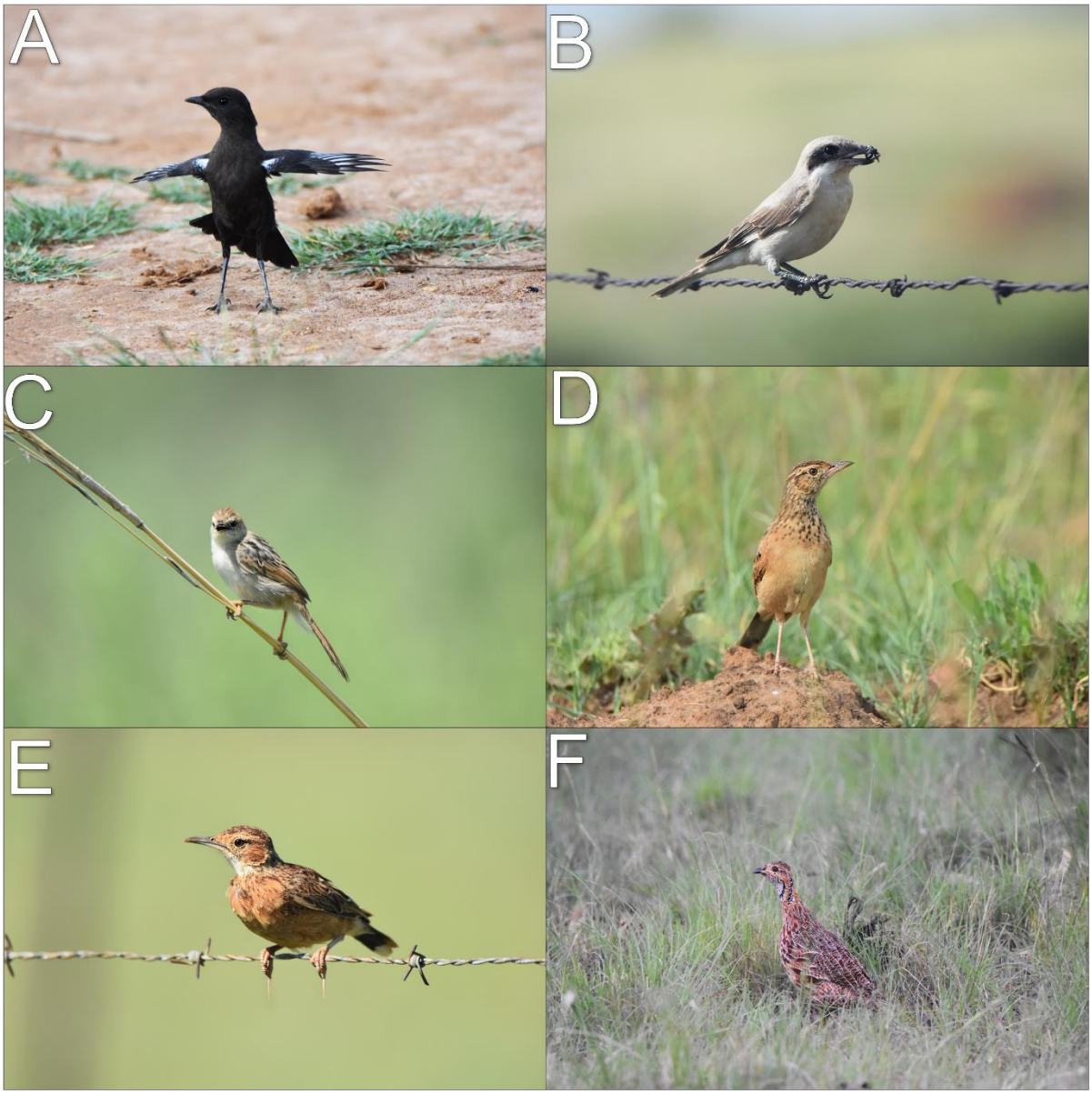

Figure 4-3 ***Photographs illustrating a portion of the avifauna species recorded in the assessment area: A: Ant-eating Chat (Myrmecocichla formicivora), B: Lesser Grey Shrike (Lanius minor), C: Levaillant's Cisticola (Cisticola tinniens), D: Rufous-naped Lark (Mirafra Africana), E: Spike-heeled Lark (Chersomanes albofasciata) and F: Orange-river Francolin (Scleroptila gutturalis).***

4.2 Species of Conservation Concern

Two SCC were recorded from the point count surveys (not within the PAOI) but are likely to fly over the PAOI and thus likely to be affected by impacts associated with the proposed PV facility (Table 4-2, Figure 4-4 and Figure 4-5).

Table 4-2 Avifauna SCC recorded during the site visit

Scientific name	Common name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Gyps coprotheres	Vulture, Cape	EN	EN
Phoenicopterus ruber	Flamingo, Greater	NT	LC

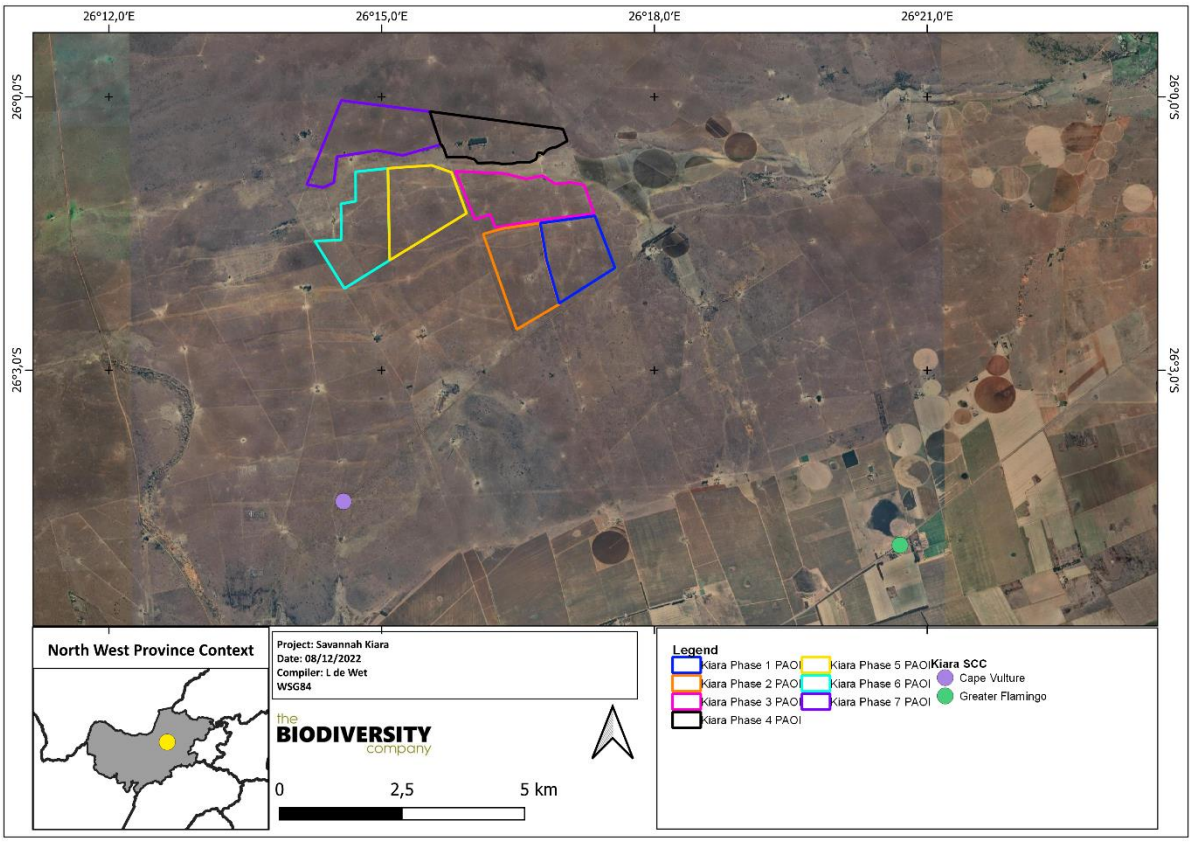

Figure 4-4 Map indicating the location of the SCC recorded from the PAOI and surrounds.

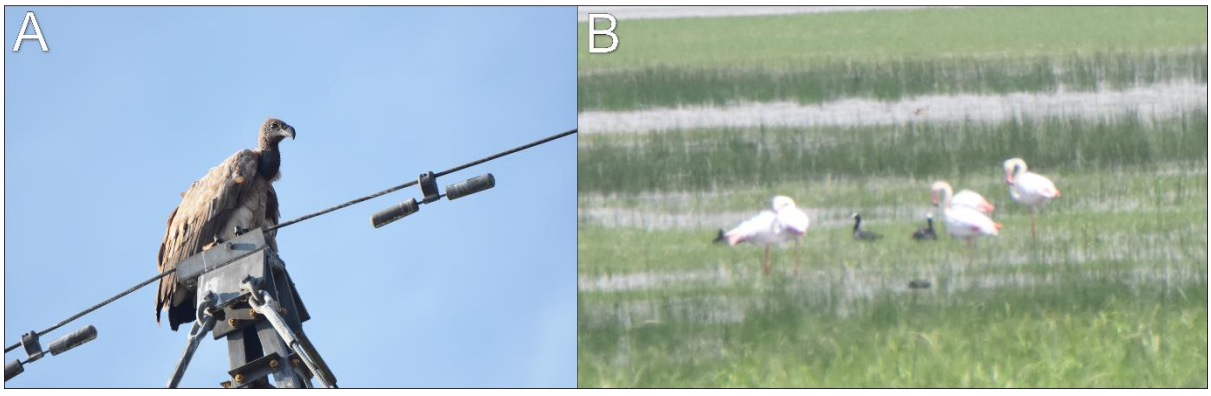

Figure 4-5 Photographs illustrating the SCC recorded for the PAOI and surrounds. A: Cape Vulture (Gyps coprotheres) and B: Greater Flamingo (Phoenicopterus roseus).

Gyps coprotheres (Cape Vulture) is listed as Endangered (EN) on both a regional and global scale. Cape Vultures are long-lived carrion-feeders specialising on large carcasses, they fly long distances

over open country, although they are usually found near steep terrain, where they breed and roost on cliffs (IUCN, 2017). This species has been recorded from the project area.

Phoenicopterus roseus (Greater Flamingo) is listed as NT on a regional scale only. This species breeds on large undisturbed alkaline and saline lakes, salt pans or coastal lagoons, usually far out from the shore after seasonal rains have provided the flooding necessary to isolate remote breeding sites from terrestrial predators and the soft muddy material for nest building (IUCN, 2017). This species has been recorded within the water resources habitat in proximity to the project site.

4.3 Risk Species

Several species were found that would be regarded as high-risk species (Table 4-3). Risk species are species that would be sensitive to habitat loss, that are regarded as collision prone species and species that would have a high electrocution risk. These could be species that are not necessarily SCC but would be impacted on by this development. Even though the panels do not pose an extensive collision risk for larger birds, powerlines associated with the infrastructure, guidelines (anchor lines) and connection lines do pose a risk. The fence could also pose a collision risk for various species as described in section 8. A map indicating the location of many of these species can be seen in Figure 4-6 and photographs of some of these species can be seen in Figure 4-7.

Table 4-3 At risk species found in the surveys

Scientific Name	Common name	Collisions	Electrocution	Disturbance/Habitat Loss
Accipiter ovampensis	Ovambo Sparrowhawk	X		
Anas erythrorhyncha	Red-billed Teal	X		
Anas undulata	Yellow-billed Duck	X		
Circus pygargus	Montagu's Harrier	X		
Gyps coprotheres	Cape Vulture	X	X	X
Microcarbo africanus	Reed Cormorant			
Phoenicopterus ruber	Greater Flamingo	X		X
Spatula hottentota	Blue-billed Teal	X		
Tyto alba	Western Barn Owl		X	
Bostrichya hagedash	Hadeda Ibis	X		
Corvus albus	Pied Crow	X		

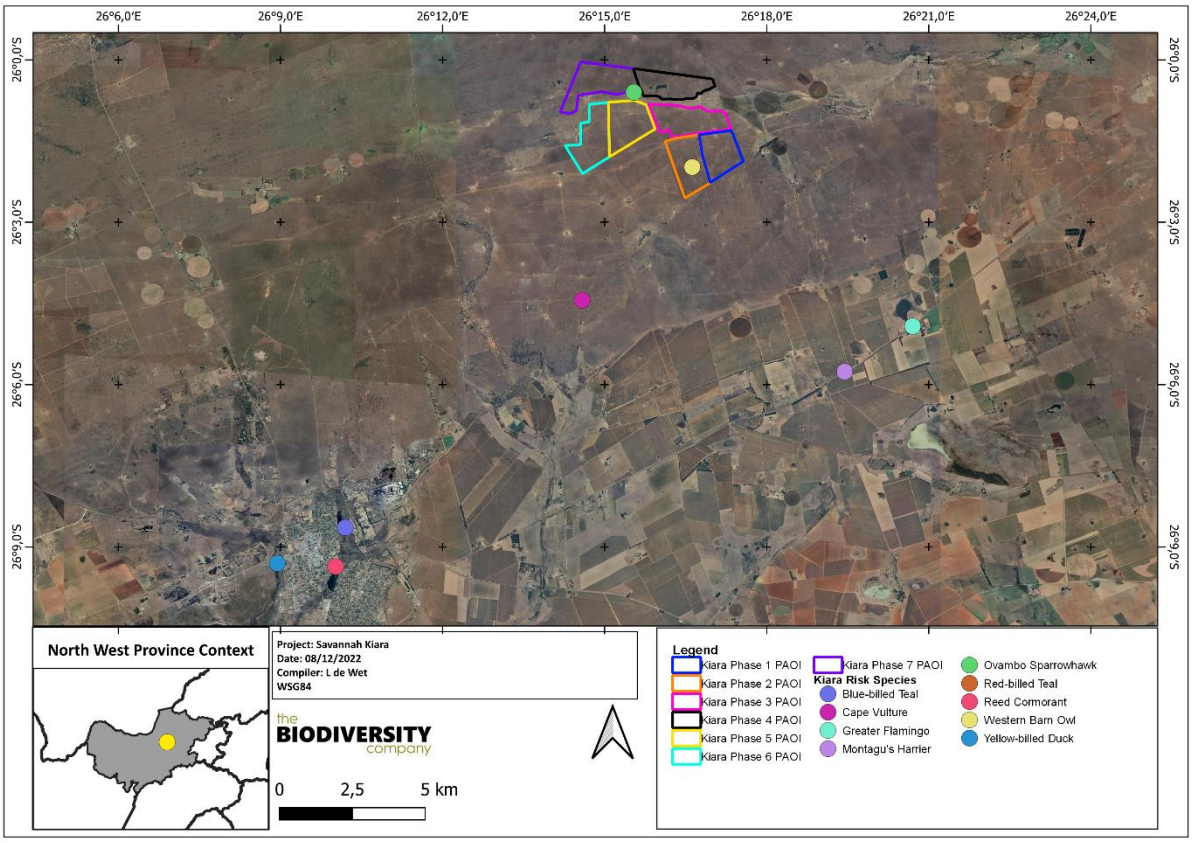

Figure 4-6 ***Map indicating the location a portion of the risk species recorded from the PAOI and surrounds.***

