AVIFAUNA IMAPCT ASSESSMENT FOR THE PROPOSED GLENCORE LYDENBURG SOLAR PHOTOVOLTAIC (PV) PROJECT

Lydenburg Local Municipality, Ehlanzeni District Municipality, Mpumalanga Province, South Africa

5/10/2024

Prepared by:

The Biodiversity Company

Cell: +27 81 319 1225

Fax: +27 86 527 1965

info@thebiodiversitycompany.com

www.thebiodiversitycompany.com

Report Name	**AVIFAUNA IMAPCT ASSESSMENT FOR THE PROPOSED GLENCORE LYDENBURG SOLAR PHOTOVOLTAIC (PV) PROJECT**
Specialist Theme	Avifauna Theme
Project Reference	Glencore Lydenburg Solar PV Impact Assessment
Report Version	Draft 1 / 5/10/2024
Environmental Assessment Practitioner	EIMS ENVIRONMENTAL IMPACT MANAGEMENT SERVICES
Fieldwork	Andre van Tonder
Report Writer	Sam van Zwieten
Reviewer	Ryno Kemp (SACNASP 117462/17)
Reviewer	Andrew Husted (SACNASP 400213/11)
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.

Table of Contents

1 Introduction 1
1.1 Background 1
1.2 Project Description 1
1.3 Scope of Work 3
1.4 Assumptions and Limitations 3
1.5 Key Legislative Requirements 3
2 Fieldwork 4
2.1 Avifauna Field Assessment 4
3 Results & Discussion 6
3.1 Ecologically Important Landscape Features 6
3.1.1 Red List of Ecosystems 6
3.1.2 Ecosystem Protection Level 7
3.1.3 Critical Biodiversity Areas and Ecological Support Areas 8
3.1.4 National Protected Area Expansion Strategy 9
3.1.5 Protected Areas 10
3.1.6 Important Bird and Biodiversity Area 11
3.1.7 South African Inventory of Inland Aquatic Ecosystems 12
3.1.8 National Freshwater Ecosystem Priority Area Status 13
3.1.9 Coordinated Waterbird Counts (CWAC) 14
3.1.10 Coordinated Avifaunal Roadcount (CAR) 15
3.2 Avifauna Expected Species 16
3.3 Vultures 19
3.4 Fieldwork Findings 20
3.4.1 Species List of First Field Survey 20
3.4.2 Species List of Second Field Survey 22
3.4.3 Flight and Nest Analysis 24
3.5 Habitat Assessment 25
3.5.1 Degraded Thornveld 25
3.5.2 Degraded Grassland 26
3.5.3 Transformed 27
3.5.4 Water Resoucres 27
3.6 Site Ecological Importance 29

3.6.1 Desktop Ecological Senstivity 30
3.6.2 Screening Tool Comparison 32
4 Impact Assessment 32
4.1 Current Impacts to Biodiversity 32
4.2 Alternatives Considered 33
4.3 Loss of Irreplaceable Resources 34
4.4 Quantitative Impact Assessment 34
4.4.1 Construction Phase 35
4.4.2 Operation Phase 35
4.4.3 Construction Phase 35
4.4.4 Cumulative Impacts 37
5 Avifauna Impact Management Actions 39
6 Monitoring ..... **Error! Bookmark not defined.**
7 Conclusion 43
7.1 Impact Statement 43
7.2 Specialist Opinion 44
8 References 45
9 Appendix Items 47
9.1 Appendix A: Methodology 47
9.1.1 Desktop Dataset Assessment 47
9.1.2 Avifauna Survey 48
9.2 Appendix B: Site Ecological Importance 49
9.3 Appendix C: Impact Assessment Significance Rating 52
9.4 Appendix D: Expected Avifaunal Species 52
9.5 Appendix E: Point Count Data from First Field Survey 61
9.6 Appendix F: Incidental Records from Frist Field Survey 61
9.7 Appendix G: Point Count Data from Second Field Survey 62
9.8 Appendix H: Incidental Records from Second Field Survey 63
9.9 Appendix I: Specialist Declaration of Independence 64
9.10 Appendix J – Specialist CVs 65

List of Tables

Table 1-1 A list of key legislative requirements 3

Table 3-1 Summary of relevance of the proposed project to ecologically important landscape features 6

Table 3-2 Threatened avifauna species that are expected to occur within the PAOI. EN = Endangered, LC = Least Concern, NT = Near Threatened and VU = Vulnerable 16

Table 3-3 Summary of Priority Species recorded within and around the proposed development. 20

Table 3-4 Relative abundance and frequency of occurrence of dominant avifauna species recorded during the standardised point counts within and around the proposed development during the first field survey. 21

Table 3-5 Summary of Priority Species recorded within and around the proposed development. 22

Table 3-6 Relative abundance and frequency of occurrence of dominant avifauna species recorded during the standardised point counts within and around the proposed development during the second field survey. 23

Table 3-7 Summary of habitat types delineated within field assessment area 29

Table 3-8 Summary of the screening tool vs specialist-assigned sensitivities 32

Table 4-1 Alternatives Considered 33

Table 4-2 Impacts associated with the Construction Phase. 36

Table 4-3 The cumulative impacts considered for avifauna 37

Table 4-4 Cumulative Impacts to avifauna associated with the proposed project 38

Table 5-1 Summary of management outcomes pertaining to impacts on avifauna and their habitats 39

Table 9-1 Summary of Conservation Importance (CI) criteria 49

Table 9-2 Summary of Functional Integrity (FI) criteria 50

Table 9-3 Matrix used to derive Biodiversity Importance (BI) from Functional Integrity (FI) and Conservation Importance (CI) 50

Table 9-4 Summary of Resource Resilience (RR) criteria 51

Table 9-5 Matrix used to derive Site Ecological Importance (SEI) from Receptor Resilience (RR) and Biodiversity Importance (BI) 51

Table 9-6 Guidelines for interpreting Site Ecological Importance (SEI) in the context of the proposed development activities 51

List of Figures

Figure 1-1 Proposed location of the project area in relation to the nearby towns 2
Figure 1-2 Project area of influence 2
Figure 2-1 Map illustrating the point count locations 5
Figure 3-1 Map illustrating the ecosystem threat status associated with the proposed development. 7
Figure 3-2 Map illustrating the ecosystem protection level associated with the PAOI 8
Figure 3-3 Map illustrating the biodiversity spatial plan in relation to the PAOI 9
Figure 3-4 The PAOI in relation to the National Protected Area Expansion Strategy 10
Figure 3-5 Map illustrating the location of protected areas proximal to the PAOI 11
Figure 3-6 The PAOI in relation to the nearest IBAs 12
Figure 3-7 Map illustrating ecosystem threat status of rivers and wetland ecosystems in relation to the PAOI 13
Figure 3-8 The PAOI in relation to the National Freshwater Ecosystem Priority Areas 14
Figure 3-9 The PAOI in relation to the CWAC site 15
Figure 3-10 The CAR routes in relation to the PAOI 16
Figure 3-11 The tracking data of vulture species in and around the PAOI 19
Figure 3-12 Photos of Risk Species found within the PAOI; A) Black-winged Kite and B) Egyptian Goose 20
Figure 3-13 Column plot illustrating the proportion of each Functional Feeding Guild to the total abundance. Avifaunal trophic guilds – 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, Invertivore Air Diurnal; IGD, Insectivore Ground Diurnal; IWD, Invertivore Water Diurnal; NFD, Nectivore Foliage Diurnal; OMD, Omnivore Multiple Diurnal; IAN, Invertivore Air Nocturnal. 22
Figure 3-14 Photos of Risk Species found within the PAOI; A) Helmeted Guineafowl and B) Brown Snake Eagle 22
Figure 3-15 Column plot illustrating the proportion of each Functional Feeding Guild to the total abundance. Avifaunal trophic guilds – 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, Invertivore Air Diurnal; IGD, Insectivore Ground Diurnal; IWD, Invertivore Water Diurnal; NFD, Nectivore Foliage Diurnal; OMD, Omnivore Multiple Diurnal; IAN, Invertivore Air Nocturnal. 24
Figure 3-16 Habitats identified within the assessment areas 25
Figure 3-17 Example of Degraded Thornveld habitat (at location -25.060322°; 30.475837°) .. 26
Figure 3-18 Example of Degraded Grassland habitat (at location -25.052425°; 30.468356°) .. 27
Figure 3-19 Example of Transformed habitat (at location -25.060701°; 30.471767°) 27

Figure 3-20 Example of Water Resources (at location -25.065638°; 30.462534°) 28
Figure 3-21 Animal Species Theme Sensitivity 31
Figure 3-22 Site ecological importance, with mitigation measures applied 32
Figure 4-1 Photograph illustrating current negative impacts associated with the PAOI: A) Fencing, B) Roads and mining activity 33
Figure 4-2 Cumulative habitat loss in 30 km surrounding the PAOI 38

1 Introduction

1.1 Background

The Biodiversity Company was appointed by EIMS to undertake an avifauna impact assessment for the proposed Glencore Lydenburg Solar Photovoltaic (PV) project. The project area is located near Lydenburg (Mashishing), within the Lydenburg Local Municipality, Ehlanzeni District, Mpumalanga Province. The area that is being investigated for the proposed solar PV project is located just northeast of Lydenburg (Mashishing) and approximately 65 km northwest of Mbombela (Nelspruit), Mpumalanga (Figure 1-1). The project area of interest (PAOI) consists of the project area provided, made up of the Lydenburg Smelter property boundary and Portion 143 of Farm 30 Potloodspruit (Figure 1-2).

The approach was informed by 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 320 (20 March 2020) in terms of NEMA, dated 20 March and 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 at a scoping level, enabling informed decision making.

1.2 Project Description

Glencore (Pty) Ltd is proposing the development of a Solar Photovoltaic (PV) Energy Generation Facility at the Lydenburg CMI Smelter. The generation capacity will be up to 200MW. All power generated from the facility will be used at the smelter. The proposed facility will include the following infrastructure:

- PV Panels;
- Power line connection (88kV);
- Access roads;
- On-site substation / switching station; and
- Possibly an on-site battery storage facility.

The proposed project is located on Portion 143 of Farm 30 Potloodspruit, Portions 114, 457 and 471 of Farm 31 Townlands of Lydenburg, Portion 1 of Lydenburg Smelter Erf 6099, Lydenburg Smelter Erf 2540 and Lydenburg Smelter Erf 2541 within Thaba Chweu Local Municipality (Ward 12 and 13), Ehlanzeni District Municipality, Mpumalanga Province. All power generated from the facility will be used at the smelter.

A PV plant is designed to produce bulk electrical power from solar radiation. The solar power plant uses solar energy to produce electrical power. Therefore, it is a conventional power plant. Solar energy can be used directly to produce electrical energy using solar PV panels or alternatively using concentrated solar energy. When using concentrated solar energy, the radiation energy of solar is first converted into heat (thermal energy) and this heat is used to drive a conventional generator. This method is difficult and not efficient to produce electrical power on a large scale. Hence, to produce electrical power on a large scale, solar PV panels are used, similar to the design of the proposed PV Facility.

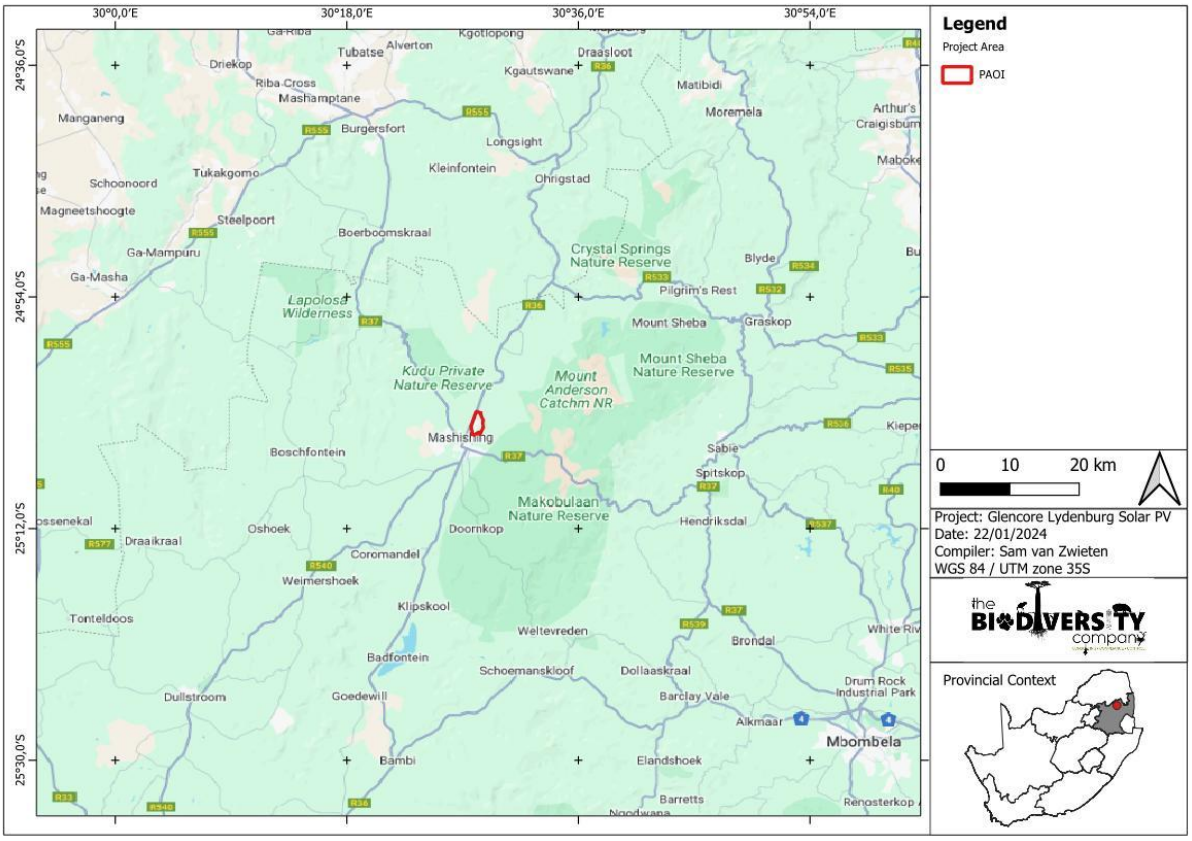


Figure 1-1 Proposed location of the project area in relation to the nearby towns

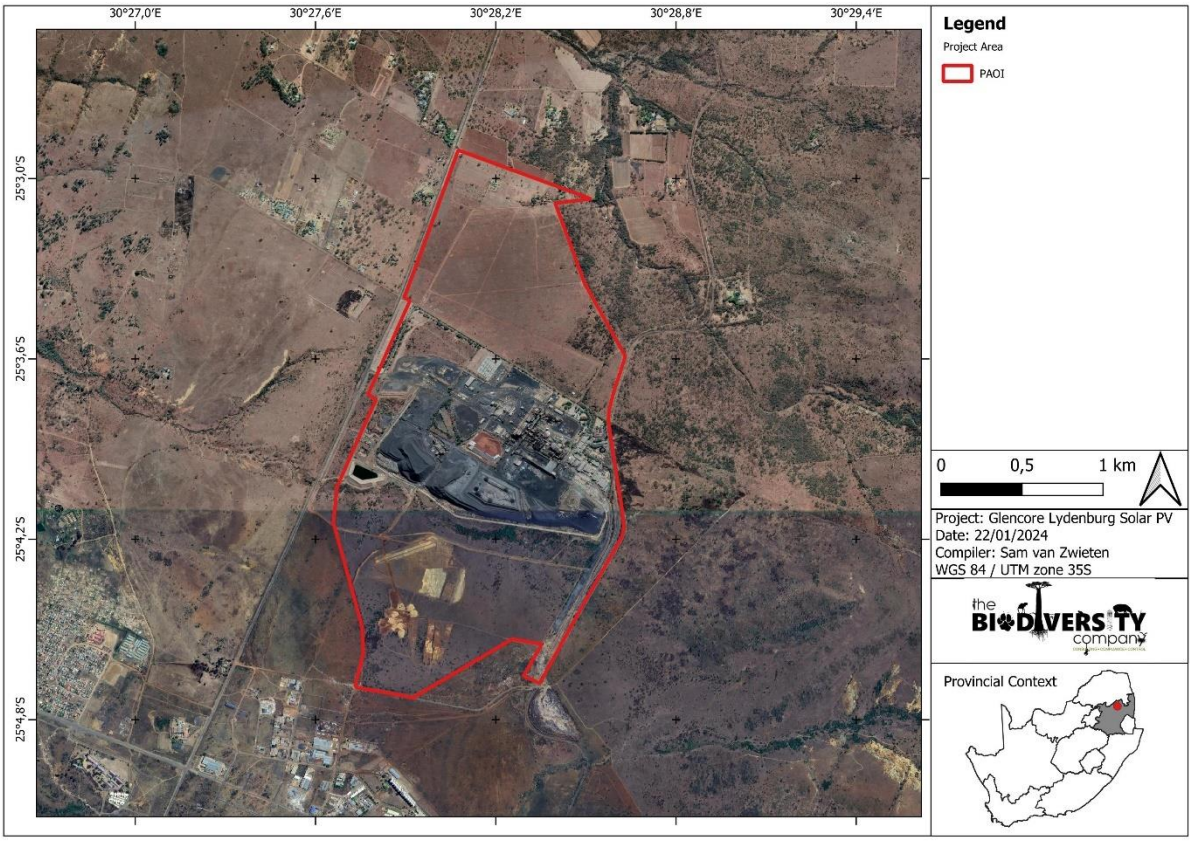


Figure 1-2 Project area of influence

1.3 Scope of Work

The assessment was achieved according to the above-mentioned legislation and the best-practice guidelines and principles for Avifaunal Impact Assessments within the context of PVs as outlined by BirdLife South Africa (2017).

- The scope of the Avifaunal Impact Assessment included the following:
- Desktop assessment to identify the relevant ecologically important geographical features within the Project Area of Influence (PAOI) and surrounding landscape
- Desktop assessment to compile an expected species list and possible avifauna Species of Conservation Concern (SCC) that potentially occur within the PAOI;
- Fieldwork to determine the density and composition of species in 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.

1.4 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- The PAOI was based on the project footprint area as provided by the client. Any alterations to the area and/or missing GIS information pertaining to the assessment area would have affected the area surveyed and hence the results of this assessment;
- The first avifaunal field survey was completed on the 18th of January 2024, whilst the second survey was completed on 6th to the 8th of May 2024. These assessments are deemed sufficient for a regime 2 assessment;
- Whilst every effort was made to cover as much of the PAOI as possible it is possible that some species that are present within the PAOI were not recorded during the field investigations due to their secretive behaviour; and
- The GPS used in the assessment has an accuracy of 5 m, and consequently, any spatial features delineated may be offset by up to 5 m.

1.5 Key Legislative Requirements

The legislation, policies and guidelines listed below in Table 1-1 are applicable to the current project. The list below, although extensive, may not be complete and other legislation, policies and guidelines may apply in addition to those listed below.

Table 1-1 A list of key legislative requirements

Region	Legislation / Guideline	Comment
National	NEMA	Environmental Impact Assessment Regulations. 2014 (GNR 326, 7 April 2017), Appendix 6 requirements
	The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA), Threatened or Protected Species Regulations	The protection of species and ecosystems that warrant protection
	Assessment Protocol (March 2020)	The minimum criteria for reporting.
	Assessment Protocol (October 2020)	Protocol for the specialist assessment and minimum report content requirements.
	NEMWA;	The regulation of waste management to protect the environment.
	NWA	The regulation of water uses.
	GN 1003 of GG 43726 of 18 Sept 2020	The regulation and management of alien invasive species.
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)	To provide for control over the utilisation of the natural agricultural resources, including the vegetation and the combating of weeds and invader plants.
Provincial	Mpumalanga Parks Board Act 6 of 1995	To provide effective conservation management of natural resources of the Mpumalanga Province
	Mpumalanga Conservation Act, 1998 (Act 10 of 1998)	To consolidate and amend the laws relating to nature conservation.
	Mpumalanga Tourism and Parks Agency Act, No 5 of 2005	To provide for conservation management of the natural resources of Mpumalanga; to confer powers and functions upon the Agency; to provide for the registration of certain persons and entities directly involved in tourism; to provide for transitional arrangements; and to provide for matters incidental thereto.
	Mpumalanga Conservation Plan (C-plan 2)	To guide conservation and land-use decisions in support of sustainable development at a strategic level.
	Mpumalanga Biodiversity Sector Plan	To provide a more comprehensive assessment of the biodiversity of the terrestrial and freshwater environment in Mpumalanga.

2 Fieldwork

2.1 Avifauna Field Assessment

The first avifaunal field survey was completed on the 18th of January 2024, whilst the second survey was completed on 6th to the 8th of May 2024. 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 standardised point count technique was utilised as it was demonstrated to outperform line routes (Cumming & Henry, 2019). Each point count was run over a 10 minute 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 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 shows the locations of the point counts conducted.

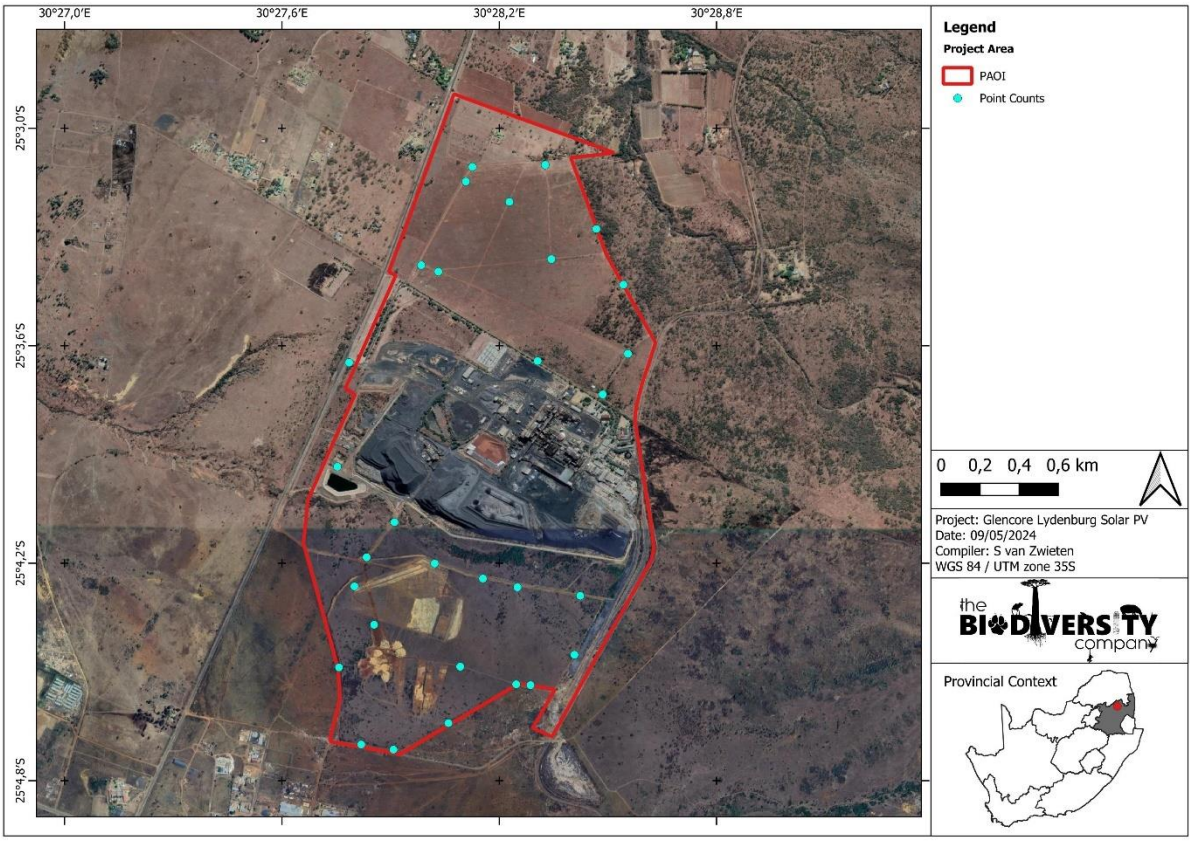


Figure 2-1 Map illustrating the point count locations

3 Results & Discussion

3.1 Ecologically Important Landscape Features

The GIS analysis pertaining to the relevance of the proposed project to ecologically important landscape features is summarised in Table 3-1.

