Sendawo Battery Energy Storage System and Overhead Powerline – Biodiversity and Avifauna Impact Assessment

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CLIENT

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Submitted to	**WSP**
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Field Work	**André van Tonder** André van Tonder is a student at the University of Pretoria, awaiting results for a Masters in Zoology. He is an experienced field assistant with experience ranging from Antarctic surveys, overwintering on Marion Island and bird surveys for forest rehabilitation and renewable energy projects. His academic study focused on stable isotope analysis to characterise sub-Antarctic food webs.
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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.

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1 Introduction

1.1 Background

The Biodiversity Company (TBC) was appointed to undertake a Biodiversity (Fauna & Flora) Assessment and an Avifauna Assessment for the proposed Battery Energy Storage System (BESS) and Overhead powerline (OHPL) for the authorised Sendawo Solar Energy Facility (SEF) substation near Vryburg in the North West province (Figure 1-1). The project area of influence (PAOI) was determined by assigning a 2 km area around the powerlines as per Strategic Transmission Corridors (STC) guidelines.

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).

1.2 Project Description

The project descriptions is as per WSP (2023), and illustration of the infrastructure is shown in Figure 1-2:

BESS:

The project will include development of BESS (with laydown area) up to 5 ha. in extent to be located within 500 m of the onsite substation;

The proposed BESS comprises of a number of DC Battery Enclosures, Converter Stations, associated auxiliary transformers and an HV substation;

Each DC Battery Enclosure has approximate dimensions of 10 x 2 x 4 m (l x b x h) and houses a number of liquid cooled Lithium-ion batteries or Vanadium Redox Flow batteries. The enclosure is equipped with a fire detection system as well as a gas detection and prevention mechanism;

A typical 153 MW/612MWh BESS system comprises of a number of DC Battery Enclosures of capacity of 2.81 MW. For this system with a 4 hour discharge time, the usable energy from the system is 0.7 MW, hence for a 153MW/612MWh BESS system, the approximate number of Battery Enclosures required is ~218;

Each Converter Station comprises of 2 converters (~4200 kW,~1500VDC, - 690Vac) feeding into one MV transformer (690V/(22kV-33kV)) and each Converter has approximate dimensions of 3.0 x 2.0 x 2.2 m;

Each Converter is fed from approximately 7 Battery Enclosures;

The BESS is supplied by number of outdoor auxiliary transformers ((22kV-33kV)/(220-380V)) to provide auxiliary power to plant;

The MV transformers feed the HV substation which steps the voltage from 22kV to 132kV through one or more HV transformers in the HV substation connecting to the Eskom grid;

The onsite HV substation will be constructed with a maximum footprint of approximately 150m x 150m and encloses the 22kV/132kV HV power transformer, a lightning mast with a maximum height of 24 m. tower sections, earthing switches, circuit breakers, surge arrestors, busbars and other miscellaneous substation equipment including a substation building containing MV switchgear, control and protection equipment; and

Services required are water supply as well as general, sewage and construction waste disposal.

OHPL

The 132kV Over Head Power Line will run from the onsite HV substation to Eskom Mookodi substation;

The proposed OHPL is a 132kV steel single or double structure with kingbird conductor. The line will be supported by powerline towers which can be steel lattice or monopole structures of height up to 20 m;

Powerline towers: Up to 20 m high;

Lightning mast (at Sendawo substation): Up to 22m height; and

Existing road infrastructure will be used as far as possible to provide access for construction vehicles during the construction of the line. Thereafter, the roads are used for inspection and maintenance purposes. Where appropriate roads may be upgraded to access transmission lines and substations.

VRFB (Vanadium Redox Flow Batteries)

The proposed technology comprises of a number of VRFB stacks, back cooler, flame arrestor, gas barriers, switch cabinets, pre-pressure tanks, electrolyte pumps and electrolyte tanks, all within a single VRFB unit, additionally associated auxiliary transformers and an HV substation will be required.

Each VRFB unit comprises of 5, 40 foot containers:

The 2 containers situated at the top of the VRFB unit contains the stacks (where the charging and discharging of electrolyte solution occur) and control mechanisms (required for operation of each VRFB unit)

The 3 containers situated at the bottom of the VRFB unit stores the charged/discharged electrolyte solution, housed within double containment tanks.

There will be up to 230 VRFB units required to provide up to 153MW of generation capacity.

The development area required for an up to 153MW VRFB facility is approximately up to 7.8 ha in extent.

The entire facility will require bunding to contain 110% of the total electrolyte tank capacity.

Liquid cooled Lithium-ion batteries:

The proposed technology comprises of a number of DC Battery Enclosures, Converter Stations, associated auxiliary transformers and an HV substation.

Each DC Battery Enclosure has approximate dimensions of 10 x 2 x 4 m (l x b x h) and houses and a number of liquid cooled Lithium-ion batteries. The enclosure is equipped with a fire detection system, as well as a gas detection and prevention mechanism.

Each DC Battery Enclosure will have a capacity of 2.81 MW, with a 4 hour discharge time, the usable energy from the system is 0.7 MW, hence, for an up to 153 MW/612 MWh BESS system, the approximate number of Battery Enclosures required is ~218.

Each Converter Station is comprised of 2 converters (~4200 kW,~1500 VDC, - 690 Vac) feeding into one MV transformer (690 V/(22 kV-33 kV)) and each Converter has approximate dimensions of 3.0 x 2.0 x 2.2 m.

Each Converter is fed from approximately 7 Battery Enclosures.

A number of outdoor auxiliary transformer is required ((22 kV-33 kV)/(220-380 V)) to provide auxiliary power to the facility.

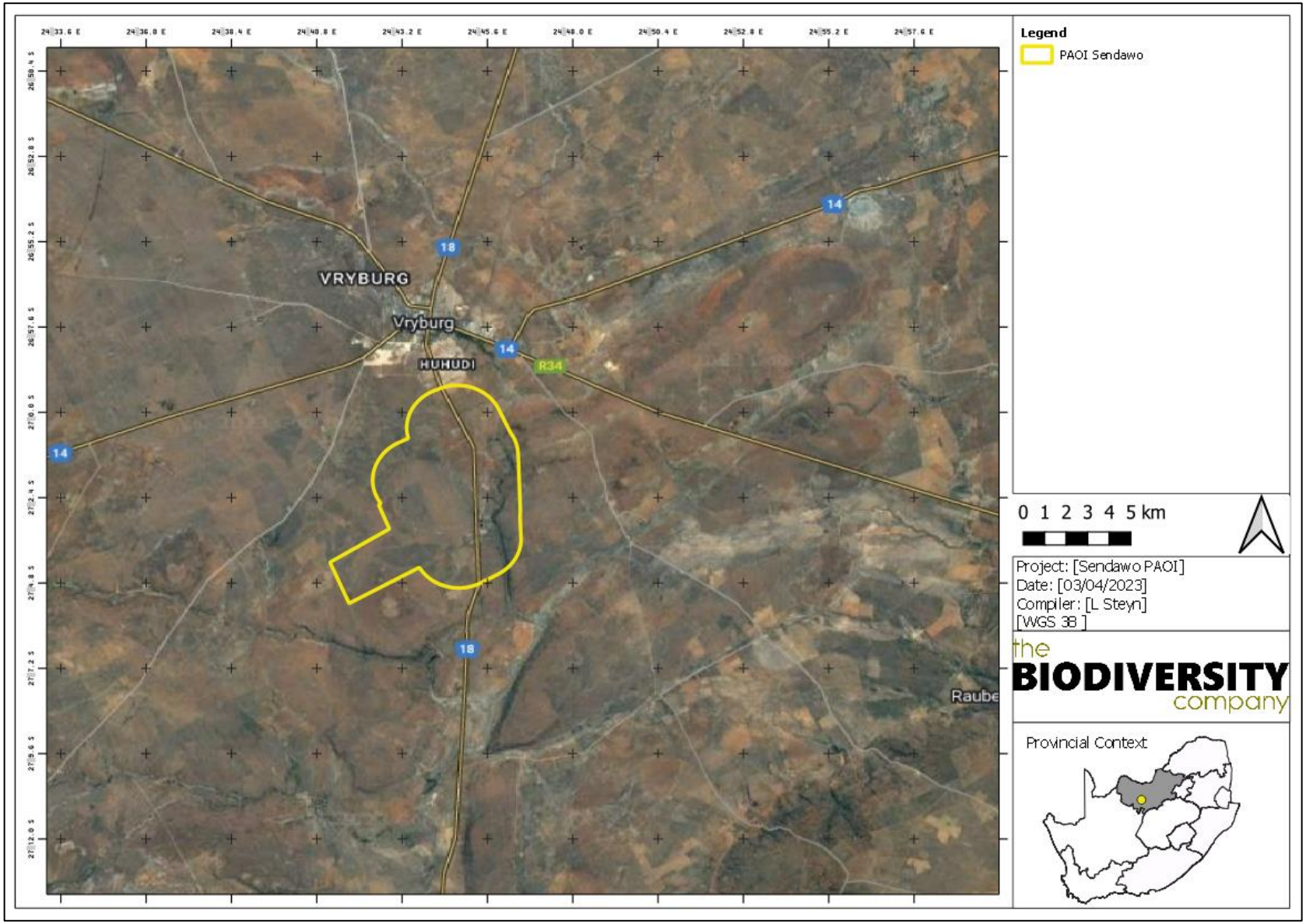


Figure 1-1 Map illustrating the location of the proposed development

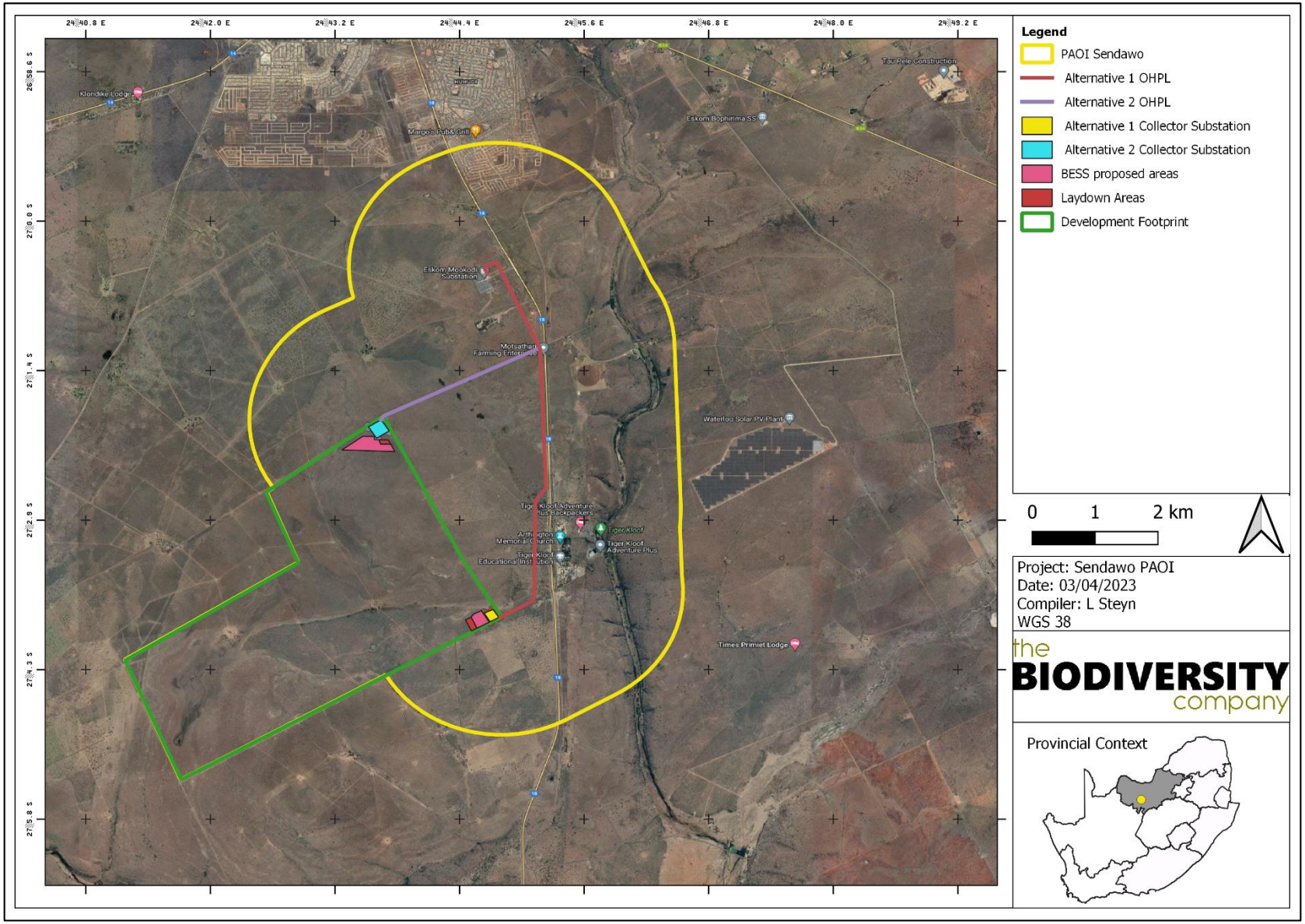


Figure 1-2 Map illustrating the layout of the proposed Sendawo BESS and OHPL

1.3 Scope of Work

The principal aim of the assessment was to provide information to guide the risk of the proposed development to the flora and fauna communities of the ecosystems associated with the PAOI. The scope of work for the assessment comprises of the following:

Desktop assessment to identify the relevant ecologically important geographical features within the proposed mining area and surrounding landscape;

- Desktop assessment to compile an expected species list and possible threatened flora and fauna species that occur within the proposed development area;
- Field survey to ascertain the species composition of the present flora and fauna community within the proposed development area;
- Delineate and map the habitats and their respective sensitivities that occur within the proposed development area;
- Identify the manner that the proposed development impacts the flora and fauna community and evaluate the level of risk of these potential impacts; and
- The prescription of mitigation measures and recommendations for identified risks.

1.4 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- A single season field survey was undertaken;
- This assessment has not assessed any temporal trends for the project;
- Access in the 2 km area surrounding the OHPL corridor was restricted;
- The habitats and SEI delineations is based on field assessment information in the 200 m corridor, the rest of the PAOI is based on aerial information;
- Access to the river was restricted and as such the water bird species recorded were low;
- The delineation of water resources was completed at a desktop level only;
- Whilst every effort was made to cover as much of the site as possible, it is possible that some flora and fauna species that are present on site were not recorded during the field survey, especially secretive or rare species; and
- The GPS used in the assessment has an accuracy of 5 m and consequently any spatial features may be offset by 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 relevant to biodiversity and conservation in the North West

Region	Legislation
International	Convention on Biological Diversity (CBD, 1993)
	The Convention on Wetlands (RAMSAR Convention, 1971)
	The United Nations Framework Convention on Climate Change (UNFCC,1994)
	The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)
	The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)
National	Constitution of the Republic of South Africa (Act No. 108 of 2006)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management Biodiversity Act (Act No. 10 of 2004)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24, No 42946 (January 2020)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24, No 43110 (March 2020)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24, No 43855 (October 2020)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989) and associated EIA Regulations
	National Protected Areas Expansion Strategy (NPAES)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Biodiversity Framework (NBF, 2009)
	National Forest Act (Act No. 84 of 1998)
	National Veld and Forest Fire Act (101 of 1998)
	National Water Act (NWA, 1998)
	National Spatial Biodiversity Assessment (NSBA)
	World Heritage Convention Act (Act No. 49 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations, 2014
	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)
	Sustainable Utilisation of Agricultural Resources (Draft Legislation).
	White Paper on Biodiversity
	Government Notice No. 113 in Government Gazette No. 41445 and Government Notice No. 383 in Government Gazette No. 44504. Government Notice No. 2313 of Government Gazette No. 47095 of 27 July 2022
	Government Notice No. 114 in Government Gazette No. 41445 and Government Notice No. 142, 144 and 145 in Government Gazette No. 44191
Provincial	North-West Biodiversity Sector Plan of 2015 (READ, 2015).
	The North West Biodiversity Management Amendment Bill, 2017

2 Methods

This section details the methods used in the assessment and is divided into the desktop and field components.