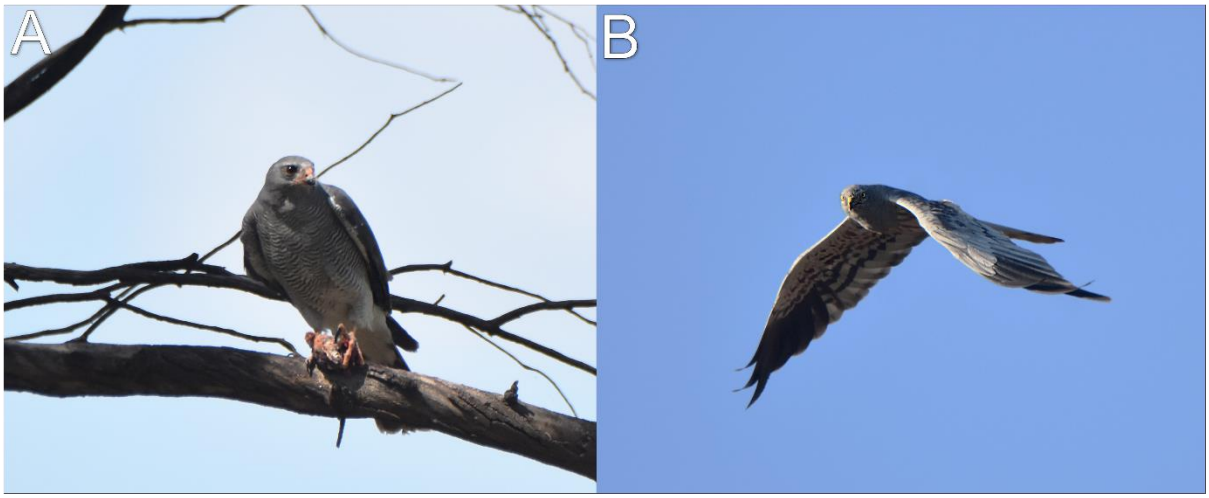

Figure 4-7 ***Photographs illustrating a portion of the risk species recorded from the PAOI and surrounds. A: Ovambo Sparrowhawk (Accipiter ovampensis) and B: Montagu's Harrier (Circus pygargus).***

4.3.1 Flight and Nest Analysis

Observing and monitoring flight paths and nesting sites of SCC and/or priority species are important in ascertaining habitat sensitivity and evaluating the impact risk significance of any proposed development. Flight analysis is also important for species that exhibit dual movement between roosting and foraging sites to prevent the risk of collision with infrastructure. However, due to the limited survey time, no flight analysis was undertaken for these groups.

No nests of SCC were observed. The low number of species recorded nesting within the PAOI should be interpreted with caution because the survey was undertaken using point surveys, and the full assessment area was not covered. It is postulated that more species are likely to be nesting if an assessment of the full PAOI is done (walked over). One nest, that of a Western Barn Owl (*Tyto alba*) was recoded from the PAOI and surrounds (Figure 4-8, Figure 4-9).

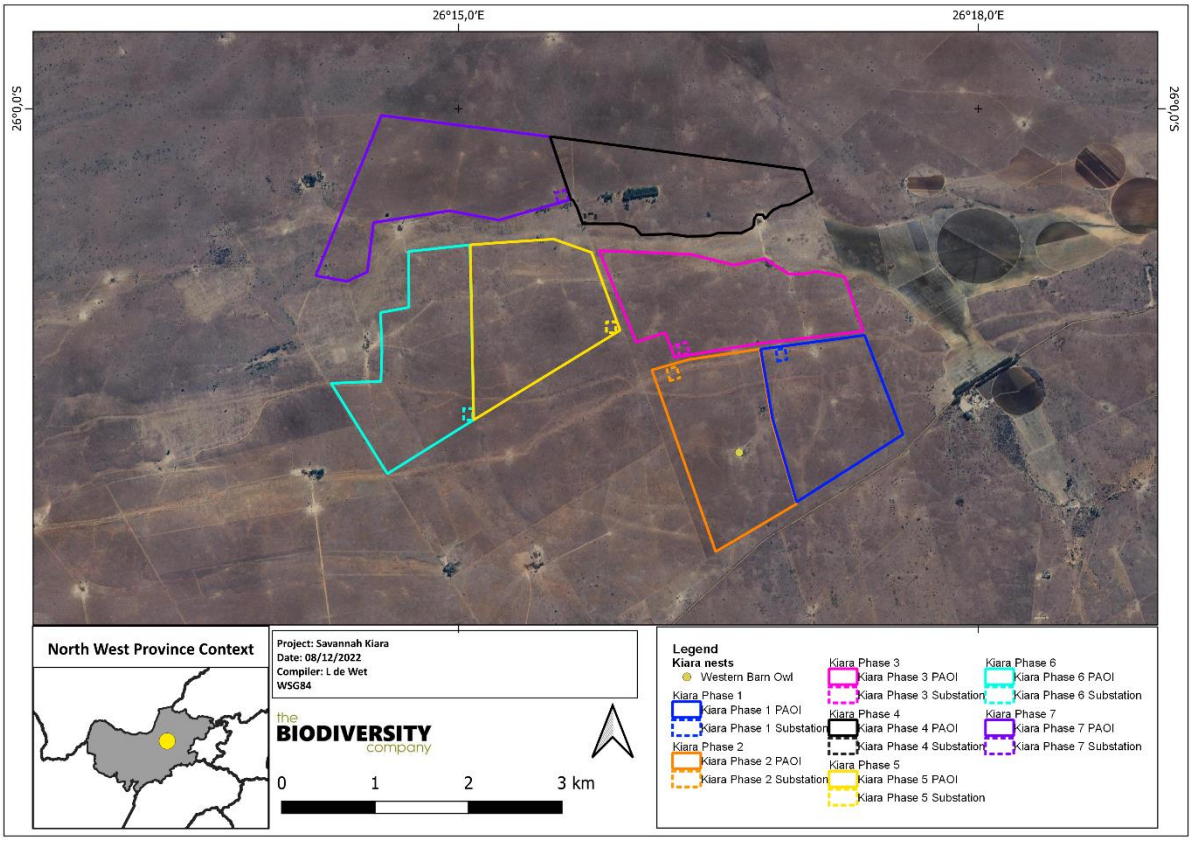

Figure 4-8 Map indicating the location of nests recorded from the PAOI and surrounds.

Figure 4-9 Western Barn Owl nesting site

5 Fine-Scale Habitat Use

Fine-scale habitats within the landscape are important in supporting a diverse avifauna community as they provide differing nesting, foraging and reproductive opportunities.

The main habitat types identified across the Project Area of Influence were initially delineated largely based on aerial imagery, and these main habitat types were then refined based on the field coverage and data collected during the survey. Four (4) habitats were delineated in total within the site and surrounds, and these are summarised in Table 5-1 below, along with a brief description and an outline of the key ecosystem services provided by each (Figure 5-1 and Figure 5-2).

Table 5-1 Summary of the habitat types delineated within the Project Area of Influence and their key ecosystem services provided

Habitat	Description	Key Ecosystem Services
Transformed	Little to no functional vegetation remaining. Characterised by development and cleared land.	Foraging for common fauna species.
Degraded Grassland	Grassland vegetation of a low functionality that has been historically impacted by the edge effects of nearby development, heavy grazing, erosion, and human and vehicle ingress.	Foraging for fauna species, erosion control and basic nutrient cycling and grazing land.
Grassland	Functional grassland vegetation that may be considered intact habitat, important for supporting key ecosystem services and providing habitat connectivity between protected areas and CBAs.	Foraging and nesting resources for fauna, including potential SCC. Important erosion control and soil nutrient cycling processes. Habitat connectivity and carbon sequestration.
Bush Clumps	Functional bushclump vegetation forming isolated clumps that provide niche habitats and islands for certain species. Dominated by thorny shrubs.	Foraging and nesting resources for fauna, including potential SCC. Important erosion control and soil nutrient cycling processes and carbon sequestration.

Transformed areas are those areas with no natural vegetation remaining consisting mainly of man-made structures with some areas of heavily invaded (with *Eucalyptus* spp.) grassland. These areas host species that occur in disturbed habitats such as the Cape Sparrow (*Passer melanurus*), House Sparrow (*Passer domesticus*), Speckeld Pigeon (*Columba guinea*), Common Myna (*Acridotheres tristis*), Dark-capped Bulbul (*Pycnonotus tricolor*), Laughing Dove (*Spilopelia senegalensis*), and others.

Grassland habitat comprised grassland with interspersed bushes and trees some of which formed clumps (described as bush clumps). Grassland provides foraging for seed-eating species as well as roosting areas for some species. This grassland habitat hosts species such as Pin-tailed Whydah (*Vidua macroura*), African Stonechat (*Saxicola torquatus*), Common Waxbill (*Estrilda astrild*), Ant-eating Chat (*Myrmecochla formicivore*), Northern Black Korhaan (*Afrotis afraoides*) and Eastern Clapper Lark (*Mirafra fasciolata*) among others.

Bushclumps provide areas of habitat for more secretive birds as well as foraging and nesting sites for small birds. Species recorded in these areas include Tawny-flanked Prinia (*Prinia subflava*), Red-faced Mousebird (*Urocolius indicus*), Black-chested Prinia (*Prinia flavicans*), Bokmakierie (*Telophorus zeylonus*), White-backed Mousebird (*Colius colius*) and Acacia Pied Barbet (*Tricholaema leucomelas*).

Water resources outside of the PAOI host species that may be found flying over the study site including Red-billed Teal (*Anas erythrorhyncha*), Red-knobbed Coot (*Fulica cristata*), Common Moorhen (*Gallinula chloropus*), Great Crested Grebe (*Podiceps cristatus*) and Reed Cormorant (*Microcarbo africanus*).

Figure 5-1 ***Photographs illustrating examples of the habitat types present within the site. A and B: Transformed areas, C: Degraded grassland, D and E: Grassland with scattered shrubs and F: Bushclumps.***

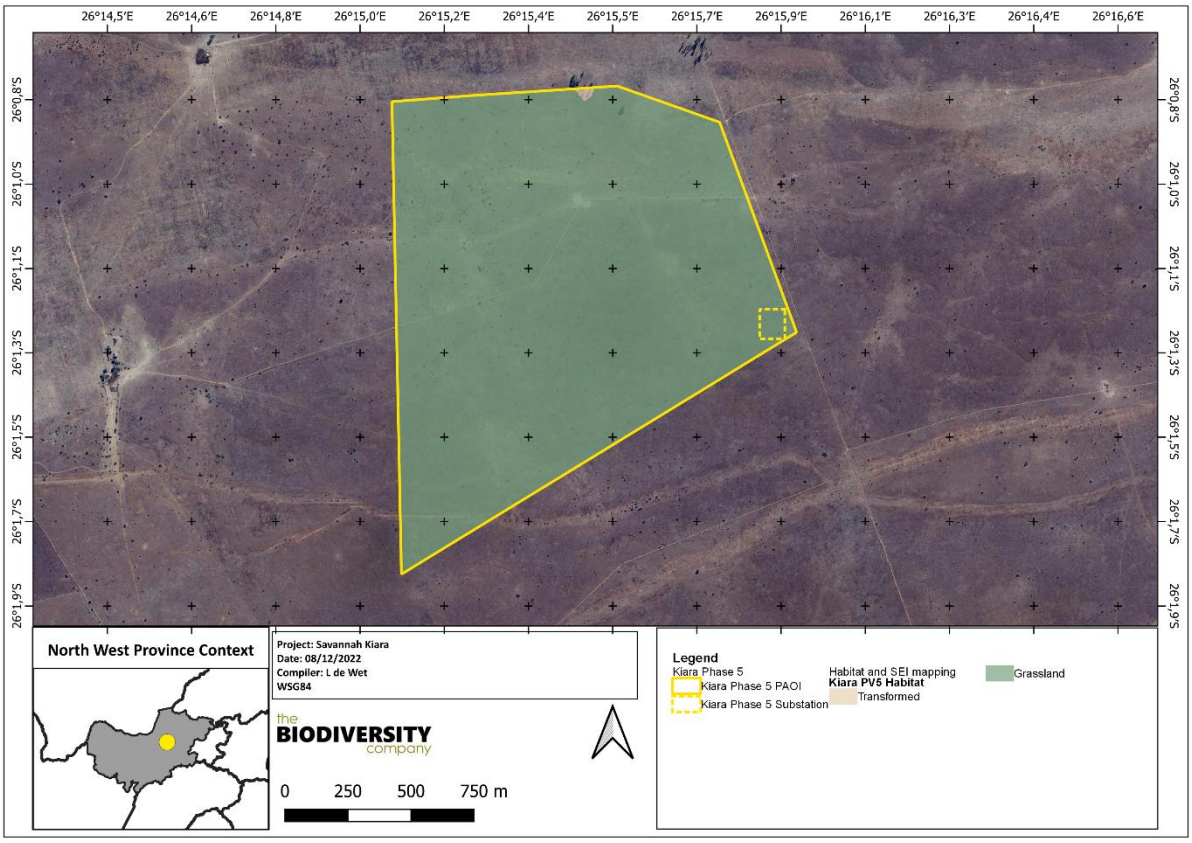

Figure 5-2 Map of the habitats within the PAOI

6 Site Sensitivity Verification

The Department of Forestry, Fisheries and the Environment, (DFFE) National Screening Tool classifies a section of the assessment area as highly sensitive from an avifaunal perspective due to the location within 20 km of a known vulture restaurant (Figure 6-1). The animal species theme is also used for identification of avifaunal sensitivities with a sensitivity rating of low (Figure 6-2). Consequently, by application of the protocol and associated guidelines, this project warrants an avifaunal assessment. The national environmental screening tool is a web-based application hosted by the Department of Environmental Affairs that allows developers to screen their prospective site for environmental sensitives. Importantly, this tool now serves as the first step in the environmental authorisation process as laid out in the gazetted assessment protocols for each environmental theme. Guidance towards achieving these protocols for terrestrial biodiversity is provided in the Species Environmental Assessment Guideline (SANBI, 2020) which, in turn, relies on the results of the screening tool to inform the level of assessment required. The screening tool provides an avifaunal sensitivity theme. However, this layer is applicable to wind energy developments and for all other projects, the user must evaluate the animal species sensitivity's theme for any avifaunal triggers.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	within 20 km of known Cape Vulturerestuarants sites