Table 3-1 Summary of relevance of the proposed project to ecologically important landscape features

Desktop Information Considered	Relevant/Irrelevant	Section
Ecosystem Threat Status	Relevant – Overlaps with a "LC" Ecosystem (RLE, 2021).	3.1.1
Ecosystem Protection Level	Relevant – Overlaps with a 'Poorly Protected' Ecosystem.	3.1.2
Provincial Conservation Plan	Relevant – Overlaps with ESAs, ONAs and MMA's or HMA's, and borders CBAs and PAs	3.1.3
National Protected Areas Expansion Strategy	Relevant – Overlaps with Priority Focus Areas and borders a Protected Area	3.1.4
SAPAD & SACAD	Relevant – Overlaps with the Lydenburg Nature Reserve protected area.	3.1.5
Important Bird and Biodiversity Areas	Irrelevant – The nearest IBA, Steenkampberg, is 19km away	3.1.6
South African Inventory of Inland Aquatic Ecosystems (SAIIAE)	Relevant – Overlaps with a CR river (Potloodspruit).	3.1.7
National Freshwater Priority Area	Relevant – Overlaps with non-priority wetlands and a Moderately Modified NFEPA river.	3.1.8
Renewable Energy Development Zones	Irrelevant – Does not overlap with any REDZ.s	-
Renewable Energy Database	Irrelevant – No REEA projects within the vicinity of the PAOI.	-
Strategic Transmission Corridors (EGI)	Irrelevant – Does not overlap with the International Corridor	-
Coordinated Water Bird Count	Relevant – Project area 3.5 km from the Lydenburg Fisheries CWAC.	3.1.9
Coordinated Avifaunal Road Count	Irrelevant - Project area does not overlap with any CAR routes	3.1.10

3.1.1 Red List of Ecosystems

The Ecosystem Threat Status is an 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. According to the spatial dataset the proposed development overlaps with a LC ecosystem (Figure 3-1).

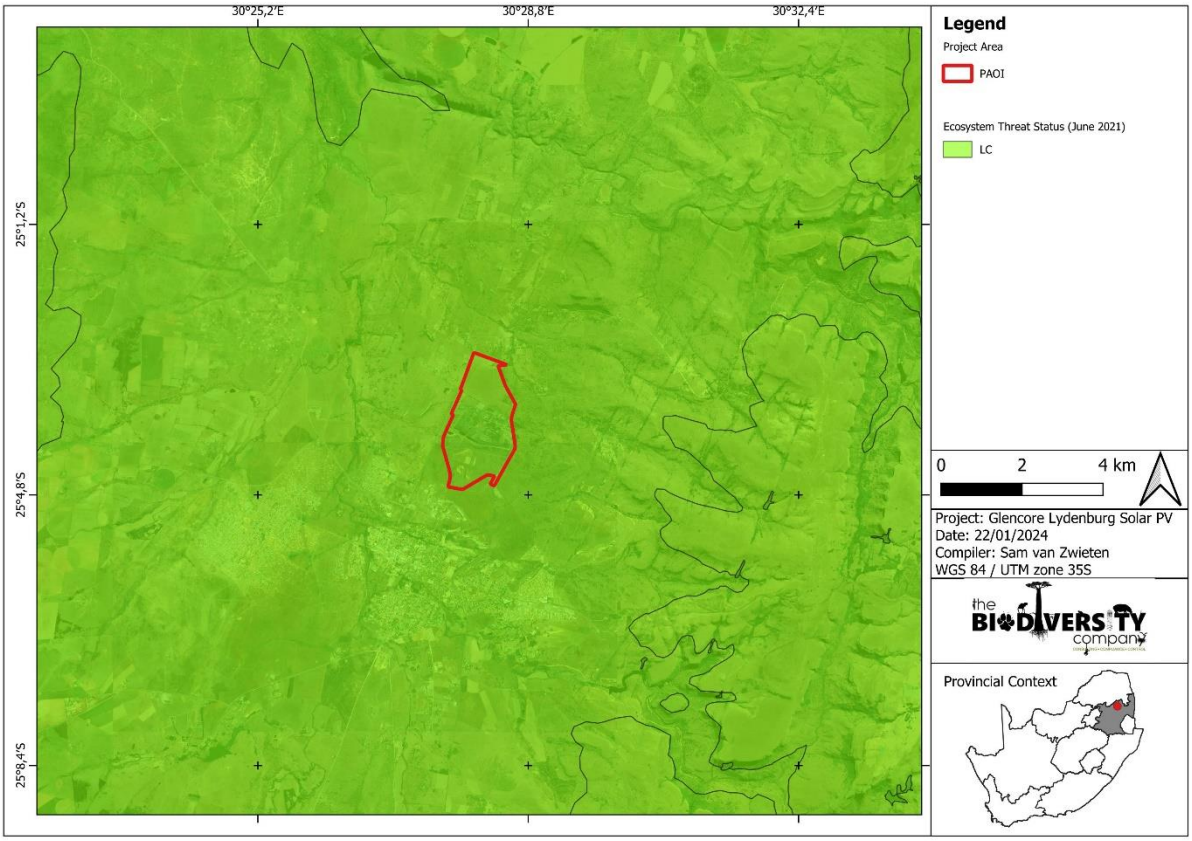


Figure 3-1 Map illustrating the ecosystem threat status associated with the proposed development.

3.1.2 Ecosystem Protection Level

This is an 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. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems. The proposed project overlaps with a PP ecosystem (Figure 3-2).

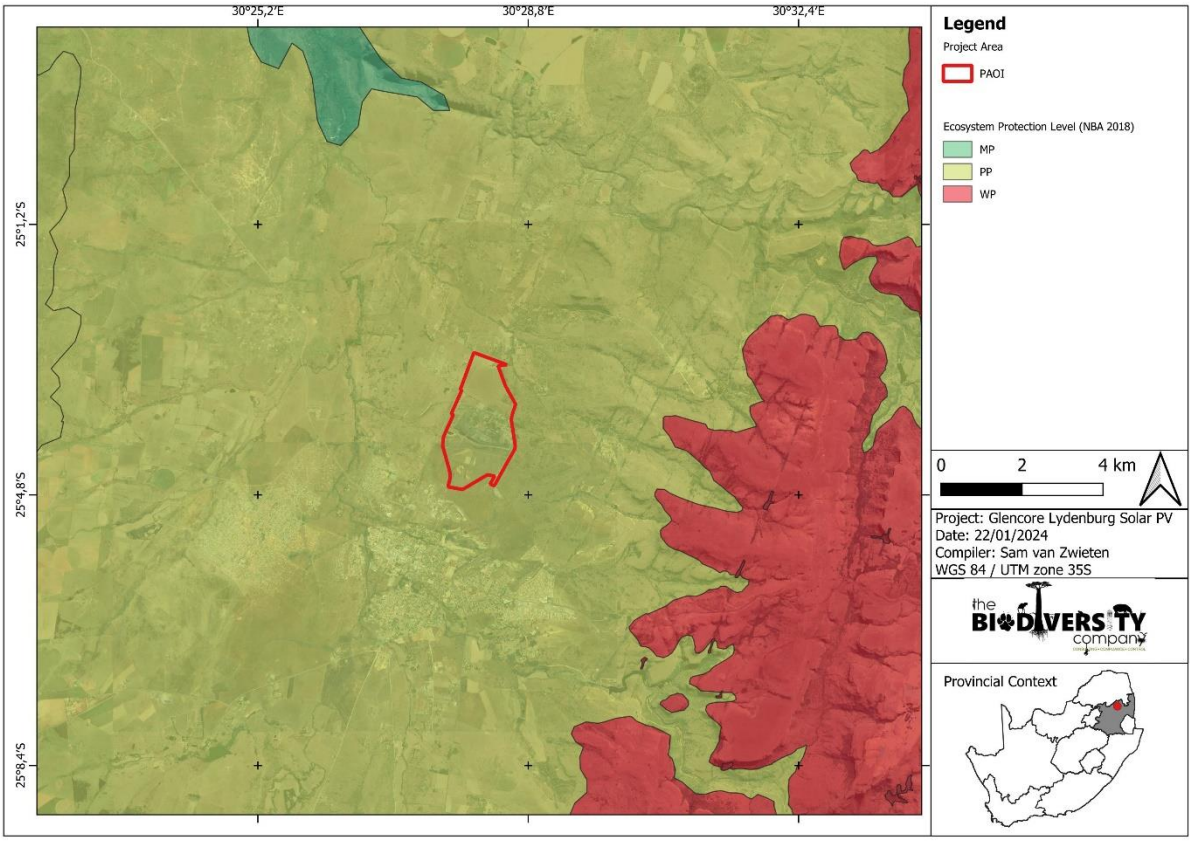


Figure 3-2 Map illustrating the ecosystem protection level associated with the PAOI

3.1.3 Critical Biodiversity Areas and Ecological Support Areas

The key output of this systematic biodiversity plan is a map of biodiversity priority areas (MTPA, 2022). The MBSP CBA map delineates Critical Biodiversity Areas, Ecological Support Areas, Other Natural Areas, Protected Areas, and areas that have been irreversibly modified from their natural state (MTPA, 2022). The MBSP uses the following terms to categorise the various land used types according to their biodiversity and environmental importance:

- Critical Biodiversity Area (CBA);
- Ecological Support Area (ESA);
- Other Natural Area (ONA);
- Protected Area (PA); and
- Moderately or Heavily Modified Areas (MMA's or HMA's).

According to the MBSP the PAOI falls across areas classified as ESAs, ONAs and MMA's or HMA's, and borders areas classified as CBAs and PAs (Figure 3-3).

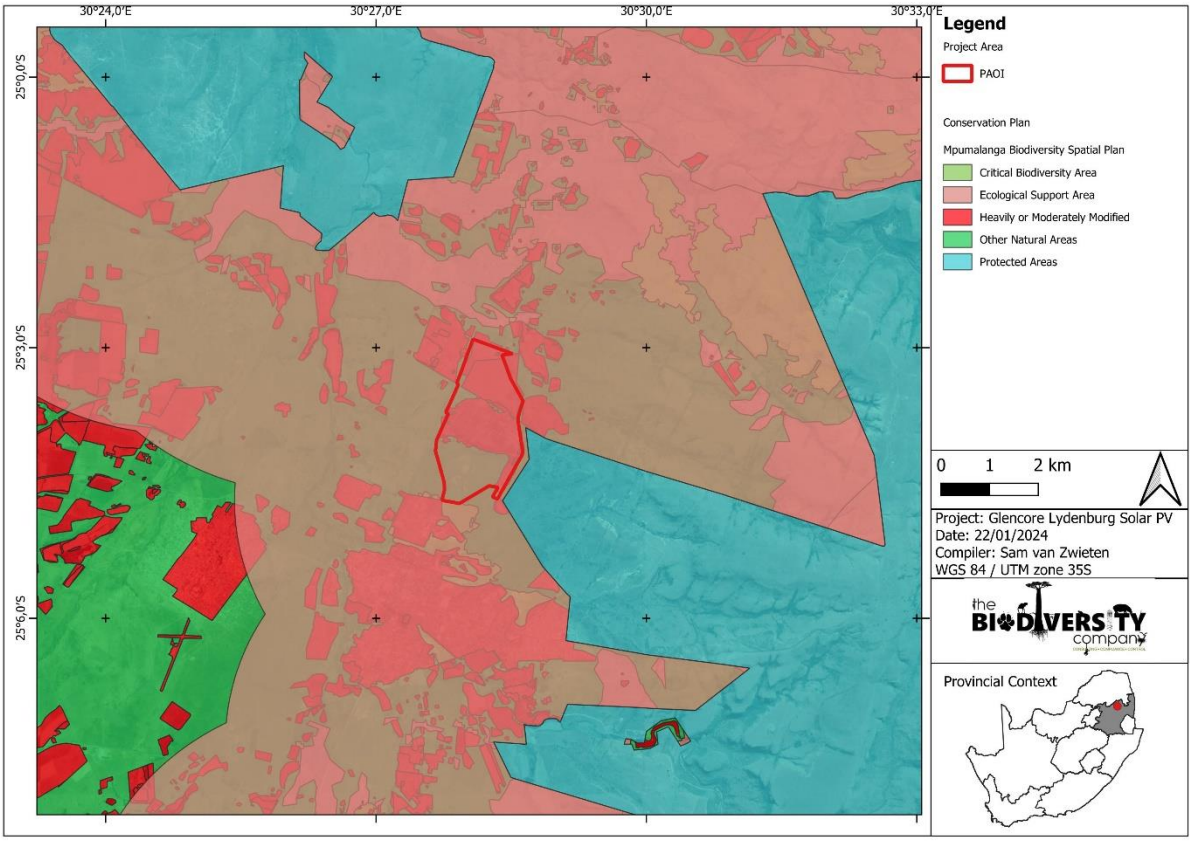


Figure 3-3 Map illustrating the biodiversity spatial plan in relation to the PAOI

3.1.4 National Protected Area Expansion Strategy

National Protected Area Expansion Strategy 2018 (NPAES) areas were identified through a systematic biodiversity planning process. They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES and were designed with a strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems. These areas should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES. They are also not a replacement for fine scale planning which may identify a range of different priority sites based on local requirements, constraints and opportunities (NPAES, 2018).

The PAOI overlaps with a Priority focus area and borders with a Protected area (Figure 3-4).

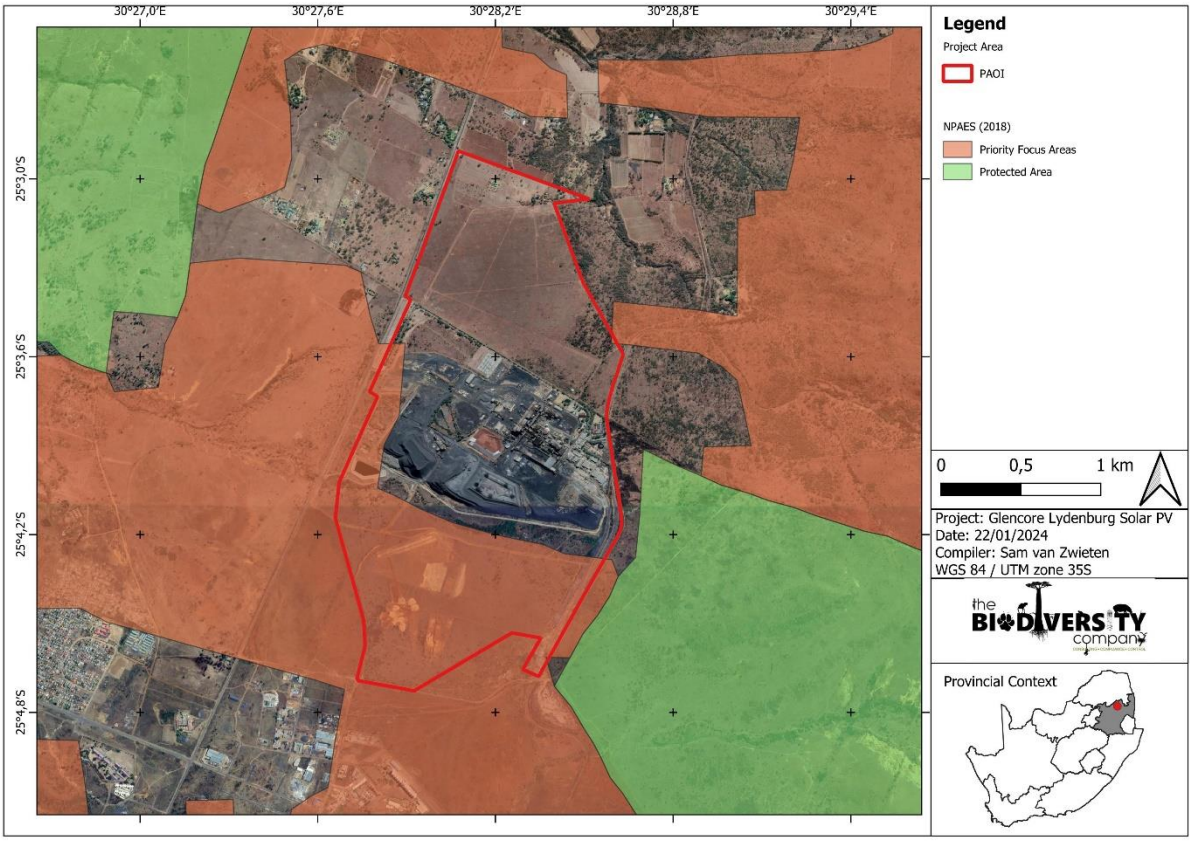


Figure 3-4 The PAOI in relation to the National Protected Area Expansion Strategy

3.1.5 Protected Areas

According to the protected and conservation area spatial datasets from SAPAD and SACAD (DFFE, 2021a), the PAOI overlaps with the Lydenburg Nature Reserve protected area. There are also several protected areas within 5 km of the PAOI, being Kudu Private Nature Reserve, Lydenburg Fisheries, and Sterkspruit Nature Reserve. The nearest conservation area is the Kruger to Canyons Biosphere Reserve, approximately 6 km away (Figure 3-5).

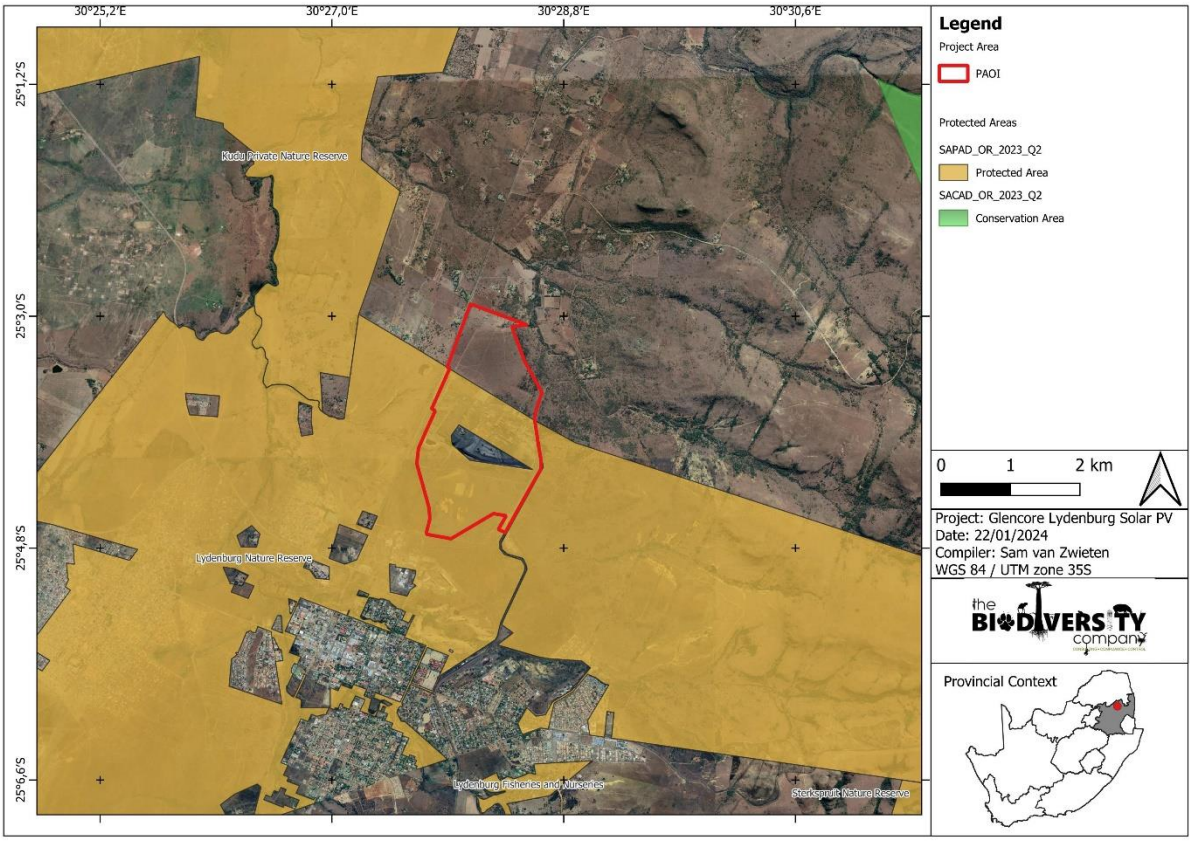


Figure 3-5 Map illustrating the location of protected areas proximal to the PAOI

3.1.6 Important Bird and Biodiversity Area

Important Bird & Biodiversity Areas (IBAs) are the sites of international significance for the conservation of the world's birds and other conservation significant species as identified by BirdLife International. These sites are also all Key Biodiversity Areas; sites that contribute significantly to the global persistence of biodiversity (Birdlife South Africa, 2017).

According to Birdlife South Africa (2017), the selection of IBAs is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge of the sizes and trends of bird populations. The criteria ensure that the sites selected as IBAs have true significance for the international conservation of bird populations and provide a common currency that all IBAs adhere to, thus creating consistency among, and enabling comparability between, sites at national, continental and global levels. Figure 3-6 shows that the PAOI is located 19 km from the nearest IBA, the Steenkampberg IBA.