2.1 Desktop Assessment

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

2.1.1 Ecologically Important Landscape Features

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

National Biodiversity Assessment 2018 (Skowno *et al*, 2019) - The purpose of the National Biodiversity Assessment (NBA) is to assess the state of South Africa's biodiversity based on best available science, with a view to understanding trends over time and informing policy and decision-making across a range of sectors. The NBA deals with all three components of biodiversity: genes, species and ecosystems; and assesses biodiversity and ecosystems across terrestrial, freshwater, estuarine and marine environments. The two headline indicators assessed in the NBA are:

Ecosystem Threat Status – indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition.

Ecosystem Protection Level – indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. Not Protected, Poorly Protected or Moderately Protected ecosystem types are collectively referred to as under-protected ecosystems.

Protected areas:

South Africa Conservation Areas Database (SACAD) and South Africa Protected Areas Database (SAPAD) (DFFE, 2022a) – The South African Protected Areas Database (SAPAD) contains spatial data for the conservation of South Africa. It includes spatial and attribute information for both formally protected areas and areas that have less formal protection. 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, 2021) – The National Protected Area Expansion Strategy (NPAES) provides spatial information on areas that are suitable for terrestrial ecosystem protection. These focus areas are large, intact and unfragmented and are therefore, of high importance for biodiversity, climate resilience and freshwater protection.

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

- Critical Biodiversity Areas (CBAs) are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (READ, 2015).

- Ecological Support Areas (ESAs) are terrestrial and aquatic areas that are not essential for meeting biodiversity representation targets (thresholds), but which play an important role in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree or extent of restriction on land use and resource use in these areas may be lower than that recommended for CBAs (READ, 2015).

Hydrological Setting:

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

Strategic Water Source Areas (SWSAs) (Le Maitre *et al*, 2021) – SWSAs are defined as areas of land that supply a quantity of mean annual surface water runoff in relation to their size and therefore, contribute considerably to the overall water supply of the country. These are key ecological infrastructure assets and the effective protection of surface water SWSAs areas is vital for national security because a lack of water security will compromise national security and human wellbeing.

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

2.1.2 Desktop Flora Assessment

The Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006) was used in order to identify the vegetation type that would have occurred under natural or pre-anthropogenically altered conditions. Furthermore, the Plants of Southern Africa (POSA) database was accessed to compile a list of expected flora species within the proposed development area and surrounding landscape (Figure 2-1). The Red List of South African Plants (Raimondo *et al.,* 2009; SANBI, 2021) was utilized to provide the most current national conservation status of flora species.

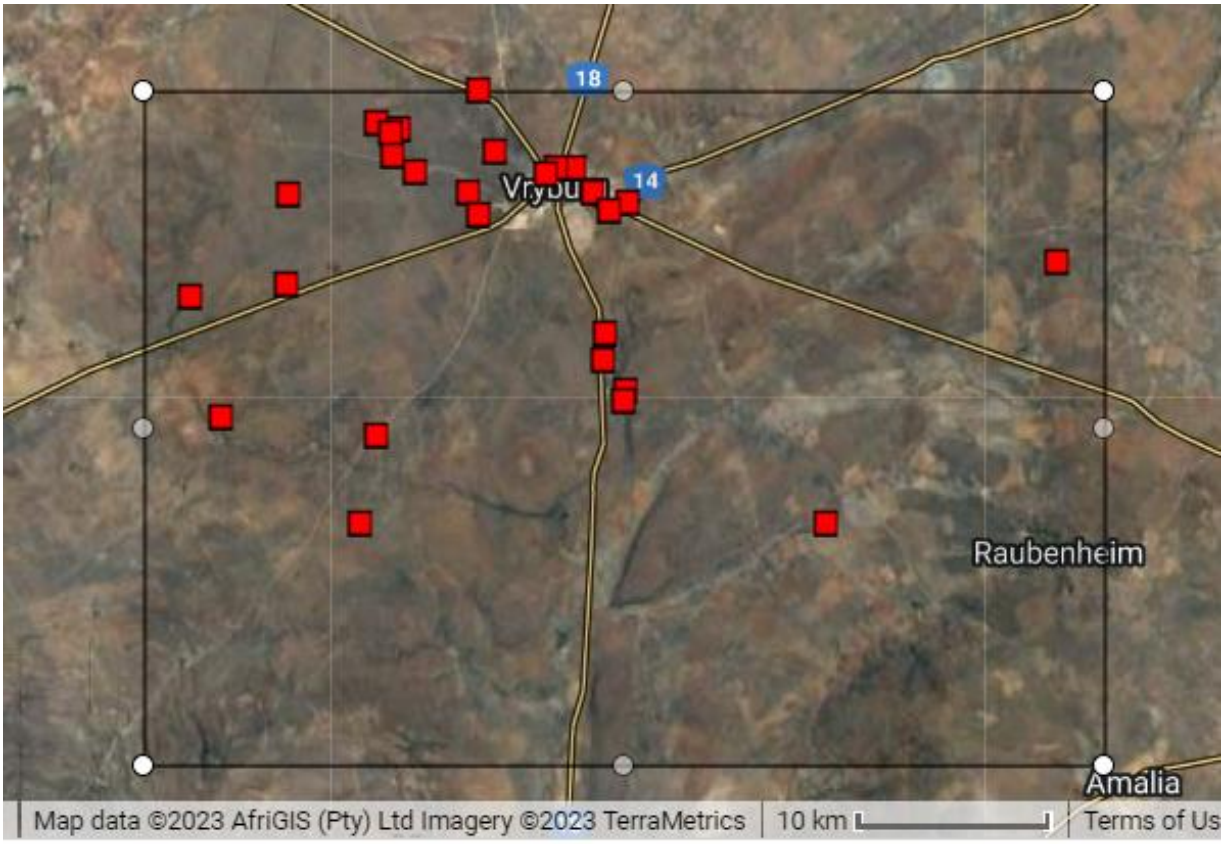


Figure 2-1 Map illustrating extent of area used to obtain the expected flora species list from the Plants of South Africa database

2.1.3 Desktop Fauna Assessment

The faunal desktop assessment comprised of the following:

Compiling an expected amphibian list generated from the IUCN spatial dataset (2017 and the FrogMap database (ADU, 2022) using the 2724 quarter degree square;

Compiling an expected reptile list generated from the IUCN spatial dataset (2017) and the ReptileMap database (ADU, 2022) using the 2724 quarter degree square; and

Compiling an expected mammal list from the IUCN spatial dataset (2017).

2.1.4 Desktop Avifauna Assessment

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

Avifauna list, generated from the SABAP2 dataset by looking at pentads 2655_2435; 2655_2440; 2655_2445; 2700_2435; 2700_2440; 2700_2445; 2705_2435 and 2705_2445.

2.1.5 Literature Review

Due to the limitation of a single field survey, ecological assessments and avifauna assessments that were previously undertaken within the landscape for energy generation and distribution were reviewed to consider species that were recorded during these surveys. In addition, the specialist's knowledge and species records from previous surveys within the area were also considered. This was done to obtain a better understanding of the biotic community within the area and the impact of the proposed development on the wellbeing of the biotic community and ecosystem function. The following reports were considered:

Ecological study on the potential impacts of the proposed BioTherm Sendawo Project 1 Solar 75MW Solar PV Energy Facility near Vryburg in the North West Province. David Hoare Consulting cc. May 2016;

Ecological study on the potential impacts of the proposed BioTherm Sendawo power line and substation near Vryburg in the North West Province. David Hoare Consulting cc. March 2016;

Bird impact assessment study. Proposed Sendawo Solar Photovoltaic (PV) Project 1 near Vryburg in the North-West Province. May 2015. Chris van Rooyen Consulting; and

Bird impact assessment study. Grid connection for the proposed three phase 225 MW Sendawo Solar Photovoltaic (PV) Plant near Vryburg in the North West Province. February 2016. Chris van Rooyen Consulting.

2.2 Field Assessment

A single terrestrial field survey was undertaken from the 28th to the 29th of March 2023 (Summer), while the avifauna survey was conducted the 24th to the 26th of March 2023. These assessments were conducted to determine the presence of Species of Conservation Concern (SCC). Effort was made to cover the different habitat types within the limits of time and access. The fieldwork was placed within targeted areas perceived as ecologically sensitive based on the preliminary interpretation of satellite imagery (Google Corporation) and GIS analysis (which included the latest applicable biodiversity datasets) available prior to the fieldwork.

2.2.1 Flora Survey

The timed random meander method is a highly efficient method for conducting floristic analysis, specifically in detecting flora SCC and maximising floristic coverage. In addition, the method is time and cost effective and highly suited for compiling flora species lists and therefore gives a

rapid indication of flora diversity. Suitable habitat for SCC were identified according to and targeted as part of the timed meanders. During the survey, notes were made regarding current impacts, subjective recording of dominant vegetation species and any sensitive features (e.g., wetlands, outcrops etc.). Relevant field guides and websites consulted for identification purposes included the following:

Identification Guide to Southern African Grasses: An Identification Manual with Keys, Descriptions, and Distributions (Fish *et al*, 2015);

iNaturalist (inaturalist.org);

Problem Plants and Alien Weeds of South Africa (Bromilow, 2010);

Field Guide to Succulents in Southern Africa (Smith *et al*, 2017);

Guide to the Aloes of South Africa (Van Wyk & Smith, 2014);

Medicinal Plants of South Africa (Van Wyk *et al*., 2013).

2.2.2 Fauna Survey

The faunal field survey comprised of the following active and passive techniques:

- Visual and auditory searches - This typically comprised of traversing the area and using a camera to view species from a distance without them being disturbed as well as listening to species calls.; and
- Active hand-searches – are used for species that shelter in or under particular micro-habitats typically rocks.

Diagnostic features of the individuals that were captured were photographed at site and released. Relevant field guides and texts consulted for identification purposes included the following:

- Field Guide to Snakes and other Reptiles of Southern Africa (Branch, 1998);
- A Complete Guide to the Snakes of Southern Africa (Marais, 2004);
- Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland (Bates *et al*, 2014);
- A Complete Guide to the Frogs of Southern Africa (du Preez and Carruthers, 2009);
- Field Guide to the Frogs & Other Amphibians of Africa (Channing & Rödel, 2019)
- Stuarts' Field Guide to Mammals of Southern Africa including Angola, Zambia & Malawi (Stuart and Stuart, 2015); and
- A Field Guide to the Tracks and Signs of Southern and East African Wildlife (Stuart and Stuart, 2000).

2.2.3 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.

2.2.3.1 Data Analysis

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

Point count data was arranged into a matrix with point count samples in rows and species in columns. The table formed the basis of the various subsequent statistical analyses. This data was first used to distinguish similarities / differences in the species composition between the two identified avifaunal habitats, the matrix was converted into a Bray-Curtis dissimilarity matrix. The data was subject to fourth root transformation to downscale the contribution of very abundant species while upscaling the influence of less abundant species. However, the effect was negligible and ultimately the raw data proved more informative. Thirdly, raw count data was converted to relative abundance values and used to establish dominant species and calculate the diversity of each habitat. The Shannon Diversity Index (H') was the metric used to estimate diversity. Lastly, present, and potentially occurring species were assigned to 13 major trophic guilds loosely based on the classification system developed by González-Salazar *et al.* (2014). Species were first classified by their dominant diet (carnivore, herbivore, granivore, frugivore, nectarivore, omnivore), then by the medium upon / within which they most frequently forage (ground, water, foliage, air) and lastly by their activity period (nocturnal or diurnal).

2.3 Site Ecological Importance

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

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

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

Table 2-1 Summary of Conservation Importance (CI) criteria

Conservation Importance	Fulfilling Criteria
Very High	Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or Critically Rare species that have a global 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 NT species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. Any area of natural habitat of threatened ecosystem type with status of VU. Presence of range-restricted species. > 50% of receptor contains natural habitat with potential to support SCC.
Low	No confirmed or highly likely populations of SCC. No confirmed or highly likely populations of range-restricted species. < 50% of receptor contains natural habitat with limited potential to support SCC.
Very Low	No confirmed and highly unlikely populations of SCC. No confirmed and highly unlikely populations of range-restricted species. No natural habitat remaining.

Table 2-2 Summary of Functional Integrity (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 2-3.

Table 2-3 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 2-4.

Table 2-4 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 2-5.

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

Site Ecological Importance		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 2-6.

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

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

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

3 Results & Discussion

This section provides the results of the assessments and is divided into the desktop and field assessment components.

3.1 Desktop Assessment

3.1.1 Ecologically Important Landscape Features

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

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

Desktop Information Considered	Description	Section
Ecosystem Threat Status	Overlaps with a Least Concern	3.1.1.1
Ecosystem Protection Level	Overlaps with a Not Protected Ecosystem.	3.1.1.2
Protected Areas	The Leon Taljaard Nature reserve is 7.5 km from the PAOI.	3.1.1.3
National Protected Areas Expansion Strategy	The proposed PAOI overlaps with a NPAES Focus Area	3.1.1.3
Critical Biodiversity Area	The PAOI overlaps with a Critical Biodiversity Area 1 (CBA1), Ecological Support Areas 1 and 2 (ESA1 and ESA2).	3.1.1.4
Important Bird and Biodiversity Areas	The PAOI is located 90 km from the Baberspan and Leeupan IBA.	-
REDZ	The PAOI overlaps with the Vryburg Solar Renewable Energy Development Zone.	-
Powerline Corridor	The PAOI overlaps with the Northern Corridor.	3.1.1.6

South African Inventory of Inland Aquatic Ecosystems	The PAOI overlaps with the Droe Harts river (CR) as well as a LC wetland	3.1.1.5
National Freshwater Priority Area	The Droe Harts transverse the PAOI, this is an unclassified system, in addition to this river unclassified wetlands can also be found in the PAOI.	3.1.1.5
Coordinated Avifaunal Road Count	The PAOI does not overlap with a CAR route	3.1.1.7
Coordinated Waterbird Count	The PAOI does not overlap with a CWAC site	3.1.1.8

3.1.1.1 Ecosystem Threat Status

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 PAOI overlaps with LC ecosystems (Figure 3-1).