Figure 6-1 Map depicting relative avifaunal species theme sensitivity of the project (National Environmental Screening Tool, 2021)

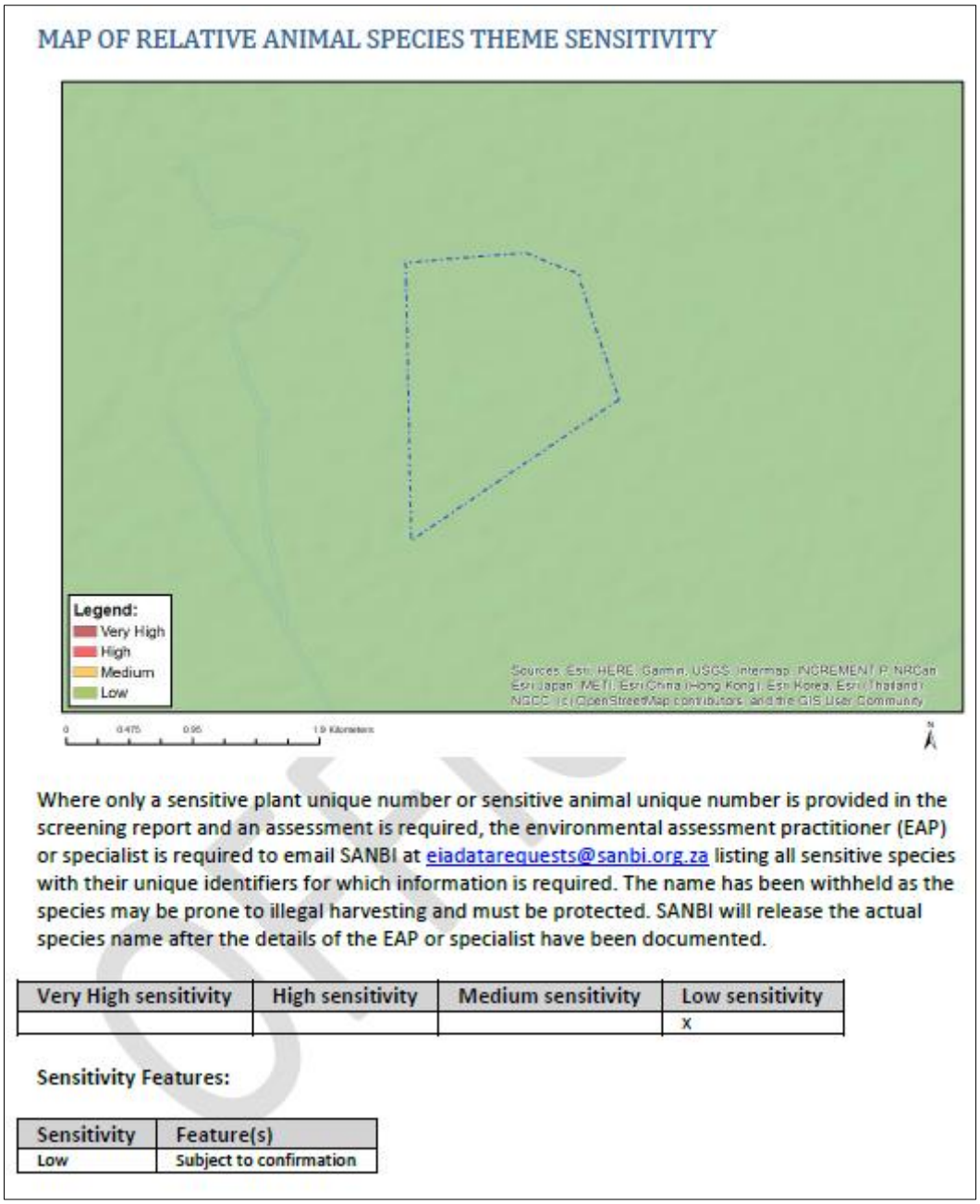

Figure 6-2 Map depicting relative animal species theme sensitivity of the project (National Environmental Screening Tool, 2021)

Four (4) habitat types were subjected to the SEI methods as described in section 4.3 and allocated a sensitivity category (Table 6-1). They can be seen in Figure 6-3.

Table 6-1 Summary of habitat types delineated within the field assessment area of the project

Habitat	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Transformed	Very Low	Very Low	Very Low	Very High	**Very Low**

Habitat	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Degraded Grassland	No natural habitat remaining.	Several major current negative ecological impacts.	**Very Low**	High	**Very Low**
	Very Low	Low		Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality of the receptor	
	No confirmed and highly unlikely populations of SCC.	Several minor and major current negative ecological impacts.			
Grassland	Medium	Medium	Medium	Medium	**Medium**
	> 50% of receptor contains natural habitat with potential to support SCC.	Mostly minor current negative ecological impacts with some major impacts and a few signs of minor past disturbance. Moderate rehabilitation potential.		Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor	
Bushclumps	Low	Low	**Low**	Medium	**Low**
	No confirmed or highly likely populations of SCC.	Small (> 1 ha but < 5 ha) area.		Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor	

Consider the following guidelines when interpreting SEI in the context of any proposed development or disturbance activities (noted in conjunction with provincial guidelines pertaining to ESA areas):

- Very Low: Minimisation mitigation – Development activities of medium to high impact acceptable and restoration activities may not be required.
- Low: Minimisation and restoration mitigation – Development activities of medium to high impact acceptable followed by appropriate restoration activities.
- Medium: Minimisation and restoration mitigation – Development activities of medium impact acceptable followed by appropriate restoration activities.

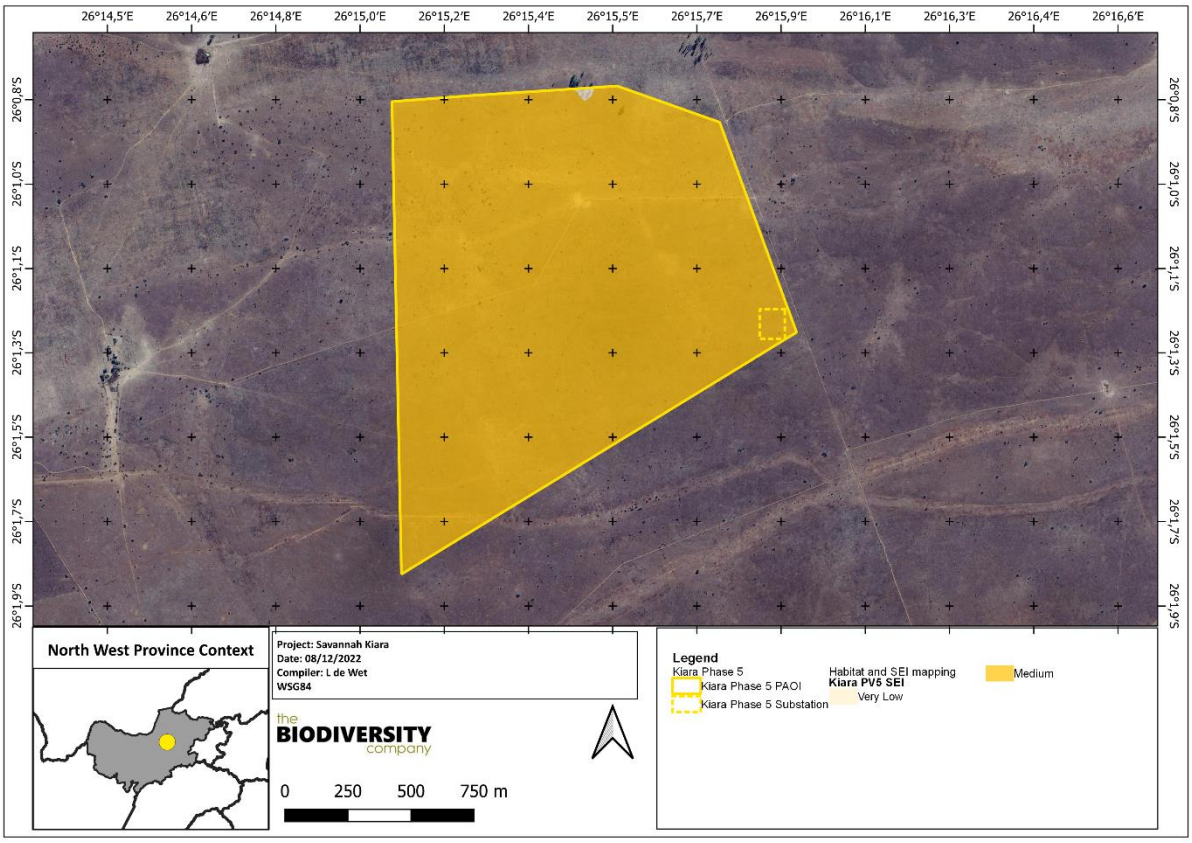

Figure 6-3 Map illustrating the sensitivities of the habitats delineated within the overall Project Area of Influence.

7 Impact Assessment

Potential impacts were evaluated against the data captured during the fieldwork and from a desktop perspective to identify relevance to the project area, specifically the proposed development footprint area.

The assessment of the significance of direct, indirect and cumulative impacts was undertaken using the method as developed by Savannah Environmental (Pty) Ltd.

Bennun *et al* (2021) describes three broad types of impacts associated with solar energy development:

- Direct impacts – Impacts that result from project activities or operational decisions that can be predicted based on planned activities and knowledge of local biodiversity, such as habitat loss under the project footprint, habitat frag- mentation as a result of project infrastructure and species disturbance or mortality as a result of project operations.
- Indirect impacts – Impacts induced by, or 'by-products' of, project activities within a project's area of influence.
- Cumulative impacts – Impacts that result from the successive, incremental and/or combined effects of existing, planned and/or reasonably anticipated future human activities in combination with project development impacts.

The assessment of impact significance was undertaken in consideration of the following:

- Extent of impact;
- Duration of impact;
- Magnitude of impact;
- Probability of impact; and
- Reversibility.

The assessment of impact significance considers pre-mitigation as well as implemented post-mitigation scenarios. Three phases were considered for the impact assessment:

- Construction Phase;
- Operational Phase; and
- Closure/Rehabilitation Phase.

7.1 Current Impacts

Considering the anthropogenic activities and influences within the landscape, several negative impacts to biodiversity were observed within the assessment area (Figure 7-1). These include:

- Erosion and loss of habitat as a result of overgrazing;
- Grazing and trampling of natural vegetation by livestock;
- Litter;
- Invasive alien plant species;

- Farm roads and main roads (and associated traffic and wildlife road mortalities);
- Powerlines;
- Fences; and
- Loss of indigenous flora and associated edge effects from existing infrastructure.

Figure 7-1 ***Some of the current impacts associated with the PAOI and surrounds. A: agricultural areas, B: existing infrastructure, C and D: livestock grazing, E: alien invasive plants and F: existing roads, paths and powerlines.***

7.2 Avifauna Impact Assessment

This section describes the potential impacts on avifauna associated with the construction, operation and decommissioning phases of the proposed development and associated powerline. During the construction phase vegetation clearing and brush cutting of vegetation for the associated infrastructure will lead to direct habitat loss. Vegetation clearing will create a disturbance and will therefore potentially lead to the displacement of avifaunal species. The operation of construction machinery on site will generate noise and cause dust pollution. Should non-environmentally friendly dust suppressants be used, chemical pollution can take place. Increased human presence can lead to poaching and the increase in vehicle traffic will potentially lead to roadkill.

The principal impacts of the operational phase are electrocution, collisions, fencing, chemical pollution due to chemical for the cleaning of the PV panels and habitat loss. Solar panels have been implicated as a potential risk for bird collisions. Collisions are thought to arise when birds (particularly waterbirds) mistake the panels for waterbodies, known as the "lake effect" (Lovich & Ennen, 2011), or when migrating or dispersing birds become disorientated by the polarised light reflected by the panels. This "lake-effect" hypothesis has not been substantiated or refuted to date (Visser *et al.,* 2019). It can however be said that the combination of powerlines, fencing and large infrastructure will influence avifauna species. Visser *et al.* (2019) performed a study at a utility-scale photovoltaic solar energy facility in the Northern Cape and found that most of the species affected by the facility were passerine species. Larger species were said to be more influenced by the facilities when they were found foraging close by and were disturbed by predators which resulted in collisions.

Large passerines are particularly susceptible to electrocution because owing to their relatively large bodies, they are able to touch conductors and ground/earth wires or earthed devices simultaneously. The chances of electrocution are increased when feathers are wet, during periods of high humidity or during defecation. Prevailing wind direction also influences the rate of electrocution casualties.

Fencing of the PV site can influence birds in six ways (Birdlife SA, 2015);

1. Snagging: Occurs when a body part is impaled on one or more barbs or razor points of a fence.
2. Snaring: When a birds foot/leg becomes trapped between two overlapping wires.
3. Impact injuries: birds flying into a fence, the impact may kill or injure the bird
4. Snarling: When birds try and push through a mesh or wire stands, ultimately becoming trapped (uncommon).
5. Electrocution: Electrified fence can kill or severely injure birds.
6. Barrier effect: Fences may limit flightless birds (e.g., Moulting waterfowl) from resources.

Chemical pollution from PV cleaning, if not environmentally friendly will result in either long term or short-term poisoning. Should this chemical run into the water sources it would also impact the whole bird population and not just species found in and around the PV footprint.