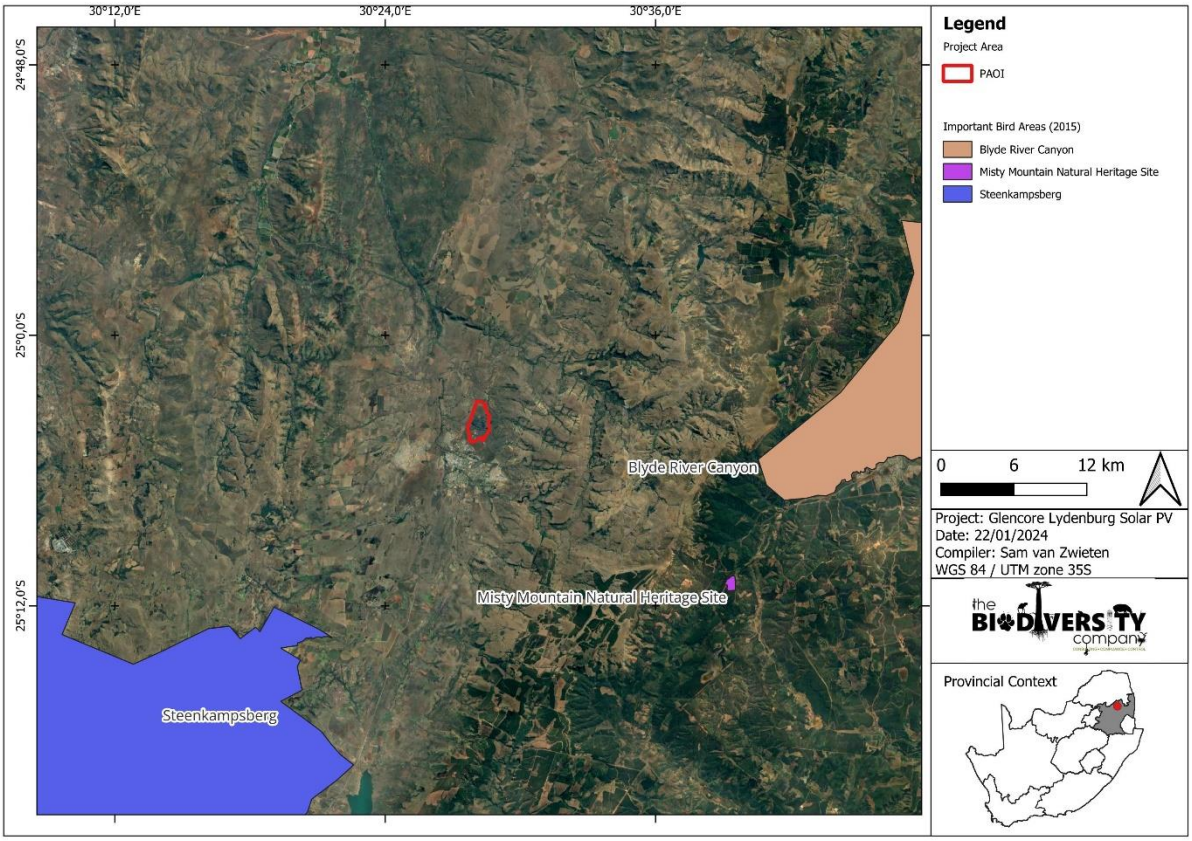


Figure 3-6 The PAOI in relation to the nearest IBAs

3.1.7 South African Inventory of Inland Aquatic Ecosystems

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was released with the NBA in 2018. Ecosystem threat status (ETS) of river and wetland ecosystem types are 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, with CR, EN and VU ecosystem types collectively referred to as 'threatened' (Van Deventer *et al*., 2019; Skowno *et al*., 2019). The PAOI is in close proximity with a CR river, the Potloodspruit (Figure 3-7).

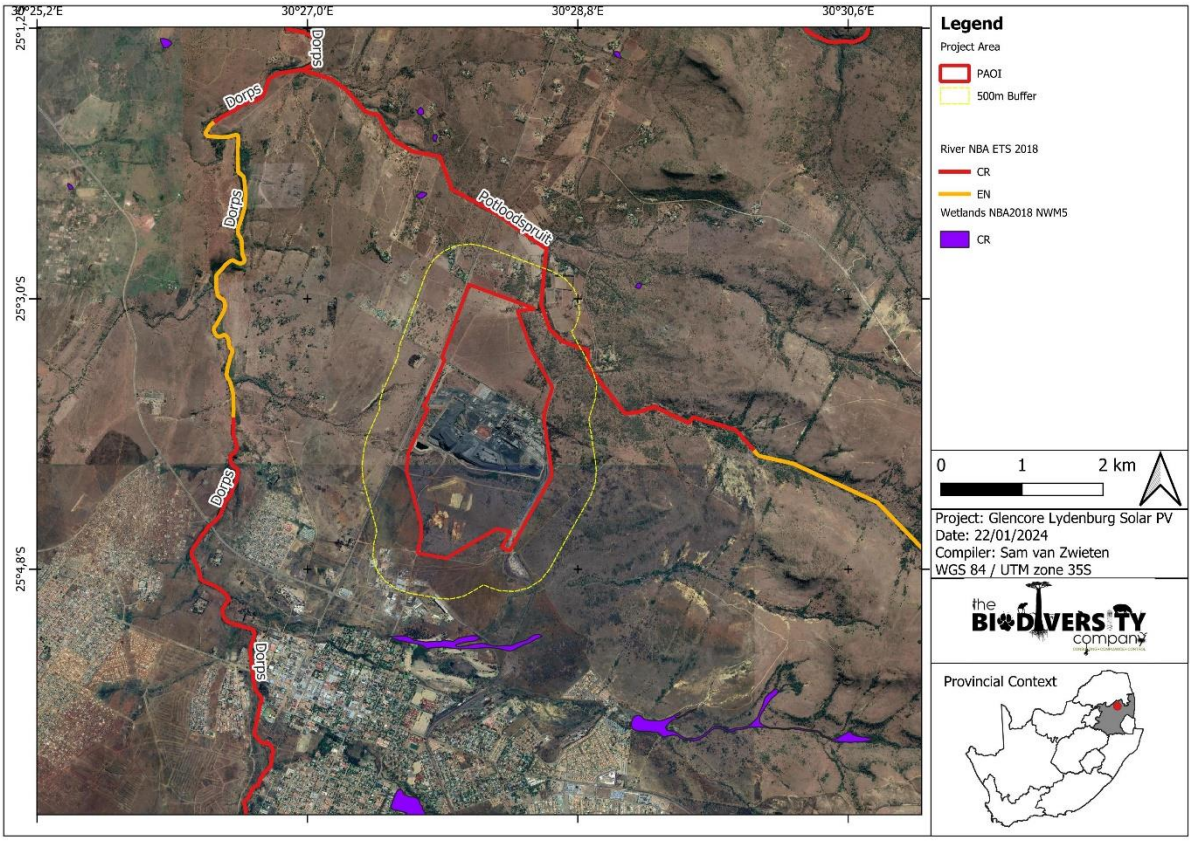


Figure 3-7 Map illustrating ecosystem threat status of rivers and wetland ecosystems in relation to the PAOI

3.1.8 National Freshwater Ecosystem Priority Area Status

In an attempt to better conserve aquatic ecosystems, South Africa has categorised its river systems according to set ecological criteria (i.e., ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs) (Driver *et al*., 2011). The FEPAs are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act's (NEM:BA) biodiversity goals (Nel *et al*., 2011).

Figure 3-8 shows that the PAOI overlaps with non-priority wetlands and a moderately modified NFEPA river.

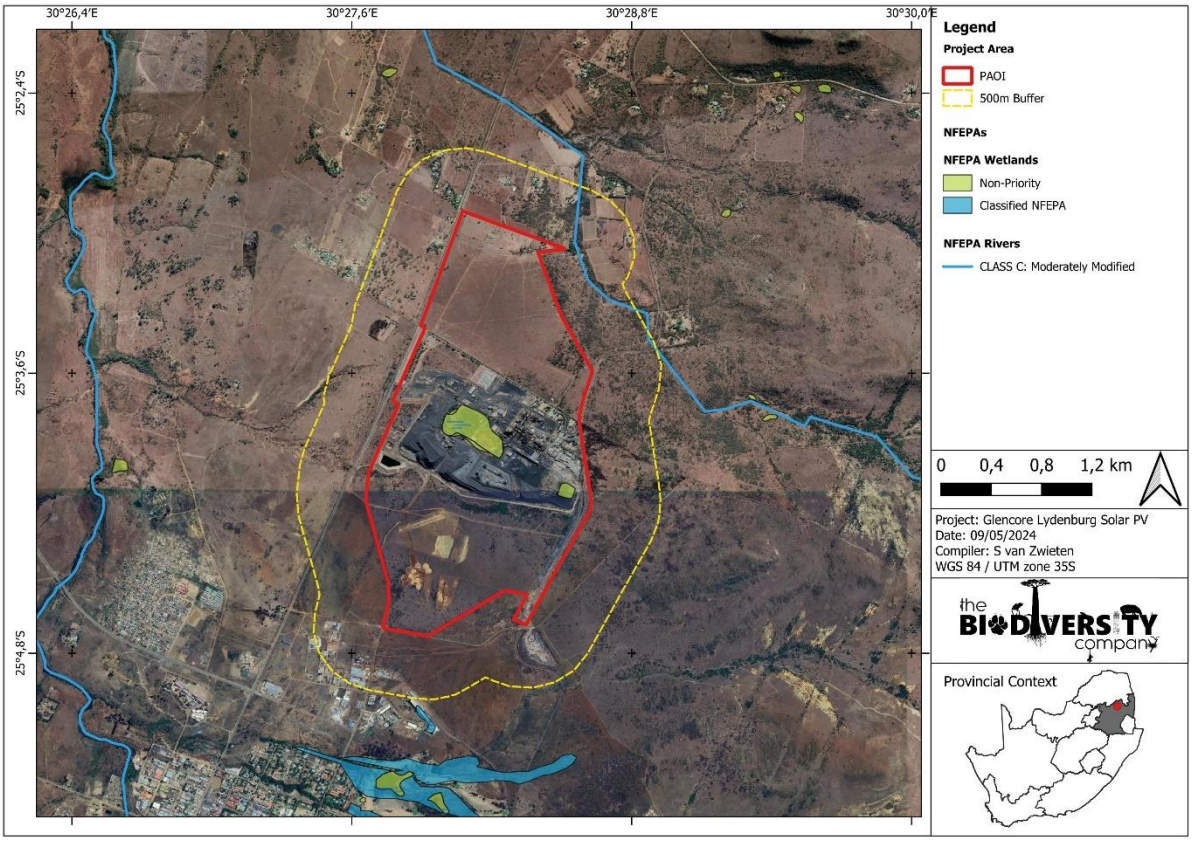


Figure 3-8 The PAOI in relation to the National Freshwater Ecosystem Priority Areas

3.1.9 Coordinated Waterbird Counts (CWAC)

The Animal demographic unit launched the Coordinated Waterbird Counts (CWAC) project in 1992 as part of 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 health of wetlands. For a full description of CWAC please refer to http://cwac.birdmap.africa/about.php. Figure 3-9 shows the PAOI is 3.5 km from the Lydenburg Fisheries CWAC.

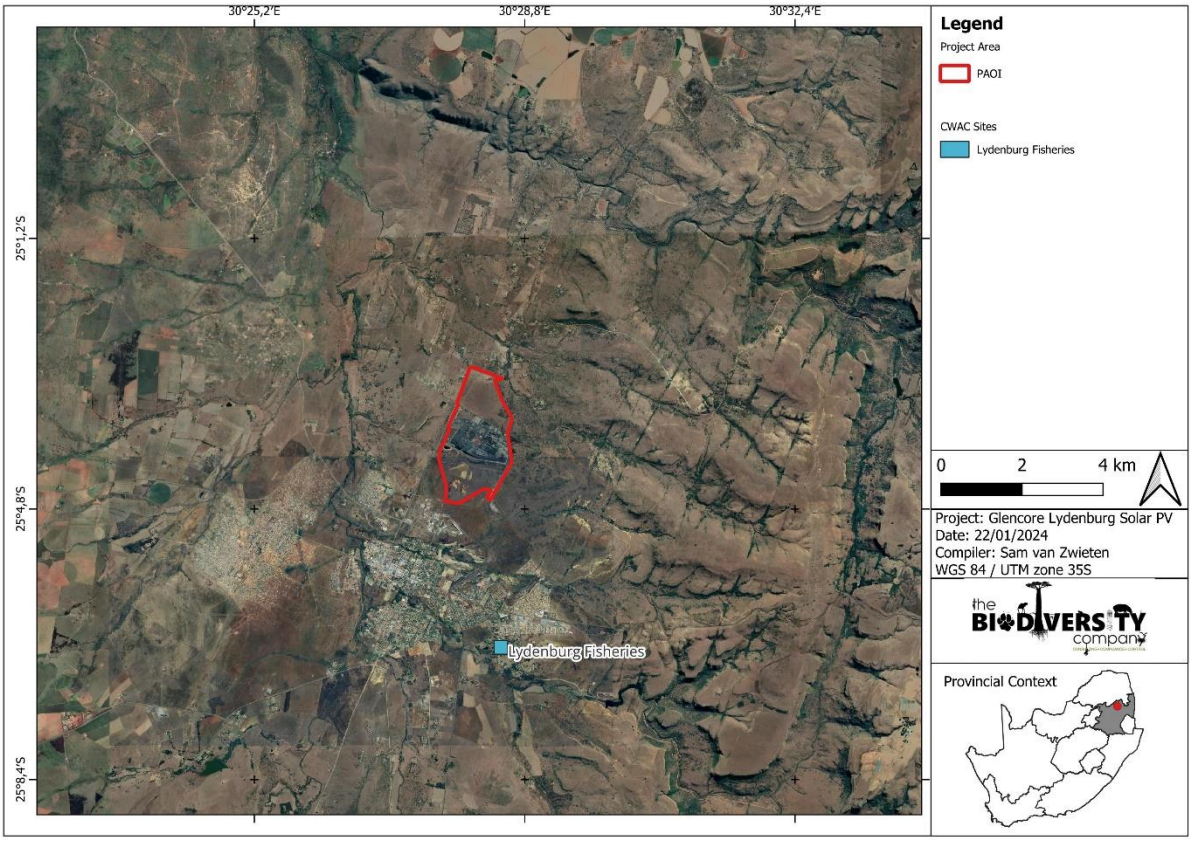


Figure 3-9 The PAOI in relation to the CWAC site

3.1.10 Coordinated Avifaunal Roadcount (CAR)

The ADU/Cape bird club pioneered avifaunal roadcount of larger birds in 1993 in South africa. Originally it was started to monitor the Blue Crane Anthropoides 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 and Southern Bald Ibis) 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 power lines. 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). Figure 3-10 shows that the PAOI is approximately 7 km from the nearest routes.

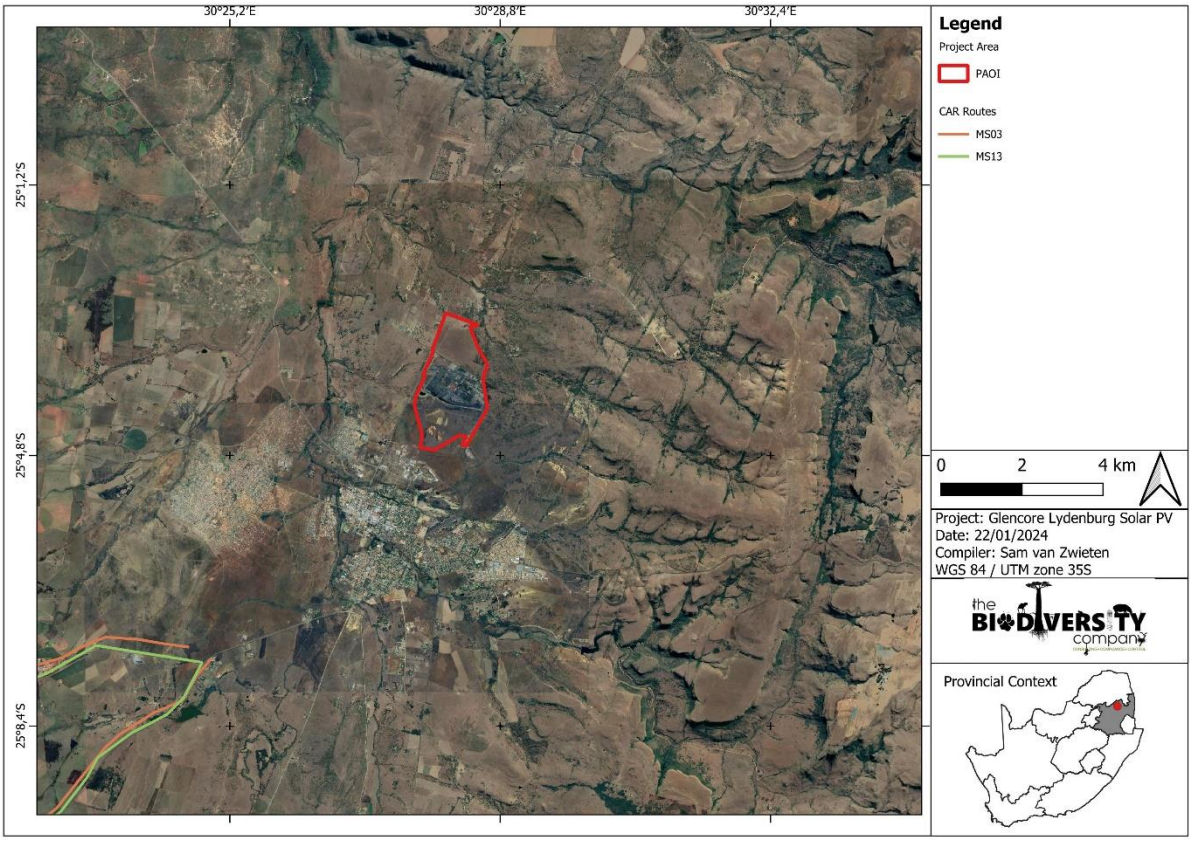


Figure 3-10 The CAR routes in relation to the PAOI

3.2 Avifauna Expected Species

SABAP2 data indicate that 329 avifauna species are expected for the PAOI and surrounds. Due to the close proximity of the Lydenburg Fisheries CWAC site, the species list from this CWAC site has also been included in the expected species list. A total of 43 avifauna species have been observed within this CWAC site, six of which were not recorded in the SABAP2 data, resulting in a total of 335 expected avifauna species for the PAOI and surrounds. Of these, 17 are considered SCC (Table 3-2). The likelihood of occurrence within the POAI are included here.

Table 3-2 Threatened avifauna species that are expected to occur within the PAOI. EN = Endangered, LC = Least Concern, NT = Near Threatened and VU = Vulnerable

Common Name	Scientific Name	Regional*	Global+	Likelihood of occurrence
African Crowned Eagle	*Stephanoaetus coronatus*	VU	NT	Low
Black Stork	*Ciconia nigra*	VU	LC	Moderate
Blue Crane	*Anthropoides paradiseus*	NT	VU	Moderate
Cape Vulture	*Gyps coprotheres*	EN	VU	Low
Denham's Bustard	*Neotis denhami*	VU	NT	Moderate
European Roller	*Coracias garrulus*	NT	LC	Moderate
Forest Buzzard	*Buteo trizonatus*	LC	NT	Low
Ground Woodpecker	*Geocolaptes olivaceus*	LC	NT	Moderate
Gurney's Sugarbird	*Promerops gurneyi*	LC	NT	Low
Half-collared Kingfisher	*Alcedo semitorquata*	NT	LC	Low

Lanner Falcon	*Falco biarmicus*	VU	LC	High
Lesser Flamingo	*Phoeniconaias minor*	NT	NT	Moderate
Martial Eagle	*Polemaetus bellicosus*	EN	EN	Moderate
Secretarybird	*Sagittarius serpentarius*	VU	EN	Moderate
Sentinel Rock Thrush	*Monticola explorator*	LC	NT	Low
Southern Bald Ibis	*Geronticus calvus*	VU	VU	High
White-bellied Korhaan	*Eupodotis senegalensis*	VU	LC	Moderate

*(Taylor *et al.* 2015), + (IUCN 2021)

Stephanoaetus coronatus (African Crowned Eagle) inhabits forest, woodland, savanna and shrubland, as well as some modified habitats, such as plantations and secondary growth, and can persist in small forest fragments including urban greenspace forests (IUCN, 2017). The species has shown high resilience to heavy deforestation and degradation in some areas.

Ciconia nigra (Black Stork) is native to South Africa, and inhabits old, undisturbed, open forests. They are known to forage in shallow streams, pools, marshes swampy patches, damp meadows, flood-plains, pools in dry riverbeds and occasionally grasslands, especially where there are stands of reeds or long grass (IUCN, 2017).

Anthropoides paradiseus (Blue Crane) is listed as NT on a regional scale and as VU on a global scale. This species has declined, largely owing to direct poisoning, power-line collisions and loss of its grassland breeding habitat owing to afforestation, mining, agriculture and development (IUCN, 2017). This species breeds in natural grass- and sedge-dominated habitats, preferring secluded grasslands at high elevations where the vegetation is thick and short.

Gyps coprotheres (Cape Vulture) is listed as EN on a regional scale and VU on a 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).

Neotis denhami (Denham's Bustard) is listed as VU on a regional scale and NT on a global scale. It occurs in flat, arid, mostly open country such as grassland, karoo, bushveld, thornveld, scrubland and savanna but also including modified habitats such as wheat fields and firebreaks Collisions with power lines may be a significant threat in parts of the range, particularly South Africa (IUCN, 2007).

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).

Buteo trizonatus (Forest Buzzard) is listed as LC on a regional scale and NT on a global scale. It occurs within local afromontane forests, occasionally in plantations and grasslands and near local forest patches (IUCN, 2017).

Geocolaptes olicaceus (Ground Woodpecker) Data from Southern African Bird Atlas Projects suggests that this species is experiencing at least a moderately rapid decline, but there is uncertainty over the rate of decline. Therefore, this species is now listed as Near Threatened, but further information regarding population trends may mean that the species' Red List status requires re-evaluation. It occurs on rocky slopes, mostly in areas dominated by grass and shrubs; including road cuttings or derelict buildings (Hockey *et al*. 2005). It is mainly sedentary but there is some suggestion that it could be an altitudinal migrant, and individuals may wander away from mountainous areas in the non-breeding season (Hockey *et al*. 2005). Afforestation may be a threat to the species (Allan *et al*. 1997, Armstrong and van Hensbergen 1999). This species has also been considered to be potentially under threat from climate change (see Taylor *et al*. 2015), and temperatures in South Africa have been reported to be

rising (van Wilgen *et al*. 2016). Given the presented declines of Lee *et al*. (2017) there could also be a separate unknown threat impacting the species.

Promerops gurneyi (Gurney's Sugarbird) is listed as near threatened on a global scale. Commercial afforestation may threaten this species' habitat, while Protea farming does provide extra habitat for the species, it could be possible that conflict will arise with farmers due to the birds damaging flowers.

Alcedo semitorquata (Half-collared Kingfisher) is listed as Near Threatened (NT) on a regional scale and occurs across a large range. This species generally prefers narrow rivers, streams, and estuaries with dense vegetation onshore, but it may also move into coastal lagoons and lakes. It mainly feeds on fish (IUCN, 2017).

Falco biarmicus (Lanner Falcon) is native to South Africa and inhabits a wide variety of habitats, from lowland deserts to forested mountains (IUCN, 2017). Global population estimates are more than 30000 breeding pairs, in South Africa it is estimated to be 1400 pairs. They may occur in groups up to 20 individuals but have also been observed solitary. They are partial and facultative migrants, that breeds from May to early September. Nests are mostly found on cliff ledges, and they may alternate between more than one nest. Their diet is mainly composed of small birds such as pigeons and francolins. Anecdotal evidence suggests these species are susceptible to agrochemicals, another threat to their population is the clearing of grassland habitats (Roberts *et al.,* 2023).

Phoeniconaias minor (Lesser Flamingo) is widely distributed throughout sub-Saharan Africa but mainly breeds in the Rift Valley Lakes in East Africa, with smaller breeding congregations in West Africa and southern Africa. This species is nomadic and makes extensive movements in response to environmental conditions and southern African populations are partially migratory, with many making regular movements from their breeding sites inland to coastal wetlands when not breeding (BirdLife International, 2018). The species is an obligate filter feeder and feeds during the night and early morning when the surface of the water is calm, primarily by swimming and filtering the algae near the surface. The global population has been estimated at between 2 220 000-3 240 000 individuals, with a declining population trend. The main threat is breeding habitat loss due to mining and hydro-electric power (BirdLife International, 2018). Further threats include effluents mining, pollution from sewage and heavy metal effluents from industries and collisions with powerlines.