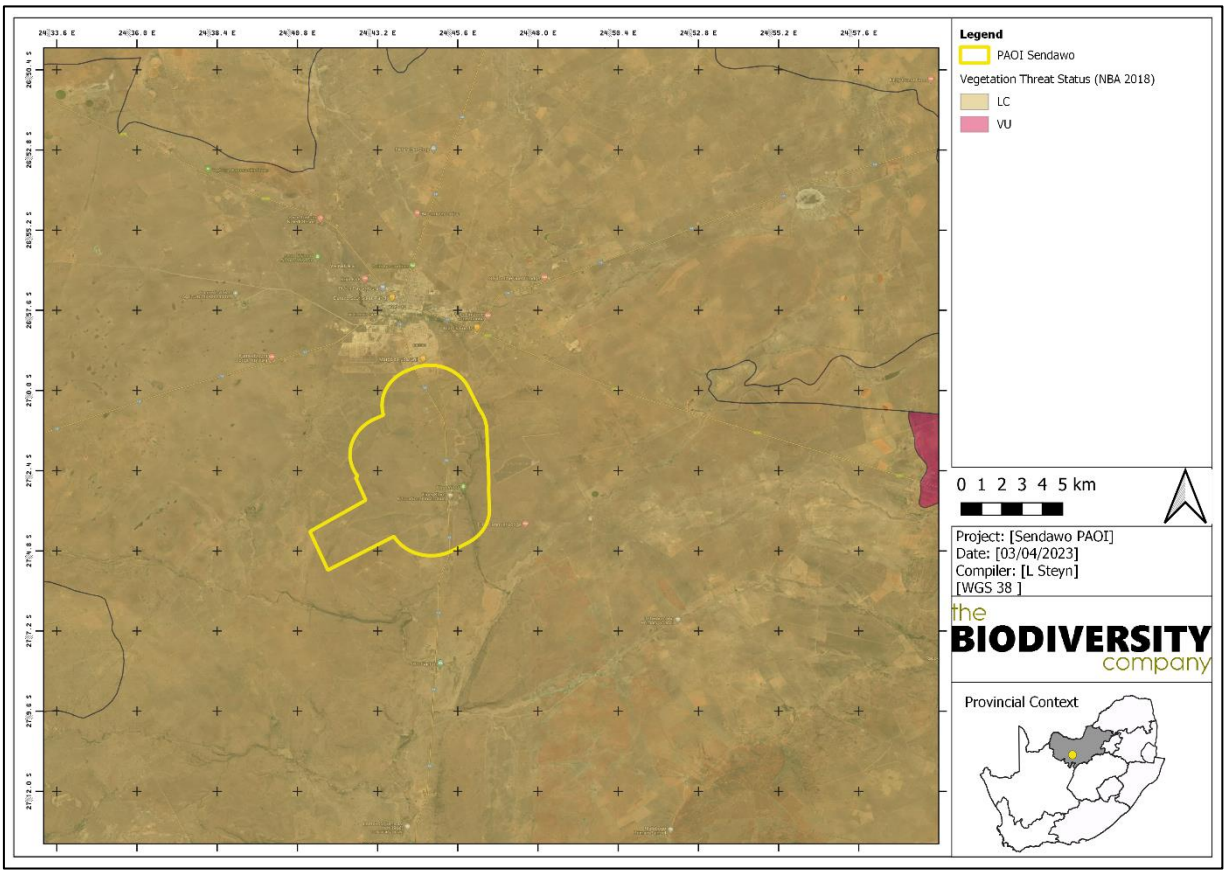


Figure 3-1 Map illustrating the ecosystem threat status associated with the proposed development PAOI

3.1.1.2 Ecosystem Protection Level

Indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. Not Protected, Poorly Protected or Moderately Protected ecosystem types are collectively referred to as under-protected ecosystems. The PAOI overlaps with NP ecosystems (Figure 3-2).

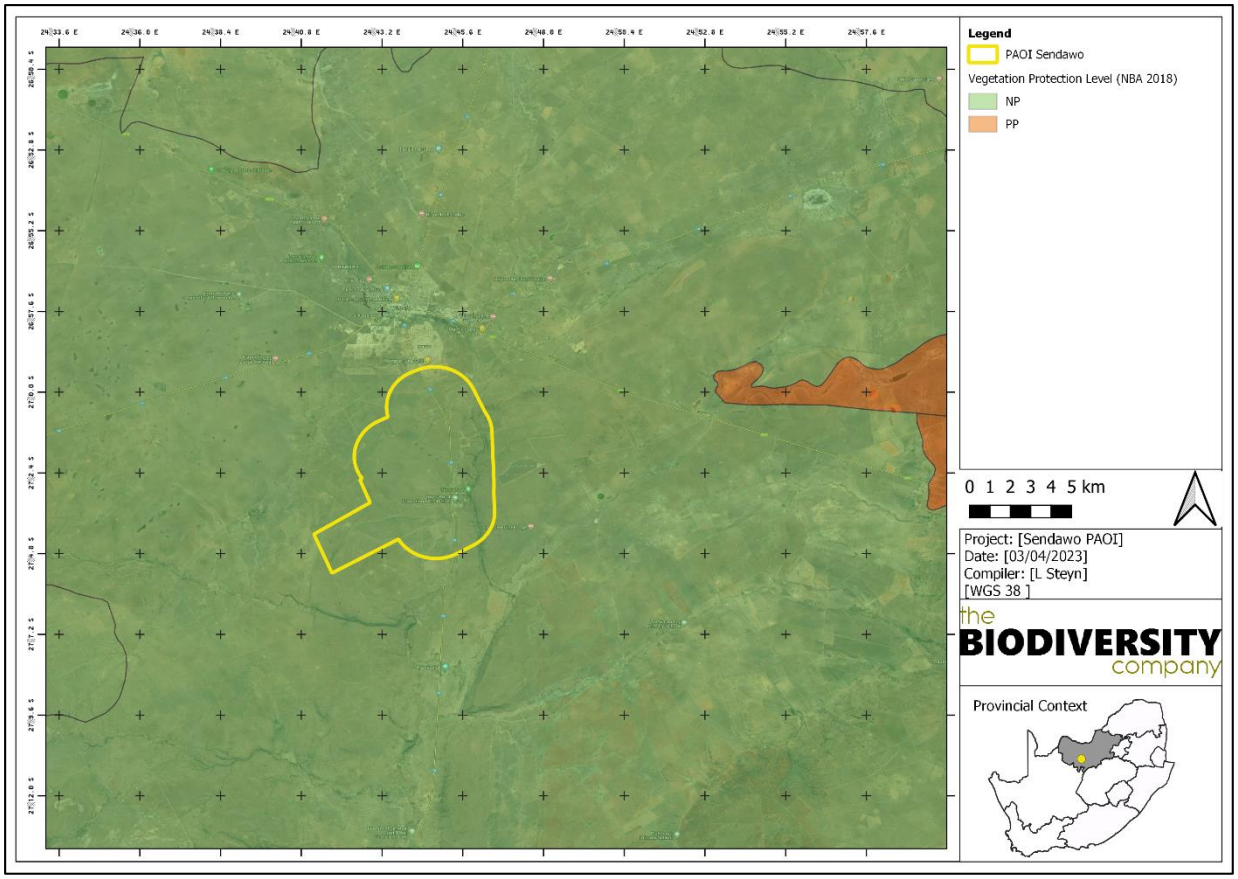


Figure 3-2 Map illustrating the ecosystem protection level associated with the proposed development PAOI

3.1.1.3 Protected Areas

According to the SACAD and SAPAD dataset (DFFE, 2022a), the proposed development area does not occur within any protected area (Figure 3-3). The Leon Taljaard Nature reserve is 7.5 km from the PAOI. The proposed development is unlikely to influence these protected areas as they are situated outside of the buffer zone required to maintain the functioning of protected areas. Nevertheless, the proposed PAOI overlaps with a NPAES Focus Area (Figure 3-4). In the NPAES, an area is considered important for the expansion of the land-based protected area network if it contributes to one or more of the following:

Meeting biodiversity thresholds for terrestrial or freshwater ecosystems;

Maintaining ecological processes; and

Resilience to climate change.

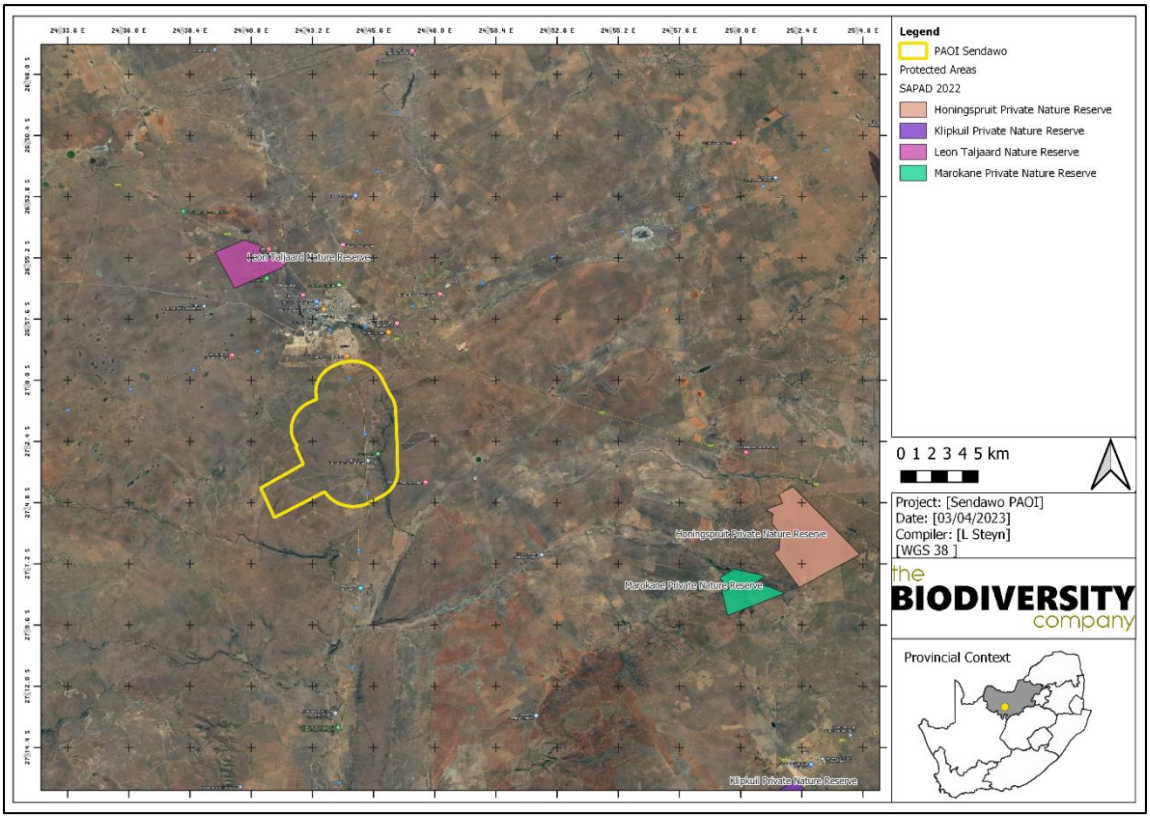


Figure 3-3 Map illustrating the location of protected areas proximal to the proposed development PAOI

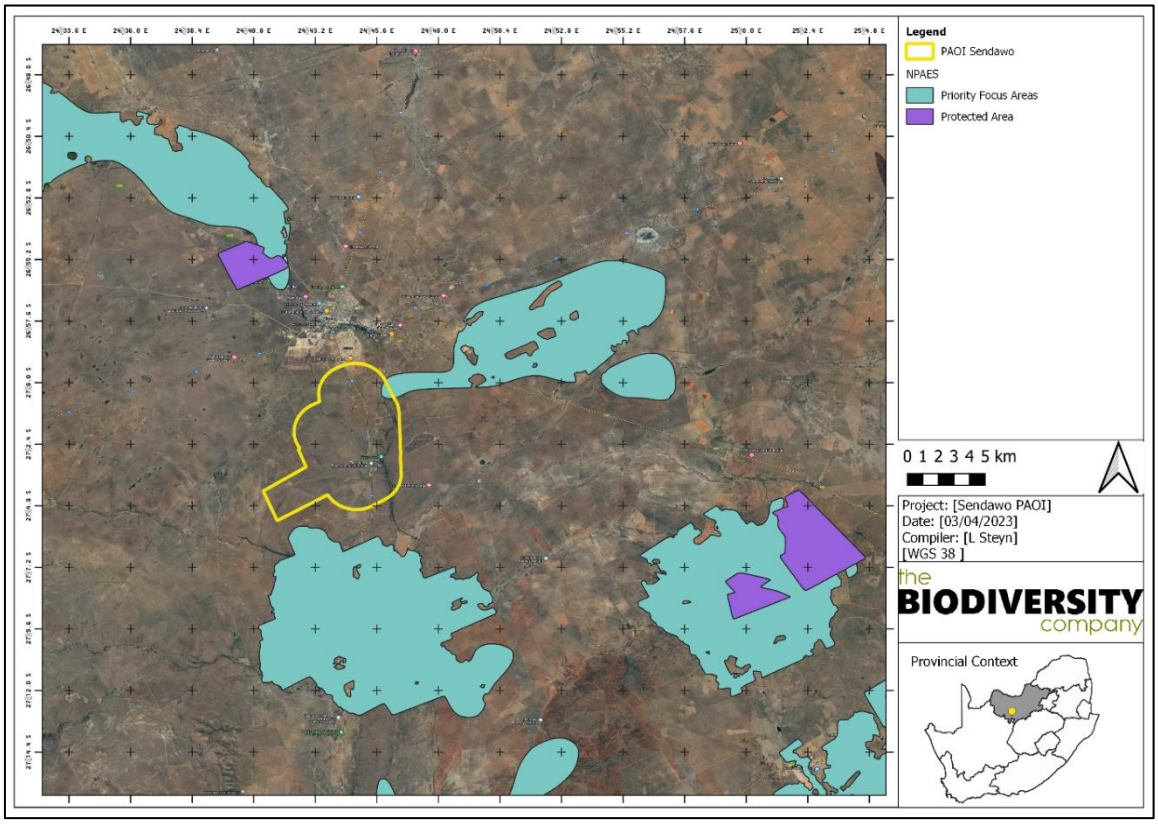


Figure 3-4 Map illustrating the NPAES proximal to the proposed development PAOI

3.1.1.4 North West Biodiversity Spatial Plan

Figure 3-5 illustrates the proposed development overlaid onto the North West BSP spatial file. It shows that the PAOI overlaps with a Critical Biodiversity Area 2 (CBA2), Ecological Support Areas 1 and 2 (ESA1 and ESA2). The definition of these categories and their respective management objective as provided in Pool *et al* (2017) are summarised in Table 3-2.