PV sites require the overall removal of vegetation, this is a measure that is implemented to restrict the risk of fire (Birdlife, 2017). The removal of vegetation results in the loss of habitat for a number of species in this case it would be displacing shrubland endemics and SCCs.

During the decommissioning phase should the infrastructure not be removed, and the area rehabilitated, the infrastructure will eventually start oxidising possibly resulting in heavy metal pollution of the water sources. The habitat will, even after rehabilitation, not return to a pre- development state but the rehabilitation of the area will reduce the likelihood of alien plant infestation and erosion.

7.2.1 Alternatives Considered

No alternatives have been considered.

7.2.2 Loss of Irreplaceable Resources

The current proposed layout of the activity will result in the irreplaceable loss of;

- Loss of ESA habitat; and
- Nesting sites for avifauna and possibly SCC themselves will be lost.

7.2.3 Identification of Potential Impacts

The assessment of impact significance considers pre-mitigation as well as implemented of post-mitigation scenarios. Although different species and groups will react differently to the development, the risk assessment was undertaken bearing in mind the potential impacts to the priority species listed in this report. The PV, roads and OHLs are all assessed simultaneously except if otherwise specified. More mitigations can be seen in section 9.

7.2.4 Construction Phase

The construction of the associated infrastructure and the PV site has been assessed collectively as their impacts overlap.

The following potential impacts were considered (Table 7-1to Table 7-5):

- Habitat Loss (Destruction, fragmentation and degradation of habitats, ultimately displacing avifauna);
- Sensory disturbances (e.g., noise, dust, light, vibrations);
- Collection of eggs and poaching (especially of SCC);
- Roadkill; and
- Chemical pollution associated with dust suppressants.

Table 7-1 Construction activities impacts of the PV facility and associated infrastructure ` on the avifauna: Habitat Loss

Nature: Habitat Loss **Destroy, fragment and degrade habitat, ultimately displacing avifauna**		
	Without mitigation	**With mitigation**
Extent	Local Area (3)	Footprint & surrounding areas (2)
Duration	Short term (2)	Very short term (1)
Magnitude	High (8)	Moderate (6)
Probability	Definite (5)	Definite (5)
Significance	**High**	**Medium**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		

• The loss of habitat in the project footprint cannot be negated but can be restricted to some extent. The loss of habitat will result in the loss of territory, feeding area, nesting sites and prey availability for numerous species. • The habitat outside the footprint can be protected by implementing the following mitigations: • Construction activity to only be within the project footprint and the area is to be well demarcated. • Areas where vegetation has been cleared must be re-vegetated within local indigenous plant species. • The affected area must be monitored for invasive plant encroachment and erosion and must be controlled. • The use of laydown areas within the development footprint must be used, to avoid habitat loss and disturbance to adjoining areas. • All areas to be developed must be walked through prior to any activity to ensure no nests or avifauna species are found in the area. • Should any Species of Conservation Concern not move out of the area, or their nest be found in the area a suitably qualified specialist must be consulted to advise on the correct actions to be taken.
Residual Impacts: The loss of habitat is a residual impact that is unavoidable. The disturbance may also cause some erosion and invasive alien plant encroachment. Movement corridors will be disrupted in the area. Residual impacts are low

Table 7-2 Construction activities impacts of the PV facility and associated infrastructure on the avifauna: Sensory disturbance

Nature: Sensory disturbances **Disturbance resulting from noise, dust, light and vibrations**		
	Without mitigation	**With mitigation**
Extent	Regional (4)	Local area (3)
Duration	Short term (2)	Very short term (1)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: • Minimize disturbance impact by abbreviating construction time. Schedule the activities to avoid breeding and movement time. • Ensure lights are kept to a minimum, lights must be red or green and not white to reduce confusion for nocturnal migrants. Lights should be placed so that they face downward onto working areas and not straight or upward to reduce the sky glow effect. • Dust management need to be done in the areas where the vegetation will be removed, this includes wetting of the soil.		
Residual Impacts: The mitigation of noise pollution during construction is difficult to mitigate against, however carefully managing this noise, dust and light pollution can reduce the overall impact. Residual impacts are Low.		

Table 7-3 Construction activities impacts of the PV facility and associated infrastructure on the avifauna: Poaching

Nature: Loss of avifauna **Collection of eggs and poaching, especially of SCC**		
	Without mitigation	**With mitigation**
Extent	Footprint & surrounding areas (2)	Site specific (1)
Duration	Short term (2)	Very short term (1)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation: • All personnel should undergo environmental induction with regards to avifauna and in particular awareness about not harming, collecting or hunting terrestrial species (e.g., guineafowl and francolin), and owls, which are often persecuted out of superstition. • Signs must be put up stating that should any person be found poaching any species they will be fined.		
Residual Impacts: There is a possibility that the eggs to be poached could be that of an SCC with decreasing numbers. Residual impacts are Low.		

Table 7-4 Construction activities impacts of the PV facility and associated infrastructure on the avifauna: Roadkill

Nature: Loss of avifauna **Roadkill**		
	Without mitigation	**With mitigation**
Extent	Local area (3)	Site specific (1)
Duration	Short term (2)	Very short term (1)
Magnitude	Moderate (6)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: • All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area. • All vehicles (construction or other) accessing the site should adhere to a low speed limit on site (40 km/h max) to avoid collisions with susceptible avifauna, such as nocturnal and crepuscular species (e.g., nightjars and owls) which sometimes forage or rest on roads, especially at night. • Signs must be put up on the roads indicating a 40km/h speed limit		
Residual Impacts:		

Roadkill will remain a possibility with mitigation with a residual impact of Low.

Table 7-5 Construction activities impacts of the PV facility and associated infrastructure on the avifauna: Pollution

Nature: Chemical Pollution **Chemical Pollution associated with dust suppressants leading to direct mortalities or habitat loss resulting in a disruption of avifauna populations.**		
	Without mitigation	**With mitigation**
Extent	Local area (3)	Footprint & surrounding areas (2)
Duration	Short term (2)	Very short term (1)
Magnitude	High (8)	Moderate (6)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: • Environmentally friendly dust suppressants must be utilised.		
Residual Impacts: Should mitigation measures be followed, this impact can be reduced to a residual impact of Low.		

7.2.5 Operational Phase

The operational phase of the impact of daily activities is anticipated to lead to collisions and electrocutions. Moving vehicles do not only cause sensory disturbances to avifauna, affecting their life cycles and movement, but will lead to direct mortalities due to collisions. The area surrounding the direct footprint will be maintained to prevent uncontrolled events such as fire, this practice will however result in the disturbance and displacement of breeding and non-breeding species.

The following potential impacts were considered (Table 7-6 to Table 7-13):

- Continued habitat loss (destruction, fragmentation and degradation of habitat ultimately displacing avifauna);
- Sensory disturbance (e.g., noise, dust, light and vibrations);
- Collection of eggs and poaching (especially of SCC);
- Roadkill;
- Collisions with PV panels, associated powerlines and connection lines and fences;
- Electrocution by infrastructure and connections to PV;
- Chemical pollution associated with chemicals to keep PV panels clean; and

- Fencing of the PV site (especially a risk for larger birds).

Table 7-6 Operational activities impacts on the avifauna: Continued habitat loss

Nature: Continued fragmentation and degradation of habitats and ecosystems **Disturbance created during the construction phase will leave the development area vulnerable to erosion and Invasive Alien Plant (IAP) encroachment.**		
	Without mitigation	**With mitigation**
Extent	Footprint & surrounding areas (2)	Site specific (1)
Duration	Permanent (5)	Short term (2)
Magnitude	High (8)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation: • Minimising habitat destruction caused by the maintenance by demarcating the footprint so that it does not increase yearly. • All areas where maintenance must be for example grass cutting walked through prior to any activity to ensure no nests or fauna species are found in the area. Should any Species of Conservation Concern not move out of the area, or their nest be found in the area a suitably qualified specialist must be consulted to advise on the correct actions to be taken.		
Residual Impacts: Mitigation measures can reduce this impact to a Low residual impact.		

Table 7-7 Operational activities impacts on the avifauna: Sensory Disturbance

Nature: Sensory disturbances **Disturbance resulting from noise, dust, light and vibrations**		
	Without mitigation	**With mitigation**
Extent	Local area (3)	Footprint & surrounding areas (2)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Minor (2)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Schedule the activities to avoid breeding and movement time. • Ensure lights are kept to a minimum, lights must be red or green and not white to reduce confusion for nocturnal migrants. Lights should be placed so that they face downward onto working areas and not straight or upward to reduce the sky glow effect. • Dust management need to be done in the areas where the vegetation will be removed, this includes wetting of the soil.		
Residual Impacts:		

Carefully managing this noise, dust and light pollution can reduce the overall impact. Residual impacts are Low.

Table 7-8 Operational activities impacts on the avifauna: Poaching

Nature: ***Loss of avifauna*** **Collection of eggs and poaching, especially of SCC**		
	Without mitigation	**With mitigation**
Extent	Footprint & surrounding areas (2)	Site specific (1)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation: • All personnel should undergo environmental induction with regards to avifauna and in particular awareness about not harming, collecting or hunting terrestrial species (e.g., guineafowl and francolin), and owls, which are often persecuted out of superstition. • Signs must be put up stating that should any person be found poaching any species they will be fined.		
Residual Impacts: There is a possibility that the eggs to be poached could be that of an SCC with decreasing numbers. Residual impacts are Low.		

Table 7-9 Operational activities impacts on the avifauna: Roadkill

Nature: ***Loss of avifauna*** **Roadkill**		
	Without mitigation	**With mitigation**
Extent	Local area (3)	Site specific (1)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: • All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the project area. • All vehicles (construction or other) accessing the site should adhere to a low speed limit on site (40 km/h max) to avoid collisions with susceptible avifauna, such as nocturnal and crepuscular species (e.g., nightjars and owls) which sometimes forage or rest on roads, especially at night. • Signs must be put up on the roads indicating a 40km/h speed limit		
Residual Impacts: Roadkill will remain a possibility with mitigation with a residual impact of Low.		

Table 7-10 Operational activities impacts on the avifauna: Collisions

Nature: Collisions		
Collisions with PV panels and associated infrastructure		
	Without mitigation	**With mitigation**
Extent	Regional (4)	Local area (3)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Moderate (6)
Probability	Highly probable (4)	Probable (3)
Significance	**High**	**Medium**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
• The design of the proposed solar plant must be of a type or similar structure as endorsed by the Eskom-Endangered Wildlife Trust (EWT) Strategic Partnership on Birds and Energy, considering the mitigation guidelines recommended by Birdlife South Africa. • Infrastructure should be consolidated where possible in order to minimise the amount of ground and air space used. This would involve using existing/approved pylons and associated infrastructure for different lines. • White strips must be placed on the edge of the solar panels to reduce reflection and prevent collisions. • Bird Flappers and diverters must be placed along the whole of the powerlines, this must be done at 5 m intervals. • Fencing mitigations: o Top 2 strands must be smooth wire o Routinely retention loose wires o Minimum 30cm between wires o Place markers on fences		
Residual Impacts:		
Some collisions may occur despite mitigations with a residual impact of Medium		

Table 7-11 Operational activities impacts on the avifauna: Electrocution

Nature: Electrocutions		
Electrocution by infrastructure and connections to PV		
	Without mitigation	**With mitigation**
Extent	Regional (4)	Footprint & surrounding areas (2)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Moderate (6)
Probability	Highly probable (4)	Improbable (2)
Significance	**High**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation:		

• The design of the proposed solar plant and grid lines must be of a type or similar structure as endorsed by the Eskom-EWT Strategic Partnership on Birds and Energy, considering the mitigation guidelines recommended by Birdlife South Africa. • Infrastructure should be consolidated where possible/practical in order to minimise the amount of ground and air space used. This would involve using the existing/approved pylons and associated infrastructure for different lines. • Ensure that monitoring is sufficiently frequent to detect electrocutions reliably and that any areas where electrocutions occurred are repaired as soon as possible. • During the first year of operation quarterly reports, summarizing interim findings should be complied and submitted to BirdLife South Africa. If the findings indicate that electrocutions have not occurred or are minimal with no red-listed species, an annual report can be submitted.
Residual Impacts: Electrocutions may occur despite mitigation measures resulting on a residual impact of Low.

Table 7-12 Operational activities impacts on the avifauna: Pollution

Nature: Chemical Pollution **Chemical Pollution associated with chemicals used to clean PV panels leading to direct mortalities or habitat loss resulting in a disruption of avifauna populations.**		
	Without mitigation	**With mitigation**
Extent	Regional (4)	Footprint & surrounding areas (2)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: • Environmentally friendly cleaning chemicals must be utilised.		
Residual Impacts: Should mitigation measures be followed, this impact can be reduced to a residual impact of Low.		

Table 7-13 Operational activities impacts on the avifauna: Fencing

Nature: Fencing **Fencing of the PV site holds risks for large avifauna species in particular**		
	Without mitigation	**With mitigation**
Extent	Local area (3)	Site specific (1)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Minor (2)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation: o Top 2 strands must be smooth wire o Routinely retention loose wires o Minimum 30cm between wires o Place markers on fences
Residual Impacts: This impact cannot be fully mitigated, resulting in a residual impact of Low

7.2.6 Decommissioning Phase

This phase is when the scaling down of activities ahead of temporary or permanent closure is initiated. During this phase, the operational phase impacts will persist until of the activity reduces and the rehabilitation measures are implemented.

The following potential impacts were considered (Table 7-14 to Table 7-18):

- Habitat loss (continued fragmentation and degradation of habitats);
- Sensory Disturbance (e.g., noise, dust, light, vibrations);
- Roadkill;
- Collisions with PV and associated infrastructure; and
- Fencing of PV site (especially a risk for larger birds).

Table 7-14 Decommissioning activities impacts on the avifauna: Habitat Loss

Nature: Continued fragmentation and degradation of habitats and ecosystems **Disturbance created during the construction and operational phases will leave the development area vulnerable to erosion and Invasive Alien Plant (IAP) encroachment.**		
	Without mitigation	**With mitigation**
Extent	Footprint & surrounding areas (2)	Site specific (1)
Duration	Permanent (5)	Short term (2)
Magnitude	Moderate (6)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation: • Implementation of a rehabilitation plan. • Implementation of an alien invasive management plan and monitoring on an annual basis for 3 years post construction. • There should be follow-up rehabilitation and revegetation of any remaining bare areas with indigenous flora. • If permanently closed; all infrastructure must be removed, and the area rehabilitated.		
Residual Impacts: No significant residual risks are expected, although IAP encroachment and erosion might still occur but would have a negligible impact if effectively managed.		