Polemaetus bellicosus (Martial eagle) is listed as EN on a regional scale and 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, thornbush and, in southern Africa, more open country and even sub-desert (IUCN, 2017).

Sagittarius serpentarius (Secretarybird) is listed as EN on a global scale (BirdLife International, 2020). The species has a wide distribution across sub-Saharan Africa, but surveyed densities suggest that the total population size does not exceed a five-figure number. Ad-hoc records, localised surveys and anecdotal observations indicate apparent declines in many parts of the species' range, especially in South Africa where reporting rates decreased by at least 60% of quarter degree grid cells used in Southern African Bird Atlas Projects. Threats include excessive burning of grasslands that may suppress populations of prey species, whilst the intensive grazing of livestock is also probably degrading otherwise suitable habitat. Disturbance by humans is likely to negatively affect breeding. The species is captured and traded; however, it is unknown how many deaths occur in captivity and transit. Direct hunting and nest-raiding for other uses and indiscriminate poisoning at waterholes are also further threats. A proposed conservation action is that landowners of suitable properties should join biodiversity stewardship initiatives and to manage their properties in a sustainable way for the species' populations.

Monticola exploratory (Sentinel Rock-thrush) is listed as LC on a regional scale and NT on a global scale. It occurs in high altitude grassland, usually found with exposed rocky areas. It is a resient in

Lesotho and the Drakensburg, but can make seasonal and altitudanl moveents in other regions, such as Gauteng (IUCN, 2017).

Geronticus calvus (Southern Bald Ibis) is listed as VU on a regional basis and prefers high rainfall (>700 mm p.a.), sour and alpine grasslands, with an absence of trees and a short, dense grass sward and also occurs in lightly wooded and relatively arid country. It forages on recently burned ground, also using unburnt natural grassland, cultivated pastures, reaped maize fields and ploughed areas. It has a varied diet, mainly consisting of insects and other terrestrial invertebrates (IUCN, 2017). It has high nesting success on safe, undisturbed cliffs.

Eupodotis senegalensis (White-bellied Korhaan) is Near-endemic to South Africa, occurring from the Limpopo Province and adjacent provinces, south through Swaziland to KwaZulu-Natal and the Eastern Cape. It generally prefers tall, dense sour or mixed grassland, either open or lightly wooded, occasionally moving into cultivated or burnt land (Hockey *et al,* 2005).

3.3 Vultures

SABAP2 data indicated one vulture species, Cape Vulture (*Gyps coprotheres*) has been observed in the PAOI and surrounds. The presence of this species necessitates the inclusion of vulture-specific information. Figure 3-11**Error! Reference source not found.** illustrate the PAOI in relation to the nearby Vulture restaurants. Three restaurants are located within 50 km of the PAOI. The tracking data of Cape Vultures, Lappet Faced Vultures and African White-backed Vultures from Movebank as per information provided by VulPro (April 2024) was used to compile Figure 3-11. This data indicates a low density of vultures in the area, which may utilize this region. Consequently, the area should be regarded as a moderate collision and electrocution zone, requiring appropriate mitigation measures. For mitigations refer to section 5.

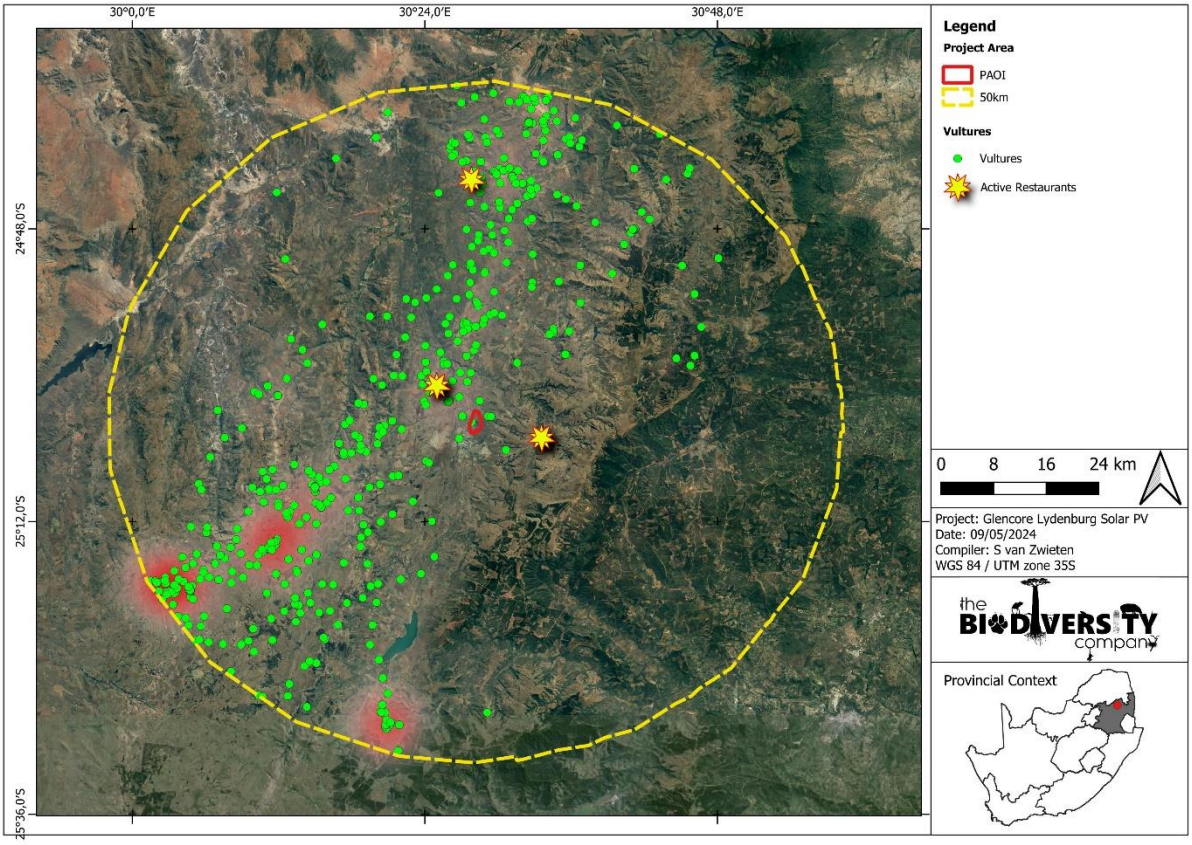


Figure 3-11 The tracking data of vulture species in and around the PAOI

3.4 Fieldwork Findings

3.4.1 Species List of First Field Survey

The first avifaunal field survey was completed on the 18th of January 2024. This site visit was conducted to determine the presence of Species of Conservation Concern (SCC). Effort was made to cover all the different habitat types, within the limits of time and access. A total of 34 species were observed during the first field survey and no SCC were recorded during this first survey period.

3.4.1.1 Risk Species

Priority Species are considered threatened, rare or prone to impacts from energy development (Ralston Paton *et al*, 2017). TBC has defined Risk Species as those species that are listed in Ralston Paton *et al* (2017) as Priority Species, as well as those listed in the Eskom poster of Birds and Power Lines (Eskom and EWT, no date), which together include all species, common or red-listed that may be at risk of collision, electrocution, or habitat loss as a result of the proposed activity. Five (5) of the species observed within the PAOI are regarded as priority species (Table 3-3 and Figure 3-12).

Table 3-3 Summary of Priority Species recorded within and around the proposed development.

Common Name	Scientific Name	Collision	Electrocution	Disturbance/Habitat Loss
Black-winged Kite	*Elanus caeruleus*	x	x	
Egyptian Goose	*Alopochen aegyptiaca*	x	x	
Hadeda Ibis	*Bostrychia hagedash*		x	
Helmeted Guineafowl	*Numida meleagris*		x	
Pied Crow	*Corvus albus*		x	

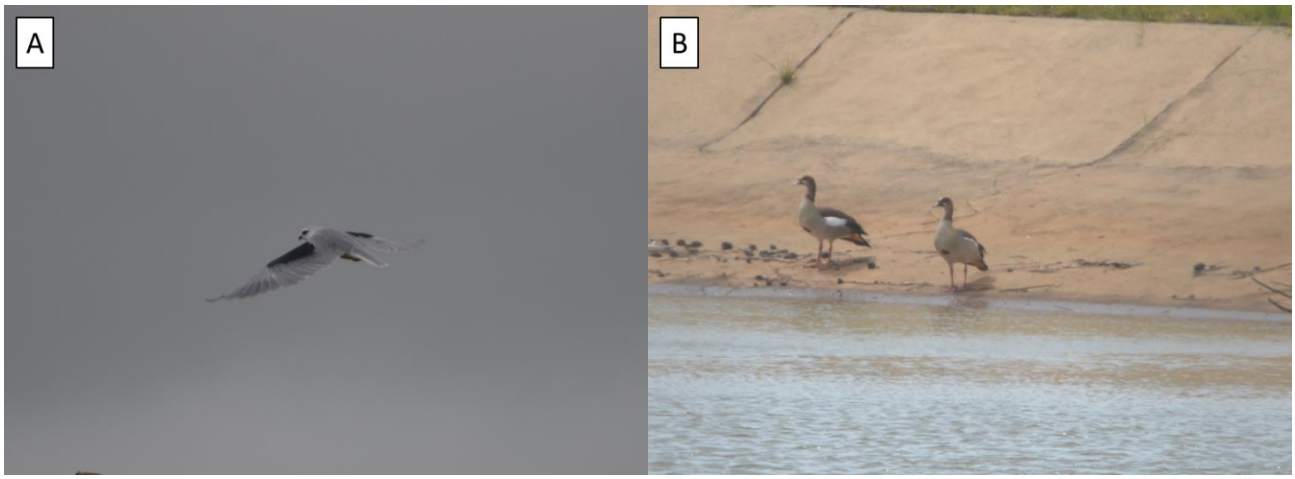


Figure 3-12 Photos of Risk Species found within the PAOI; A) Black-winged Kite and B) Egyptian Goose

3.4.1.2 Dominant Species

Table 3-4 provides the relative abundance of the dominant species as well as the frequency with which each species appeared in the point count samples. The most abundant species was the *Corvus albus* (Pied Crow), with a relative abundance of 0.16 and a frequency of occurrence of 14,29%.

Table 3-4 Relative abundance and frequency of occurrence of dominant avifauna species recorded during the standardised point counts within and around the proposed development during the first field survey.

Common Name	Scientific Name	Family Name	Relative abundance	Frequency (%)
Pied Crow	*Corvus albus*	Corvidae	0,160	14,286
Rufous-naped Lark	*Mirafra africana*	Alaudidae	0,130	71,429
Greater Striped Swallow	*Cecropis cucullata*	Hirundinidae	0,060	14,286
Zitting Cisticola	*Cisticola juncidis*	Cisticolidae	0,060	42,857
Barn Swallow	*Hirundo rustica*	Hirundinidae	0,050	28,571
Neddicky	*Cisticola fulvicapilla*	Cisticolidae	0,050	35,714
White-browed Sparrow-Weaver	*Plocepasser mahali*	Ploceidae	0,050	21,429
Southern Fiscal	*Lanius collaris*	Laniidae	0,040	28,571
Egyptian Goose	*Alopochen aegyptiaca*	Anatidae	0,030	7,143
Helmeted Guineafowl	*Numida meleagris*	Numididae	0,030	7,143
Western Cattle Egret	*Bubulcus ibis*	Ardeidae	0,030	14,286

3.4.1.3 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. Although species to tend to exhibit varied diet with invertivores consuming fruit and frugivores consuming insects for example, the dominant composition of the diet was considered.

The analysis of the major avifaunal guilds reveals that the species composition during the survey was dominated by Insectivore Ground Diurnal (IGD) and Omnivore Multiple Diurnal (OMD) birds (Figure 3-13).

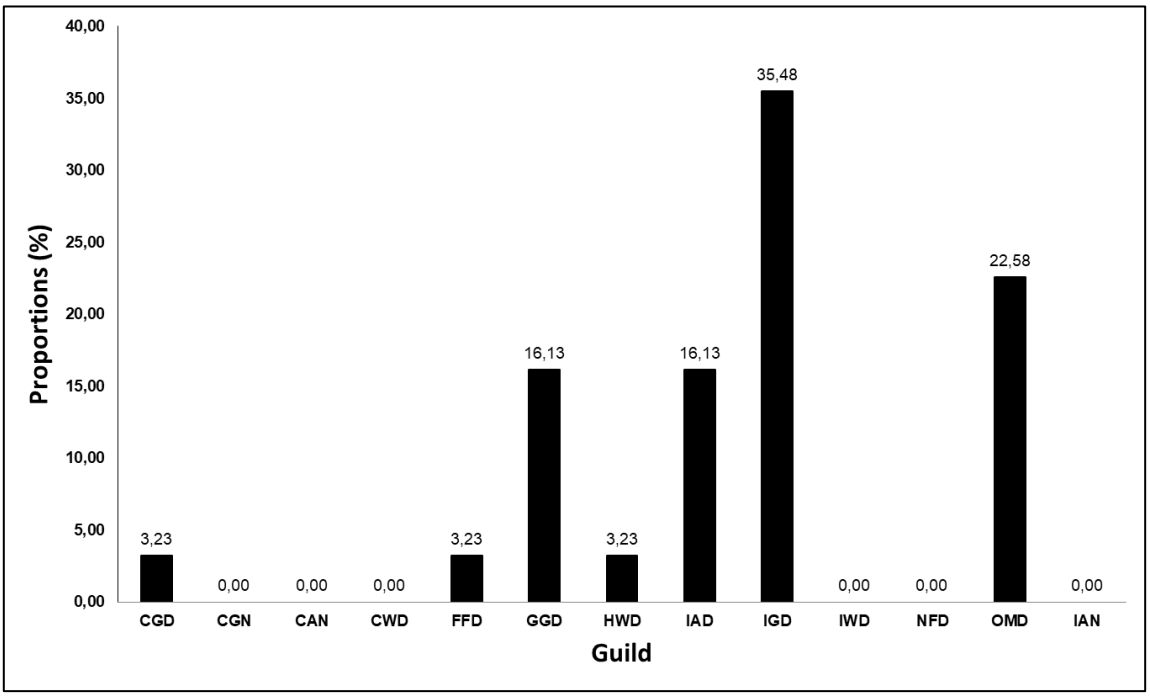


Figure 3-13 Column plot illustrating the proportion of each Functional Feeding Guild to the total abundance. Avifaunal trophic guilds – CGD, Carnivore Ground Diurnal; CGN, Carnivore Ground Nocturnal, CAN, Carnivore Air Nocturnal, CWD, Carnivore Water Diurnal; FFD, Frugivore Foliage Diurnal; GGD, Granivore Ground Diurnal; HWD, Herbivore Water Diurnal; IAD, Invertivore Air Diurnal; IGD, Insectivore Ground Diurnal; IWD, Invertivore Water Diurnal; NFD, Nectivore Foliage Diurnal; OMD, Omnivore Multiple Diurnal; IAN, Invertivore Air Nocturnal.

3.4.2 Species List of Second Field Survey

The second avifaunal field survey was completed on the 6th to the 8th of May 2024. This site visit was conducted to determine the presence of Species of Conservation Concern (SCC). Effort was made to cover all the different habitat types, within the limits of time and access. A total of 40 species were observed during the second field survey and no SCC were recorded during this first survey period.

3.4.2.1 Risk Species

Priority Species are considered threatened, rare or prone to impacts from energy development (Ralston Paton *et al*, 2017). TBC has defined Risk Species as those species that are listed in Ralston Paton *et al* (2017) as Priority Species, as well as those listed in the Eskom poster of Birds and Power Lines (Eskom and EWT, no date), which together include all species, common or red-listed that may be at risk of collision, electrocution, or habitat loss as a result of the proposed activity. Five (5) of the species observed within the PAOI are regarded as priority species (Table 3-5Table 3-3 and Figure 3-14Figure 3-12).

Table 3-5 Summary of Priority Species recorded within and around the proposed development.

Common Name	Scientific Name	Collision	Electrocution	Disturbance/Habitat Loss
Black-winged Kite	*Elanus caeruleus*	x	x	
Brown Snake Eagle	*Circaetus cinereus*	x	x	
Helmeted Guineafowl	*Numida meleagris*		x	
Pied Crow	*Corvus albus*		x	
South African Shelduck	*Tadorna cana*	x	x	x

Figure 3-14 Photos of Risk Species found within the PAOI; A) Helmeted Guineafowl and B) Brown Snake Eagle

3.4.2.2 Dominant Species

Table 3-6 provides the relative abundance of the dominant species as well as the frequency with which each species appeared in the point count samples. The most abundant species was the *Numida meleagris* (Helmeted Guineafowl), with a relative abundance of 0.16 and a frequency of occurrence of 13,04%.

Table 3-6 Relative abundance and frequency of occurrence of dominant avifauna species recorded during the standardised point counts within and around the proposed development during the second field survey.

Common Name	Scientific Name	Family Name	Relative abundance	Frequency (%)
Helmeted Guineafowl	*Numida meleagris*	Numididae	0,162	13,043
Red-faced Mousebird	*Urocolius indicus*	Coliidae	0,092	8,696
Common Waxbill	*Estrilda astrild*	Estrildidae	0,087	4,348
Brown-throated Martin	*Riparia paludicola*	Hirundinidae	0,058	4,348
Southern Fiscal	*Lanius collaris*	Laniidae	0,052	26,087
Southern Masked Weaver	*Ploceus velatus*	Ploceidae	0,046	13,043
White-browed Sparrow-Weaver	*Plocepasser mahali*	Ploceidae	0,046	13,043
Dark-capped Bulbul	*Pycnonotus tricolor*	Pycnonotidae	0,040	17,391
Ring-necked Dove	*Streptopelia capicola*	Columbidae	0,040	30,435
Black-chested Prinia	*Prinia flavicans*	Cisticolidae	0,035	17,391
Greater Striped Swallow	*Cecropis cucullata*	Hirundinidae	0,035	4,348
Pied Crow	*Corvus albus*	Corvidae	0,035	17,391
African Pipit	*Anthus cinnamomeus*	Motacillidae	0,029	13,043
Red-eyed Dove	*Streptopelia semitorquata*	Columbidae	0,023	8,696
African Stonechat	*Saxicola torquatus*	Muscicapidae	0,017	8,696
Cape Robin-Chat	*Cossypha caffra*	Muscicapidae	0,017	8,696
Laughing Dove	*Spilopelia senegalensis*	Columbidae	0,017	13,043
Swainson's Spurfowl	*Pternistis swainsonii*	Phasianidae	0,017	4,348
Zitting Cisticola	*Cisticola juncidis*	Cisticolidae	0,017	8,696

3.4.2.3 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. Although species to tend to exhibit varied diet with invertivores consuming fruit and frugivores consuming insects for example, the dominant composition of the diet was considered.

The analysis of the major avifaunal guilds reveals that the species composition during the survey was dominated by Insectivore Ground Diurnal (IGD) and Omnivore Multiple Diurnal (OMD) birds (Figure 3-15).

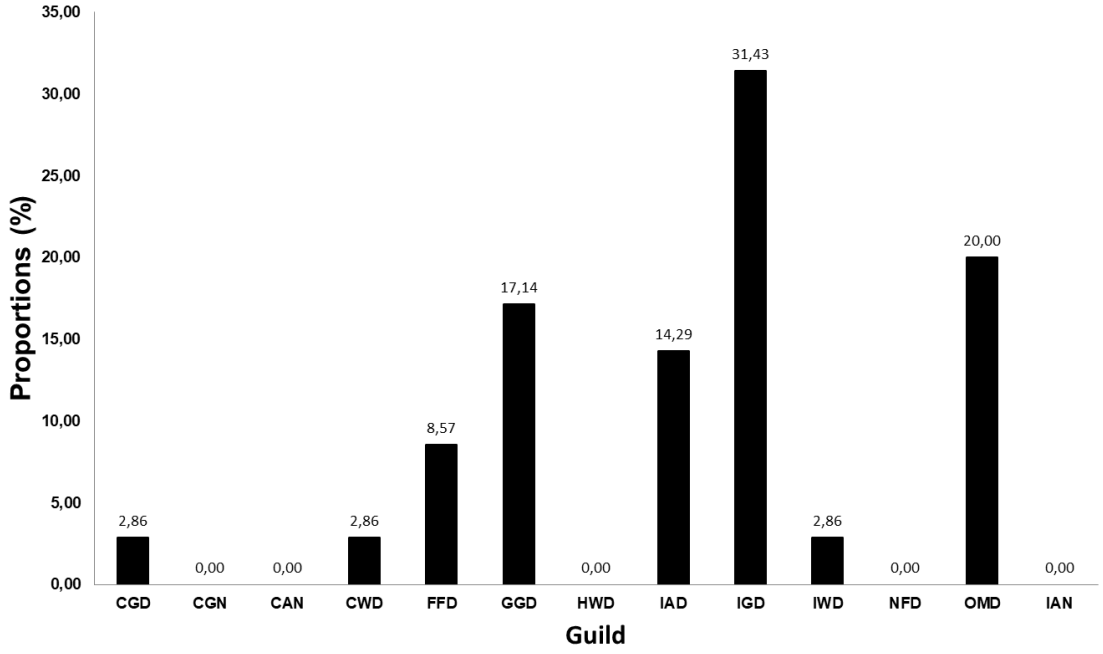


Figure 3-15 ***Column plot illustrating the proportion of each Functional Feeding Guild to the total abundance. Avifaunal trophic guilds – CGD, Carnivore Ground Diurnal; CGN, Carnivore Ground Nocturnal, CAN, Carnivore Air Nocturnal, CWD, Carnivore Water Diurnal; FFD, Frugivore Foliage Diurnal; GGD, Granivore Ground Diurnal; HWD, Herbivore Water Diurnal; IAD, Invertivore Air Diurnal; IGD, Insectivore Ground Diurnal; IWD, Invertivore Water Diurnal; NFD, Nectivore Foliage Diurnal; OMD, Omnivore Multiple Diurnal; IAN, Invertivore Air Nocturnal.***

3.4.3 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 diel movement between roosting and foraging sites to prevent the risk of collision with infrastructure. A very condensed version of flight path analysis was done, the aim of this was to determine if there is a general direction of most birds on site. This section needs to be interpreted cautiously based on the limited time spent on this component.

No specific flight paths were noted.

No active nest sites of Priority Species or SCC were recorded.

3.5 Habitat Assessment

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 PAOI 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 (Figure 3-16), a full description of the habitats is provided below.