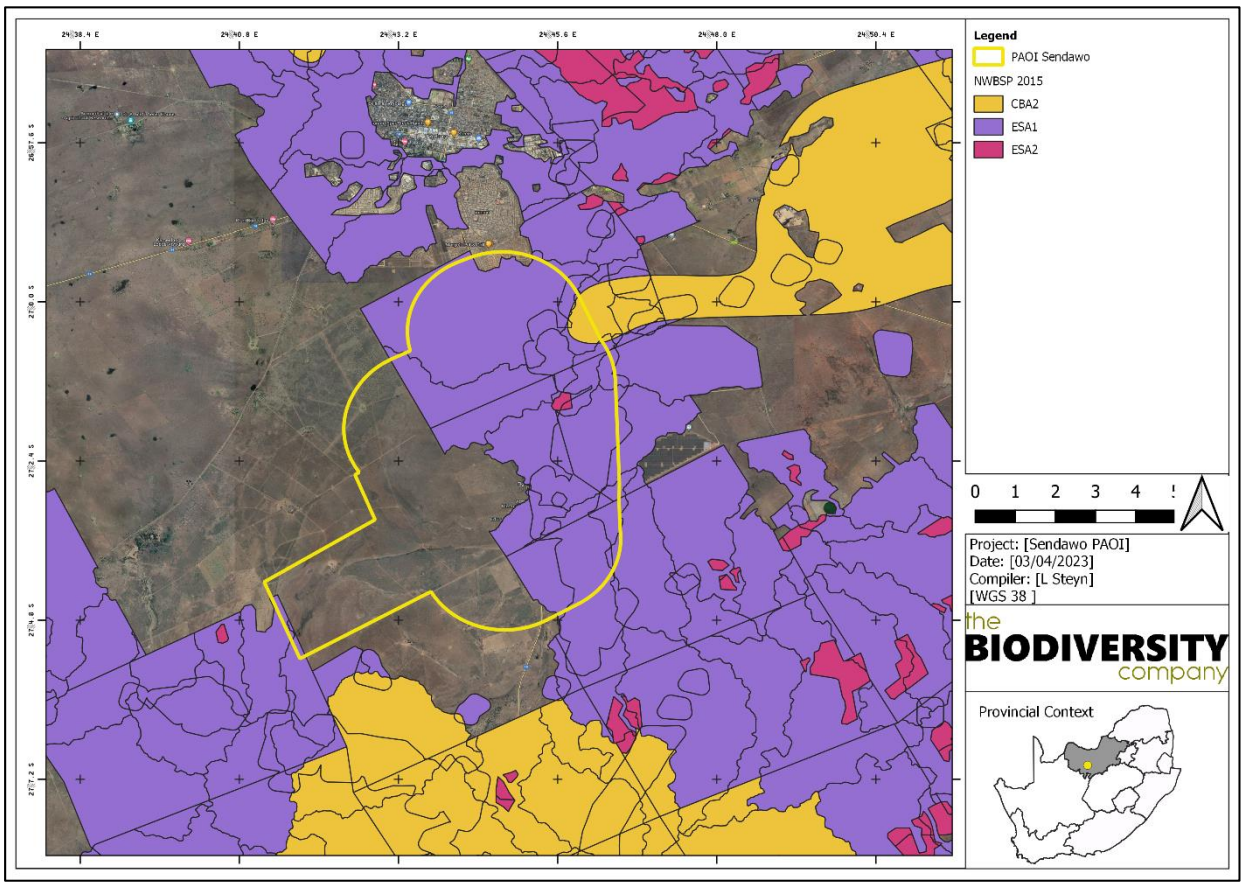


Figure 3-5 Map illustrating the proposed PAOI overlaid onto the North West Critical Biodiversity Areas

Table 3-2 Summary of Biodiversity Spatial Plan categories (Pool et al, 2017)

Category	Definition	Management Objective
CBA2	Areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.	Maintain in a natural or near-natural state, with no further loss of habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.
ESA1	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PAs or CBAs and are often vital for delivering ecosystem services.	Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.
ESA2	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PAs or CBAs and are often vital for delivering ecosystem services.	Restore and/or manage to minimise impact on ecological infrastructure functioning, especially soil and water-related services.
ONAs	Areas that have not been identified as a priority in the current systematic biodiversity plan but retain most of their natural character and perform a range of biodiversity and ecological infrastructure functions. Although they have not been prioritised for biodiversity, they are still an important part of the natural ecosystem.	Minimise habitat and species loss and ensure ecosystem functionality through strategic landscape planning. Offers flexibility in permissible land uses, but some authorisation may still be required for high-impact land uses.

3.1.1.5 Hydrological Context

The ETS 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. The PAOI overlaps with the Droe Harts river (CR) as well as a LC wetland (Figure 3-6). The respective river and wetland systems are not traversed by the project components.

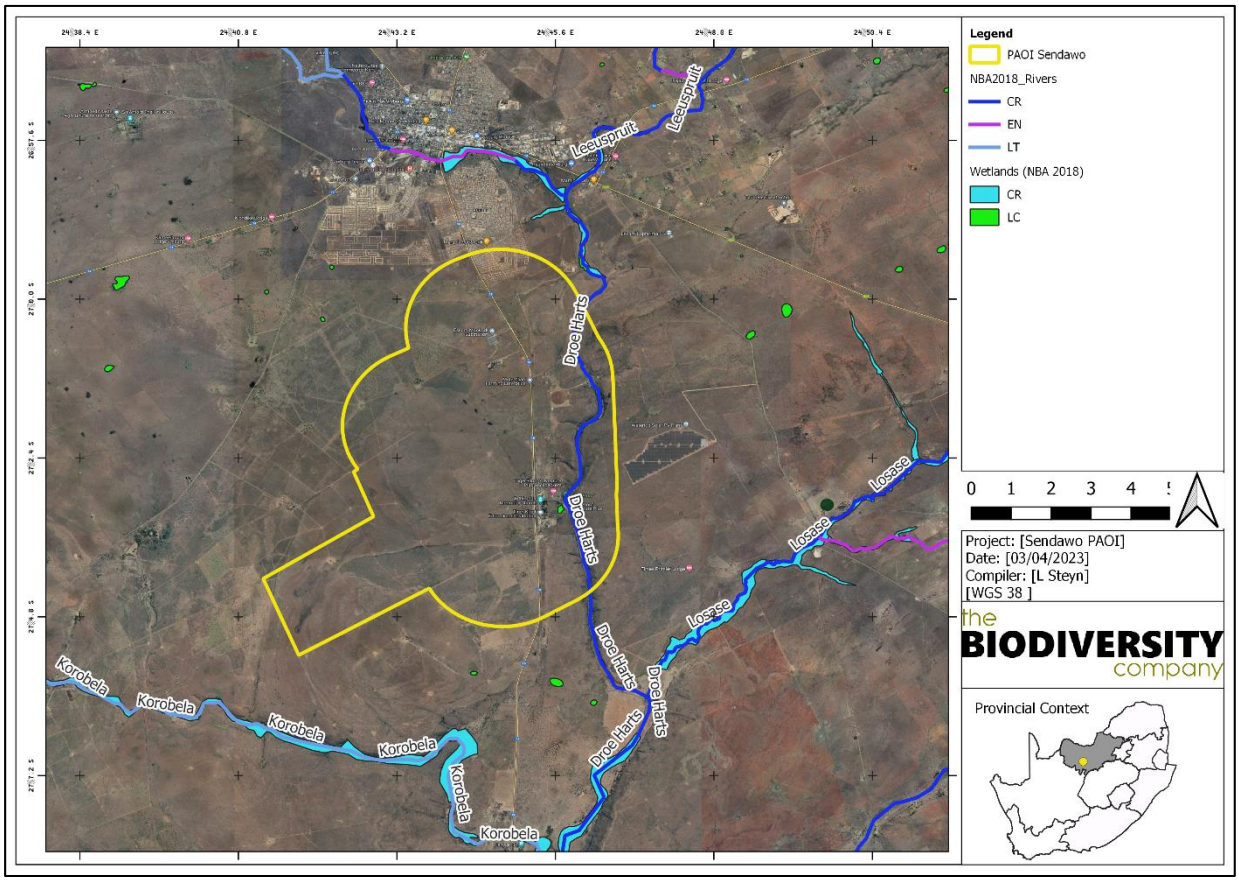


Figure 3-6 Map illustrating the Ecosystem Threat Status of the rivers and wetlands proximal to the PAOI

The National Freshwater Ecosystem Priority Area (NFEPA) database forms part of a comprehensive approach of the sustainable and equitable development of South Africa's scarce water resources. The NFEPAs 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 biodiversity goals (NEM:BA) (Act 10 of 2004), informing both the listing of threatened freshwater ecosystems and the process of bioregional planning provided for by this Act (Nel *et al.,* 2011). The Droe Harts transverse the PAOI, this is an unclassified system, in addition to this river unclassified wetlands can also be found in the PAOI (Figure 3-7).

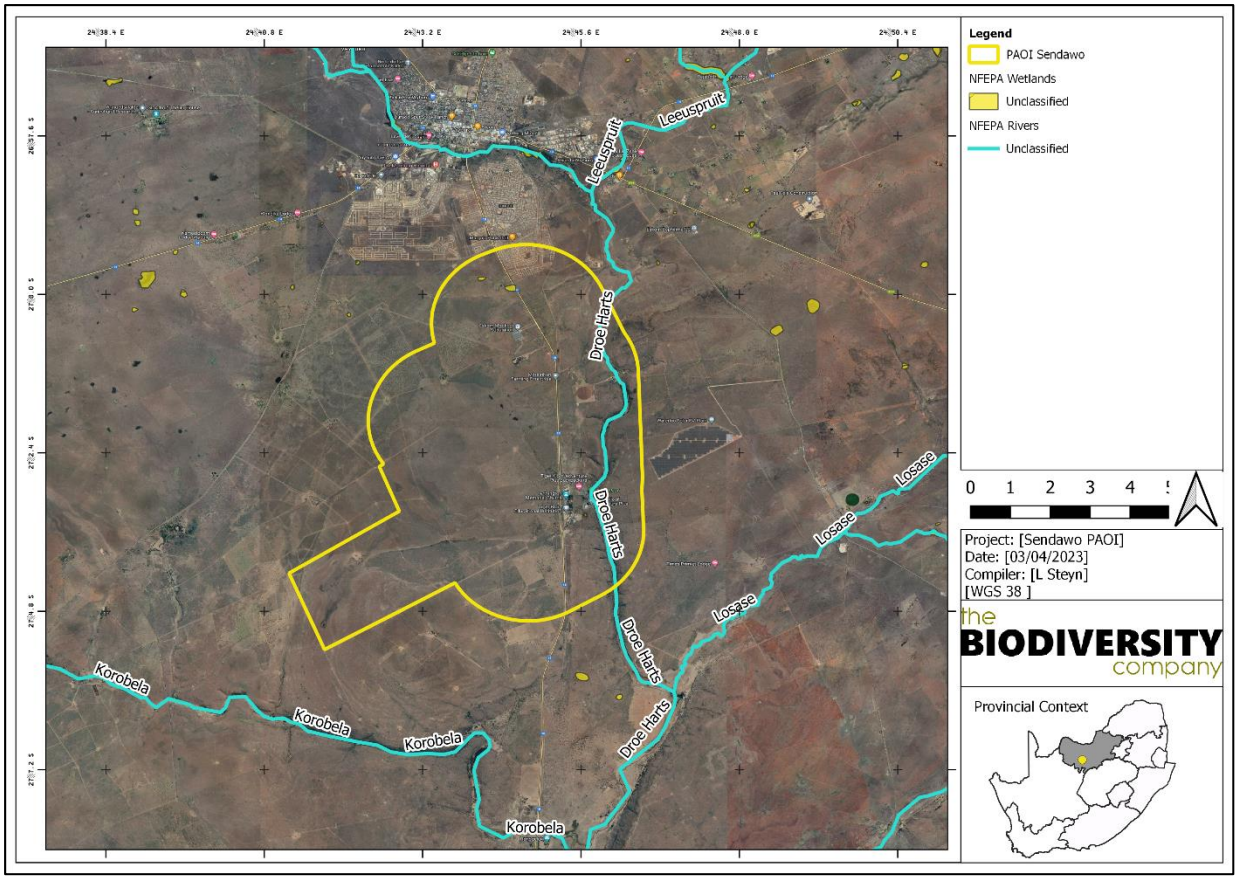


Figure 3-7 Map illustrating the National Freshwater Ecosystem Priority Areas proximal to the PAOI

3.1.1.6 Strategic Transmission Corridors (EGI)

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

On 29 April 2021, Minister Barbara Dallas Creecy published Government Notice No. 383 in Government Gazette No. 44504, which expanded the eastern and western transmission corridors and gave notice of the applicability of the application procedures identified in Government Notice No. 113, to these expanded corridors. More information on this can be obtained from https://egis.environment.gov.za/egi. The PAOI overlaps with the Northern Corridor (Figure 3-8).

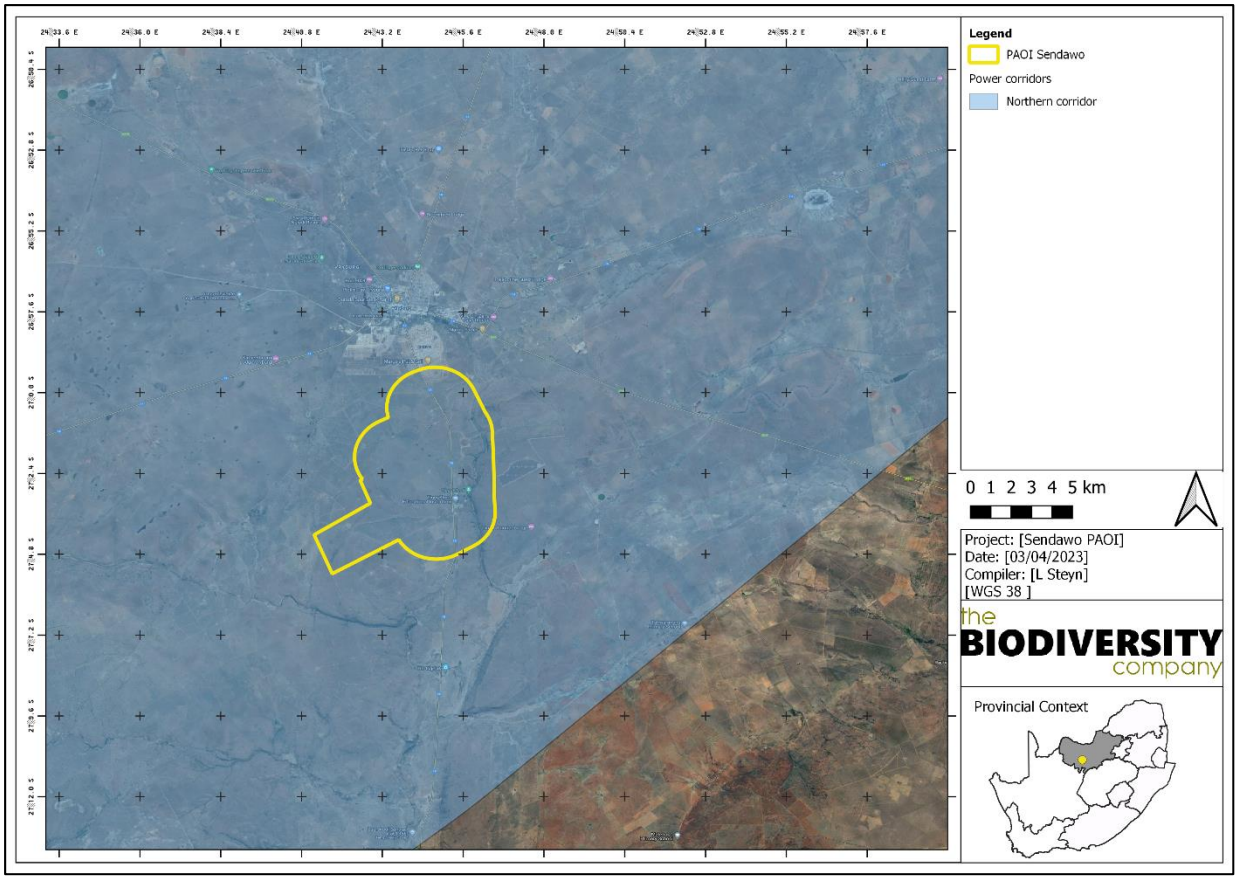


Figure 3-8 The PAOI in relation to the Strategic Transmission Corridors

3.1.1.7 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). The PAOI does not overlap with a CAR route (Figure 3-9).