Table 7-15 Decommissioning activities impacts on the avifauna: Sensory Disturbance

Nature: Sensory disturbances **Disturbance resulting from noise, dust, light and vibrations**		
	Without mitigation	**With mitigation**
Extent	Local area (3)	Footprint & surrounding areas (2)
Duration	Long term (4)	Short term (2)
Magnitude	Moderate (6)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: • Minimize disturbance impact by abbreviating construction time • Schedule the activities to avoid breeding and movement times report • Dust management need to be done in the areas where the vegetation will be removed, this includes wetting of the soil. This area must be rehabilitated as soon as possible. • All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the decommissioning area. • All vehicles (construction or other) accessing the site should adhere to a low speed limit on site (40 km/h max) to avoid collisions with susceptible avifauna, such as nocturnal and crepuscular species (e.g., nightjars and owls) which sometimes forage or rest on roads, especially at night.		
Residual Impacts: If this impact is mitigated and monitored correctly there should be no residual impacts.		

Table 7-16 Decommissioning activities impacts on the avifauna: Roadkill

Nature: Loss of avifauna **Roadkill**		
	Without mitigation	**With mitigation**
Extent	Local area (3)	Site specific (1)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Mlinor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		

• All vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the project area. • All vehicles (construction or other) accessing the site should adhere to a low speed limit on site (40 km/h max) to avoid collisions with susceptible avifauna, such as nocturnal and crepuscular species (e.g., nightjars and owls) which sometimes forage or rest on roads, especially at night. • Signs must be put up on the roads indicating a 40km/h speed limit
Residual Impacts: Roadkill will remain a possibility with mitigation with a residual impact of Low.

Table 7-17 Decommissioning activities impacts on the avifauna: Collisions

Nature: Collisions **Collisions with PV panels and associated infrastructure**		
	Without mitigation	**With mitigation**
Extent	Footprint & surrounding areas (2)	Site specific (1)
Duration	Long term (4)	Short term (2)
Magnitude	High (8)	minor (2)
Probability	Probable (3)	Very improbable (1)
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: • Schedule the activities to avoid breeding and movement times • All infrastructure must be removed as the collision risk will persist if the infrastructure is not taken down if the development is permanently closed.		
Residual Impacts: If this is mitigated and monitored correctly no residual impacts should be present.		

Table 7-18 Decommissioning activities impacts on the avifauna: Fencing

Nature: Fencing **Fencing of the PV site holds risks for large avifauna species in particular**		
	Without mitigation	**With mitigation**
Extent	Local area (3)	Site specific (1)
Duration	Long term (4)	Short term (2)
Magnitude	High (8)	None (0)
Probability	Probable (3)	Very improbable (1)
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: • All fenced should be removed and no wires left at the site		
Residual Impacts:		

If this is mitigated and monitored correctly no residual impacts should be present.

7.2.7 Cumulative Impact

Cumulative impacts are assessed in context of the extent of the proposed assessment area; other developments in the area; and general habitat loss and transformation resulting from other activities in the area.

The impacts of projects are often assessed by comparing the post-project situation to a pre-existing baseline. Where projects can be considered in isolation this provides a good method of assessing a project's impact. However, in areas where baselines have already been affected, or where future development will continue to add to the impacts in an area or region, it is appropriate to consider the cumulative effects of development. This is similar to the concept of shifting baselines, which describes how the environmental baseline at a point in time may represent a significant change from the original state of the system. This section describes the potential impacts of the project that are cumulative for avifauna.

Localised cumulative impacts include those from operations that are close enough to potentially cause additive effects on the local environment or any sensitive receivers (such as nearby large road networks, other solar PV facilities, and power infrastructure). Relevant activities and impacts include dust deposition, noise and vibration, loss of corridors or habitat, disruption of waterways, groundwater drawdown, groundwater and surface water depletion, and transport activities. Long-term cumulative impacts associated with the site development activities can lead to the loss of endemic and threatened species, including natural habitat and vegetation types, and these impacts can even lead to the degradation of conserved areas.

The total area within the 30 km buffer around the project area amounts to 330 546 ha, but when considering the transformation (143 841 ha) that has taken place within this radius, 186 705 ha of intact habitat remains according to the 2018 National Biodiversity Assessment. Therefore, the area within 30 km of the project has experienced approximately 43.5% loss in natural habitat. Considering this context, the project footprint for the project and adjacent 6 projects (according to the provided layout), and similar project exist in the 30 km region measuring a maximum of 41 341 ha, which includes the project options (as per the latest South African Renewable Energy EIA Application Database). This means that the total amount of remaining habitat lost as a result of solar projects in the region amounts to 22.14% (the sum of all related developments as a percentage of the total remaining habitat). Table 7-19 outlines the calculation procedure for the spatial assessment of cumulative impacts.

Table 7-19 Total cumulative habitat loss

	Total Habitat (ha)	Total Loss (ha)	Tot. Remaining Habitat (ha) (Remnants)	Total Historical Loss	Cumulative Projects (ha)	Cumulative Habitat Lost
Approximate Solar development cumulative effects (Spatial)	330 546	143 841	186 705	**43.5%**	41 341	**22.14 %**

The overall cumulative impact assessment is presented in Table 7-20 below. Note that this also accounts for the relative importance of the habitats within and adjacent to the project area, in the context of the value of the regional habitat. Approximately 43.5% of the habitat has already been lost, and as discussed above the proposed solar developments will result in a cumulative loss of approximately 22.14% from only similar developments (Solar, approved and in process) in the area for the remaining habitat, as such the cumulative impact from the proposed development is rated as "high", with overall medium significance (Figure 7-2). The overall cumulative (total) habitat loss within the 30 km buffer amounts to 56%. This means that the careful spatial management and planning of the entire region

must be a priority, and existing large infrastructure projects must be carefully monitored over the long term.

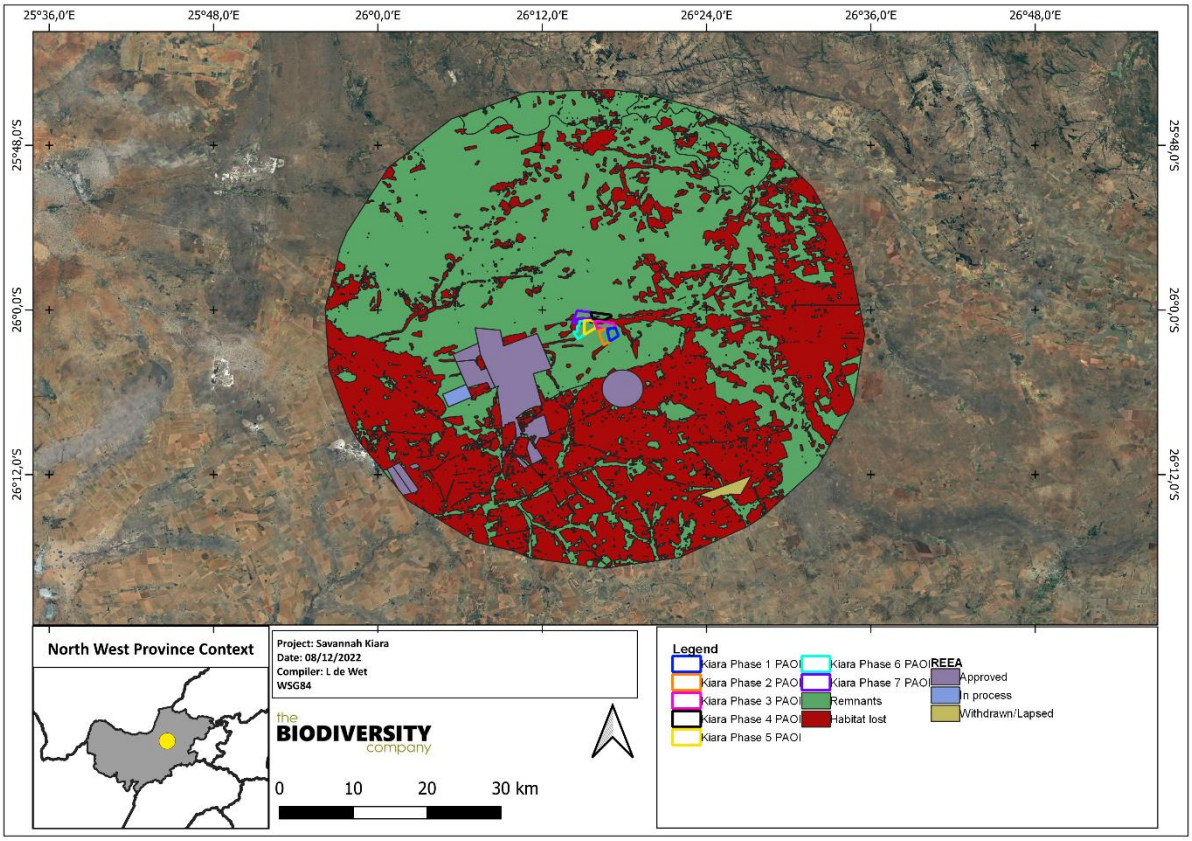

Figure 7-2Cumulative habitat loss in the area

Table 7-20 Cumulative impact of the solar project

Nature: Cumulative habitat loss within the region **The development of the proposed infrastructure will contribute to cumulative habitat loss and thereby impact the ecological processes in the region.**		
	Project in Isolation	**Cumulative Impacts**
Extent	Footprint & surrounding areas (2)	Regional (4)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	High (8)
Probability	Highly probable (4)	Definite (5)
Significance	**Medium**	**High**
Status (positive or negative)	Negative	Negative
Reversibility	None	None
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	No	
Mitigation: Even though collisions can be mitigated to some extent for individual solar facilities their combined densities will increase the rate of collisions. Monitoring of the implementation of mitigation measures needs to be done to ensure the cumulative impact does not become high.		
Residual Impacts: The cumulative impacts are rated as high based on the loss of habitat for key avifauna species found in the region. Residual impacts include loss of habitat for endemic and SCC as well as loss of SCC due to collisions.		

8 Specialist Management Plan

The aim of the management outcomes is to present the mitigations in such a way that they can be incorporated into the Environmental Management Programme (EMPr), allowing for more successful implementation and auditing of the mitigations and monitoring guidelines.

Table 8-1 presents the recommended mitigation measures and the respective timeframes, targets, and performance indicators for the avifaunal study.

Table 8-1 Summary of management outcomes pertaining to impacts to avifauna and their habitats

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Management outcome: Habitats				
Restrict all clearing of vegetation to the planned footprint area. Clearing of vegetation should be minimized and avoided where possible, maintaining vegetation amongst infrastructure where feasible. Clearing beneath panels should be avoided.	Life of operation	Project manager, Environmental Officer	Areas of indigenous vegetation	Ongoing
Visibly demarcate all development footprint areas, to avoid the unnecessary disturbance / clearance of areas that will not be developed. This will facilitate rehabilitation of the area.	Construction/Operational Phase	Environmental Officer & Design Engineer	Development area	During Phase
Where possible, existing access routes must be prioritised for project access routes. Existing walking paths may also be considered for project access routes.	Construction/Operational Phase	Environmental Officer & Design Engineer	Roads and paths used	Ongoing
Areas that are denuded during construction and that will not be developed need to be re-vegetated with indigenous vegetation to prevent erosion during wind events.	Closure Phase/Rehabilitation phase	Environmental Officer & Contractor	Assess the state of rehabilitation and encroachment of alien vegetation	Quarterly for up to two years after the closure
Any woody material removed can be shredded and used in conjunction with the topsoil to augment soil moisture and prevent further erosion.	Closure Phase/ Post Closure Phase	Environmental Officer & Contractor	Road edges and project area footprint	During Phase
Rehabilitation of the disturbed areas that will not be developed must be made a priority. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are endemic to this vegetation type.	Operational/Closure Phase	Environmental Officer & Contractor	Road edges and footprint	During Phase
Erosion control and alien invasive management plan must be implemented from the onset of the construction phase.	Life of operation	Environmental Officer & Contractor	Erosion and alien invasive species	Ongoing
Environmentally friendly dust suppressants need to be utilised.	Operational phase	Environmental Officer & Contractor	Water pollution	During Phase
A fire management plan needs to be compiled and implemented from the construction phase to restrict the impact fire might have on the surrounding areas.	Life of operation	Environmental Officer & Contractor	Fire Management	During Phase
Management outcome: Avifauna				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	**Responsible Party**	**Aspect**	**Frequency**
Visibly demarcate construction areas to prevent movement of staff or any individual	Construction/Operational Phase	Project manager,	Infringement into these areas	Ongoing

into the surrounding environments. Signs must be put up to enforce this.		Environmental Officer		
All personnel must undergo environmental induction with regards to avifauna and in particular awareness about not harming, collecting, or hunting terrestrial species (e.g., guineafowl and francolin), and owls, which are often persecuted out of superstition. Signs must be put up to enforce this.	Life of operation	Environmental Officer	Evidence of trapping etc	Ongoing
The duration of the construction should be kept to a minimum to avoid disturbing avifauna.	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Construction/Closure Phase	During Phase
Outside lighting must be designed and limited to minimize impacts on fauna. All outside lighting should be directed away from highly sensitive areas. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (red/green) motion detection lights must be used wherever possible.	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Light pollution and period of light.	During Phase
All construction and maintenance motor vehicle operators must undergo an environmental induction that includes instruction on the need to comply with speed limit (40 km/h), to respect all forms of wildlife. Speed limits must be enforced to ensure that road killings and erosion is limited.	Life of operation	Health and Safety Officer	Compliance to the training.	Ongoing
Schedule or limit (where feasible) activities during least sensitive periods, to avoid migration, nesting and breeding seasons (May – August)	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Activities should take place during the day in winter.	During Phase
All project activities must be undertaken with appropriate noise mitigation measures to avoid disturbance to avifauna population in the region. Noise should be limited at night and during dusk and dawn to avoid disturbing roosting birds.	Construction/Operational Phase	Project manager, Environmental Officer	Noise	During Phase
All areas to be developed must be walked through prior to any activity to ensure no nests or avifauna species are found in the area. Should any Species of Conservation Concern be found and not move out of the area, or their nest be found in the area a suitably qualified specialist must be consulted to advise on the correct actions to be taken.	Planning, Construction and Decommissioning	Project manager, Environmental Officer	Presence of Nests and faunal species	During Phase
The design of the proposed PV must be of a type or similar structure as endorsed by the Eskom-EWT Strategic Partnership on Birds and Energy, considering the mitigation guidelines recommended by Birdlife South Africa (Jenkins *et al.,* 2017).	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of electrocuted birds or bird strikes	During Phase
Infrastructure should be consolidated where possible in order to minimise the amount of ground and air space used.	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of bird collisions	During phase
All the parts of the infrastructure must be nest proofed and anti-perch devices placed on areas that can lead to electrocution	Planning and construction	Environmental Officer &	Presence of electrocuted birds	During phase