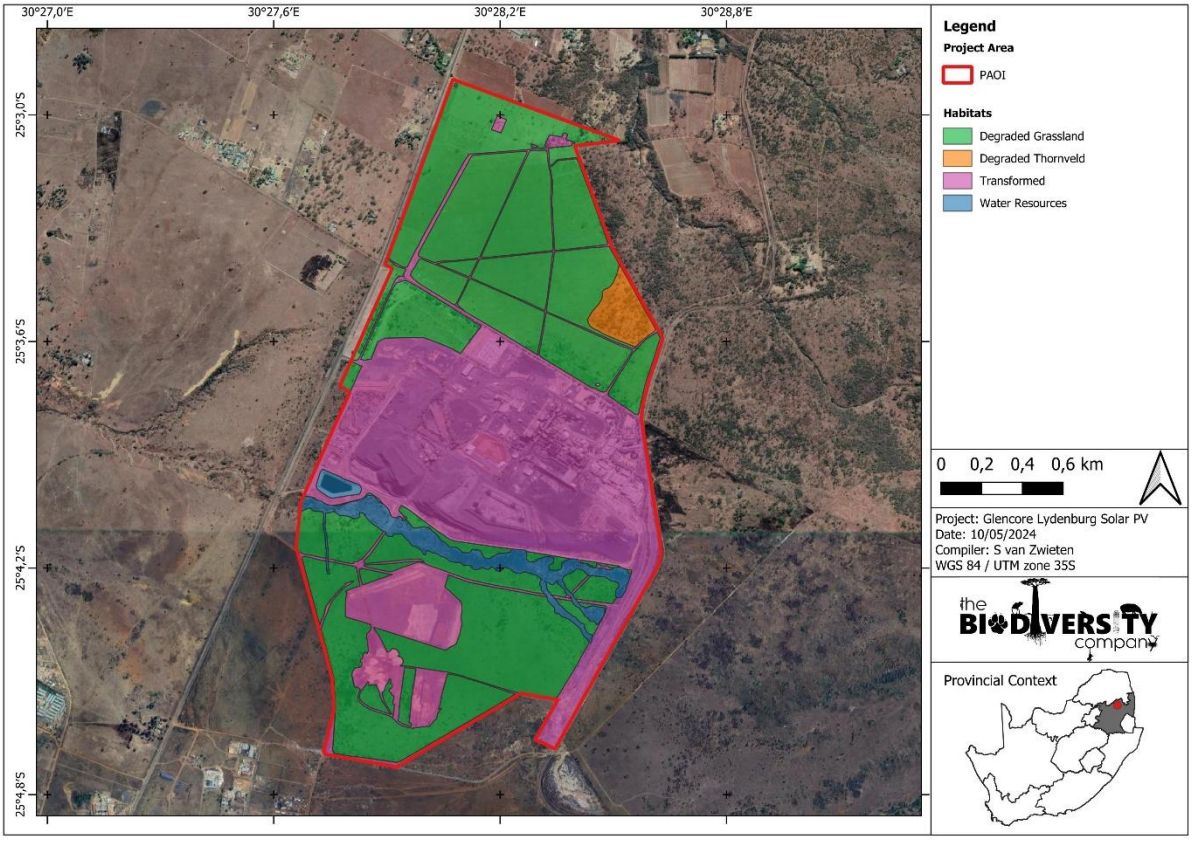


Figure 3-16 Habitats identified within the assessment areas

3.5.1 Degraded Thornveld

This habitat is often found in undulating plains and can be heavily wooded in more rocky areas. This habitat provides suitable nesting, roosting and foraging sites for local avifauna. Although this habitat has been degraded by historic and current over grazing by local livestock, it retains more of a resemblance to thornveld than the surrounding grasslands (Figure 3-17).

SCC possible occupying this habitat: European Roller, Lanner Falcon, Martial Eagle, and Secretarybird.

Figure 3-17 Example of Degraded Thornveld habitat (at location -25.060322°; 30.475837°)

3.5.2 Degraded Grassland

This habitat is recovering grassland from historic negative impacts such as agricultural practices but cannot fully recover due to ongoing mismanagement and land use such as overgrazing by livestock and miming activities. Although this habitat has experienced negative impacts it still provides suitable habitat for foraging and nesting for avifaunal species (Figure 3-18).

SCC possible occupying this habitat: Blue Crane, Denham's Bustard, European Roller, Ground Woodpecker, Lanner falcon, Secretarybird, Southern Bald Ibis, and White-bellied Korhaan.

Figure 3-18 Example of Degraded Grassland habitat (at location -25.052425°; 30.468356°)

3.5.3 Transformed

Transformed habitat is has been completely cleared of its natural habitation for infrastructure, roads, housing and in this case, mine usage. Due to its lack of natural habitation, it provides very little suitable habitat for local avifauna (Figure 3-19).

Figure 3-19 Example of Transformed habitat (at location -25.060701°; 30.471767°)

3.5.4 Water Resoucres

This habitat provides crucial habitat for waterbirds. Some of the water resources are natural while others are artificial, from an avifauna perspective both are important. The SCC recorded and expected would

also utilise varying depths of water. Due to the overall importance of this resource the different water resources were combined (Figure 3-20).

SCC possible occupying this habitat: Black Stork, Blue Crane, Lesser Flamingo

Figure 3-20 Example of Water Resources (at location -25.065638°; 30.462534°)

3.6 Site Ecological Importance

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

Four habitat types were delineated within the Project Area, namely Degraded Thornveld, Degraded Grassland, Transformed, and Water Resources. Their respective SEI and the corresponding mitigation guidelines are summarised in Table 3-7.

Table 3-7 Summary of habitat types delineated within field assessment area

Habitat Type	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance Guidelines
Degraded Thornveld	**Medium** Confirmed or highly likely occurrence of CR, EN, VU species.	**Low** Small (> 1 ha but < 5 ha) area. Only narrow corridors of good habitat connectivity. Mostly minor current negative ecological impacts with some major impacts and a few signs of minor past disturbance. Moderate rehabilitation potential.	**Low**	**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.	**Medium** Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Degraded Grassland	**High** Confirmed or highly likely occurrence of CR, EN, VU species.	**Medium** Mostly minor current negative ecological impacts with some major impacts and a few signs of minor past disturbance. Moderate rehabilitation potential.	**Medium**	**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: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) returning to a site once the disturbance or impact has been removed.	**Medium** Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Transformed	**Very Low** No confirmed and highly unlikely populations of SCC. No natural habitat remaining	**Very Low** Several major current negative ecological impacts.	**Very Low**	**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	**Very Low** Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

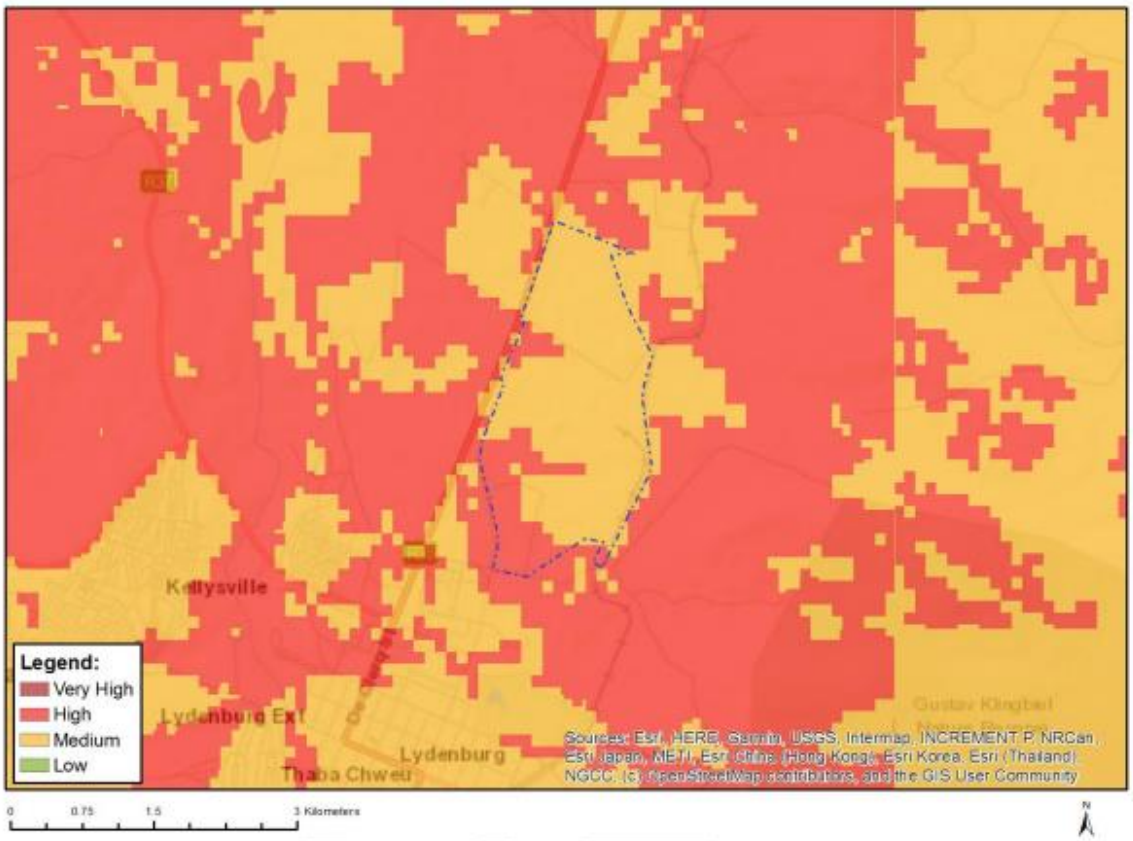
				occurring, or species that have a very high likelihood of returning to a site once the disturbance or impact has been removed.	
Water Resources	**Medium** Confirmed or highly likely occurrence of CR, EN, VU species.	**High** Only minor current negative ecological impacts with no signs of major past disturbance and good rehabilitation potential.	**Medium**	**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.	**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.

3.6.1 Desktop Ecological Senstivity

The following is deduced from the National Web-based Environmental Screening Tool Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended):

- Animal Species Theme sensitivity is 'High' for the PAOI, with the possibility of Avifauna Species of Conservation Concern (SCC) being present (Figure 3-21).

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



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

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Geronticus calvus
Medium	Aves-Neotis denhami
Medium	Aves-Eupodotis senegalensis
Medium	Mammalia-Amblysomus robustus
Medium	Mammalia-Chrysospalax villosus
Medium	Mammalia-Crocidura maquassiensis
Medium	Mammalia-Dasymys robertsii
Medium	Mammalia-Hydrictis maculicollis
Medium	Mammalia-Ourebia ourebi ourebi
Medium	Invertebrate-Thoracistus peringueyi

Figure 3-21 Animal Species Theme Sensitivity

3.6.2 Screening Tool Comparison

The allocated sensitivities for each of the relevant themes are either disputed or validated for the assessed areas in Table 3-8 below. A summative explanation for each result is provided as relevant. The specialist-assigned sensitivity ratings are based largely on the SEI process followed in the previous section, and consideration is given to any observed or likely presence of SCC or protected species. The sensitivities delineated for the project area is illustrated in Figure 3-22.

Table 3-8 Summary of the screening tool vs specialist-assigned sensitivities

Screening Tool Theme	Screening Tool	Habitat	Specialist	Tool Validated or Disputed by Specialist - Reasoning
Animal Theme	High	Degraded Thornveld	Medium	Disputed – Habitat shows some impacts and has the potential to support SCC but is a very small size which provides low functional integrity.
		Degraded Grassland	Medium	Disputed – Habitat has been severely altered to some extent. It does however still possess the potential to support SCC.
		Transformed	Very Low	Disputed – Habitat has been severely altered with limited potential to support SCC.
		Water Resources	High	Validated – Habitat is generally intact, possesses low resilience to impacts and possible SCC would be dependent on this as a resource and for nesting.

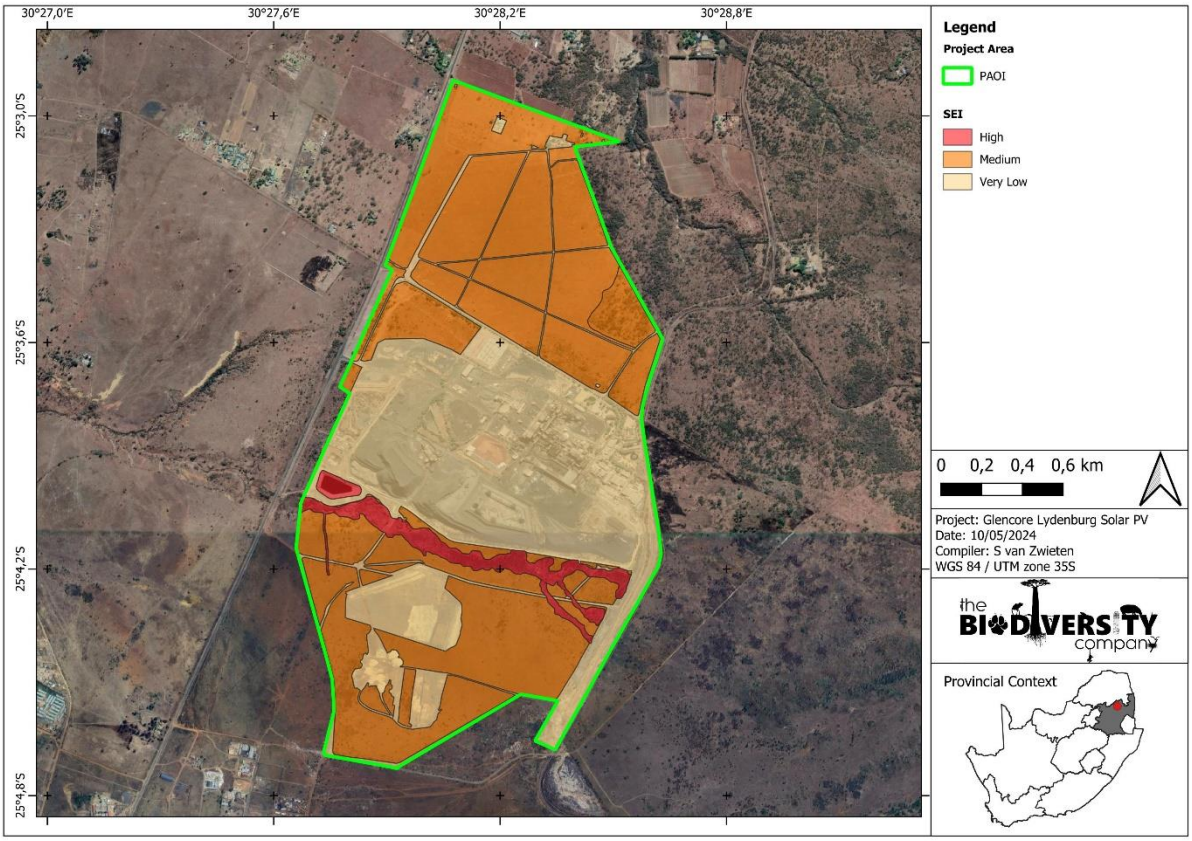


Figure 3-22 Site ecological importance, with mitigation measures applied

4 Impact Assessment

4.1 Current Impacts to Biodiversity

In consideration that there are anthropogenic activities and influences present within the landscape, there are currently several negative impacts to biodiversity, including avifauna. These include:

- Historic land modification to accommodate roads, powerline infrastructure, mining infrastructure and the associated land clearing;
- Erosion;
- Livestock; and
- Fences and the associated infrastructure (Figure 4-1).

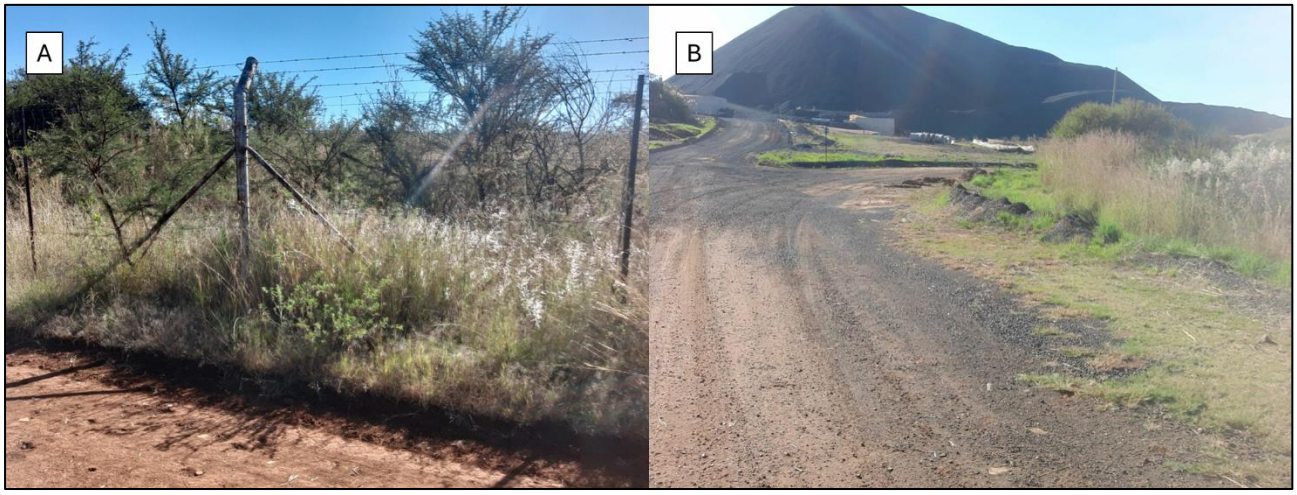


Figure 4-1 Photograph illustrating current negative impacts associated with the PAOI: A) Fencing, B) Roads and mining activity

4.2 Alternatives Considered

Location, technology, and No-Go alternatives were provided by EIMS (2023). A description of the alternatives is provided in Table 4-1.

Table 4-1 Alternatives Considered

Alternative Category	Alternative	Alternative Description Summary	Advantages	Disadvantages/Risks
Location Alternatives	S1	Facility located on open space	Access during construction will be easier as site is open space and is not located on existing TSF. Site is larger allowing more panels and therefore more MW can be produced.	Impacts on terrestrial biodiversity expected to be higher than for Alternative S2
	S2	Facility located on top of existing TSF	No significant impacts on biodiversity expected due to location on top of existing TSF.	PV panels may be visible from some distance due to location on top of TSF. Stability/settling of TSF will need to be taken into account.

				Potential dust generation during construction. Smaller site therefore less MW could be produced.
Layout Alternatives	Any identified layout alternatives will be assessed in the EIA phase once detailed layout information becomes available. On site sensitivities will also be identified in the EIA phase which could affect the layout/footprint.			
Process Alternatives	No specific feasible process alterative were identified.			
Technology Alternatives	The environmental impacts will likely be similar for all of the possible technology alternatives; however this aspect will be addressed in more detail in the EIA phase once more detail regarding design and facility infrastructure becomes available. If feasible technology alternatives are identified these will be investigated further.			
Activity Alternatives	It is not deemed reasonable or practical to assess any other type of activities. PV is identified as the only feasibly activity through the applicant's pre-feasibility assessments.			
No-Go Alternative	No-Go	The proposed activities will not take place on-site and the site will remain unutilized.	No environmental impacts as a result of the PV project.	No benefits with respect to job creation and also no indirect socio-economic benefits created.

4.3 Loss of Irreplaceable Resources

The proposed development will lead to the loss of the following irreplaceable resources:

- Habitat and possible nesting sites for numerous expected avifauna SCC.

4.4 Quantitative 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 of interest, specifically the proposed development footprint area. 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 fragmentation 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; and

- 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 considers pre-mitigation as well as implemented 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. Three phases were considered for the impact assessment:

- Construction Phase;
- Operational Phase; and
- Decommissioning Phase.

4.4.1 Construction Phase

The following potential main impacts on biodiversity were considered for the construction phase of the proposed development. This phase refers to the period during construction when the proposed features are constructed; and is considered to have the largest direct impact on biodiversity. The following potential impacts to avifauna were considered (Table 4-2):

- Habitat destruction within the project footprint;
- Destruction, degradation and fragmentation of surrounding habitats due to noise pollution;
- Displacement/emigration of avifauna community (including SCC);
- Direct mortality from persecution or poaching of avifauna species and collection of eggs; and
- Direct mortality from increased vehicle and heavy machinery traffic.

4.4.2 Operation Phase

The operational phase includes the following impacts (Table 4-2):

- Collisions with infrastructure associated with the PV Facility and powerlines;
- Electrocution due to infrastructure associated with the PV Facility;
- Direct mortality from roadkills, persecution or poaching of avifauna species and collection of eggs;
- Pollution of water sources and surrounding habitat due to cleaning products of the PV panels;
- Heat radiation from the BESS and PV panels; and
- Encroachment of Invasive Alien Plants into disturbed areas.

4.4.3 Construction Phase

This phase is when the plant is being decommissioned and the infrastructure is being removed. The following impacts were considered (Table 4-2):

- Direct mortality due to earthworks, vehicle collisions and persecution; and
- Continued habitat degradation due to Invasive Alien Plant encroachment and erosion.

Table 4-2 Impacts associated with the Construction Phase.

IMPACT DESCRIPTION		PRE - MITIGATION							
Impact	Phase	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Pre-mitigation ER	Confidence
Construction									
Habitat destruction within the project footprint	Construction	-1	3	1	4	3	4	-11	High
Destruction, degradation and fragmentation of surrounding habitats	Construction	-1	3	1	4	3	4	-11	High
Displacement/emigration of avifauna community (including SCC) due to noise pollution	Construction	-1	4	1	3	2	4	-10	High
Direct mortality from persecution or poaching of avifauna species and collection of eggs	Construction	-1	3	1	3	3	4	-10	High
Direct mortality from increased vehicle and heavy machinery traffic	Construction	-1	3	1	3	3	3	-7,5	High
Operation									
Collisions with infrastructure associated with the PV Facility and powerlines	Operation	-1	3	4	4	3	4	-14	High
Electrocution due to infrastructure associated with the PV Facility	Operation	-1	3	4	4	3	4	-14	High
Direct mortality from roadkills, persecution or poaching of avifauna species and collection of eggs	Operation	-1	3	4	3	3	3	-9,75	High
Pollution of water sources and surrounding habitat due to cleaning products of the PV panels	Operation	-1	3	4	4	3	3	-10,5	High
Heat radiation from the BESS and PV panels	Operation	-1	3	4	3	3	3	-9,75	High
Encroachment of Invasive Alien Plants into disturbed areas	Operation	-1	3	4	4	3	3	-10,5	High
Decommissioning									
Direct mortality due to earthworks, vehicle collisions and persecution	Decommissioning	-1	3	1	3	3	3	-7,5	Medium
Continued habitat degradation due to Invasive Alien Plant encroachment and erosion	Decommissioning	-1	3	1	4	3	4	-11	Medium
IMPACT DESCRIPTION		**POST - MITIGATION**							
Impact	Phase	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Post-mitigation ER	Confidence
Construction									
Habitat destruction within the project footprint	Construction	-1	2	1	2	2	3	-5,25	High
Destruction, degradation and fragmentation of surrounding habitats	Construction	-1	2	1	2	2	2	-3,5	High
Displacement/emigration of avifauna community (including SCC) due to noise pollution	Construction	-1	2	1	2	2	3	-5,25	High
Direct mortality from persecution or poaching of avifauna species and collection of eggs	Construction	-1	2	1	2	1	1	-1,5	High
Direct mortality from increased vehicle and heavy machinery traffic	Construction	-1	1	1	2	1	1	-1,25	High
Operation									
Collisions with infrastructure associated with the PV Facility and powerlines	Operation	-1	2	4	2	2	2	-5	High
Electrocution due to infrastructure associated with the PV Facility	Operation	-1	2	4	2	2	2	-5	High

Direct mortality from roadkills, persecution or poaching of avifauna species and collection of eggs	Operation	-1	1	4	2	1	1	-2	High
Pollution of water sources and surrounding habitat due to cleaning products of the PV panels	Operation	-1	2	4	2	2	1	-2,5	High
Heat radiation from the BESS and PV panels	Operation	-1	1	4	2	2	1	-2,25	High
Encroachment of Invasive Alien Plants into disturbed areas	Operation	-1	1	4	2	2	1	-2,25	High
Decommissioning									
Direct mortality due to earthworks, vehicle collisions and persecution	Decommissioning	-1	1	1	2	2	1	-1,5	Medium
Continued habitat degradation due to Invasive Alien Plant encroachment and erosion	Decommissioning	-1	1	1	2	2	1	-1,5	Medium

4.4.4 Cumulative Impacts

Cumulative impacts are assessed within the context of the extent of the proposed PAOI, other developments and activities in the area (existing and proposed) and general habitat loss and disturbance resulting from any other anthropogenic 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 or disturbance activities. This is similar to the concept of shifting baselines, which describes how the environmental baseline at a specific point in time may actually represent a significant change from the original state of the system. This section describes the potential cumulative impacts of the project on the local and regional avifauna community.