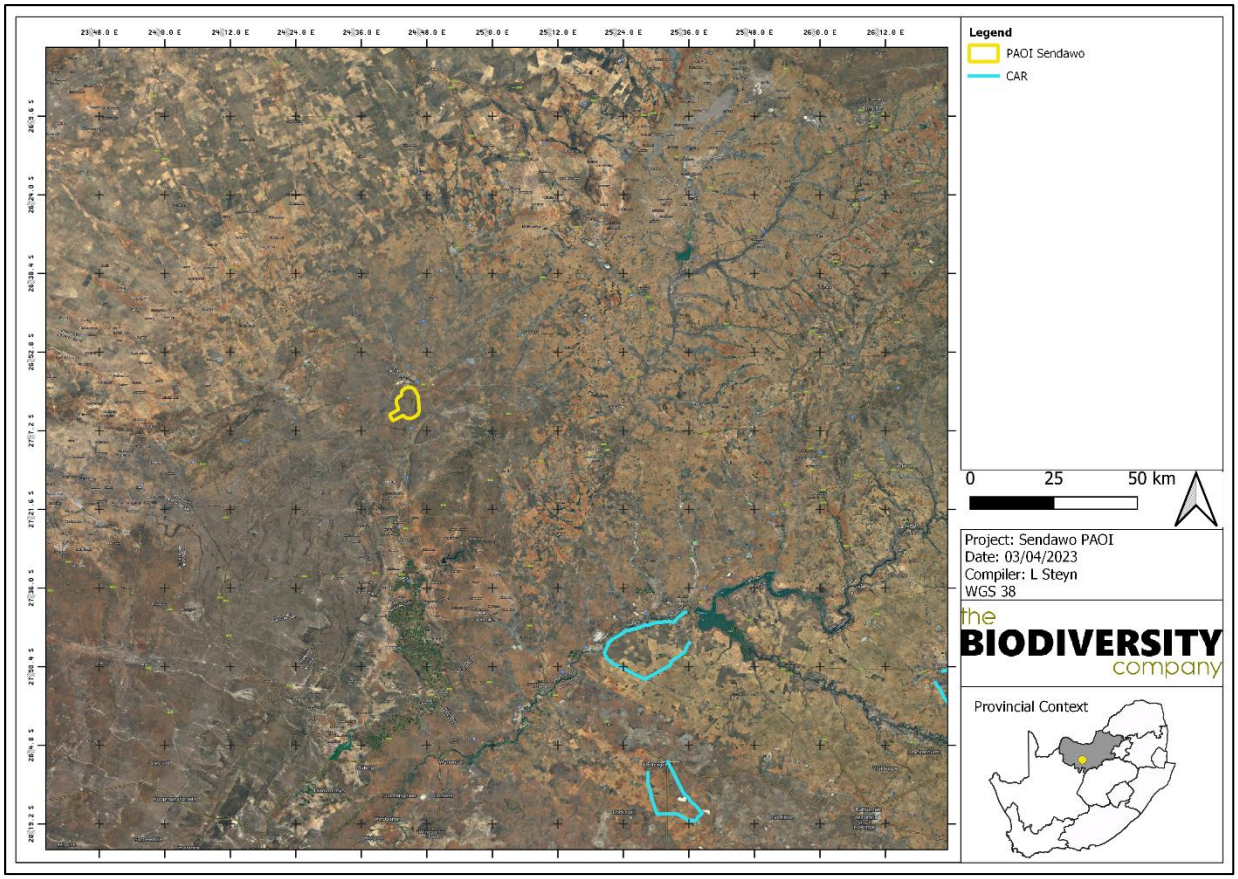


Figure 3-9 The PAOI in relation to the CAR routes

3.1.1.8 Coordinated Waterbird Counts (CWAC)

The Animal demographic unit launched the Coordinated Waterbird Counts (CWAC) project in 1992 as part South Africa's commitment to International waterbird conservation. Regular mid-summer and mid-winter censuses are done to determine the various features of water birds including population size, how waterbirds utilise water sources and determining the heath of wetlands. For a full description of CWAC please refer to http://cwac.birdmap.africa/about.php. The closest CWAC, Baberspan and Leeupan CWAC, is 91 km from the PAOI (Figure 3-10).

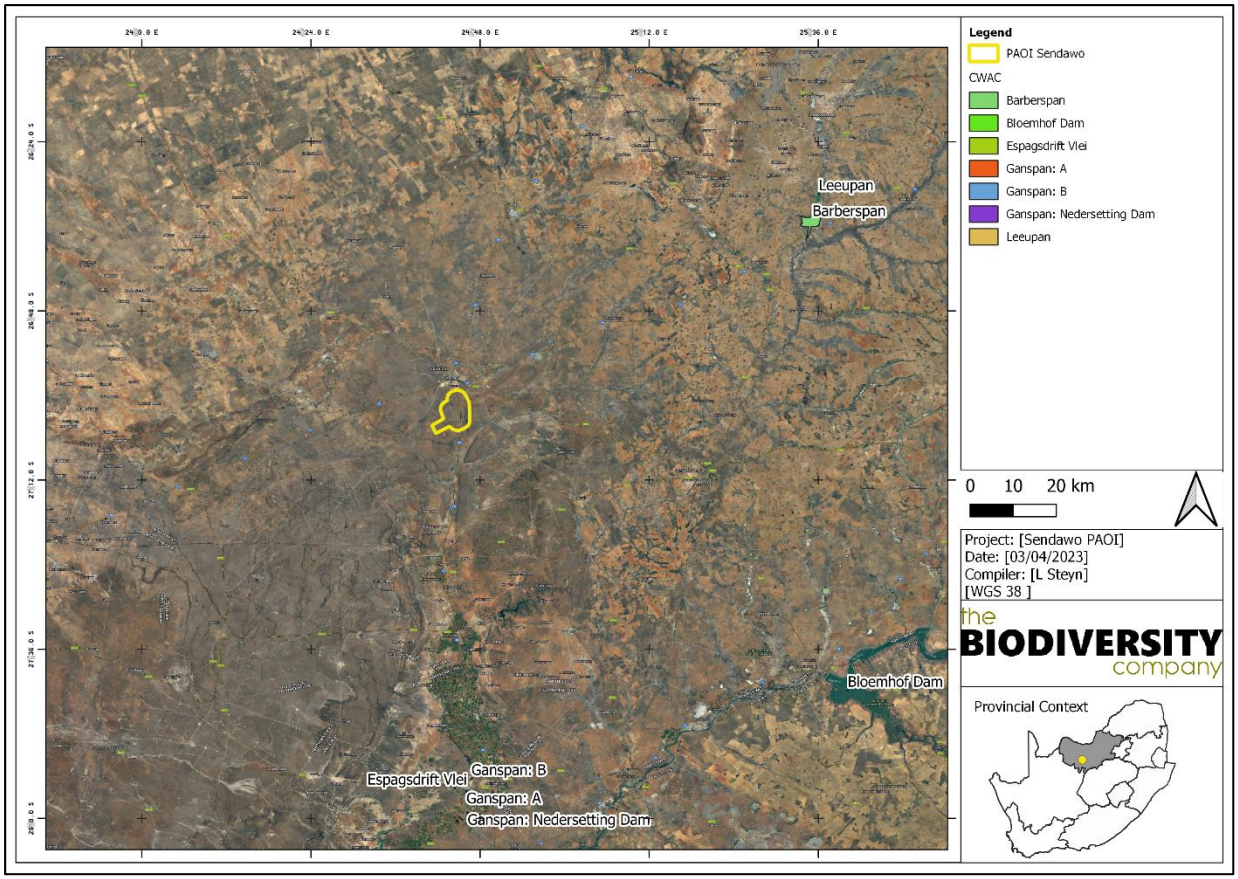


Figure 3-10 The PAOI in relation to the CWAC sites

3.1.2 Flora Assessment

This section is divided into a description of the vegetation type expected under natural conditions and the expected flora species.

3.1.2.1 Vegetation Type

The PAOI is situated in the Savanna biome. The savanna vegetation of South Africa represents the southernmost extension of the most widespread biome in Africa (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the Savanna biome include:

a) Seasonal precipitation; and

b) (Sub) tropical thermal regime with no or usually low incidence of frost (Mucina & Rutherford, 2006).

Most savanna vegetation communities are characterised by a herbaceous layer dominated by grasses and a discontinuous to sometimes very open tree layer (Mucina & Rutherford, 2006).

The savanna biome is the largest biome in South Africa, extending throughout the east and north-eastern areas of the country. Savannas are characterised by a dominant grass layers, over-topped by a discontinuous, but distinct woody plant layer. At a structural level, Africa's savannas can be broadly categorised as either fine-leaved (microphyllous) savannas or broad-leaved savannas. Fine-leaved savannas typically occur on nutrient rich soils and are dominated by microphyllous woody plants of the Mimosaceae family (Common genera include *Vachellia*

and *Albizia*) and a generally dense herbaceous layer (Scholes & Walker, 1993). On a fine-scale vegetation type, the PAOI overlaps with the Ghaap Plateau Vaalbosveld (Figure 3-11).

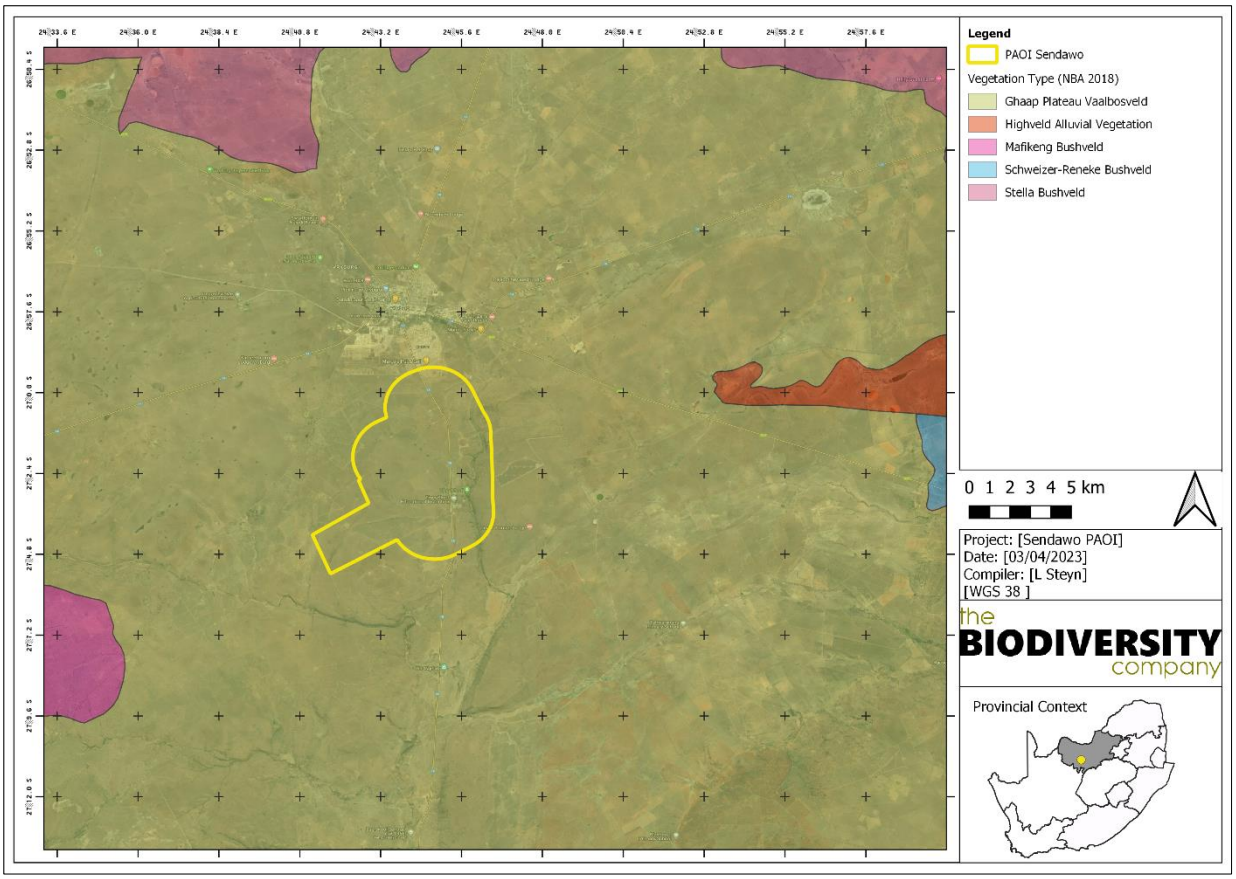


Figure 3-11 Map illustrating the vegetation types within the proposed PAOI

This vegetation type is described as follows:

- Topography – Flat plateau.
- Geology – Surface limestone of Tertiary to Recent age, and dolomite and chert of the Campbell Group. Mispah and Hutton soil are prominent.
- Climate – Summer and autumn rainfall with very dry winters, with an average of 400mm annually. Mean daily maximum and minimum temperatures 36.3˚C and -7.5 ˚C for January and July, respectively.
- Important Taxa – Tall Tree: Vachellia erioloba. Small Trees: Senegalia mellifera subsp. detinens, Searsia lancea, Vachellia karroo, V. tortilis subsp. heteracantha, Boscia albitrunca. Tall Shrubs: Olea europaea subsp. africana, Rhigozum trichotomum, Tarchonanthus camphoratus, Ziziphus mucronata, Diospyros austro-africana, D. pallens, Ehretia rigida subsp. rigida, Euclea crispa subsp. ovata, Grewia flava, Gymnosporia buxifolia, Lessertia frutescens, Rhus tridactyla. Low Shrubs: Acacia hebeclada subsp. hebeclada, Aptosimum procumbens, Chrysocoma ciliata, Helichrysum zeyheri, Hermannia comosa, Lantana rugosa, Leucas capensis, Melolobium microphyllum, Peliostomum leucorrhizum, Pentzia globosa, P. viridis, Zygophyllum pubescens. Succulent Shrubs: Hertia pallens, Lycium cinereum.

Semiparasitic Shrub: Thesium hystrix. Woody Climber: Asparagus africanus. Graminoids: Anthephora pubescens, Cenchrus ciliaris, Digitaria eriantha subsp. eriantha, Enneapogon scoparius, Eragrostis lehmanniana, Schmidtia pappophoroides, Themeda triandra, Aristida adscensionis, A. congesta, A. diffusa, Cymbopogon pospischilii, Enneapogon cenchroides, E. desvauxii, Eragrostis echinochloidea, E. obtusa, E. rigidior, E. superba, Fingerhuthia africana, Heteropogon contortus, Sporobolus fimbriatus, Stipagrostis uniplumis, Tragus racemosus. Herbs: Barleria macrostegia, Geigeria filifolia, G. ornativa, Gisekia africana, Helichrysum cerastioides, Heliotropium ciliatum, Hermbstaedtia odorata, Hibiscus marlothianus, H. pusillus, Jamesbrittenia aurantiaca, Limeum fenestratum, Lippia scaberrima, Selago densiflora, Vahlia capensis subsp. vulgaris. Succulent Herb: Aloe grandidentata.