		Contractor, Engineer		
Use environmentally friendly cleaning and dust suppressant products	Construction and operation	Environmental Officer & Contractor, Engineer	Presence of chemicals in and around the project area	During phase
Fencing mitigations: • Top 2 strands must be smooth wire • Routinely retention loose wires • Minimum 30 cm between wires • Place markers on fences	Planning, construction, and operation	Environmental Officer & Contractor, Engineer	Presence of birds stuck /dead in fences Monitor fences for slack wires	During phase
As far as possible power cables within the project area should be thoroughly insulated and preferably buried.	Planning and construction	Environmental Officer & Contractor, Engineer	Exposed cables	During phase
Any exposed parts must be covered (insulated) to reduce electrocution risk	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of electrocuted birds	During phase
White strips should be placed along the edges of the panels, to reduce similarity to water and deter birds and insects (Horvath *et al,* 2010). Consider the use of bird deterrent devices to limit collision risk.	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of dead birds in the project area	During phase

9 Monitoring Plan

Monitoring is to take place between September and February so that mitigation measures can be adapted to ensure the development does not have a long-term impact on the SCCs in the area. A follow-up assessment on avian biodiversity and species abundance within the assessment area and surrounding areas must be conducted within one year after the facility has been in operation and should be repeated every 3-5 years. Information obtained from the monitoring must be provided to BirdLife Renewable Energy Programme on energy@birdlife.org.za. The data must be presented as described in Jenkins *et al.,* 2017. Table 9-1 lists monitoring guidelines to be followed.

Table 9-1 Monitoring guidelines

Avian group	Survey Type	Survey objective	Timing
Raptor and larger ground birds	Drive transect & Incidental	To evaluate the population size To determine the abundance of the species and their use of habitat types To determine the effect of the PV on these species	Timing must overlap with birds breeding season as well as for migratory visitors
Passerines	Point Counts	Point count gives you a good representation of the species diversity and distribution throughout the various habitats. Also allows for an understanding of the impact of the PV on the various habitats.	Summer survey must be performed.
All species	Nest monitoring	To ensure the breeding patterns and attempts are not interrupted or discontinued nest monitoring will be done from a distance with binoculars.	Summer during the breeding season

10 Conclusion

The assessment area consisted of four avifauna habitats; transformed areas, degraded grassland, grassland and bushclumps. These habitats were still mostly in a natural state with the exception of some areas that have been disturbed by livestock grazing and transformed due to anthropogenic activities. Two SCC were confirmed in the assessment area and surrounds: Cape Vulture (*Gyps coprotheres*) and Greater Flamingo (*Phoenicopterus roseus*) (which is likely to fly over the assessment area). There is a possibility that additional conservation important and sensitive vulture species occur within the project area. Some high-risk avifauna species were recorded from the project area and surrounds, including both raptors and water birds.

The project will result in habitat loss and degradation of avifaunal habitats. The development will lead to the clearing of vegetation and an altering in the undeveloped nature of the area. Based on the medium receptor resilience and the medium functional integrity, the assessment area was given a medium to low site ecological importance with transformed areas having a very low site ecological importance (SEI).

The development will also lead to sensory disturbance, collision and electrocution risks. Even though the latter three impacts can be effectively mitigated, the loss of habitat cannot be mitigated. Considering the number of applications and current solar plant developments in the area the cumulative impact is regarded as being high.

The mitigation hierarchy implemented in this report is as per the information provided in section 2(4)(a)(i) of NEMA as well as the overall policy on Environmental offsetting (Biodiversity Offset Guidelines, section 24 J of NEMA, Sept 2021). The mitigation hierarchy includes first avoiding the impact, then minimising it, then rehabilitation and then offsetting. Where the residual impact, even after mitigation is high, then should offsetting only be considered. In this case no impacts are high post mitigation and according to available data, offsets will not be required. Mitigation measures have resulted in the reduction of most impacts to a Moderate or Low, which is considered within the limits of acceptable change.

10.1 Impact Statement

Considering the above-mentioned information, a number of sensitive features were identified for the project. It is the opinion of the specialist that the project may be considered for approval, but all prescribed mitigation measures and monitoring must be considered by the issuing authority. Any powerlines that may be developed must be extensively mitigated due to the presence of a vulture restaurant in the vicinity.

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12 Appendices

12.1 Appendix A: Avifaunal species expected in the area.

Scientific name	Common name	Regional (SANBI, 2016)	IUCN (2017)
Accipiter melanoleucus	Black Sparrowhawk	Unlisted	LC
Acridotheres tristis	Common Myna	Unlisted	LC
Acrocephalus arundinaceus	Great Reed Warbler	Unlisted	LC
Acrocephalus baeticatus	African Reed Warbler	Unlisted	Unlisted
Acrocephalus gracilirostris	Lesser Swamp Warbler	Unlisted	LC
Acrocephalus palustris	Marsh Warbler	Unlisted	LC
Actitis hypoleucos	Common Sandpiper	Unlisted	LC
Afrotis afraoides	Northern Black Korhaan	Unlisted	LC
Alcedo cristata	Malachite Kingfisher	Unlisted	Unlisted
Alopochen aegyptiacus	Egyptian Goose	Unlisted	LC
Amadina erythrocephala	Red-headed Finch	Unlisted	LC
Amandava subflava	Orange-breasted Waxbill	Unlisted	Unlisted
Amaurornis flavirostris	Black Crake	Unlisted	LC
Anas capensis	Cape Teal	Unlisted	LC
Anas erythrorhyncha	Red-billed Teal	Unlisted	LC
Anas hottentota	Blue-billed Teal	Unlisted	LC
Anas smithii	Cape Shoveler	Unlisted	LC
Anas sparsa	African Black Duck	Unlisted	LC
Anas undulata	Yellow-billed Duck	Unlisted	LC
Anhinga rufa	African Darter	Unlisted	LC
Anthoscopus minutus	Cape Penduline Tit	Unlisted	LC
Anthus cinnamomeus	African Pipit	Unlisted	LC
Anthus leucophrys	Plain-backed Pipit	Unlisted	LC
Anthus vaalensis	Buffy Pipit	Unlisted	LC
Apus affinis	Little Swift	Unlisted	LC
Apus caffer	White-rumped Swift	Unlisted	LC
Ardea cinerea	Grey Heron	Unlisted	LC
Ardea goliath	Goliath Heron	Unlisted	LC
Ardea intermedia	Intermediate Egret	Unlisted	LC
Ardea melanocephala	Black-headed Heron	Unlisted	LC
Ardea purpurea	Purple Heron	Unlisted	LC
Ardeola ralloides	Squacco Heron	Unlisted	LC
Batis molitor	Chinspot Batis	Unlisted	LC
Bostrychia hagedash	Hadada Ibis	Unlisted	LC
Bradornis mariquensis	Marico Flycatcher	Unlisted	LC
Bradypterus baboecala	Little Rush Warbler	Unlisted	LC
Bubo africanus	Spotted Eagle-Owl	Unlisted	LC
Bubulcus ibis	Western Cattle Egret	Unlisted	LC
Burhinus capensis	Spotted Thick-knee	Unlisted	LC

Scientific name	Common name	Regional (SANBI, 2016)	IUCN (2017)
Buteo vulpinus	Common Buzzard	Unlisted	Unlisted
Butorides striata	Striated Heron	Unlisted	LC
Calandrella cinerea	Red-capped Lark	Unlisted	LC
Calendulauda sabota	Sabota Lark	Unlisted	LC
Calidris ferruginea	Curlew Sandpiper	LC	NT
Calidris minuta	Little Stint	LC	LC
Campephaga flava	Black Cuckooshrike	Unlisted	LC
Campethera abingoni	Golden-tailed Woodpecker	Unlisted	LC
Caprimulgus pectoralis	Fiery-necked Nightjar	Unlisted	LC
Cecropis abyssinica	Lesser Striped Swallow	Unlisted	LC
Centropus burchellii	Burchell's Coucal	Unlisted	Unlisted
Cercomela familiaris	Familiar Chat	Unlisted	LC
Cercotrichas leucophrys	White-browed Scrub Robin	Unlisted	LC
Cercotrichas paena	Kalahari Scrub Robin	Unlisted	LC
Ceryle rudis	Pied Kingfisher	Unlisted	LC
Chalcomitra amethystina	Amethyst Sunbird	Unlisted	LC
Charadrius tricollaris	Three-banded Plover	Unlisted	LC
Chersomanes albofasciata	Spike-heeled Lark	Unlisted	LC
Chlidonias hybrida	Whiskered Tern	Unlisted	LC
Chlidonias leucopterus	White-winged Tern	Unlisted	LC
Chroicocephalus cirrocephalus	Grey-headed Gull	Unlisted	LC
Chrysococcyx caprius	Diederik Cuckoo	Unlisted	LC
Cinnyris talatala	White-bellied Sunbird	Unlisted	LC
Circaetus cinereus	Brown Snake Eagle	Unlisted	LC
Circaetus pectoralis	Black-chested Snake Eagle	Unlisted	LC
Cisticola aridulus	Desert Cisticola	Unlisted	LC
Cisticola ayresii	Wing-snapping Cisticola	Unlisted	LC
Cisticola chiniana	Rattling Cisticola	Unlisted	LC
Cisticola fulvicapilla	Neddicky	Unlisted	LC
Cisticola juncidis	Zitting Cisticola	Unlisted	LC
Cisticola textrix	Cloud Cisticola	Unlisted	LC
Cisticola tinniens	Levaillant's Cisticola	Unlisted	LC
Colius colius	White-backed Mousebird	Unlisted	LC
Colius striatus	Speckled Mousebird	Unlisted	LC
Columba guinea	Speckled Pigeon	Unlisted	LC
Columba livia	Rock Dove	Unlisted	LC
Coracias caudatus	Lilac-breasted Roller	Unlisted	LC
Coracias garrulus	European Roller	NT	LC
Corvus albus	Pied Crow	Unlisted	LC
Corvus capensis	Cape Crow	Unlisted	LC
Corythaixoides concolor	Grey Go-away-bird	Unlisted	LC
Cossypha caffra	Cape Robin-Chat	Unlisted	LC
Cossypha humeralis	White-throated Robin-Chat	Unlisted	LC

Scientific name	Common name	Regional (SANBI, 2016)	IUCN (2017)
Creatophora cinerea	Wattled Starling	Unlisted	LC
Crithagra atrogularis	Black-throated Canary	Unlisted	LC
Crithagra flaviventris	Yellow Canary	Unlisted	LC
Crithagra gularis	Streaky-headed Seedeater	Unlisted	LC
Crithagra mozambicus	Yellow-fronted Canary	Unlisted	LC
Cypsiurus parvus	African Palm Swift	Unlisted	LC
Delichon urbicum	Common House Martin	Unlisted	LC
Dendrocygna bicolor	Fulvous Whistling Duck	Unlisted	LC
Dendrocygna viduata	White-faced Whistling Duck	Unlisted	LC
Dendroperdix sephaena	Crested Francolin	Unlisted	LC
Dicrurus adsimilis	Fork-tailed Drongo	Unlisted	LC
Egretta alba	Great Egret	Unlisted	LC
Egretta ardesiaca	Black Heron	Unlisted	LC
Egretta garzetta	Little Egret	Unlisted	LC
Elanus caeruleus	Black-winged Kite	Unlisted	LC
Emberiza flaviventris	Golden-breasted Bunting	Unlisted	LC
Emberiza impetuani	Lark-like Bunting	Unlisted	LC
Emberiza tahapisi	Cinnamon-breasted Bunting	Unlisted	LC
Eremopterix leucotis	Chestnut-backed Sparrow-Lark	Unlisted	LC
Estrilda astrild	Common Waxbill	Unlisted	LC
Euplectes afer	Yellow-crowned Bishop	Unlisted	LC
Euplectes albonotatus	White-winged Widowbird	Unlisted	LC
Euplectes ardens	Red-collared Widowbird	Unlisted	LC
Euplectes orix	Southern Red Bishop	Unlisted	LC
Euplectes progne	Long-tailed Widowbird	Unlisted	LC
Falco amurensis	Amur Falcon	Unlisted	LC
Falco biarmicus	Lanner Falcon	VU	LC
Falco naumanni	Lesser Kestrel	Unlisted	LC
Falco peregrinus	Peregrine Falcon	Unlisted	LC
Falco rupicoloides	Greater Kestrel	Unlisted	LC
Falco vespertinus	Red-footed Falcon	NT	NT
Fulica cristata	Red-knobbed Coot	Unlisted	LC
Gallinago nigripennis	African Snipe	Unlisted	LC
Gallinula chloropus	Common Moorhen	Unlisted	LC
Glareola nordmanni	Black-winged Pratincole	NT	NT
Granatina granatina	Violet-eared Waxbill	Unlisted	LC
Gyps africanus	White-backed Vulture	CR	CR
Gyps coprotheres	Cape Vulture	EN	EN
Himantopus himantopus	Black-winged Stilt	Unlisted	LC
Hirundo albigularis	White-throated Swallow	Unlisted	LC
Hirundo cucullata	Greater Striped Swallow	Unlisted	LC
Hirundo rustica	Barn Swallow	Unlisted	LC
Hirundo semirufa	Red-breasted Swallow	Unlisted	LC