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 such as the adjacent game parks and reserves.

A total area of 30 km surrounding the PAOI were used to assess the total habitat loss in the area and subsequently the cumulative impact. To determine the intact remnant habitat the NBA (2018) remnant spatial data was utilised. The future renewable energy projects were also considered by utilising the REEA Q2 (2023) spatial dataset. In order to remove any duplication, only the areas that overlap with the remanence areas were considered. The total cumulative loss was found to be 34.11% (Table 4-3).

Table 4-3 The cumulative impacts considered for avifauna

Total Area of 30km^2	Total Habitat Lost	Intact Remnant Habitat	Total Historic Loss	REEA area overlapping with remnant areas	Total Disturbed/Transformed habitat	Percentage area lost
303879.0 ha	103578.5 ha	200300.5 ha	**34.09%**	75.8 ha	103654.3 ha	**34.11%**

The proposed SPP in isolation has a Negative Low impact significance (Table 4-4). In consideration of the aforementioned information, although there is still a high amount of intact remnant habitat within the 30 km buffer, the project area and other future renewable energy projects have minimal overlap with these remnants, resulting in the cumulative impact determined to be of a Negative low significance (Figure 4-2).

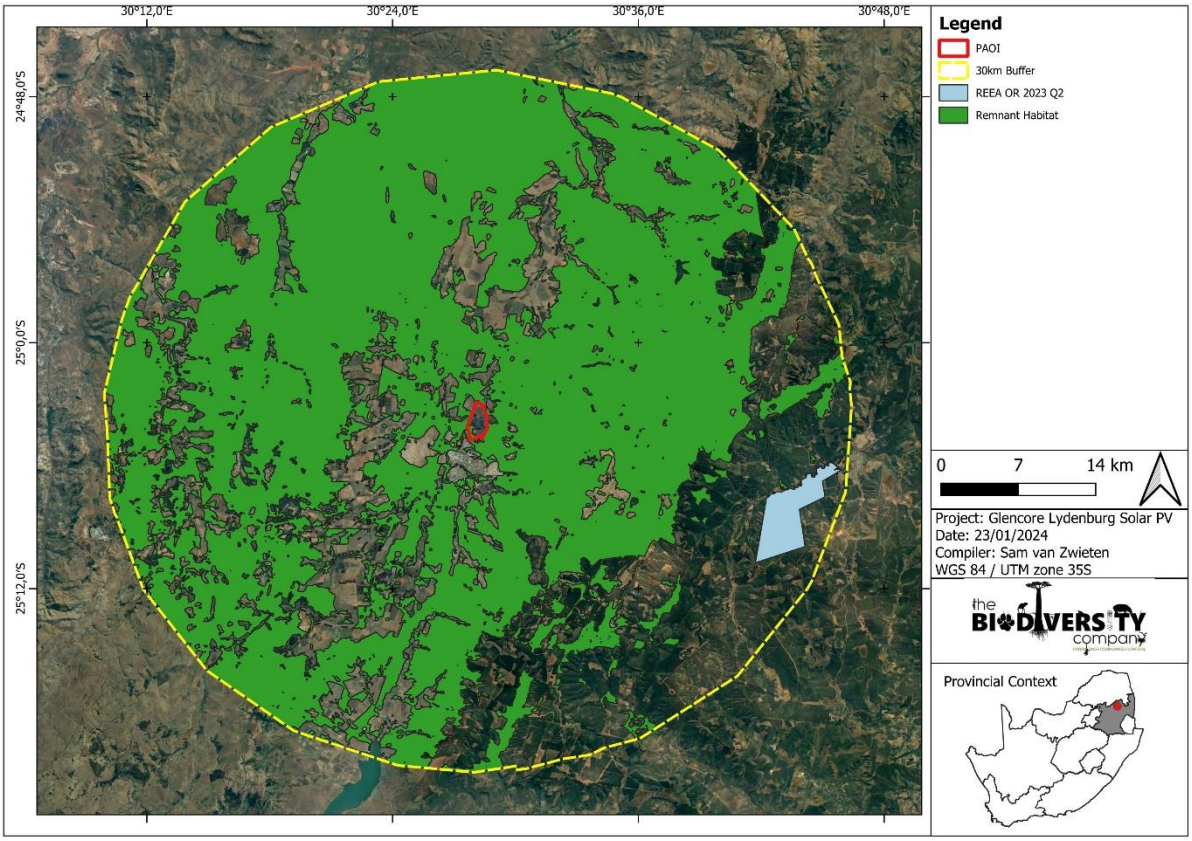


Figure 4-2 Cumulative habitat loss in 30 km surrounding the PAOI

Table 4-4 Cumulative Impacts to avifauna associated with the proposed project

IMPACT DESCRIPTION					IMPACT PRIORITISATION			
Impact	Phase	Pre-mitigation ER	Post-mitigation ER	Confidence	Cumulative Impact	Irreplaceable loss	Priority Factor	Final score
Construction								
Habitat destruction within the project footprint	Construction	-11	-5,25	High	2	2	1,33	-7,00
Destruction, degradation and fragmentation of surrounding habitats	Construction	-11	-3,5	High	2	2	1,33	-4,67
Displacement/emigration of avifauna community (including SCC) due to noise pollution	Construction	-10	-5,25	High	2	2	1,33	-7,00
Direct mortality from persecution or poaching of avifauna species and collection of eggs	Construction	-10	-1,5	High	1	2	1,17	-1,75
Direct mortality from increased vehicle and heavy machinery traffic	Construction	-7,5	-1,25	High	1	2	1,17	-1,46
Operation								
Collisions with infrastructure associated with the PV Facility and powerlines	Operation	-14	-5	High	2	3	1,50	-7,50
Electrocution due to infrastructure associated with the PV Facility	Operation	-14	-5	High	2	3	1,50	-7,50
Direct mortality from roadkills, persecution or poaching of	Operation	-9,75	-2	High	1	2	1,17	-2,33

avifauna species and collection of eggs								
Pollution of water sources and surrounding habitat due to cleaning products of the PV panels	Operation	-10,5	-2,5	High	2	2	1,33	-3,33
Heat radiation from the BESS and PV panels	Operation	-9,75	-2,25	High	1	2	1,17	-2,63
Encroachment of Invasive Alien Plants into disturbed areas	Operation	-10,5	-2,25	High	2	2	1,33	-3,00
Decommissioning								
Direct mortality due to earthworks, vehicle collisions and persecution	Decommissioning	-7,5	-1,5	Medium	1	2	1,17	-1,75
Continued habitat degradation due to Invasive Alien Plant encroachment and erosion	Decommissioning	-11	-1,5	Medium	2	2	1,33	-2,00

5 Avifauna Impact Management Actions

The purpose of the Biodiversity Impact Management Actions of 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. This mitigation table must be read in conjunction with the Generic Environmental Management Programme (EMPR) for the development and expansion of substation infrastructure for the transmission and distribution of electricity as per No. 42323 GOVERNMENT GAZETTE, 22 MARCH 2019.

Table 5-1 presents the recommended mitigation measures and the respective timeframes, targets, and performance indicators pertaining to the avifaunal component.

Table 5-1 Summary of management outcomes pertaining to impacts on avifauna and their habitats

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Management outcome: Habitats				
High sensitivity areas must be avoided for the PV development while the gridline might span these areas and no pylon may be placed in them	Life of operation	Project Manager Environmental Officer	High sensitivity area	Ongoing
A nest walkdown must be performed prior to clearance of the site, this is especially pertinent for the detection of the SCC species Blue Crane, Denham's Bustard, and White-bellied Korhaan nests. If nests are found a suitably qualified specialist must be contacted to advise on the way forward.	Construction Phase	Environmental Officer	Development footprint	During Phase
The areas to be developed must be specifically demarcated to prevent movement into surrounding environments.	Life of operation	Project Manager Environmental Officer	Development footprint	Ongoing
Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, must under no circumstances be fragmented or disturbed further.	Life of operation	Project Manager Environmental Officer	Areas of indigenous vegetation	Ongoing
As far as possible, solar panels must be mounted on pile driven or screw foundations, such as post support spikes, rather than heavy foundations, such as trench-fill or mass concrete foundations, to reduce the negative effects on natural soil functioning, such as its	Life of operation	Project Manager	Solar panels must be mounted on pile driven or screw foundations, such as post support spikes, rather than heavy foundations, such as trench-fill or mass concrete	Life of operation

filtering and buffering characteristics, while maintaining habitats for both below and above-ground biodiversity.			foundations, to reduce the negative effects on natural soil functioning, such as its filtering and buffering characteristics, while maintaining habitats for both below and above-ground biodiversity	
Indigenous vegetation to be maintained under the solar panels to ensure biodiversity is maintained and to prevent soil erosion (Beatty *et al*, 2017; Sinha *et al*, 2018).	Life of operation	Project Manager	Indigenous vegetation to be maintained under the solar panels to ensure biodiversity is maintained and to prevent soil erosion (Beatty *et al,* 2017; Sinha *et al,* 2018).	Life of operation
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion. This will also reduce the likelihood of encroachment by alien invasive plant species. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are indigenous to this vegetation type.	Decommissioning /Rehabilitation	Project Manager	Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion. This will also reduce the likelihood of encroachment by alien invasive plant species. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are indigenous to this vegetation type.	Decommissioning /Rehabilitation
A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. No servicing of equipment on site unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers. Appropriately contain any generator diesel storage tanks, machinery spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them leaking and entering the environment.	Life of operation	Environmental Officer Contractor	Spill events, Vehicles dripping.	Ongoing
Cement must be mixed in a designated area on a liner away from water sources and buffers and that successful rehabilitation of the construction areas can take place.	Planning and Construction	Project Manager Environmental Officer Contractor Engineer	Water pollution and restricted rehabilitation	During phase
Leaking equipment and vehicles must be repaired immediately or be removed from PAOI to facilitate repair.	Life of operation	Environmental Officer Contractor	Leaks and spills	Ongoing
A fire management plan needs to be complied to restrict the impact of fire.	Life of operation	Environmental Officer Contractor	Fire Management	During Phase
Dust-reducing mitigation measures must be put in place and must be strictly adhered to, for all areas of construction. This includes wetting of exposed soft soil surfaces. No non-environmentally friendly suppressants may be used as this could result in the pollution of water sources.	Life of operation	Project Manager Contractor	Dustfall	As per dust monitoring program.
Only environmentally friendly substances may be used for the cleaning/washing of the panels	Operational Phase	Project Manager Environmental Officer	Water pollution	During Phase

Management outcome: Avifauna				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	**Responsible Party**	**Aspect**	**Frequency**
All personnel should undergo environmental induction with regards to avifauna and in particular awareness about not harming, collecting, or hunting terrestrial species, 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 must be kept to a minimum to avoid disturbing avifauna.	Construction/Operational Phase	Project Manager Environmental Officer	Construction/Closure Phase	Ongoing
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) lights should be used.	Construction/Operational Phase	Project Manager Environmental Officer Design Engineer	Light pollution and period of light.	Ongoing
Bird Flappers and diverters must be placed along the whole route, this must be done at 5 m intervals.	Construction/Operational Phase	Project Manager Environmental Officer Design Engineer	Bird Collisions	Ongoing
Overhead cables/lines must be fitted with industry standard bird flight diverters in order to make the lines as visible as possible to collision-susceptible species. Shaw *et al* (2021) demonstrated that large avifauna species mortality was reduced by 51% (95% CI: 23–68%). Recommended bird diverters such as flapping devices (dynamic device) and thickened wire spirals (static device) that increase the visibility of the lines should be fitted 5 m apart. The Inotec BFD88 bird diverter is highly recommended due to its visibility under low light conditions when most species move from roosting to feeding sites.  	Construction/Operational Phase	Project Manager Environmental Officer Design Engineer	Bird Collisions	Ongoing
Any OHLs must be of a design that minimizes electrocution risk by using adequately insulated	Construction/Operational Phase	Project Manager Environme	Bird Electrocutions	Ongoing

'bird friendly' monopole structures, with clearances between live components of 2 m or greater.		ntal Officer Design Engineer		
Ensure that the phase cables are spaced far enough apart to reduce the risk of large birds, such as vultures, touching both simultaneously (2 m or greater) (Prinsen *et al.,* 2012). If such separation (isolation) cannot be provided, exposed parts must be covered (insulated) to reduce electrocution risk.	Construction/Operational Phase	Project Manager Environmental Officer Design Engineer	Bird Electrocutions	Ongoing
All construction and maintenance motor vehicle operators should 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
All project activities must be undertaken with appropriate noise mitigation measures to avoid disturbance to avifauna population in the region	Construction/Operational Phase	Project Manager Environmental Officer	Noise	Ongoing
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.	Construction	Environmental Officer	Presence of avifauna species and nests	During Phase
The design of the proposed transmission line 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	Project Manager Environmental Officer Contractor Engineer	Presence of electrocuted birds or bird strikes	During Phase
Infrastructure must be consolidated where possible in order to minimise the amount of ground and air space used.	Planning and Construction	Project Manager 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 Contractor Engineer	Presence of electrocuted birds	During phase
Use environmentally friendly cleaning and dust suppressant products	Construction and Operation	Environmental Officer Contractor Engineer	Chemicals used	During phase
Fencing mitigations: • Top 2 strands must be smooth wire; • Routinely retention loose wires; • Minimum 300 mm between wires; and • Place markers on fences.	Life of Operation	Project Manager Environmental Officer Contractor Design Engineer	Presence of birds stuck /dead in fences Monitor fences for slack wires	During phase
As far as possible power cables within the PAOI should be thoroughly insulated and preferably buried.	Construction and Operation	Project Manager Environmental Officer Design 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
Post-construction monitoring should follow the BirdLife South Africa best practice guidelines for solar energy facilities (BirdLife South Africa, 2017). If monitoring results indicate excessive bird fatalities, then adaptive mitigations should be implemented. Before implementation, these should be discussed with the avifaunal specialist and ECO and could include the retrofitting/incorporation of additional visual cues/diverters to existing PV panels/infrastructure. This is especially pertinent based on the possible occurrence of SCC such as vultures.	Operational	Project Manager Environmental Officer Design Engineer	Presence of dead birds in the project site. Monitoring must be undertaken in accordance with the BirdLife South Africa best practice guidelines for solar energy facilities (BirdLife South Africa, 2017). The precise location of any dead birds found should be recorded and mapped (using GPS). All carcasses should be photographed as found then placed in a plastic bag, labelled as to the location and date, and preserved (refrigerated or frozen) until identified. Feather spots (e.g., a group of feathers attached to skin) and body parts should also be collected.	During phase. The monitoring frequency is based on the collision rate.
All infrastructure, must be removed if the facility is decommissioned.	Closure/Rehabilitation	Project Manager Environmental Officer	Infrastructure removal	During Process

6 Conclusion

The aim of this Avifauna Impact Assessment was to provide information to guide the risk of the proposed Solar PV facility to the avifauna community likely affected by its development.

Based on the SABAP2 and CWAC data, 335 avifauna species are expected for the PAOI and surrounds. Of these, 17 are considered SCC, with two species having a high likelihood of occurrence (the Lanner Falcon and the Southern Bald Ibis) and nine species having a moderate likelihood of occurrence. Two avifaunal field surveys were completed on the 18th of January 2024 and on the 6th to the 8th of May 2024. These assessments are deemed sufficient for a regime 2 survey. No SCC were observed during the two field surveys however, seven (7) risk species were recorded. These risk species are susceptible to collisions, electrocutions, and habitat loss.

Four habitats were delineated, namely Degraded Thornveld, Degraded Grassland, Transformed, and Water Resources. Majority of the project area was found to be either medium or very low sensitivity disputing the screening tool High sensitivity, with only Water Resources being regarded as a high sensitivity habitat. This rating is based on the resource resilience and the overall disturbed state of the habitat. The collision risk, electrocution risk and loss of habitat are the main impacts, should these be successfully mitigated the overall impact rating can be reduced.

6.1 Impact Statement

The main expected impacts of the proposed PV and infrastructure will include the following:

- Habitat loss and fragmentation;
- Electrocutions; and
- Collisions result in mortalities amongst other SCCs.

Mitigation measures, as described in this report, can be implemented to reduce the significance of the risk, but there is still a possibility of impacts. Considering that this area has been identified as significant for biodiversity maintenance and ecological processes (Moderate and High sensitivity), development may proceed but with caution and only with the implementation of mitigation measures.

6.2 Specialist Opinion

It is the opinion of the specialist that the development can be favourably considered should the mitigation measures and management actions be implemented. High sensitivity areas must be avoided as much feasibly possible.

7 References

Bird Atlas Project (SABAP2). (2022). http://vmus.adu.org.za/

BirdLife International. 2021. The IUCN Red List of Threatened Species 2021

Birdlife South Africa (2022). Important Bird and Biodiversity Areas. https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/

BirdLife South Africa. 2015. Fences & birds, minimising unintended impacts. https://www.birdlife.org.za/what-we-do/landscape-conservation/what-we-do/birds-and-fences/

BirdLife South Africa. 2017. Birds and Solar Energy Best Practice Guidelines. https://www.birdlife.org.za/wp-content/uploads/2020/03/BLSA-Guidelines-Solar-and-Energy.pdf

BirdLife South Africa. (2017). Important Bird Areas Factsheet. http://www.birdlife.org

Buckland, S., Anderson, D., Burnham, K.P. and Laake, J. 1993. Distance Sampling: Estimating Abundance of Biological Populations. 440 pgs., Chapman and Hall, London

Coordinated Avifaunal Roadcounts (CAR) (2020). http://car.birdmap.africa/index.php

Cumming, G.S. & Henry, D.A.W. 2019. Point counts outperform line transects when sampling birds along routes in South African protected areas. African Zoology, 54(4): 187-198. doi: 10.1080/15627020.2019.1658540.

Del Hoyo, J., Collar, N.J., Christie, D.A., Elliott, A., Fishpool, L.D.C., Boesman, P. & Kirwan, G.M. (1996). HBW and BirdLife International Illustrated Checklist of the Birds of the World. Volume 2: Passerines. Lynx Editions and BirdLife International, Barcelona, Spain and Cambridge, UK.

Department of Forestry, Fisheries and the Environment (DFFE). 2023a. SACAD (South Africa Conservation Areas Database) and SAPAD (South Africa Protected Areas Database). http://egis.environment.gov.za.

Department of Forestry, Fisheries and the Environment (DFFE). 2021b. National Protected Areas Expansion Strategy. http://egis.environment.gov.za.

Department of Forestry, Fisheries and the Environment (DFFE). 2021c. Renewable Energy EIA Application Database. http://egis.environment.gov.za.

Taylor, M.R., Peacock, F. & Wanless, R.M. (Eds). 2015. The 2015 Eskom Red Data Book of birds of South Africa, Lesotho and Swaziland. BirdLife South Africa, Johannesburg.

Hockey, P.A.R., Dean, W.R.J. & Ryan, P.G. (Eds). (2005). Roberts – Birds of Southern Africa, VIIth ed. The Trustees of the John Voelcker Bird Book Fund, Cape Town.

Horvath, G., Blaho, M., Egri A., Kriska, G., Seres, I. & Robertson, B. 2010. Reducing the Maladaptive Attractiveness of Solar Panels to Polarotactic Insects Conservation biology 24 (6) 1644-1653

IUCN. (2021). The IUCN Red List of Threatened Species. www.iucnredlist.org

Jenkins, A.R., van Rooyen, C.S., Smallie, J.J., Harrison., J.A., Diamond., M., Smit-Robinson., H.A. & Ralston., S. 2015. Birds and Wind-Energy Best-Practice Guidelines. Birds and Wind-Energy Best-Practice Guidelines.

Lovich, J.E. & Ennen, J.R. 2011. Wildlife conservation and solar energy development in the desert southwest, United States. BioScience 61:982-992.

Prinsen, H.A.M., Smallie, J.J., Boere, G.C. & Píres, N. (Compilers). 2012. Guidelines on How to Avoid or Mitigate Impact of Electricity Power Grids on Migratory Birds in the African-Eurasian Region. AEWA

Conservation Guidelines No. 14, CMS Technical Series No. 29, AEWA Technical Series No. 50, CMS Raptors MOU Technical Series No. 3, Bonn, Germany.

Ralston Paton, S., Smallie J., Pearson A., & Ramalho, R. 2017. Wind energy's impacts on birds in South Africa: A preliminary review of the results of operational monitoring at the first wind farms of the Renewable Energy Independent Power Producer Procurement Programme in South Africa. BirdLife South Africa Occasional Report Series No. 2. BirdLife South Africa, Johannesburg, South Africa

Shaw, J.M., Reid, T.A., Gibbons, B.K., Pretorius, M., Jenkins, A.R., Visagie, R., Michael, M.D. & Ryan, P.G. 2021. A large-scale experiment demonstrates that line marking reduces power line collision mortality for large terrestrial birds, but not bustards, in the Karoo, South Africa. Ornithological Applications, 123: 1-10.

Skowno, A.L., Raimondo, D.C., Poole, C.J., Fizzotti, B. & Slingsby, J.A. (eds.). 2019. South African National Biodiversity Assessment 2018 Technical Report Volume 1: Terrestrial Realm. South African National Biodiversity Institute, Pretoria.

South African National Biodiversity Institute (SANBI). 2016. Lexicon of Biodiversity Planning in South Africa. Beta Version, June 2016. South African National Biodiversity Institute, Pretoria. 72 pp.

South African National Biodiversity Institute (SANBI). 2017. Technical guidelines for CBA Maps: Guidelines for developing a map of Critical Biodiversity Areas & Ecological Support Areas using systematic biodiversity planning. Driver, A., Holness, S. & Daniels, F. (Eds). 1st Edition. South African National Biodiversity Institute, Pretoria.

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.

Van Deventer, H., Smith-Adao, L., Mbona, N., Petersen, C., Skowno, A., Collins, N.B., Grenfell, M., Job, N., Lötter, M., Ollis, D., Scherman, P., Sieben, E. & Snaddon, K. 2018. South African National Biodiversity Assessment 2018: Technical Report. Volume 2a: South African Inventory of Inland Aquatic Ecosystems (SAIIAE). Version 3, final released on 3 October 2019. Council for Scientific and Industrial Research (CSIR) and South African National Biodiversity Institute (SANBI): Pretoria, South Africa.

Visser, Elke & Perold, V. & Ralston-Paton, S. & Cardenal, A. C. & Ryan, P.G., 2019. "Assessing the impacts of a utility-scale photovoltaic solar energy facility on birds in the Northern Cape, South Africa," Renewable Energy, Elsevier, vol. 133(C), pages 1285-1294.