- Biogeographically Important Taxa –Tall Shrubs: Lebeckia macrantha, Nuxia gracilis. Low Shrubs: Blepharis marginata, Putterlickia saxatilis, Tarchonanthus obovatus. Succulent Shrubs: Euphorbia wilmaniae, Prepodesma orpenii (endemic genus). Graminoids: Digitaria polyphylla, Panicum kalaharense. Herbs: Corchorus pinnatipartitus, Helichrysum arenicola. Succulent Herb: Orbea knobelii

- Endemic Taxon Herb: *Rennera stellata*.

3.1.2.2 Expected Flora Species of Conservation Concern

The POSA database indicates that 210 species of indigenous plants are expected to occur within the PAOI and surrounding landscape. Appendix A provides the list of species and their respective conservation status and endemism. Based on the POSA database and the reports reviewed, five (5) flora SCC are expected to occur within the PAOI (Table 3-3). All of these have a high likelihood of occurrence. The likelihood of occurrence was determined by considering the species habitat requirements and examining records on the Global Biodiversity Information Facility (GBIF) database.

Table 3-3 Threatened flora species that may occur within the proposed PAOI. NT = Near Threatened

Species name	Threat Status	Habitat
Lithops lesliei sp lesliei	NT	Primarily in arid grasslands, usually in rocky places, growing under the protection of forbs and grasses.
Harpogophytum procumbens	Provincially Protected plant species	Well drained sandy habitats in open savanna and woodlands.
Pentzia stellata	NT	Seasonally waterlogged calcrete pans.
Vachellia erioloba	Protected Tree	Savanna, semi-desert and desert areas with deep, sandy soils and along drainage lines in very arid areas, sometimes in rocky outcrops.
Boscia albitrunca	Protected Tree	This species is found in the drier parts of southern Africa, in areas of low rainfall.

3.1.3 Fauna Assessment

3.1.3.1 Expected Amphibian Species of Conservation Concern

Based on the IUCN Red List Spatial Data and the FrogMAP database, 16 amphibian species are expected to occur within the area with one of these expected species regarded as of conservation concern on a regional scale (Table 3-4; Appendix B).

Table 3-4 Amphibian Species of Conservation Concern that are expected to occur within the proposed PAOI. NT = Near threatened and LC = Least Concern

Scientific Name	Common Name	Conservation Status		Likelihood of Occurrence
		Regional	Global	
Pyxicephalus adspersus	Giant Bullfrog	NT	LC	High

The Giant Bull Frog (*Pyxicephalus adspersus*) is a species of conservation concern that could possibly occur in the PAOI. The Giant Bull Frog is listed as near threatened on a regional scale. It is a species of drier savannahs. It is fossorial for most of the year, remaining buried in cocoons. They emerge at the start of the rains, and breed in shallow, temporary waters in pools, pans and ditches (IUCN, 2017). Suitable pans are found in the PAOI therefore the likelihood of occurrence is high.

3.1.3.2 Expected Reptile Species of Conservation Concern

Based on the IUCN Red List Spatial Data and the ReptileMAP database, 39 reptile species are expected to occur within the area with two of these species regarded as of conservation concern Table 3-5 (Appendix C).

Table 3-5 Reptile Species of Conservation Concern that are expected to occur within the proposed PAOI. VU = Vulnerable

Scientific Name	Common Name	Conservation Status		Likelihood of Occurrence
		Regional	Global	
Psammophis leightoni	Cape Sand Snake	VU	LC	Moderate
Python natalensis	Southern African Python	LC (TOPS species)	Unlisted	High

Psammophis leightoni (Cape Sand Snake) is categorised as VU internationally and locally. Endemic to the western regions of the Western Cape, South Africa. Threatened primarily by habitat loss associated with agriculture and development of human settlements throughout its range. The likelihood of finding the species in the PAOI is moderate.

Python natalensis (Southern African Python) is a TOPS species in South Africa. Based on David Hoare Consulting (2016) this species has a high likelihood of occurrence in the PAOI.

3.1.3.3 Expected Mammal Species of Conservation Concern

The IUCN Red List Spatial Data indicates that 57 mammal species are expected to occur within the PAOI. This list excludes larger mammal species that are generally restricted to protected areas and mammal species which were not considered in this assessment. Nine (9) mammal SCC could be expected to occur within the PAOI (Table 3-6; Appendix D).

Table 3-6 Mammal Species of Conservation Concern that are expected to occur within the proposed PAOI. NT= Near Threatened and VU = Vulnerable

Scientific Name	Common Name	Conservation Status		Likelihood of Occurrence
		Regional	Global	
Aonyx capensis	Cape Clawless Otter	NT	NT	High
Atelerix frontalis	South Africa Hedgehog	NT	NT	High
Felis nigripes	Black-footed Cat	VU	VU	High

Mystromys albicaudatus	White-tailed Rat	VU	VU	High
Panthera pardus	Leopard	VU	VU	Low
Parahyaena brunnea	Brown Hyaena	NT	NT	Moderate
Poecilogale albinucha	African Striped Weasel	NT	NT	High
Rhinolophus denti	Dent's Horseshoe Bat	NT	NT	High
Smutsia temminckii	Temminck's Ground Pangolin	VU	VU	Low

Aonyx capensis (Cape Clawless Otter) is the most widely distributed otter species in Africa. This species is predominantly aquatic, and it is seldom found far from water. The main threat to the species is the declining state of freshwater ecosystems in Africa (Jacques *et al*, 2015). In parts of their range, they are killed for skins and other body parts, because they are regarded as competitors for food, particularly in rural areas where fishing is an important source of income, or where they are believed to be responsible for poultry losses, and damage to young maize plants. The river in the PAOI is regarded as suitable habitat for this species therefore the likelihood of occurrence is rated as High.

Atelerix frontalis (South African Hedgehog) has a tolerance of a degree of habitat modification and occurs in a wide variety of semi-arid and sub-temperate habitats (IUCN, 2017). Based on the Red List of Mammals of South Africa, Lesotho and Swaziland (2016), *A. frontalis* populations are decreasing due to the threats of electrocution, veld fires, road collisions, predation from domestic pets and illegal harvesting. Although the species is cryptic and therefore not often seen, there is suitable habitat in the PAOI and therefore the likelihood of occurrence is rated as high.

Felis nigripes (Black-footed cat) is endemic to the arid regions of southern Africa. This species is naturally rare, has cryptic colouring is small in size and is nocturnal. These factors have contributed to a lack of information on this species. The estimated number of mature individuals is 9 707, with the population exhibiting a continuing decline (Sliwa *et al*, 2016). The principle long-term threat for the species is the loss of key resources, such as den sites and prey, from anthropogenic disturbance or habitat degradation (Sliwa *et al*, 2016). An additional threat is indirect persecution, such as accidental poisonings (for example locust spraying, predator control lures/baits) and general predator persecution throughout most of their range. The long-term effects of climate change should not be overlooked and may lead to changes in range, changes in timing of breeding events, increases in severe weather such as flooding and droughts, as well as increased disease patterns or risks of the spread of pathogens from parasites. The likelihood of occurrence for the species within the PAOI was rated as ‘High’, due to the presence of suitable habitat, burrows and available prey.

Mystromys albicaudatus (White-tailed Rat) is listed as VU on a regional basis and EN on a global scale. It is relatively widespread across South Africa and Lesotho; the species is known to occur in shrubland and grassland areas. A major requirement of the species is black loam soils with good vegetation cover. Suitable habitat is present for this species in the PAOI.

Parahyaena brunnea (Brown Hyaena) is endemic to southern Africa. This species occurs in dry areas, generally with annual rainfall less than 100 mm, particularly along the coast, semi-desert, open scrub and open woodland savanna. Given its known ability to persist outside of formally protected areas the likelihood of occurrence of this species in the PAOI is moderate to good.

Poecilogale albinucha (African Striped Weasel) is widely distributed throughout sub-saharan Africa and ranges from southwestern Uganda and Kenya to the Western Cape in South Africa. It is regarded as rare to uncommon, with highest densities reached in moist higher rainfall grasslands (Stuart *et al*, 2015). There are no major threats to the species, but it is hunted for use in traditional medicines.

Rhinolophus denti (Dent's Horseshoe Bat) is listed as NT regionally and is typically associated with savanna habitats. Populations are largely dependent on caves, abandoned mines and similar habitats for roosting (IUCN, 2007). Suitable roosting habitats can be found in the PAOI therefore the likelihood of occurrence is rated as high.

3.1.4 Avifauna Assessment

The SABAP2 Data lists 196 avifauna species that could be expected to occur within the PAOI (Appendix E). Ten (10) of these expected species are regarded as threatened (Table 3-7). Four (4) of the species have a low likelihood of occurrence due to the expected lack of suitable habitat in the PAOI, these species can however very likely still move over the PAOI and can still be influenced by the development.

Table 3-7 Threatened avifauna species that are expected to occur within the PAOI.

Common Name	*Scientific Name*	Regional	Global	Likelihood of Occurrence
Abdim's Stork	*Ciconia abdimii*	NT	LC	Low
Black Stork	*Ciconia nigra*	VU	LC	Moderate
Cape Vulture	*Gyps coprotheres*	EN	VU	Low
European Roller	*Coracias garrulus*	NT	LC	Low
Kori Bustard	*Ardeotis kori*	NT	NT	High
Lanner Falcon	*Falco biarmicus*	VU	LC	High
Maccoa Duck	*Oxyura maccoa*	NT	EN	High
Martial Eagle	*Polemaetus bellicosus*	EN	EN	High
Secretarybird	*Sagittarius serpentarius*	VU	EN	Medium
White-backed Vulture	*Gyps africanus*	CR	CR	Low

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). It is unlikely that this species would breed in the PAOI due to the lack of forested areas, however some suitable foraging habitat remains in the form of the open grasslands and wetland areas, and as such the likelihood of occurrence is rated as moderate.

Ardeotis kori (Kori Bustard) is listed as NT on a regional and global scale (BirdLife International, 2016a). This species has a large but disjunct range in sub-Saharan Africa, occurring from Ethiopia and Somalia south to Tanzania, and from southern Angola and Zimbabwe south to South Africa. The species occupies 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. The diet includes a wide range of plants and animals including insects, reptiles, small rodents, birds, carrion, seeds, berries and roots. It is largely sedentary but does undertake local movements. The global population size has not been quantified, but the population in South Africa has been estimated at 2 000-5 000 birds individuals (BirdLife

International, 2016c). A major threat is collision with overhead powerlines but the causes of population declines and range losses in many parts of the distribution are unknown. These have been hypothesised to include persecution, rangeland degradation and bush encroachment.

Falco biarmicus (Lanner Falcon) is native to South Africa and inhabits a wide variety of habitats, from lowland deserts to forested mountains (IUCN, 2017). They may occur in groups up to 20 individuals, but have also been observed solitary. Their diet is mainly composed of small birds such as pigeons and francolins. The likelihood of incidental records of this species in the PAOI is rated as high due to the natural veld condition and the presence of many bird species on which Lanner Falcons may predate.

Oxyura maccoa (Maccoa Duck) has a large range, divided into a northern population occurring in Eritrea, Ethiopia, Kenya and Tanzania, and a southern population found in Angola, Botswana, Namibia, South Africa and Zimbabwe. During the breeding season it inhabits small temporary and permanent inland freshwater lakes, preferring those that are shallow and nutrient-rich with extensive emergent vegetation such as reeds and sedges on which it relies for nesting, although it can breed in anthropogenic systems such as farm dams and sewerage treatment plants (BirdLife International, 2021c). It exhibits a preference for habitats with a bottom of mud or silt and minimal amounts of floating vegetation, since this provides the best foraging conditions. Outside the breeding season it will wander over larger, deeper lakes and brackish lagoons. Currently the links between population trends and threats facing this species are poorly understood. Pollution is a primary concern, since the species feeds mainly on benthic invertebrates, and is therefore more vulnerable to bio-accumulation of pollutants than other duck species (BirdLife International, 2021c). Hunting and poaching, competition with alien benthic fish and habitat alteration by invasive plants are further threats. The species has a high likelihood of occurrence in the river in the PAOI.

Polemaetus bellicosus (Martial Eagle) is listed as EN on a regional scale and EN on a global scale. This species has an extensive range across much of sub-Saharan Africa, but populations are declining due to deliberate and incidental poisoning, habitat loss, reduction in available prey, pollution and collisions with power lines (IUCN, 2017). It inhabits open woodland, wooded savanna, bushy grassland, thorn-bush and, in southern Africa, more open country and even sub-desert (IUCN, 2017). With the presence of good grassland habitat in the PAOI along with suitable tees for nesting the likelihood of occurrence is rated as high.

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. T has a moderate likelihood of occurrence in the PAOI.

3.2 Field Assessment

The following sections provides the results from the field survey for the proposed development that was undertaken during March 2023.

3.2.1 Flora Assessment

3.2.1.1 Indigenous Flora

The vegetation assessment was conducted throughout the extent of the PAOI and beyond to cover the potential areas of influence. A total of 51 tree, shrub, herbaceous and graminoid plant species were recorded in the PAOI during the field assessment (Table 3-8). Plants listed as Category 1 alien or invasive species under the NEMBA appear in green text. Plants listed in Category 2 or as 'not indigenous' or 'naturalised' according to NEMBA, appear in blue text. Some of the plant species recorded can be seen in Figure 3-12.

The list of plant species recorded to is by no means comprehensive, and repeated surveys during different phenological periods not covered, may likely yield up to 40% additional flora species for the PAOI. However, floristic analysis conducted to date is however regarded as a sound representation of the local flora for the PAOI.