Scientific name	Common name	Regional (SANBI, 2016)	IUCN (2017)
Indicator indicator	Greater Honeyguide	Unlisted	LC
Indicator minor	Lesser Honeyguide	Unlisted	LC
Ixobrychus minutus	Little Bittern	Unlisted	LC
Lagonosticta rhodopareia	Jameson's Firefinch	Unlisted	LC
Lagonosticta senegala	Red-billed Firefinch	Unlisted	LC
Lamprotornis nitens	Cape Starling	Unlisted	LC
Laniarius atrococcineus	Crimson-breasted Shrike	Unlisted	LC
Laniarius ferrugineus	Southern Boubou	Unlisted	LC
Lanius collaris	Southern Fiscal	Unlisted	LC
Lanius collurio	Red-backed Shrike	Unlisted	LC
Lanius minor	Lesser Grey Shrike	Unlisted	LC
Leptoptilos crumeniferus	Marabou Stork	Unlisted	LC
Lybius torquatus	Black-collared Barbet	Unlisted	LC
Macronyx capensis	Cape Longclaw	Unlisted	LC
Malaconotus blanchoti	Grey-headed Bushshrike	Unlisted	LC
Megaceryle maximus	Giant Kingfisher	Unlisted	Unlisted
Merops apiaster	European Bee-eater	Unlisted	LC
Merops bullockoides	White-fronted Bee-eater	Unlisted	LC
Merops hirundineus	Swallow-tailed Bee-eater	Unlisted	LC
Merops persicus	Blue-cheeked Bee-eater	Unlisted	LC
Merops pusillus	Little Bee-eater	Unlisted	LC
Microcarbo africanus	Reed Cormorant	Unlisted	LC
Milvus aegyptius	Yellow-billed Kite	Unlisted	Unlisted
Milvus migrans	Black Kite	Unlisted	LC
Mirafra africana	Rufous-naped Lark	Unlisted	LC
Mirafra fasciolata	Eastern Clapper Lark	Unlisted	LC
Motacilla capensis	Cape Wagtail	Unlisted	LC
Muscicapa striata	Spotted Flycatcher	Unlisted	LC
Myrmecocichla formicivora	Ant-eating Chat	Unlisted	LC
Netta erythrophthalma	Southern Pochard	Unlisted	LC
Nilaus afer	Brubru	Unlisted	LC
Numida meleagris	Helmeted Guineafowl	Unlisted	LC
Nycticorax nycticorax	Black-crowned Night Heron	Unlisted	LC
Oena capensis	Namaqua Dove	Unlisted	LC
Oenanthe monticola	Mountain Wheatear	Unlisted	LC
Oenanthe pileata	Capped Wheatear	Unlisted	LC
Oriolus larvatus	Black-headed Oriole	Unlisted	LC
Ortygospiza atricollis	Quailfinch	Unlisted	LC
Oxyura maccoa	Maccoa Duck	NT	VU
Parus cinerascens	Ashy Tit	Unlisted	LC
Passer diffusus	Southern Grey-headed Sparrow	Unlisted	LC
Passer domesticus	House Sparrow	Unlisted	LC
Passer melanurus	Cape Sparrow	Unlisted	LC

Scientific name	Common name	Regional (SANBI, 2016)	IUCN (2017)
Passer motitensis	Great Sparrow	Unlisted	LC
Peliperdix coqui	Coqui Francolin	Unlisted	LC
Petrochelidon spilodera	South African Cliff Swallow	Unlisted	LC
Phalacrocorax carbo	White-breasted Cormorant	LC	LC
Philomachus pugnax	Ruff	Unlisted	LC
Phoenicopterus minor	Lesser Flamingo	NT	NT
Phoenicopterus ruber	Greater Flamingo	NT	LC
Phoeniculus purpureus	Green Wood Hoopoe	Unlisted	LC
Phylloscopus trochilus	Willow Warbler	Unlisted	LC
Platalea alba	African Spoonbill	Unlisted	LC
Plectropterus gambensis	Spur-winged Goose	Unlisted	LC
Plegadis falcinellus	Glossy Ibis	Unlisted	LC
Plocepasser mahali	White-browed Sparrow-Weaver	Unlisted	LC
Ploceus capensis	Cape Weaver	Unlisted	LC
Ploceus velatus	Southern Masked Weaver	Unlisted	LC
Podiceps nigricollis	Black-necked Grebe	Unlisted	LC
Pogoniulus chrysoconus	Yellow-fronted Tinkerbird	Unlisted	LC
Polemaetus bellicosus	Martial Eagle	EN	EN
Polyboroides typus	African Harrier-Hawk	Unlisted	LC
Porphyrio madagascariensis	African Swamphen	Unlisted	Unlisted
Prinia flavicans	Black-chested Prinia	Unlisted	LC
Prinia subflava	Tawny-flanked Prinia	Unlisted	LC
Prionops plumatus	White-crested Helmetshrike	Unlisted	LC
Psophocichla litsipsirupa	Groundscraper Thrush	Unlisted	Unlisted
Pternistis natalensis	Natal Spurfowl	Unlisted	LC
Pternistis swainsonii	Swainson's Spurfowl	Unlisted	LC
Ptyonoprogne fuligula	Rock Martin	Unlisted	Unlisted
Pycnonotus nigricans	African Red-eyed Bulbul	Unlisted	LC
Pycnonotus tricolor	Dark-capped Bulbul	Unlisted	Unlisted
Pytilia melba	Green-winged Pytilia	Unlisted	LC
Quelea quelea	Red-billed Quelea	Unlisted	LC
Recurvirostra avosetta	Pied Avocet	Unlisted	LC
Rhinopomastus cyanomelas	Common Scimitarbill	Unlisted	LC
Riparia cincta	Banded Martin	Unlisted	LC
Riparia paludicola	Brown-throated Martin	Unlisted	LC
Rostratula benghalensis	Greater Painted-snipe	NT	LC
Sagittarius serpentarius	Secretarybird	VU	EN
Sarkidiornis melanotos	Knob-billed Duck	Unlisted	LC
Saxicola torquatus	African Stonechat	Unlisted	LC
Scleroptila levaillantoides	Orange River Francolin	Unlisted	LC
Scopus umbretta	Hamerkop	Unlisted	LC
Sigelus silens	Fiscal Flycatcher	Unlisted	LC
Spilopelia senegalensis	Laughing Dove	Unlisted	LC

Scientific name	Common name	Regional (SANBI, 2016)	IUCN (2017)
Sporopipes squamifrons	Scaly-feathered Weaver	Unlisted	LC
Spreo bicolor	Pied Starling	Unlisted	LC
Streptopelia capicola	Cape Turtle Dove	Unlisted	LC
Streptopelia semitorquata	Red-eyed Dove	Unlisted	LC
Struthio camelus	Common Ostrich	Unlisted	LC
Sylvia communis	Common Whitethroat	Unlisted	LC
Sylvia subcaerulea	Chestnut-vented Warbler	Unlisted	Unlisted
Sylvietta rufescens	Long-billed Crombec	Unlisted	LC
Tachybaptus ruficollis	Little Grebe	Unlisted	LC
Tadorna cana	South African Shelduck	Unlisted	LC
Tchagra australis	Brown-crowned Tchagra	Unlisted	LC
Tchagra senegalus	Black-crowned Tchagra	Unlisted	LC
Telophorus zeylonus	Bokmakierie	Unlisted	LC
Terpsiphone viridis	African Paradise Flycatcher	Unlisted	LC
Threskiornis aethiopicus	African Sacred Ibis	Unlisted	LC
Torgos tracheliotus	Lappet-faced Vulture	EN	EN
Trachyphonus vaillantii	Crested Barbet	Unlisted	LC
Tricholaema leucomelas	Acacia Pied Barbet	Unlisted	LC
Tringa glareola	Wood Sandpiper	Unlisted	LC
Tringa nebularia	Common Greenshank	Unlisted	LC
Tringa stagnatilis	Marsh Sandpiper	Unlisted	LC
Turdoides jardineii	Arrow-marked Babbler	Unlisted	LC
Turdus libonyanus	Kurrichane Thrush	Unlisted	Unlisted
Turdus smithi	Karoo Thrush	Unlisted	LC
Turtur chalcospilos	Emerald-spotted Wood Dove	Unlisted	LC
Tyto alba	Western Barn Owl	Unlisted	LC
Upupa africana	African Hoopoe	Unlisted	LC
Uraeginthus angolensis	Blue Waxbill	Unlisted	LC
Urocolius indicus	Red-faced Mousebird	Unlisted	LC
Vanellus armatus	Blacksmith Lapwing	Unlisted	LC
Vanellus coronatus	Crowned Lapwing	Unlisted	LC
Vidua macroura	Pin-tailed Whydah	Unlisted	LC
Vidua paradisaea	Long-tailed Paradise Whydah	Unlisted	LC
Vidua regia	Shaft-tailed Whydah	Unlisted	LC
Zosterops pallidus	Orange River White-eye	Unlisted	LC
Zosterops virens	Cape White-eye	Unlisted	LC

12.2 Appendix B: Avifauna species recorded in the survey: point samples

Scientific Name	Common Name	Regional (SANBI, 2016)	IUCN (2017)	Guild code	Relative abundance	Frequency
Acridotheres tristis	Common Myna	Unlisted	LC	OMD	0,016	23,077
Acrocephalus baeticatus	African Reed Warbler	Unlisted	Unlisted	IWD	0,005	7,692
Acrocephalus gracilirostris	Lesser Swamp Warbler	Unlisted	LC	IGD	0,022	30,769
Afrotis afraoides	Northern Black Korhaan	Unlisted	LC	IGD	0,038	53,846
Alopochen aegyptiaca	Egyptian Goose	Unlisted	LC	HWD	0,005	7,692
Amblyospiza albifrons	Thick-billed Weaver	Unlisted	LC	GGD	0,005	7,692
Anas erythrorhyncha	Red-billed Teal	Unlisted	LC	OMD	0,055	7,692
Anas undulata	Yellow-billed Duck	Unlisted	LC	HWD	0,011	7,692
Ardeola ralloides	Squacco Heron	Unlisted	LC	CWD	0,005	7,692
Bostrychia hagedash	Hadada Ibis	Unlisted	LC	OMD	0,022	30,769
Bradypterus baboecala	Little Rush Warbler	Unlisted	LC	IWD	0,011	15,385
Chlidonias hybrida	Whiskered Tern	Unlisted	LC	CWD	0,005	7,692
Chrysococcyx caprius	Diederik Cuckoo	Unlisted	LC	IGD	0,016	23,077
Cisticola aridulus	Desert Cisticola	Unlisted	LC	IGD	0,038	53,846
Cisticola juncidis	Zitting Cisticola	Unlisted	LC	IGD	0,016	23,077
Cisticola lais	Wailing Cisticola	Unlisted	LC	IGD	0,011	15,385
Cisticola textrix	Cloud Cisticola	Unlisted	LC	IGD	0,016	23,077
Cisticola tinniens	Levaillant's Cisticola	Unlisted	LC	IGD	0,033	46,154
Columba guinea	Speckled Pigeon	Unlisted	LC	FFD	0,005	7,692
Corvus albus	Pied Crow	Unlisted	LC	OMD	0,022	30,769
Corythornis cristatus	Malachite Kingfisher	Unlisted	Unlisted	CWD	0,005	7,692
Crithagra atrogularis	Black-throated Canary	Unlisted	LC	OMD	0,011	15,385
Cypsiurus parvus	African Palm Swift	Unlisted	LC	IAD	0,005	7,692
Estrilda astrild	Common Waxbill	Unlisted	LC	GGD	0,005	7,692
Euplectes albonotatus	White-winged Widowbird	Unlisted	LC	GGD	0,005	7,692
Euplectes orix	Southern Red Bishop	Unlisted	LC	GGD	0,027	38,462
Euplectes progne	Long-tailed Widowbird	Unlisted	LC	GGD	0,005	7,692
Fulica cristata	Red-knobbed Coot	Unlisted	LC	HWD	0,098	38,462
Gallinula chloropus	Common Moorhen	Unlisted	LC	HWD	0,022	30,769
Hirundo albigularis	White-throated Swallow	Unlisted	LC	IAD	0,005	7,692
Hirundo rustica	Barn Swallow	Unlisted	LC	IAD	0,005	7,692
Macronyx capensis	Cape Longclaw	Unlisted	LC	IGD	0,005	7,692
Microcarbo africanus	Reed Cormorant	Unlisted	LC	CWD	0,005	7,692
Mirafra africana	Rufous-naped Lark	Unlisted	LC	IGD	0,011	15,385
Mirafra fasciolata	Eastern Clapper Lark	Unlisted	LC	IGD	0,011	15,385
Motacilla capensis	Cape Wagtail	Unlisted	LC	IGD	0,005	7,692
Myrmecocichla formicivora	Ant-eating Chat	Unlisted	LC	IGD	0,033	30,769
Numida meleagris	Helmeted Guineafowl	Unlisted	LC	OMD	0,011	7,692
Passer domesticus	House Sparrow	Unlisted	LC	GGD	0,005	7,692
Passer melanurus	Cape Sparrow	Unlisted	LC	GGD	0,016	15,385
Phoenicopterus ruber	Greater Flamingo	NT	LC	HWD	0,055	7,692

Scientific Name	Common Name	Regional (SANBI, 2016)	IUCN (2017)	Guild code	Relative abundance	Frequency
Ploceus velatus	Southern Masked Weaver	Unlisted	LC	GGD	0,049	38,462
Podiceps cristatus	Great Crested Grebe	Unlisted	LC	CWD	0,005	7,692
Prinia flavicans	Black-chested Prinia	Unlisted	LC	IGD	0,027	38,462
Prinia subflava	Tawny-flanked Prinia	Unlisted	LC	IGD	0,011	15,385
Pternistis swainsonii	Swainson's Spurfowl	Unlisted	LC	OMD	0,005	7,692
Pycnonotus tricolor	Dark-capped Bulbul	Unlisted	Unlisted	OMD	0,005	7,692
Riparia cincta	Banded Martin	Unlisted	LC	IAD	0,005	7,692
Sarothrura rufa	Red-chested Flufftail	Unlisted	LC	HWD	0,005	7,692
Saxicola torquatus	African Stonechat	Unlisted	LC	IGD	0,005	7,692
Scleroptila gutturalis	Orange River Francolin	Unlisted	LC	GGD	0,022	15,385
Spatula hottentota	Blue-billed Teal	Unlisted	LC	OMD	0,011	7,692
Spilopelia senegalensis	Laughing Dove	Unlisted	LC	GGD	0,016	23,077
Streptopelia semitorquata	Red-eyed Dove	Unlisted	LC	GGD	0,011	15,385
Tachybaptus ruficollis	Little Grebe	Unlisted	LC	CWD	0,011	15,385
Telophorus zeylonus	Bokmakierie	Unlisted	LC	OMD	0,005	7,692
Urocolius indicus	Red-faced Mousebird	Unlisted	LC	FFD	0,011	15,385
Vanellus armatus	Blacksmith Lapwing	Unlisted	LC	IGD	0,055	7,692
Vidua macroura	Pin-tailed Whydah	Unlisted	LC	GGD	0,005	7,692
Zapornia flavirostra	Black Crake	Unlisted	LC	OMD	0,005	7,692
Zosterops virens	Cape White-eye	Unlisted	LC	OMD	0,011	15,385