8 Appendix Items

8.1 Appendix A: Methodology

8.1.1 Desktop Dataset Assessment

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

8.1.1.1 Expected Species

The avifaunal desktop assessment comprised of the following, compiling an expected species list:

- Avifauna list, generated from the SABAP2 dataset by looking at pentads 2455_3020; 2455_3025; 2455_3030; 2500_3020; 2500_3025; 2500_3030; 2505_3020; 2505_3025; and 2505_3030; and

- Compilation of a Coordinated Water Bird Count (CWAC) species list if the PAOI was found to be in a vicinity of a CWAC site; and

- Compilation of a Coordinated Avifaunal Roadcount (CAR) species list if the PAOI was found to be in a vicinity of a CAR route.

8.1.1.2 Ecologically Important Landscape Features

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

- Ecosystem Threat Status (ETS) – 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. The revised red list of threatened ecosystems was developed between 2016 and 2021 incorporating the best available information on terrestrial ecosystem extent and condition, pressures and drivers of change. The revised list (known as the Red List of Ecosystems (RLE) 2022) is based on assessments that followed the International Union for Conservation of Nature (IUCN) Red List of Ecosystems Framework (version 1.1) and covers all 456 terrestrial ecosystem types described in South Africa (Mucina and Rutherford 2006; with updates described in Dayaram *et al.,* 2019). The revised list identifies 120 threatened terrestrial ecosystem types (55 Critically Endangered, 51 Endangered and 14 Vulnerable types). The revised list was published in the Government Gazette (Gazette Number 47526, Notice Number 2747) and came into effect on 18 November 2022;

- Ecosystem Protection level (EPL) informs on whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Not Protected (NP), Poorly Protected (PP), Moderately Protected (MP) or Well Protected (WP), based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act (Skowno *et al.,* 2019). NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems.

- Protected areas - South Africa Protected Areas Database (SAPAD) (DEA, 2023) – The SAPAD Database contains spatial data pertinent to the conservation of South African biodiversity. It includes spatial and attribute information for both formally protected areas and areas that have

less formal protection. SAPAD 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, 2018) – The NPAES provides spatial information on areas that are suitable for terrestrial ecosystem protection. These focus areas are large, intact and unfragmented and therefore, of high importance for biodiversity, climate resilience and freshwater protection.

- The Mpumalanga Biodiversity Sector Plan (MBSP) specifies two different CBA areas, Irreplaceable CBA's and Optimal CBA's. Irreplaceable CBA's include: (1) areas required to meet targets and with irreplaceability biodiversity values of more than 80%; (2) critical linkages or pinch-points in the landscape that must remain natural; or (3) critically Endangered ecosystems (MTPA, 2021).

- ESAs are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services. Critical Biodiversity Areas and Ecological Support Areas may be terrestrial or aquatic (SANBI-BGIS, 2017).

- ONAs consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs. A biodiversity sector plan or bioregional plan must not specify the desired state/management objectives for ONAs or provide land-use guidelines for ONAs (SANBI-BGIS, 2017).

- Moderately or Heavily Modified Areas (sometimes called 'transformed' areas) are areas that have been heavily modified by human activity so that they are by-and-large no longer natural, and do not contribute to biodiversity targets (MTPA, 2021). Some of these areas may still provide limited biodiversity and ecological infrastructural functions but, their biodiversity value has been significantly, and in many cases irreversibly, compromised.

- Important Bird and Biodiversity Areas (IBAs) (BirdLife South Africa, 2017) – 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

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

8.1.2 Avifauna Survey

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.

8.1.2.1 Data Analysis

The analyses described below only used the data collected from the standardised point counts. See Appendix E and G for the point count raw data.

The analyses described below only used the data collected from the Standardised Point Counts. Raw count data was converted to relative abundance values and used to establish dominant species and calculate the diversity of each habitat. 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).

8.2 Appendix B: Site Ecological Importance

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

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 **Error! Reference source not found.** and Table 8-2, respectively.

Table 8-1 Summary of Conservation Importance (CI) criteria

Conservation Importance	Fulfilling Criteria
Very High	Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or CR species that have a global extent of occurrence (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 Near Threatened (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 8-2 Summary of Functional Integrity (FI) 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 8-3.

Table 8-3 Matrix used to derive Biodiversity Importance (BI) from Functional Integrity (FI) and Conservation Importance (CI)

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 8-4.

Table 8-4 Summary of Resource Resilience (RR) 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 8-5.

Table 8-5 Matrix used to derive Site Ecological Importance (SEI) from Receptor Resilience (RR) and Biodiversity Importance (BI)

Site Ecological Importance (SEI)		Biodiversity Importance (BI)				
		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 8-6.

Table 8-6 Guidelines for interpreting Site Ecological Importance (SEI) in the context of the proposed development activities

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

Site Ecological Importance (SEI)	Interpretation in relation to proposed development 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.

8.3 Appendix C: Impact Assessment Significance Rating

Impact assessment must take account of the nature, scale, and duration of impacts on the environment whether such impacts are positive or negative. Each impact is also assessed according to the project phases:

- Construction;
- Operation; and
- Decommissioning.

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance should also be included. The rating system is applied to the potential impacts on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each impact, the criteria set out by EIMS' Impact Assessment Significance Rating system was followed. This assessment is available upon request.

8.4 Appendix D: Expected Avifaunal Species

Scientific Name	Common Name	Family Name	Regional	Global (IUCN)	Endemism in South Africa (E)
Telophorus zeylonus	Bokmakierie	Malaconotidae	Unlisted	Unlisted	
Nilaus afer	Brubru	Malaconotidae	Unlisted	Unlisted	
Scopus umbretta	Hamerkop	Scopidae	Unlisted	Unlisted	
Anas platyrhynchos	Mallard	Anatidae	Unlisted	Unlisted	
Cisticola fulvicapilla	Neddicky	Cisticolidae	Unlisted	Unlisted	
Ortygospiza atricollis	Quailfinch	Estrildidae	Unlisted	Unlisted	
Sagittarius serpentarius	Secretarybird	Sagittariidae	VU	EN	
Apalis thoracica	Bar-throated Apalis	Cisticolidae	Unlisted	Unlisted	
Apalis flavida	Yellow-breasted Apalis	Cisticolidae	Unlisted	Unlisted	
Turdoides jardineii	Arrow-marked Babbler	Leiothrichidae	Unlisted	Unlisted	
Tricholaema leucomelas	Acacia Pied Barbet	Lybiidae	Unlisted	Unlisted	
Lybius torquatus	Black-collared Barbet	Lybiidae	Unlisted	Unlisted	
Trachyphonus vaillantii	Crested Barbet	Lybiidae	Unlisted	Unlisted	
Batis capensis	Cape Batis	Platysteiridae	Unlisted	Unlisted	
Batis molitor	Chinspot Batis	Platysteiridae	Unlisted	Unlisted	

Merops apiaster	European Bee-eater	Meropidae	Unlisted	Unlisted	
Merops pusillus	Little Bee-eater	Meropidae	Unlisted	Unlisted	
Merops hirundineus	Swallow-tailed Bee-eater	Meropidae	Unlisted	Unlisted	
Merops bullockoides	White-fronted Bee-eater	Meropidae	Unlisted	Unlisted	
Euplectes orix	Southern Red Bishop	Ploceidae	Unlisted	Unlisted	
Euplectes capensis	Yellow Bishop	Ploceidae	Unlisted	Unlisted	
Euplectes afer	Yellow-crowned Bishop	Ploceidae	Unlisted	Unlisted	
Laniarius ferrugineus	Southern Boubou	Malaconotidae	Unlisted	Unlisted	
Phyllastrephus terrestris	Terrestrial Brownbul	Pycnonotidae	Unlisted	Unlisted	
Pycnonotus tricolor	Dark-capped Bulbul	Pycnonotidae	Unlisted	Unlisted	
Emberiza capensis	Cape Bunting	Emberizidae	Unlisted	Unlisted	
Emberiza tahapisi	Cinnamon-breasted Bunting	Emberizidae	Unlisted	Unlisted	
Emberiza flaviventris	Golden-breasted Bunting	Emberizidae	Unlisted	Unlisted	
Telophorus viridis	Gorgeous Bush-shrike	Malaconotidae	Unlisted	Unlisted	
Malaconotus blanchoti	Grey-headed Bush-shrike	Malaconotidae	Unlisted	Unlisted	
Chlorophoneus olivaceus	Olive Bush-shrike	Malaconotidae	Unlisted	Unlisted	
Chlorophoneus sulfureopectus	Orange-breasted Bush-shrike	Malaconotidae	Unlisted	Unlisted	
Lissotis melanogaster	Black-bellied Bustard	Otididae	Unlisted	Unlisted	
Neotis denhami	Denham's Bustard	Otididae	VU	NT	
Eupodotis senegalensis	White-bellied Korhaan	Otididae	VU	LC	
Buteo buteo	Common Buzzard	Accipitridae	Unlisted	Unlisted	
Buteo trizonatus	Forest Buzzard	Accipitridae	LC	NT	SLS
Buteo rufofuscus	Jackal Buzzard	Accipitridae	Unlisted	Unlisted	NE
Kaupifalco monogrammicus	Lizard Buzzard	Accipitridae	Unlisted	Unlisted	
Camaroptera brachyura	Green-backed Camaroptera	Cisticolidae	Unlisted	Unlisted	
Crithagra atrogularis	Black-throated Canary	Fringillidae	Unlisted	Unlisted	
Crithagra sulphurata	Brimstone Canary	Fringillidae	Unlisted	Unlisted	
Serinus canicollis	Cape Canary	Fringillidae	Unlisted	Unlisted	
Crithagra mozambica	Yellow-fronted Canary	Fringillidae	Unlisted	Unlisted	
Myrmecocichla formicivora	Ant-eating Chat	Muscicapidae	Unlisted	Unlisted	
Campicoloides bifasciatus	Buff-streaked Chat	Muscicapidae	Unlisted	Unlisted	SLS
Oenanthe familiaris	Familiar Chat	Muscicapidae	Unlisted	Unlisted	
Thamnolaea cinnamomeiventris	Mocking Cliff Chat	Muscicapidae	Unlisted	Unlisted	
Cisticola textrix	Cloud Cisticola	Cisticolidae	Unlisted	Unlisted	NE
Cisticola natalensis	Croaking Cisticola	Cisticolidae	Unlisted	Unlisted	
Cisticola aberrans	Lazy Cisticola	Cisticolidae	Unlisted	Unlisted	
Cisticola tinniens	Levaillant's Cisticola	Cisticolidae	Unlisted	Unlisted	
Cisticola chiniana	Rattling Cisticola	Cisticolidae	Unlisted	Unlisted	
Cisticola erythrops	Red-faced Cisticola	Cisticolidae	Unlisted	Unlisted	
Cisticola lais	Wailing Cisticola	Cisticolidae	Unlisted	Unlisted	

Cisticola ayresii	Wing-snapping Cisticola	Cisticolidae	Unlisted	Unlisted
Cisticola juncidis	Zitting Cisticola	Cisticolidae	Unlisted	Unlisted
Fulica cristata	Red-knobbed Coot	Rallidae	Unlisted	Unlisted
Microcarbo africanus	Reed Cormorant	Phalacrocoracidae	Unlisted	Unlisted
Phalacrocorax lucidus	White-breasted Cormorant	Phalacrocoracidae	Unlisted	Unlisted
Centropus burchellii	Burchell's Coucal	Cuculidae	Unlisted	Unlisted
Zapornia flavirostra	Black Crake	Rallidae	Unlisted	Unlisted
Anthropoides paradiseus	Blue Crane	Gruidae	NT	VU
Sylvietta rufescens	Long-billed Crombec	Macrosphenidae	Unlisted	Unlisted
Corvus capensis	Cape Crow	Corvidae	Unlisted	Unlisted
Corvus albus	Pied Crow	Corvidae	Unlisted	Unlisted
Cuculus gularis	African Cuckoo	Cuculidae	Unlisted	Unlisted
Cuculus clamosus	Black Cuckoo	Cuculidae	Unlisted	Unlisted
Chrysococcyx caprius	Diederik Cuckoo	Cuculidae	Unlisted	Unlisted
Clamator jacobinus	Jacobin Cuckoo	Cuculidae	Unlisted	Unlisted
Chrysococcyx klaas	Klaas's Cuckoo	Cuculidae	Unlisted	Unlisted
Clamator levaillantii	Levaillant's Cuckoo	Cuculidae	Unlisted	Unlisted
Cuculus solitarius	Red-chested Cuckoo	Cuculidae	Unlisted	Unlisted
Campephaga flava	Black Cuckooshrike	Campephagidae	Unlisted	Unlisted
Anhinga rufa	African Darter	Anhingidae	Unlisted	Unlisted
Streptopelia capicola	Ring-necked Dove	Columbidae	Unlisted	Unlisted
Turtur chalcospilos	Emerald-spotted Wood Dove	Columbidae	Unlisted	Unlisted
Spilopelia senegalensis	Laughing Dove	Columbidae	Unlisted	Unlisted
Oena capensis	Namaqua Dove	Columbidae	Unlisted	Unlisted
Streptopelia semitorquata	Red-eyed Dove	Columbidae	Unlisted	Unlisted
Columba livia	Rock Dove	Columbidae	Unlisted	Unlisted
Turtur tympanistria	Tambourine Dove	Columbidae	Unlisted	Unlisted
Dicrurus adsimilis	Fork-tailed Drongo	Dicruridae	Unlisted	Unlisted
Anas sparsa	African Black Duck	Anatidae	Unlisted	Unlisted
Sarkidiornis melanotos	Knob-billed Duck	Anatidae	Unlisted	Unlisted
Dendrocygna viduata	White-faced Whistling Duck	Anatidae	Unlisted	Unlisted
Anas undulata	Yellow-billed Duck	Anatidae	Unlisted	Unlisted
Haliaeetus vocifer	African Fish Eagle	Accipitridae	Unlisted	Unlisted
Circaetus pectoralis	Black-chested Snake Eagle	Accipitridae	Unlisted	Unlisted
Circaetus cinereus	Brown Snake Eagle	Accipitridae	Unlisted	Unlisted
Stephanoaetus coronatus	African Crowned Eagle	Accipitridae	VU	NT
Lophaetus occipitalis	Long-crested Eagle	Accipitridae	Unlisted	Unlisted
Polemaetus bellicosus	Martial Eagle	Accipitridae	EN	EN
Aquila verreauxii	Verreaux's Eagle	Accipitridae	NA	LC
Hieraaetus wahlbergi	Wahlberg's Eagle	Accipitridae	Unlisted	Unlisted

Bubo africanus	Spotted Eagle-Owl	Strigidae	Unlisted	Unlisted	
Ardea intermedia	Intermediate Egret	Cisticolidae	Unlisted	Unlisted	
Egretta garzetta	Little Egret	Ardeidae	Unlisted	Unlisted	
Bubulcus ibis	Western Cattle Egret	Ardeidae	Unlisted	Unlisted	
Falco amurensis	Amur Falcon	Falconidae	Unlisted	Unlisted	
Falco biarmicus	Lanner Falcon	Falconidae	VU	LC	
Falco peregrinus	Peregrine Falcon	Falconidae	Unlisted	Unlisted	
Amadina fasciata	Cut-throat Finch	Estriididae	Unlisted	Unlisted	
Amadina erythrocephala	Red-headed Finch	Estriididae	Unlisted	Unlisted	
Lagonosticta rubricata	African Firefinch	Estriididae	Unlisted	Unlisted	
Lagonosticta rhodopareia	Jameson's Firefinch	Estriididae	Unlisted	Unlisted	
Lagonosticta senegala	Red-billed Firefinch	Estriididae	Unlisted	Unlisted	
Lanius collaris	Southern Fiscal	Laniidae	Unlisted	Unlisted	
Phoeniconaias minor	Lesser Flamingo	Phoenicopteridae	NT	NT	
Sarothrura rufa	Red-chested Flufftail	Sarothruridae	Unlisted	Unlisted	
Muscicapa adusta	African Dusky Flycatcher	Muscicapidae	Unlisted	Unlisted	
Terpsiphone viridis	African Paradise Flycatcher	Monarchidae	Unlisted	Unlisted	
Muscicapa caerulescens	Ashy Flycatcher	Muscicapidae	Unlisted	Unlisted	
Melaenornis silens	Fiscal Flycatcher	Muscicapidae	Unlisted	Unlisted	NE
Melaenornis mariquensis	Marico Flycatcher	Muscicapidae	Unlisted	Unlisted	
Melaenornis pallidus	Pale Flycatcher	Muscicapidae	Unlisted	Unlisted	
Melaenornis pammelaina	Southern Black Flycatcher	Muscicapidae	Unlisted	Unlisted	
Muscicapa striata	Spotted Flycatcher	Muscicapidae	Unlisted	Unlisted	
Peliperdix coqui	Coqui Francolin	Phasianidae	Unlisted	Unlisted	
Dendroperdix sephaena	Crested Francolin	Phasianidae	Unlisted	Unlisted	
Scleroptila afra	Grey-winged Francolin	Phasianidae	Unlisted	Unlisted	SLS
Scleroptila levaillantii	Red-winged Francolin	Phasianidae	Unlisted	Unlisted	
Scleroptila shelleyi	Shelley's Francolin	Phasianidae	Unlisted	Unlisted	
Corythaixoides concolor	Grey Go-away-bird	Musophagidae	Unlisted	Unlisted	
Alopochen aegyptiaca	Egyptian Goose	Anatidae	Unlisted	Unlisted	
Plectropterus gambensis	Spur-winged Goose	Anatidae	Unlisted	Unlisted	
Accipiter tachiro	African Goshawk	Accipitridae	Unlisted	Unlisted	
Sphenoeacus afer	Cape Grassbird	Macrosphenidae	Unlisted	Unlisted	NE
Tringa nebularia	Common Greenshank	Pycnonotidae	Unlisted	Unlisted	
Catriscus brevirostris	Broad-tailed Warbler	Locustellidae	Unlisted	Unlisted	
Tachybaptus ruficollis	Little Grebe	Podicipedidae	Unlisted	Unlisted	
Andropadus importunus	Sombre Greenbul	Pycnonotidae	Unlisted	Unlisted	
Chlorocichla flaviventris	Yellow-bellied Greenbul	Pycnonotidae	Unlisted	Unlisted	
Numida meleagris	Helmeted Guineafowl	Numididae	Unlisted	Unlisted	
Polyboroides typus	African Harrier-Hawk	Accipitridae	Unlisted	Unlisted	

Aquila spilogaster	African Hawk Eagle	Accipitridae	Unlisted	Unlisted	
Prionops retzii	Retz's Helmet-shrike	Vangidae	Unlisted	Unlisted	
Prionops plumatus	White-crested Helmet-shrike	Vangidae	Unlisted	Unlisted	
Egretta ardesiaca	Black Heron	Ardeidae	Unlisted	Unlisted	
Nycticorax nycticorax	Black-crowned Night Heron	Ardeidae	Unlisted	Unlisted	
Ardea melanocephala	Black-headed Heron	Ardeidae	Unlisted	Unlisted	
Ardea cinerea	Grey Heron	Ardeidae	Unlisted	Unlisted	
Ardea purpurea	Purple Heron	Ardeidae	Unlisted	Unlisted	
Ardeola ralloides	Squacco Heron	Ardeidae	Unlisted	Unlisted	
Butorides striata	Striated Heron	Ardeidae	Unlisted	Unlisted	
Pernis apivorus	European Honey Buzzard	Accipitridae	Unlisted	Unlisted	
Prodotiscus regulus	Brown-backed Honeybird	Indicatoridae	Unlisted	Unlisted	
Indicator indicator	Greater Honeyguide	Indicatoridae	Unlisted	Unlisted	
Indicator minor	Lesser Honeyguide	Indicatoridae	Unlisted	Unlisted	
Indicator variegatus	Scaly-throated Honeyguide	Indicatoridae	Unlisted	Unlisted	
Upupa africana	African Hoopoe	Upupidae	Unlisted	Unlisted	
Lophoceros nasutus	African Grey Hornbill	Bucerotidae	Unlisted	Unlisted	
Tockus rufirostris	Southern Red-billed Hornbill	Bucerotidae	Unlisted	Unlisted	
Tockus leucomelas	Southern Yellow-billed Hornbill	Bucerotidae	Unlisted	Unlisted	
Threskiornis aethiopicus	African Sacred Ibis	Threskiornithidae	Unlisted	Unlisted	
Bostrychia hagedash	Hadada Ibis	Threskiornithidae	Unlisted	Unlisted	
Geronticus calvus	Southern Bald Ibis	Threskiornithidae	VU	VU	SLS
Vidua funerea	Dusky Indigobird	Viduidae	Unlisted	Unlisted	
Falco rupicolus	Rock Kestrel	Falconidae	Unlisted	Unlisted	
Ispidina picta	African Pygmy Kingfisher	Alcedinidae	Unlisted	Unlisted	
Halcyon albiventris	Brown-hooded Kingfisher	Alcedinidae	Unlisted	Unlisted	
Megaceryle maxima	Giant Kingfisher	Alcedinidae	Unlisted	Unlisted	
Alcedo semitorquata	Half-collared Kingfisher	Alcedinidae	NT	LC	
Corythornis cristatus	Malachite Kingfisher	Alcedinidae	Unlisted	Unlisted	
Ceryle rudis	Pied Kingfisher	Alcedinidae	Unlisted	Unlisted	
Halcyon chelicuti	Striped Kingfisher	Alcedinidae	Unlisted	Unlisted	
Halcyon senegalensis	Woodland Kingfisher	Alcedinidae	Unlisted	Unlisted	
Elanus caeruleus	Black-winged Kite	Accipitridae	Unlisted	Unlisted	
Milvus aegyptius	Yellow-billed Kite	Accipitridae	Unlisted	Unlisted	
Vanellus senegallus	African Wattled Lapwing	Charadriidae	Unlisted	Unlisted	
Vanellus melanopterus	Black-winged Lapwing	Charadriidae	Unlisted	Unlisted	
Vanellus armatus	Blacksmith Lapwing	Charadriidae	Unlisted	Unlisted	
Vanellus coronatus	Crowned Lapwing	Charadriidae	Unlisted	Unlisted	
Certhilauda semitorquata	Eastern Long-billed Lark	Alaudidae	Unlisted	Unlisted	SLS