Figure 3-12 Plant species recorded Left to right: Vachellia tortilis, Tarchonanthus camphoratus, Aloe grandidentata

Table 3-8 Plant species recorded

Scientific Name	Common Name	Threat Status	Invasive Category	Form
Agave sisalana	Sisal		Cat. 2	Succulent
Aloe grandidentata	Dwarf Soap Aloe	LC		Aloe
Andropogon appendiculatus	Vlei Bluestem	Decreaser - Climax		Grass
Ammocharis coranica	Ground Lilly	Protected		Bulb
Aristida adscensionis	Six Weeks Three awn			Grass
Aristida congesta congesta	Tassel Tree-awn	Increaser 2 - Pioneer		Grass
Aristida diffusa	Iron Grass	Increaser 3 - Subclimax to climax		Grass
Asparagus africanus	Bush asparagus	Medicinal		Herb
Asparagus laricinus	Cluster leaved asparagus		Weed	Herb
Barleria macrostegia				Herb
Bidens pilosa	Common Black-jack		Alien Invasive	Herb
Boophone disticha	Poison bulb	LC		Bulb
Chloris virgata	Feather top chloris	Pioneer increaser 2		Grass
Cirsium vulgare	Spear Thistle		Cat1. b	Herb
Conyza bonariensis	Flax-leaf fleabane			Herb
Cymbopogon caesius	Broad-leaved Turpentine Grass	Increaser 1 - Climax		Grass
Cynodon dactylon	Couch Grass	Increaser 2 - Pioneer		Grass
Cyperus denudatus	Winged Sedge			Sedge
Datura stramonium	Common Thorn Apple		Cat1. b	Herb
Enneapogon cenchroides	Nine Awned Grass	Increaser 2 - Subclimax		Grass
Eragrostis superba	Saw tooth love grass	Increaser 2 - Subclimax		Grass
Eragrostis obtusa	Dew Grass	Pioneer increaser 2		Grass
Eragrostis curvula	Weeping Love Grass	Increaser 2 - Subclimax to climax		Grass

Eragrostis nindensis	Whether love Grass	Increaser 2 - Subclimax		Grass
Eragrostis trichophora	Hairy Love Grass	Increaser 2 - Subclimax		Grass
Eucalyptus camaldulensis	Red River Gum		Cat1. b	Tree
Fingerhuthia africana	Thimble Grass	Increaser 1 - Climax		Grass
Geigera filifolia				Herb
Gomphocarpus fruticosus	Milkweed		Weed	Herb
Gomphrena celosioides	Batchelor's Button		Exotic	Herb
Grewia flava	Velvet Raisin	Medicinal		Tree
Heteropogon contortus	Spear Grass	Increaser 2 - Subclimax		Grass
Hyparrhenia hirta	Common Thatching Grass	Increaser 1 - Subclimax to climax		Grass
Melia azedarach	Syringa		Cat1. b	Tree
Melinis repens	Natal Red Top	Increaser 2 - Pioneer to subclimax		Grass
Nerine spp.				Bulb
Nicotiana glauca	Wild tobacco		Cat1. b	
Opuntia ficus-indica	Sweet Prickly Pear		Cat1. b	Tree/Shrub
Searsia lancea	Common Wild current			Shrub
Seriphium plumosum	Bankrupt Bush		Weed	Shrub
Solanum incanum	Poison apple		Cat1. b	
Sporobolus fimbriatus	Dropseed grass		Climax Decreaser	Grass
Tarchonanthus camphoratus	Camphor Bush			Shrub
Tagetes minuta	Tall Khaki Weed		Alien Invasive	Herb
Tragus racemosus				Grass
Themeda triandra	Red Grass	Decreaser - Climax		Grass
Vachellia erioloba	Camel thorn	National forest act protected tree		Tree
Vachellia karroo	Sweet thorn	Medicinal		Tree
Vachellia tortilis	Umbrella thorn			Tree

Vachellia hebeclada	Candle Thorn			Shrub
Zizpiphus mucronata	Buffalo Thorn			Shrub

3.2.1.2 Invasive Alien Plants

Invasive Alien Plants (IAPs) tend to dominate or replace indigenous flora, thereby transforming the structure, composition and functioning of ecosystems. Therefore, it is important that these plants are controlled by means of an eradication and monitoring programme. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species.

NEMBA is the most recent legislation pertaining to alien invasive plant species. In August 2014, the list of Alien Invasive Species was published in terms of the NEMBA. The Alien and Invasive Species Regulations were published in the Government Gazette No. 44182, 24th of February 2021. The legislation calls for the removal and / or control of AIP species (Category 1 species). In addition, unless authorised thereto in terms of the NWA, no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse. Below is a brief explanation of the three categories in terms of the NEMBA:

- Category 1a: Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued;
- Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued;
- Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones; and
- Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

Note that according to the regulations, a person who has under his or her control a category 1b listed invasive species must immediately:

- Notify the competent authority in writing;
- Take steps to manage the listed invasive species in compliance with:
    - Section 75 of the Act;
    - The relevant invasive species management programme developed in terms of regulation 4; and
    - Any directive issued in terms of section 73(3) of the Act.

Seven (7) IAP species were recorded within the PAOI. Certain of these species are listed under the Alien and Invasive Species List 2020, Government Gazette No. GN1003 as Category 1b as well as Category 2. Category 1b species must be controlled by implementing an IAP Management Programme, in compliance of section 75 of the NEMBA, as stated above.

3.2.1.3 Flora species of Concervation Concern

During the infield assessment protected and SCC was recorded. *Vachellia erioloba* is protected trees species under the National Forests Act, 1998 (ACT NO 84 of 1998). This species occurred in the *Vachellia/Searsia* habitat type. The provincially protected *Ammocharis coranica* was also recorded.

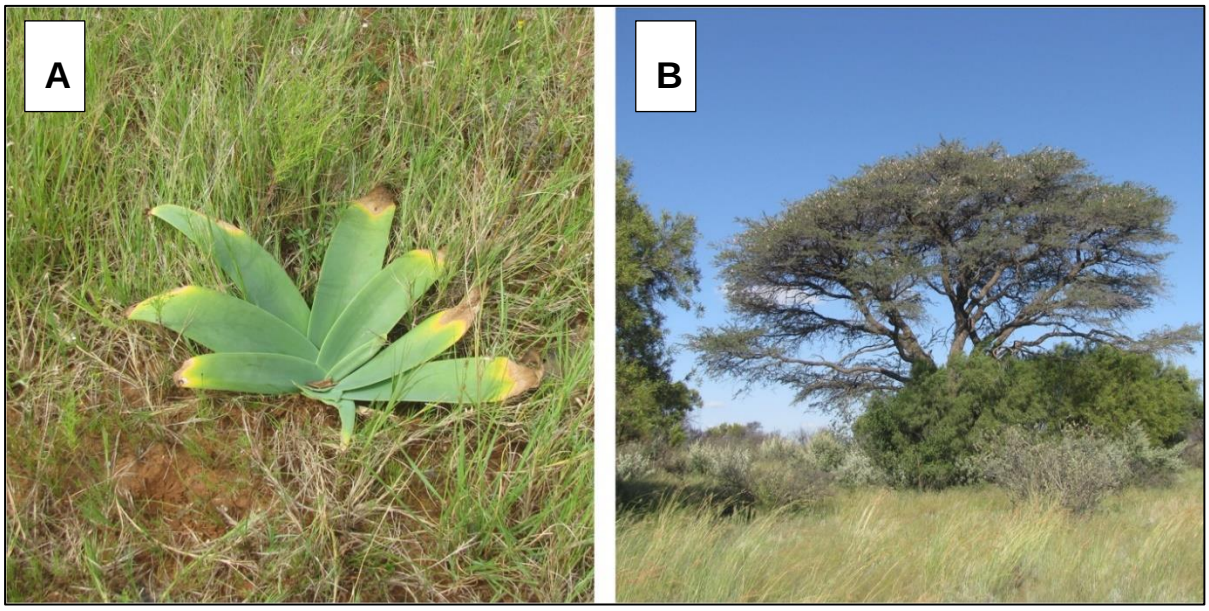


Figure 3-13 A) Ammocharis coranica and B) Vachellia erioloba observed in the PAOI

The effect of this declaration is that in terms of Section 15(1) of the National Forests Act, 1998, no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a licence or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated.

3.2.2 Fauna Assessment

3.2.2.1 Amphibians

Three (3) amphibian species were recorded within the PAOI and proximal landscape during the survey period (Table 3-9). None of the species recorded are regarded as being of conservation concern.

Table 3-9 Summary of amphibian species recorded within the proposed PAOI and proximal landscape during the survey period. LC = Least Concern

Scientific Name	Common Name	Conservation Status	
		Regional	Global
Kassina senegalensis	Bubbling Kassina	LC	LC

Sclerophrys gutturalis	Guttural Toad	LC	LC
Tomopterna cryptotis	Tremelo Sand Frog	LC	LC

3.2.2.2 Reptiles

Seven (7) species of reptile were recorded within the PAOI during the survey period, accounting for approximately 17% of the expected species (Table 3-10). Based on the extent and diversity of fine-scale habitats within the PAOI, it is likely to support a diverse assemblage of reptiles. The lack of species diversity recorded during the field survey is due to the secretive behaviour of many species and therefore, extensive survey periods are required to obtain an accurate representative sample.

Table 3-10 Summary of reptile species recorded within the proposed PAOI during the survey period. Species of Conservation Concern are highlighted in bold. LC = Least Concern

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Agama aculeata distanti	Ground Agama	LC	LC
Agama atra	Southern Rock Agama	LC	LC
Bitis arietans arietans	Puff Adder	LC	Unlisted
Trachylepis striata	Striped Skink	LC	Unlisted
Trachylepis varia	Variable Skink	LC	LC
Naja nivea	Cape Cobra	LC	Unlisted
Psammobates oculifer	Serrated Tent Tortoise	LC	Unlisted

3.2.2.3 Mammals

During field work a total of seven mammal species were recorded, either through direct observation or interviews with local landowners (Table 3-11). During the field visit actual sightings, spoor, calls, dung and nesting sites were used to establish the presence of animals on the existing dam project site.

Table 3-11 Summary of mammal species recorded within the proposed PAOI and proximal landscape during the survey period. LC = Least Concern

Scientific Name	Common Name	SA Red List	IUCN
Hystrix africaeaustralis	Cape Porcupine	LC	LC
Lepus saxatillis	Scrub Hare	LC	LC
Raphicerus campestris	Steenbok	LC	LC
Rhabdomys pumilio	Four-striped Grass Mouse	LC	LC
Saccostomus campestris	Pouched Mouse	LC	LC
Sylvicapra grimmia	Common Duiker	LC	LC
Xerus inauris	Cape Ground Squirrel	LC	LC

Figure 3-14 Ground Squirrel observed in the PAOI

3.2.3 Avifauna Assessment

During the assessment performed in the summer 59 species were recorded during the point counts (Appendix F) and 18 during the incidental counts (Appendix G). Some species were observed both as incidental records and during the point counts. No SCCs were recorded.

3.2.3.1 Risk Species

Priority species are susceptible to impacts from energy developments (Ralston Paton *et al.* 2017). These species are typically susceptible to collisions. This list (Ralston Paton *et al.* 2017) was developed initially for use with Wind Energy Facilities; however, the collision, electrocution and habitat loss risks are considered appropriate for renewable energy developments and so are utilised here. Also utilised here is the Eskom and EWT poster: Birds and Powerlines (Eskom and EWT, Date unknown) poster, which identifies birds most prone to collision and electrocution from powerlines. Some birds are not included in these lists, but are considered by the TBC avifauna specialists as risk species for collisions, electrocutions and habitat loss as a result of Solar PV infrastructure. All of species are referred to collectively in this report as “Risk Species” (Table 3-12). Photographs of some of the species are shown in Figure 3-15.

Table 3-12 Summary of Risk Species recorded within and around the proposed PAOI

Scientific Name	Common Name	Collisions	Electrocutions	Habitats Loss
Threskiornis aethiopicus	African Sacred Ibis	x	x	
Falco rupicoloides	Greater kestrel		x	
Bostrychia hagedash	Hadada Ibis	x	x	
Numida meleagris	Helmeted Guineafowl	x		
Afrotis afraoides	Northern Black Korhaan	x		x
Corvus albus	Pied Crow		x	
Lophotis ruficrista	Red-crested Korhaan	x		x

Figure 3-15 One of the risk species identified; Greater Kestrel

3.2.3.2 Dominant Species

Table 3-13 provides the relative abundance of the dominant species as well as the frequency with which each species appeared in the point count samples. Twenty-four of the recorded species accounted for more than 85% of the total number of individuals recorded. Black Chested Prinia and Speckled Pigeon were the most abundant species, while the Pied Crow and Chestnut-vented Warbler were both common species found in the assessment (Table 3-13).

Table 3-13 Relative abundance and frequency of occurrence of dominant avifauna species recorded within the PAOI during the field survey. Dominant species cumulatively account for more than 85% of the overall abundance. Only data from the standardized point counts were considered.

Common Name	Scientific Name	Relative abundance	Frequency (%)
Black-chested Prinia	*Prinia flavicans*	0,107	68,182
Speckled Pigeon	*Columba guinea*	0,077	11,364
European Bee-eater	*Merops apiaster*	0,077	25,000
Red-billed Quelea	*Quelea quelea*	0,073	4,545
Pied Crow	*Corvus albus*	0,069	43,182
Ring-necked Dove	*Streptopelia capicola*	0,047	27,273
Scaly-feathered Weaver	*Sporopipes squamifrons*	0,045	11,364
Chestnut-vented Warbler	*Curruca subcoerulea*	0,042	38,636
Yellow Canary	*Crithagra flaviventris*	0,040	18,182
Barn Swallow	*Hirundo rustica*	0,036	18,182
Tinkling Cisticola	*Cisticola rufilatus*	0,034	22,727
White-browed Sparrow-Weaver	*Plocepasser mahali*	0,026	2,273
Desert Cisticola	*Cisticola aridulus*	0,024	11,364
Little Swift	*Apus affinis*	0,020	9,091
Rufous-naped Lark	*Mirafra africana*	0,018	15,909
Shaft-tailed Whydah	*Vidua regia*	0,016	4,545

Black-throated Canary	*Crithagra atrogularis*	0,016	6,818
Long-billed Crombec	*Sylvietta rufescens*	0,014	11,364
Black-faced Waxbill	*Brunhilda erythronotos*	0,014	6,818
Cape Penduline Tit	*Anthoscopus minutus*	0,012	4,545
Cape Sparrow	*Passer melanurus*	0,012	6,818
Lesser Grey Shrike	*Lanius minor*	0,012	13,636
Red-billed Firefinch	*Lagonosticta senegala*	0,012	4,545
White-bellied Sunbird	*Cinnyris talatala*	0,012	6,818

3.2.3.3 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 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 insectivorous and granivores birds that feed on the ground during the day (IGD and GGD). Followed by Omnivores (OMD) with no set feeding habits (Figure 3-16). Nocturnal surveys were not performed due to safety risk and might not represent the infield composition. Access to the river in the PAOI was also restricted therefore the absence of water birds are not representative of the field compositions.