12.3 Appendix C: Avifauna species recorded in the survey all species

Scientific Name	Common Name	Regional (SANBI, 2016)	IUCN (2017)
Accipiter ovampensis	Ovambo Sparrowhawk	Unlisted	LC
Acridotheres tristis	Common Myna	Unlisted	LC
Acrocephalus baeticatus	African Reed Warbler	Unlisted	Unlisted
Acrocephalus gracilirostris	Lesser Swamp Warbler	Unlisted	LC
Afrotis afraoides	Northern Black Korhaan	Unlisted	LC
Alopochen aegyptiaca	Egyptian Goose	Unlisted	LC
Amblyospiza albifrons	Thick-billed Weaver	Unlisted	LC
Anas erythrorhyncha	Red-billed Teal	Unlisted	LC
Anas undulata	Yellow-billed Duck	Unlisted	LC
Ardeola ralloides	Squacco Heron	Unlisted	LC
Bostrychia hagedash	Hadada Ibis	Unlisted	LC
Bradypterus baboecala	Little Rush Warbler	Unlisted	LC
Burhinus capensis	Spotted Thick-knee	Unlisted	LC
Caprimulgus rufigena	Rufous-cheeked Nightjar	Unlisted	LC
Chlidonias hybrida	Whiskered Tern	Unlisted	LC
Chrysococcyx caprius	Diederik Cuckoo	Unlisted	LC
Circus pygargus	Montagu's Harrier	Unlisted	LC
Cisticola aridulus	Desert Cisticola	Unlisted	LC
Cisticola juncidis	Zitting Cisticola	Unlisted	LC
Cisticola lais	Wailing Cisticola	Unlisted	LC
Cisticola textrix	Cloud Cisticola	Unlisted	LC
Cisticola tinniens	Levaillant's Cisticola	Unlisted	LC
Columba guinea	Speckled Pigeon	Unlisted	LC
Corvus albus	Pied Crow	Unlisted	LC
Corythornis cristatus	Malachite Kingfisher	Unlisted	Unlisted
Crithagra atrogularis	Black-throated Canary	Unlisted	LC
Cypsiurus parvus	African Palm Swift	Unlisted	LC
Estrilda astrild	Common Waxbill	Unlisted	LC
Euplectes albonotatus	White-winged Widowbird	Unlisted	LC
Euplectes orix	Southern Red Bishop	Unlisted	LC
Euplectes progne	Long-tailed Widowbird	Unlisted	LC
Fulica cristata	Red-knobbed Coot	Unlisted	LC
Gallinula chloropus	Common Moorhen	Unlisted	LC
Gyps coprotheres	Cape Vulture	EN	EN
Hirundo albigularis	White-throated Swallow	Unlisted	LC
Hirundo rustica	Barn Swallow	Unlisted	LC
Lanius minor	Lesser Grey Shrike	Unlisted	LC
Macronyx capensis	Cape Longclaw	Unlisted	LC
Microcarbo africanus	Reed Cormorant	Unlisted	LC
Mirafra africana	Rufous-naped Lark	Unlisted	LC
Mirafra fasciolata	Eastern Clapper Lark	Unlisted	LC

Scientific Name	Common Name	Regional (SANBI, 2016)	IUCN (2017)
Motacilla capensis	Cape Wagtail	Unlisted	LC
Myrmecocichla formicivora	Ant-eating Chat	Unlisted	LC
Numida meleagris	Helmeted Guineafowl	Unlisted	LC
Passer domesticus	House Sparrow	Unlisted	LC
Passer melanurus	Cape Sparrow	Unlisted	LC
Phoenicopterus ruber	Greater Flamingo	NT	LC
Ploceus velatus	Southern Masked Weaver	Unlisted	LC
Podiceps cristatus	Great Crested Grebe	Unlisted	LC
Prinia flavicans	Black-chested Prinia	Unlisted	LC
Prinia subflava	Tawny-flanked Prinia	Unlisted	LC
Pternistis swainsonii	Swainson's Spurfowl	Unlisted	LC
Pycnonotus tricolor	Dark-capped Bulbul	Unlisted	Unlisted
Riparia cincta	Banded Martin	Unlisted	LC
Sarothrura rufa	Red-chested Flufftail	Unlisted	LC
Saxicola torquatus	African Stonechat	Unlisted	LC
Scleroptila gutturalis	Orange River Francolin	Unlisted	LC
Spatula hottentota	Blue-billed Teal	Unlisted	LC
Spilopelia senegalensis	Laughing Dove	Unlisted	LC
Streptopelia semitorquata	Red-eyed Dove	Unlisted	LC
Tachybaptus ruficollis	Little Grebe	Unlisted	LC
Telophorus zeylonus	Bokmakierie	Unlisted	LC
Tyto alba	Western Barn Owl	Unlisted	LC
Urocolius indicus	Red-faced Mousebird	Unlisted	LC
Vanellus armatus	Blacksmith Lapwing	Unlisted	LC
Vidua macroura	Pin-tailed Whydah	Unlisted	LC
Zapornia flavirostra	Black Crake	Unlisted	LC
Zosterops virens	Cape White-eye	Unlisted	LC

12.4 CVs of Specialist

Leigh-Ann de Wet

M.Sc Botany (*Pr Sci Nat*)

Cell: +27 83 352 1936
Email: leigh-ann@thebiodiversitycompany.com
Identity Number: 8209010127081
Date of birth: 1 September 1982

Profile Summary

Working experience throughout South Africa, Southern Africa West and Central Africa and also Madagascar.

Specialist experience in exploration, mining, engineering, hydropower, private sector and renewable energy.

Experience with project management for national and international biodiversity projects.

Experience with IFC Performance Standards, Critical Habitat and High Conservation Value Assessments. Experience in numerous vegetation and habitat types throughout Africa,

Specialist expertise includes botany, forest ecology, avifauna and terrestrial fauna. Methodology development, conservation management and terrestrial monitoring.

Areas of Interest

Forest ecology and ecosystem functionality.

Ecology and plant identification.

Field methodology.

Publication of scientific journals and articles.

Key Experience

- Familiar with World Bank, Equator Principles and the International Finance Corporation requirements.
- Familiar with High Conservation Value assessments as per ProForest guidelines.
- Conservation Management Plans.
- Flora assessments.
- Avifauna assessments.
- Terrestrial fauna assessments.
- Monitoring.
- Ecosystem services
- Rehabilitation Plans.
- Alien Invasive Plant Management Plans.
- Permitting.

Country Experience

Mozambique,

Malawi,

Zambia,

Madagascar,

Liberia,

Guinea'

Democratic Republic of the Congo,

South Africa

Nationality

South African

Languages

English – Proficient

Afrikaans – Conversational

Zulu - Basic

Qualifications

- MSc (Rhodes University) – Botany.
- BSc Honours (Rhodes University) – Botany
- BSc Natural Science (Botany and Entomology)
- Pr Sci Nat (400233/12)
- Certificate of Competence: UFS Introduction to wetland delineation.
- Certificate of Competence: UFS Introduction to wetland law
- Certificate of competence: Africa Land Use Training Grass Identification (long and short course)
- Certificate of Competence: ASI Snake Awareness, first aid for snake bite and venomous snake handling.

SELECTED PROJECT EXPERIENCE

Project Name: The Environmental Impact Assessment for the Karpowership Project including ships, and associated terrestrial infrastructure in Richards Bay, Coega and Saldanha Bay, South Africa.

Personal position / role on project: Specialist Terrestrial Ecologist and Avifauna specialist.

Location: South Africa (including KZN, Eastern and Western Cape) (2021).

Main project features: To determine the current status of the avifauna and terrestrial biodiversity.

Project Name: A biodiversity baseline and impact assessment for the proposed Siguiri Gold Mine Project, in Kankan Province, Guinea.

Personal position / role on project: Botanist

Location: Guinea

Main project features: To conduct a dual season ecological baseline assessment for the expected impact footprint area. The study was required to meet national and IFC requirements, including a Critical Habitat assessment.

Project Name: The Environmental Impact Assessment for the proposed Sibaya Node 6 development, Umdloti, South Africa.

Personal position / role on project: Terrestrial Ecologist

Location: South Africa

Main project features: To conduct a flora and fauna specialist assessment of the proposed mixed use development location and determine the impacts associated with the proposed development in relation to terrestrial fauna and flora.

Project Name: Terrestrial Biodiversity Monitoring (including rehabilitation, alien vegetation and indigenous ecology) for the Sibaya Node 6 development, Umdloti, South Africa.

Personal position / role on project: Terrestrial Ecologist

Location: South Africa

Main project features: To conduct monthly monitoring for the Sibaya Node 6 development (Salta) for 6 months including completing a detailed Vegetation Assessment, Rehabilitation Plan, Plant Rescue Plan, Conservation Management Plan and Biodiversity Action Plan.

Project Name: The Environmental Impact Assessment for the proposed Roodeplaatwind energy facility, Eastern Cape, South Africa.

Personal position / role on project: Terrestrial Ecologist

Location: South Africa

Main project features: To conduct a flora and fauna specialist assessment of the proposed wind farm location and determine the impacts associated with the proposed development in relation to

terrestrial fauna and flora. This included An Ecological Assessment, Rehabilitation Plan, Plant Rescue and Protection Plan, Open Space Management Plan and Alien Vegetation Management Plan.

Project Name: The Environmental Impact Assessment for the proposed Roodeplaatwind energy facility, Eastern Cape, South Africa.

Personal position / role on project: Terrestrial Ecologist

Location: South Africa

Main project features: To conduct a flora and fauna specialist assessment of the proposed wind farm location and determine the impacts associated with the proposed development in relation to terrestrial fauna and flora.

Project Name: Conservation Value Assessment for the City of Johannesburg (Little Falls Nature Reserve, Melville Koppies Nature Reserve, Ruimsig Butterfly Reserve and Rietfontein Nature Reserve)

Personal position / role on project: Terrestrial Ecologist

Location: Gauteng, South Africa

Main project features: Determination of the conservation potential and connectivity of four nature reserves within the City of Johannesburg including both fauna and flora.

Project Name: Feronia Palm Oil Projects, Including Boteka, Lokutu and Yaligimba, Democratic Republic of the Congo.

Personal position / role on project: Terrestrial Ecologist and HCV Specialist

Location: Democratic Republic of the Congo

Main project features: Determination and mapping of High Conservation Value areas within three oil palm plantations in the DRC to meet international best practice. Components including flora and fauna assessments as well as the integration of social aspects into the HCV assessment.

OVERVIEW

An overview of the specialist technical expertise includes the following:

- Terrestrial Ecological baseline assessments and categorization of the current condition of the environment.
- Ecosystem services for biodiversity, and the ecological and social interactions.
- Integration of specialist reports into IFC standard or HCV reporting.
- Design and adaptation of field methodology for assessment.
- Terrestrial Biodiversity offset strategy designs.
- Terrestrial rehabilitation plans.
- Monitoring plans for terrestrial systems.
- Faunal surveys which include mammals, birds, amphibians and reptiles.

- The design, compilation and implementation of Biodiversity and Land Management Plans and strategies.

EMPLOYMENT EXPERIENCE

The Biodiversity Company (March 2022 – Present)

Terrestrial Ecologist.

LD Biodivesity (August 2014 – March 2022)

Director and Terrestrial Ecologist

Digby Wells Environmental (July 2012 – September 2014)

Terrestrial Ecologist

Coastal and Environmental Services (March 2009 – June 2012)

Terrestrial Ecologist

PREVIOUS EMPLOYMENT: Rhodes University Department of Botany

Research Assisstant

ACADEMIC QUALIFICATIONS

Rhodes University, Grahamstown, South Africa (2007): MAGISTER SCIENTIAE (MSc) - Botany:

Title: *Pollinator mediated selection in Pelargonium reniforme Curtis (Geraniaceae): Patterns and Process.*

Rand Afrikaans University (RAU), Johannesburg, South Africa (2004): BACCALAUREUS SCIENTIAE CUM HONORIBUS (Hons) – Botany

Rand Afrikaans University (RAU), Johannesburg, South Africa (2001 - 2004): BACCALAUREUS SCIENTIAE IN NATURAL AND ENVIRONMENTAL SCIENCES. Majors: Entomology and Botany.

PUBLICATIONS

Taylor, S, Ripley, B, Martin, T, **de Wet, L,** Woodward, I and Osborne, C (2014.) Physiological advantages of C4 grasses in the field: a comparative experiment demonstrating the importance of drought. Global Change Biology – in Press.

Ripley BS, **de Wet, L** and Hill MP (2008). Herbivory-induced reduction in photosynthetic productivity of water hyacinth, *Eichhornia crassipes* (Martius) Solms-Laubach (Pontederiaceae), is not directly related to reduction in photosynthetic leaf area. African Entomology 16(1): 140-142.

de Wet LR, Barker NP and Peter CI (2008). The long and the short of gene flow and reproductive isolation: Inter-Simple Sequence Repeat (ISSR) markers support the recognition of two floral forms in *Pelargonium reniforme* (Geraniaceae). Biochemical Systematics and Ecology 36: 684-690.

de Wet L, NP Barker and CI Peter (2006). Beetles and Bobartia: an interesting herbivore-plant relationship. Veld & flora. September: 150 – 151.

de Wet LR and Botha CEJ (2007). Resistance or tolerance: An examination of aphid (*Sitobion yakini*) phloem feeding on Betta and Betta-Dn wheat (*Triticum aestivum* L.). South African Journal of Botany 73(1): 35-39.

de Wet L (2005). Is *Pelargonium reniforme* in danger? The effects of harvesting on *Pelargonium reniforme*. Veld & Flora. December: 182-184.