Mirafra rufocinnamomea	Flappet Lark	Alaudidae	Unlisted	Unlisted	
Calandrella cinerea	Red-capped Lark	Alaudidae	Unlisted	Unlisted	
Mirafra africana	Rufous-naped Lark	Alaudidae	Unlisted	Unlisted	
Macronyx capensis	Cape Longclaw	Motacillidae	Unlisted	Unlisted	
Macronyx croceus	Yellow-throated Longclaw	Motacillidae	Unlisted	Unlisted	
Spermestes cucullata	Bronze Mannikin	Estrildidae	Unlisted	Unlisted	
Riparia cincta	Banded Martin	Hirundinidae	Unlisted	Unlisted	
Riparia paludicola	Brown-throated Martin	Hirundinidae	Unlisted	Unlisted	
Delichon urbicum	Common House Martin	Hirundinidae	Unlisted	Unlisted	
Ptyonoprogne fuligula	Rock Martin	Hirundinidae	Unlisted	Unlisted	
Gallinula chloropus	Common Moorhen	Rallidae	Unlisted	Unlisted	
Paragallinula angulata	Lesser Moorhen	Rallidae	Unlisted	Unlisted	
Urocolius indicus	Red-faced Mousebird	Coliidae	Unlisted	Unlisted	
Colius striatus	Speckled Mousebird	Coliidae	Unlisted	Unlisted	
Acridotheres tristis	Common Myna	Sturnidae	Unlisted	Unlisted	
Caprimulgus pectoralis	Fiery-necked Nightjar	Caprimulgidae	Unlisted	Unlisted	
Caprimulgus tristigma	Freckled Nightjar	Caprimulgidae	Unlisted	Unlisted	
Caprimulgus rufigena	Rufous-cheeked Nightjar	Caprimulgidae	Unlisted	Unlisted	
Oriolus larvatus	Black-headed Oriole	Oriolidae	Unlisted	Unlisted	
Pandion haliaetus	Western Osprey	Pandionidae	Unlisted	Unlisted	
Struthio camelus	Common Ostrich	Struthionidae	Unlisted	Unlisted	
Asio capensis	Marsh Owl	Strigidae	Unlisted	Unlisted	
Tyto alba	Western Barn Owl	Strigidae	Unlisted	Unlisted	
Glaucidium perlatum	Pearl-spotted Owlet	Strigidae	Unlisted	Unlisted	
Buphagus erythrorynchus	Red-billed Oxpecker	Buphagidae	Unlisted	Unlisted	
Treron calvus	African Green Pigeon	Columbidae	Unlisted	Unlisted	
Columba arquatrix	African Olive Pigeon	Columbidae	Unlisted	Unlisted	
Columba guinea	Speckled Pigeon	Columbidae	Unlisted	Unlisted	
Anthus cinnamomeus	African Pipit	Motacillidae	Unlisted	Unlisted	
Anthus vaalensis	Buffy Pipit	Motacillidae	Unlisted	Unlisted	
Anthus caffer	Bushveld Pipit	Motacillidae	Unlisted	Unlisted	
Anthus nicholsoni	Nicholson's Pipit	Motacillidae	Unlisted	Unlisted	
Anthus leucophrys	Plain-backed Pipit	Motacillidae	Unlisted	Unlisted	
Anthus lineiventris	Striped Pipit	Motacillidae	Unlisted	Unlisted	
Charadrius hiaticula	Common Ringed Plover	Charadriidae	Unlisted	Unlisted	
Charadrius tricollaris	Three-banded Plover	Charadriidae	Unlisted	Unlisted	
Netta erythrophthalma	Southern Pochard	Anatidae	Unlisted	Unlisted	
Prinia hypoxantha	Drakensberg Prinia	Cisticolidae	Unlisted	Unlisted	SLS
Prinia subflava	Tawny-flanked Prinia	Cisticolidae	Unlisted	Unlisted	
Dryoscopus cubla	Black-backed Puffback	Malaconotidae	Unlisted	Unlisted	

Pytilia melba	Green-winged Pytilia	Estrildidae	Unlisted	Unlisted	
Coturnix coturnix	Common Quail	Phasianidae	Unlisted	Unlisted	
Quelea quelea	Red-billed Quelea	Ploceidae	Unlisted	Unlisted	
Corvus albicollis	White-necked Raven	Corvidae	Unlisted	Unlisted	
Cossypha caffra	Cape Robin-Chat	Muscicapidae	Unlisted	Unlisted	
Cossypha dichroa	Chorister Robin-Chat	Muscicapidae	Unlisted	Unlisted	SLS
Cossypha natalensis	Red-capped Robin-Chat	Muscicapidae	Unlisted	Unlisted	
Cossypha heuglini	White-browed Robin-Chat	Muscicapidae	Unlisted	Unlisted	
Cossypha humeralis	White-throated Robin-Chat	Muscicapidae	Unlisted	Unlisted	
Eurystomus glaucurus	Broad-billed Roller	Coraciidae	Unlisted	Unlisted	
Coracias garrulus	European Roller	Coraciidae	NT	LC	
Coracias naevius	Purple Roller	Coraciidae	Unlisted	Unlisted	
Actitis hypoleucos	Common Sandpiper	Scolopacidae	Unlisted	Unlisted	
Tringa stagnatilis	Marsh Sandpiper	Scolopacidae	Unlisted	Unlisted	
Tringa glareola	Wood Sandpiper	Scolopacidae	Unlisted	Unlisted	
Psalidoprocne pristoptera	Black Saw-wing	Hirundinidae	Unlisted	Unlisted	
Rhinopomastus cyanomelas	Common Scimitarbill	Phoeniculidae	Unlisted	Unlisted	
Cercotrichas leucophrys	White-browed Scrub Robin	Muscicapidae	Unlisted	Unlisted	
Crithagra gularis	Streaky-headed Seedeater	Fringillidae	Unlisted	Unlisted	
Laniarius atrococcineus	Crimson-breasted Shrike	Malaconotidae	Unlisted	Unlisted	
Lanius minor	Lesser Grey Shrike	Laniidae	Unlisted	Unlisted	
Lanius collurio	Red-backed Shrike	Laniidae	Unlisted	Unlisted	
Eurocephalus anguitimens	Southern White-crowned Shrike	Laniidae	Unlisted	Unlisted	
Gallinago nigripennis	African Snipe	Scolopacidae	Unlisted	Unlisted	
Passer melanurus	Cape Sparrow	Passeridae	Unlisted	Unlisted	
Passer domesticus	House Sparrow	Passeridae	Unlisted	Unlisted	
Passer diffusus	Southern Grey-headed Sparrow	Passeridae	Unlisted	Unlisted	
Gymnoris superciliaris	Yellow-throated Bush Sparrow	Passeridae	Unlisted	Unlisted	
Plocepasser mahali	White-browed Sparrow-Weaver	Ploceidae	Unlisted	Unlisted	
Accipiter melanoleucus	Black Sparrowhawk	Accipitridae	Unlisted	Unlisted	
Accipiter minullus	Little Sparrowhawk	Accipitridae	Unlisted	Unlisted	
Accipiter ovampensis	Ovambo Sparrowhawk	Accipitridae	Unlisted	Unlisted	
Accipiter rufiventris	Rufous-breasted Sparrowhawk	Accipitridae	Unlisted	Unlisted	
Platalea alba	African Spoonbill	Threskiornithidae	Unlisted	Unlisted	
Pternistis natalensis	Natal Spurfowl	Phasianidae	Unlisted	Unlisted	
Pternistis swainsonii	Swainson's Spurfowl	Phasianidae	Unlisted	Unlisted	
Lamprotornis nitens	Cape Starling	Sturnidae	Unlisted	Unlisted	
Lamprotornis bicolor	Pied Starling	Sturnidae	Unlisted	Unlisted	SLS
Onychognathus morio	Red-winged Starling	Sturnidae	Unlisted	Unlisted	

Cinnyricinclus leucogaster	Violet-backed Starling	Sturnidae	Unlisted	Unlisted	
Calidris minuta	Little Stint	Scolopacidae	Unlisted	Unlisted	
Saxicola torquatus	African Stonechat	Muscicapidae	Unlisted	Unlisted	
Ciconia nigra	Black Stork	Ciconiidae	VU	LC	
Ciconia ciconia	White Stork	Ciconiidae	Unlisted	Unlisted	
Promerops gurneyi	Gurney's Sugarbird	Promeropidae	LC	NT	NE
Chalcomitra amethystina	Amethyst Sunbird	Nectariniidae	Unlisted	Unlisted	
Cinnyris afer	Greater Double-collared Sunbird	Nectariniidae	Unlisted	Unlisted	SLS
Nectarinia famosa	Malachite Sunbird	Nectariniidae	Unlisted	Unlisted	
Cinnyris chalybeus	Southern Double-collared Sunbird	Nectariniidae	Unlisted	Unlisted	NE
Cinnyris talatala	White-bellied Sunbird	Nectariniidae	Unlisted	Unlisted	
Hirundo rustica	Barn Swallow	Hirundinidae	Unlisted	Unlisted	
Cecropis cucullata	Greater Striped Swallow	Hirundinidae	Unlisted	Unlisted	
Pseudhirundo griseopyga	Grey-rumped Swallow	Hirundinidae	Unlisted	Unlisted	
Cecropis abyssinica	Lesser Striped Swallow	Hirundinidae	Unlisted	Unlisted	
Hirundo dimidiata	Pearl-breasted Swallow	Hirundinidae	Unlisted	Unlisted	
Cecropis semirufa	Red-breasted Swallow	Hirundinidae	Unlisted	Unlisted	
Hirundo albigularis	White-throated Swallow	Hirundinidae	Unlisted	Unlisted	
Hirundo smithii	Wire-tailed Swallow	Hirundinidae	Unlisted	Unlisted	
Apus barbatus	African Black Swift	Apodidae	Unlisted	Unlisted	
Cypsiurus parvus	African Palm Swift	Apodidae	Unlisted	Unlisted	
Tachymarptis melba	Alpine Swift	Apodidae	Unlisted	Unlisted	
Apus affinis	Little Swift	Apodidae	Unlisted	Unlisted	
Apus caffer	White-rumped Swift	Apodidae	Unlisted	Unlisted	
Tchagra senegalus	Black-crowned Tchagra	Malaconotidae	Unlisted	Unlisted	
Tchagra australis	Brown-crowned Tchagra	Malaconotidae	Unlisted	Unlisted	
Anas erythrorhyncha	Red-billed Teal	Anatidae	Unlisted	Unlisted	
Chlidonias hybrida	Whiskered Tern	Laridae	Unlisted	Unlisted	
Burhinus capensis	Spotted Thick-knee	Burhinidae	Unlisted	Unlisted	
Monticola rupestris	Cape Rock Thrush	Muscicapidae	Unlisted	Unlisted	SLS
Turdus litsitsirupa	Groundscraper Thrush	Turdidae	Unlisted	Unlisted	
Turdus smithi	Karoo Thrush	Turdidae	Unlisted	Unlisted	NE
Turdus libonyana	Kurrichane Thrush	Turdidae	Unlisted	Unlisted	
Turdus olivaceus	Olive Thrush	Turdidae	Unlisted	Unlisted	
Monticola explorator	Sentinel Rock Thrush	Muscicapidae	LC	NT	SLS
Pogoniulus chrysoconus	Yellow-fronted Tinkerbird	Lybiidae	Unlisted	Unlisted	
Pogoniulus bilineatus	Yellow-rumped Tinkerbird	Lybiidae	Unlisted	Unlisted	
Melaniparus niger	Southern Black Tit	Paridae	Unlisted	Unlisted	
Apaloderma narina	Narina Trogon	Trogonidae	Unlisted	Unlisted	
Tauraco corythaix	Knysna Turaco	Musophagidae	Unlisted	Unlisted	SLS

Tauraco porphyreolophus	Purple-crested Turaco	Musophagidae	Unlisted	Unlisted	
Gyps coprotheres	Cape Vulture	Accipitridae	EN	VU	
Motacilla aguimp	African Pied Wagtail	Motacillidae	Unlisted	Unlisted	
Motacilla capensis	Cape Wagtail	Motacillidae	Unlisted	Unlisted	
Motacilla clara	Mountain Wagtail	Motacillidae	Unlisted	Unlisted	
Acrocephalus baeticatus	Common Reed Warbler	Acrocephalidae	Unlisted	Unlisted	
Iduna natalensis	Dark-capped Yellow Warbler	Acrocephalidae	Unlisted	Unlisted	
Curruca subcoerulea	Chestnut-vented Warbler	Sylviidae	Unlisted	Unlisted	
Sylvia borin	Garden Warbler	Sylviidae	Unlisted	Unlisted	
Acrocephalus arundinaceus	Great Reed Warbler	Acrocephalidae	Unlisted	Unlisted	
Hippolais icterina	Icterine Warbler	Acrocephalidae	Unlisted	Unlisted	
Acrocephalus gracilirostris	Lesser Swamp Warbler	Acrocephalidae	Unlisted	Unlisted	
Bradypterus baboecala	Little Rush Warbler	Locustellidae	Unlisted	Unlisted	
Acrocephalus palustris	Marsh Warbler	Acrocephalidae	Unlisted	Unlisted	
Phylloscopus trochilus	Willow Warbler	Phylloscopidae	Unlisted	Unlisted	
Uraeginthus angolensis	Blue Waxbill	Estrildidae	Unlisted	Unlisted	
Estrilda astrild	Common Waxbill	Estrildidae	Unlisted	Unlisted	
Amandava subflava	Orange-breasted Waxbill	Estrildidae	Unlisted	Unlisted	
Coccopygia melanotis	Swee Waxbill	Estrildidae	Unlisted	Unlisted	NE
Granatina granatina	Violet-eared Waxbill	Estrildidae	Unlisted	Unlisted	
Ploceus capensis	Cape Weaver	Ploceidae	Unlisted	Unlisted	NE
Ploceus xanthops	African Golden Weaver	Ploceidae	Unlisted	Unlisted	
Ploceus intermedius	Lesser Masked Weaver	Ploceidae	Unlisted	Unlisted	
Ploceus velatus	Southern Masked Weaver	Ploceidae	Unlisted	Unlisted	
Ploceus ocularis	Spectacled Weaver	Ploceidae	Unlisted	Unlisted	
Amblyospiza albifrons	Thick-billed Weaver	Ploceidae	Unlisted	Unlisted	
Ploceus cucullatus	Village Weaver	Ploceidae	Unlisted	Unlisted	
Oenanthe pileata	Capped Wheatear	Muscicapidae	Unlisted	Unlisted	
Myrmecocichla monticola	Mountain Wheatear	Muscicapidae	Unlisted	Unlisted	
Zosterops virens	Cape White-eye	Zosteropidae	Unlisted	Unlisted	NE
Vidua macroura	Pin-tailed Whydah	Viduidae	Unlisted	Unlisted	
Euplectes axillaris	Fan-tailed Widowbird	Ploceidae	Unlisted	Unlisted	
Euplectes progne	Long-tailed Widowbird	Ploceidae	Unlisted	Unlisted	
Euplectes ardens	Red-collared Widowbird	Ploceidae	Unlisted	Unlisted	
Euplectes albonotatus	White-winged Widowbird	Ploceidae	Unlisted	Unlisted	
Phoeniculus purpureus	Green Wood Hoopoe	Phoeniculidae	Unlisted	Unlisted	
Chloropicus namaquus	Bearded Woodpecker	Picidae	Unlisted	Unlisted	
Dendropicos fuscescens	Cardinal Woodpecker	Picidae	Unlisted	Unlisted	
Campethera abingoni	Golden-tailed Woodpecker	Picidae	Unlisted	Unlisted	
Geocolaptes olivaceus	Ground Woodpecker	Picidae	LC	NT	SLS

Dendropicos griseocephalus	Olive Woodpecker	Picidae	Unlisted	Unlisted
Jynx ruficollis	Red-throated Wryneck	Picidae	Unlisted	Unlisted

8.5 Appendix E: Point Count Data from First Field Survey

Common Name	Scientific Name	Family Name	Relative abundance	Frequency (%)
African Hoopoe	*Upupa africana*	Upupidae	0,010	7,143
Barn Swallow	*Hirundo rustica*	Hirundinidae	0,050	28,571
Black-collared Barbet	*Lybius torquatus*	Lybiidae	0,010	7,143
Black-crowned Tchagra	*Tchagra senegalus*	Malaconotidae	0,010	7,143
Black-winged Kite	*Elanus caeruleus*	Accipitridae	0,010	7,143
Cape Longclaw	*Macronyx capensis*	Motacillidae	0,020	14,286
Cape Sparrow	*Passer melanurus*	Passeridae	0,020	7,143
Dark-capped Bulbul	*Pycnonotus tricolor*	Pycnonotidae	0,020	14,286
Diederik Cuckoo	*Chrysococcyx caprius*	Cuculidae	0,010	7,143
Egyptian Goose	*Alopochen aegyptiaca*	Anatidae	0,030	7,143
European Bee-eater	*Merops apiaster*	Meropidae	0,020	7,143
Greater Striped Swallow	*Cecropis cucullata*	Hirundinidae	0,060	14,286
Hadada Ibis	*Bostrychia hagedash*	Threskiornithidae	0,010	7,143
Helmeted Guineafowl	*Numida meleagris*	Numididae	0,030	7,143
Laughing Dove	*Spilopelia senegalensis*	Columbidae	0,010	7,143
Levaillant's Cisticola	*Cisticola tinniens*	Cisticolidae	0,020	7,143
Little Swift	*Apus affinis*	Apodidae	0,020	7,143
Natal Spurfowl	*Pternistis natalensis*	Phasianidae	0,020	7,143
Neddicky	*Cisticola fulvicapilla*	Cisticolidae	0,050	35,714
Pied Crow	*Corvus albus*	Corvidae	0,160	14,286
Red-chested Cuckoo	*Cuculus solitarius*	Cuculidae	0,010	7,143
Red-eyed Dove	*Streptopelia semitorquata*	Columbidae	0,020	14,286
Red-winged Starling	*Onychognathus morio*	Sturnidae	0,020	7,143
Ring-necked Dove	*Streptopelia capicola*	Columbidae	0,020	14,286
Rufous-naped Lark	*Mirafra africana*	Alaudidae	0,130	71,429
Southern Fiscal	*Lanius collaris*	Laniidae	0,040	28,571
Southern Masked Weaver	*Ploceus velatus*	Ploceidae	0,020	7,143
Tawny-flanked Prinia	*Prinia subflava*	Cisticolidae	0,010	7,143
Western Cattle Egret	*Bubulcus ibis*	Ardeidae	0,030	14,286
White-browed Sparrow-Weaver	*Plocepasser mahali*	Ploceidae	0,050	21,429
Zitting Cisticola	*Cisticola juncidis*	Cisticolidae	0,060	42,857

8.6 Appendix F: Incidental Records from Frist Field Survey

Common Name	Scientific Name
African Paradise Flycatcher	*Terpsiphone viridis*

Cape Wagtail	*Motacilla capensis*
Dark-capped Bulbul	*Pycnonotus tricolor*
Diederik Cuckoo	*Chrysococcyx caprius*
White-bellied Sunbird	*Cinnyris talatala*

8.7 Appendix G: Point Count Data from Second Field Survey

Common Name	Scientific Name	Family Name	Relative abundance	Frequency (%)
Helmeted Guineafowl	*Numida meleagris*	Numididae	0,162	13,043
Red-faced Mousebird	*Urocolius indicus*	Coliidae	0,092	8,696
Common Waxbill	*Estrilda astrild*	Estrildidae	0,087	4,348
Brown-throated Martin	*Riparia paludicola*	Hirundinidae	0,058	4,348
Southern Fiscal	*Lanius collaris*	Laniidae	0,052	26,087
Southern Masked Weaver	*Ploceus velatus*	Ploceidae	0,046	13,043
White-browed Sparrow-Weaver	*Plocepasser mahali*	Ploceidae	0,046	13,043
Dark-capped Bulbul	*Pycnonotus tricolor*	Pycnonotidae	0,040	17,391
Ring-necked Dove	*Streptopelia capicola*	Columbidae	0,040	30,435
Black-chested Prinia	*Prinia flavicans*	Cisticolidae	0,035	17,391
Greater Striped Swallow	*Cecropis cucullata*	Hirundinidae	0,035	4,348
Pied Crow	*Corvus albus*	Corvidae	0,035	17,391
African Pipit	*Anthus cinnamomeus*	Motacillidae	0,029	13,043
Red-eyed Dove	*Streptopelia semitorquata*	Columbidae	0,023	8,696
African Stonechat	*Saxicola torquatus*	Muscicapidae	0,017	8,696
Cape Robin-Chat	*Cossypha caffra*	Muscicapidae	0,017	8,696
Laughing Dove	*Spilopelia senegalensis*	Columbidae	0,017	13,043
Swainson's Spurfowl	*Pternistis swainsonii*	Phasianidae	0,017	4,348
Zitting Cisticola	*Cisticola juncidis*	Cisticolidae	0,017	8,696
Black-collared Barbet	*Lybius torquatus*	Lybiidae	0,012	4,348
Cape Longclaw	*Macronyx capensis*	Motacillidae	0,012	4,348
Chinspot Batis	*Batis molitor*	Platysteiridae	0,012	8,696
Natal Spurfowl	*Pternistis natalensis*	Phasianidae	0,012	4,348
Rock Martin	*Ptyonoprogne fuligula*	Hirundinidae	0,012	4,348
South African Shelduck	*Tadorna cana*	Anatidae	0,012	4,348
Southern Red Bishop	*Euplectes orix*	Ploceidae	0,012	4,348
Black-winged Kite	*Elanus caeruleus*	Accipitridae	0,006	4,348
Cape Starling	*Lamprotornis nitens*	Sturnidae	0,006	4,348
Fiscal Flycatcher	*Melaenornis silens*	Muscicapidae	0,006	4,348
Fork-tailed Drongo	*Dicrurus adsimilis*	Dicruridae	0,006	4,348
Little Grebe	*Tachybaptus ruficollis*	Podicipedidae	0,006	4,348
Red-throated Wryneck	*Jynx ruficollis*	Picidae	0,006	4,348
Speckled Pigeon	*Columba guinea*	Columbidae	0,006	4,348

Three-banded Plover	*Charadrius tricollaris*	Charadriidae	0,006	4,348
White-browed Scrub Robin	*Cercotrichas leucophrys*	Muscicapidae	0,006	4,348

8.8 Appendix H: Incidental Records from Second Field Survey

Common Name	Scientific Name
Blacksmith Lapwing	*Vanellus armatus*
Black-throated Canary	*Crithagra atrogularis*
Brown Snake Eagle	*Circaetus cinereus*
Cape Starling	*Lamprotornis nitens*
Cape Wagtail	*Motacilla capensis*
Greater Striped Swallow	*Cecropis cucullata*
House Sparrow	*Passer domesticus*

8.9 Appendix I: Specialist Declaration of Independence

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

May 2024

8.10 Appendix J – Specialist CVs

Andrew Husted

M.Sc Aquatic Health (*Pr Sci Nat*)

Cell: +27 81 319 1225
Email: andrew@thebiodiversitycompany.com
Identity Number: 7904195054081
Date of birth: 19 April 1979

Profile Summary

Working experience throughout South Africa, West and Central Africa and also Armenia & Serbia.

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

Experience with project management for national and international multi-disciplinary projects.

Specialist guidance, support and facilitation for the compliance with legislative processes, for in-country requirements, and international lenders.

Specialist expertise include Instream Flow and Ecological Water Requirements, Freshwater Ecology, Terrestrial Ecology and also Ecosystem Services.

Areas of Interest

Sustainability and Conservation.

Instream Flow and Ecological Water Requirements.

Publication of scientific journals and articles.

Key Experience

- Familiar with World Bank, Equator Principles and the International Finance Corporation requirements
- Environmental, Social and Health Impact Assessments (ESHIA)
- Environmental Management Programmes (EMP)
- Ecological Water Requirement determination experience
- Wetland delineations and ecological assessments
- Rehabilitation Plans and Monitoring
- Fish population structure assessments
- The use of macroinvertebrates to determine water quality
- Aquatic Ecological Assessments
- Aquaculture

Country Experience

Botswana, Cameroon

Democratic Republic of Congo

Ghana, Ivory Coast, Lesotho

Liberia, Mali, Mozambique

Nigeria, Republic of Armenia,

Senegal, Serbia, Sierra Leone, South Africa

Tanzania

Nationality

South African

Languages

English – Proficient

Afrikaans – Conversational

German - Basic

Qualifications

- MSc (University of Johannesburg) – Aquatic Health.
- BSc Honours (Rand Afrikaans University) – Aquatic Health
- BSc Natural Science
- Pr Sci Nat (400213/11)
- Certificate of Competence: Mondi Wetland Assessments
- Certificate of Competence: Wetland WET-Management
- SASS 5 (Expired) – Department of Water Affairs and Forestry for the River Health Programme
- EcoStatus application for rivers and streams