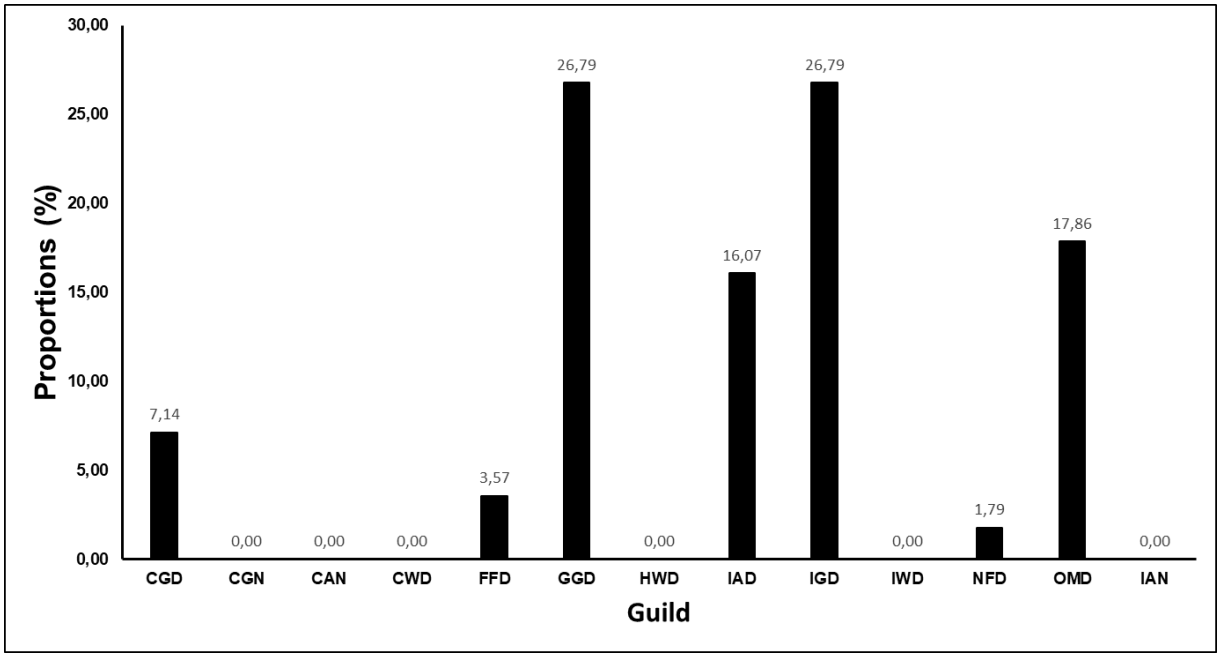


Figure 3-16 ***Column plot illustrating the proportion of each Functional Feeding Guild to the total abundance (Avifaunal trophic guilds. CGD, carnivore ground diurnal; CGN, carnivore ground nocturnal, CAN, carnivore air nocturnal, CWD, carnivore water diurnal; FFD, frugivore foliage diurnal; GGD, granivore ground diurnal; HWD, herbivore water diurnal; IAD, insectivore air diurnal; IGD, insectivore ground diurnal; IWD, insectivore water diurnal; NFD, nectivore foliage diurnal; OMD, omnivore multiple diurnal; IAN, Insectivore air nocturnal).***

4 Habitat Assessment and Site Ecological Importance (SEI)

4.1 Habitat Assessment

The footprint of the infrastructure associated coincides with natural vegetation, which has undergone variation due to historical land use. Clearance of woody and shrub species was completed in order to create grazing pastures for livestock. This practice changes from one farm owner to another.

***Vachellia - Searsia* Shrubland**

The tree layer in this vegetation community is dominated by *Vachellia karoo, V. tortilis* and *Searsia lancea* (Figure 4-1). The shrub layer is well defined in this vegetation community and *Tarchonanthus camphoratus* is the dominant shrub species, particularly on shallower soils underlain by dolomite. This vegetation community is typically covered by open grassland, with *Eragrostis lehmanniana, Themeda triandra, Aristida adscensionis, A. congesta, A, diffusa, Enneapogon cenchroides, Eragrostis superba, E. obtusa, Fingerhuthia africana, Heteropogon contortus, Sporobolus fimbriatus, Tragus racemosus, Geigera filifolia, Barleria macrostegia*.

Figure 4-1 Vachellia-Searsia vegetation type

***Tarchonanthus - Vachellia* Shrubland**

This vegetation type was found to dominate the PAOI and surrounds and is fairly similar to the *Vachellia - Searsia* Shrubland in species richness but not abundance (Figure 4-2). This vegetation type is characterised by a dominance of *Tarchonanthus* camphoratus, in association with a variety of *Vachellia* spp., particularly *Vachellia karroo* and *V. tortilis*. The graminoid layer is also dominated by an open grassland, with *Eragrostis lehmanniana, Themeda triandra, Aristida adscensionis, A. congesta, A, diffusa, Enneapogon cenchroides, Eragrostis superba, E. obtusa, Fingerhuthia africana*, dominating.

Figure 4-2 Tarconanthus-Vachellia vegetation type

Water resources

This habitat unit consists of depressions and river. Depressions consisting of a clay rich substrate over a rocky substrate, where the lowest point was recently filled with standing water. The Droe Harts river forms the other section of this habitat unit. This river has some deep pools that provides habitat for various fauna species.

Figure 4-3 Examples of the water resource habitat unit

Transformed areas

These consisted of disturbed areas where natural vegetation was partially or completely removed due to current land use, including a landfill site and illegal dumping, existing powerlines, roads and homesteads.

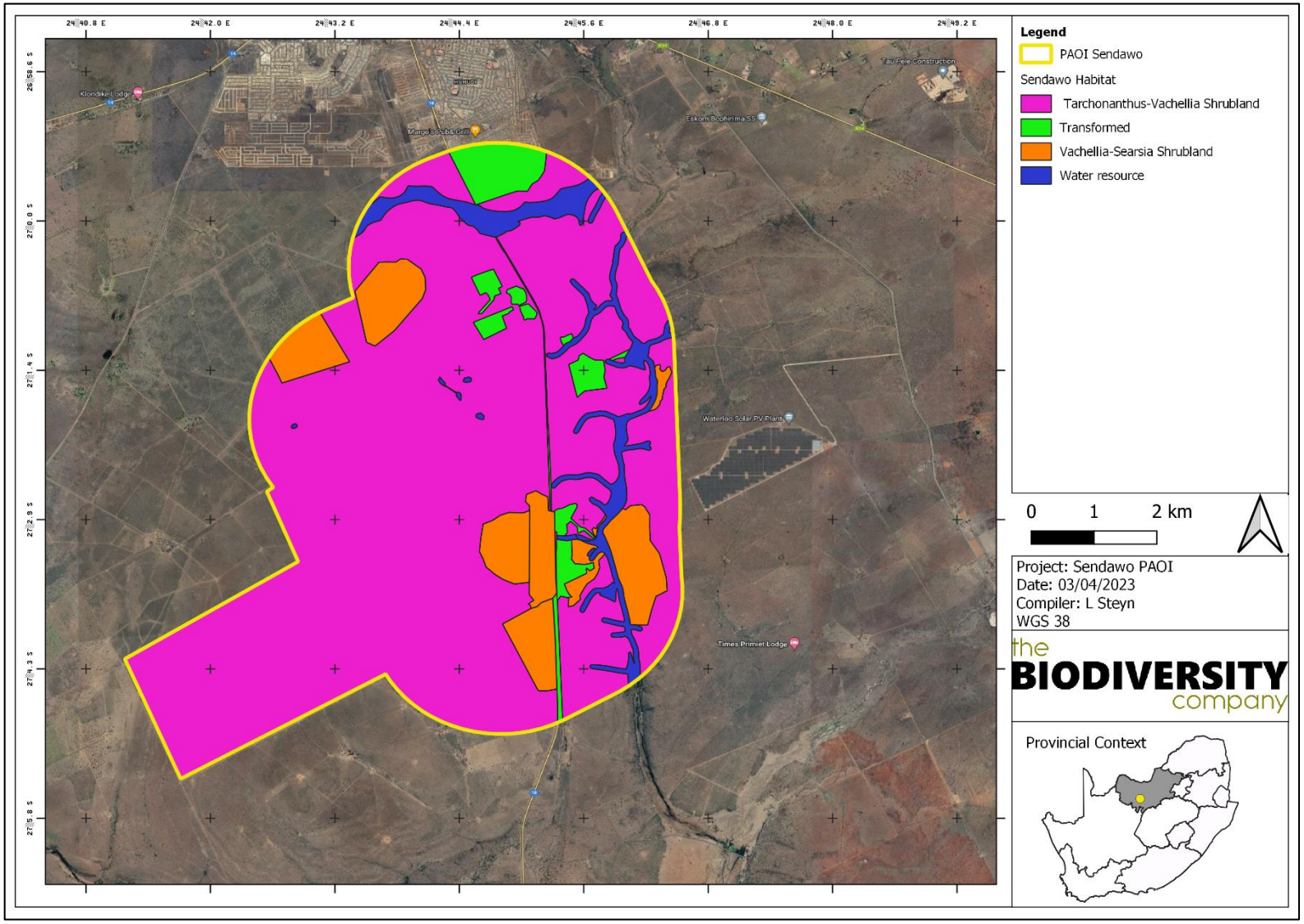


Figure 4-4 Map illustrating the location and extent of habitat types delineated within the proposed PAOI.

4.2 Site Ecological Importance

The Combined Terrestrial Biodiversity Theme Sensitivity for the project infrastrcuture as indicated in the screening report was derived to be 'Very High' (Figure 4-5). This is attributed to the area being included in the BSP as an ESA1 classified area. The Animal Theme Sensitivity was rated as "Medium" based on the likely presence of Secretary birds (Figure 4-6). The Plant Theme Sensitivity was rated as "Low" (Figure 4-7).

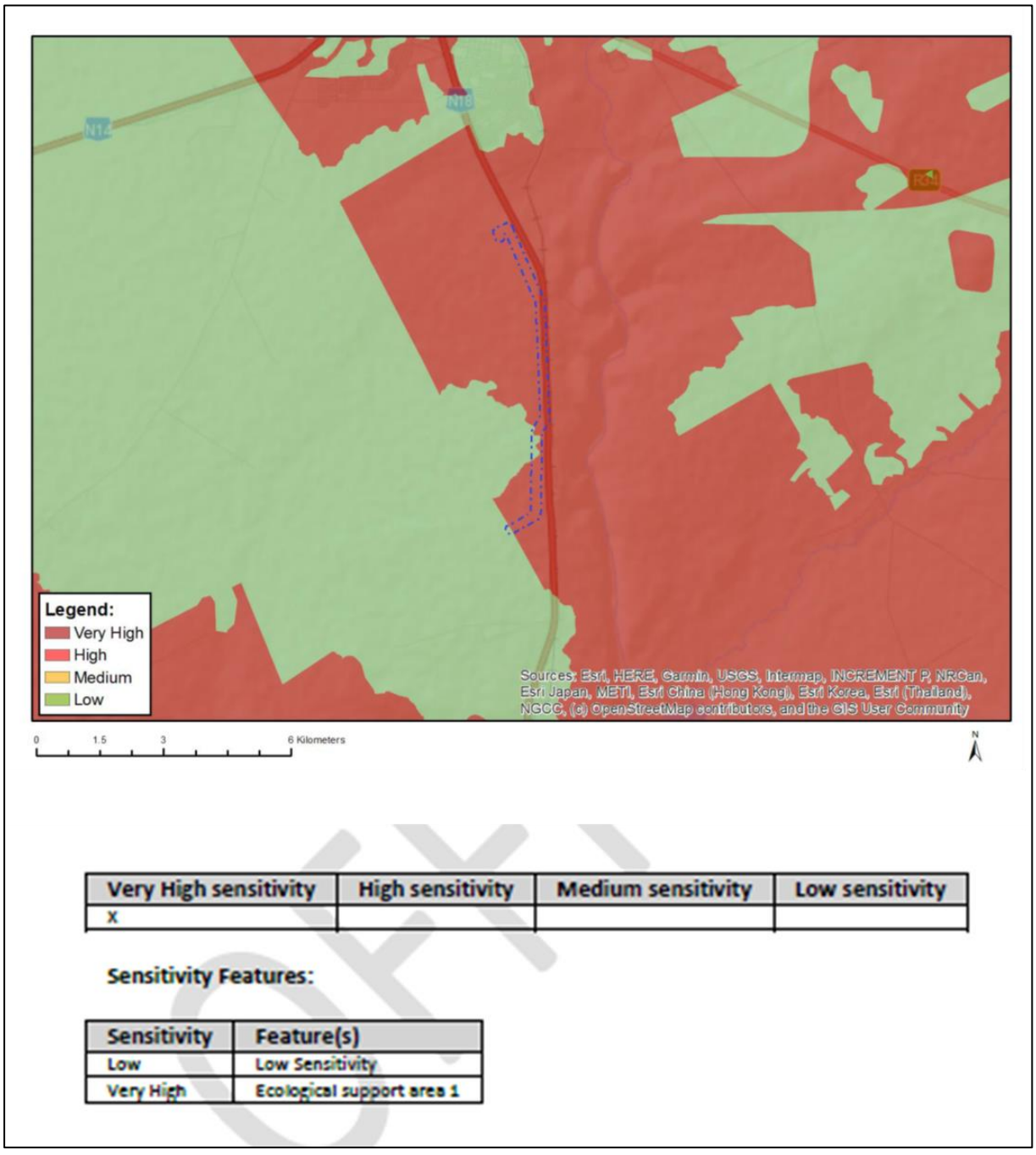
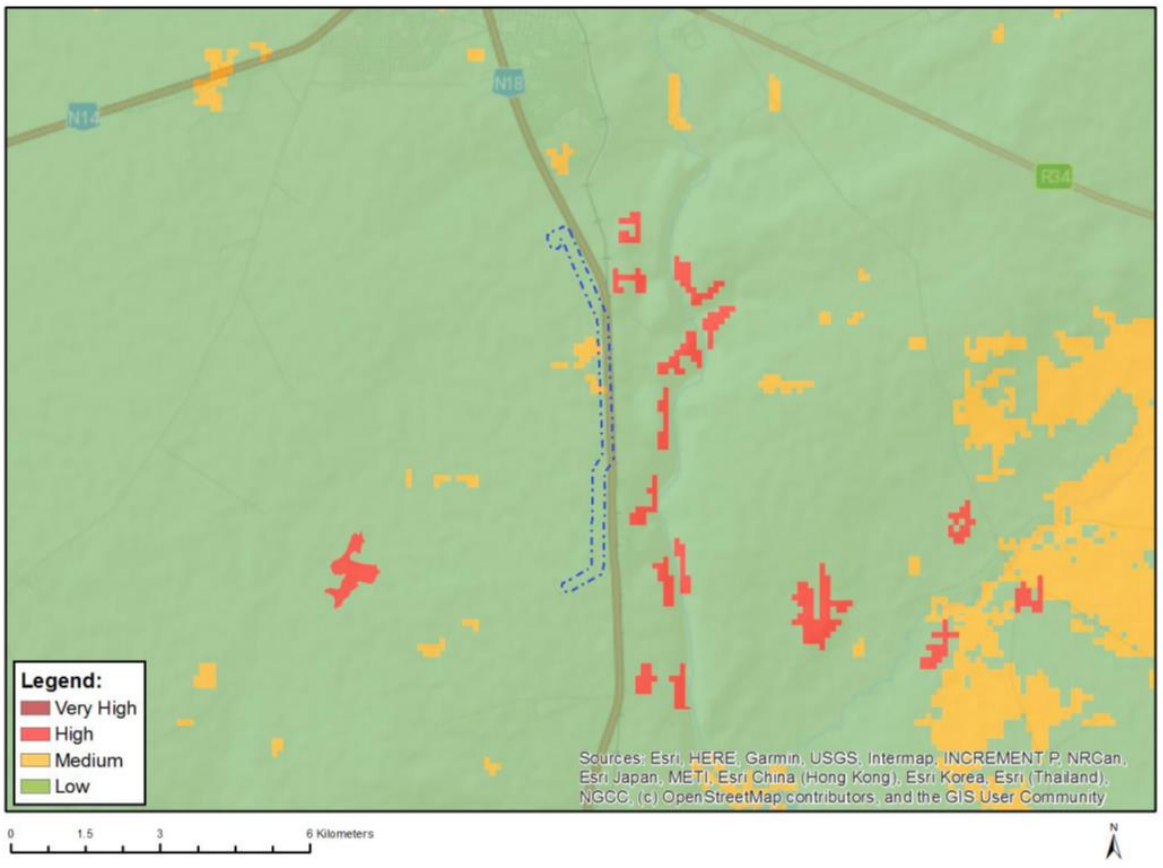


Figure 4-5 Map illustrating the Combined Terrestrial Biodiversity Theme Sensitivity for the proposed project

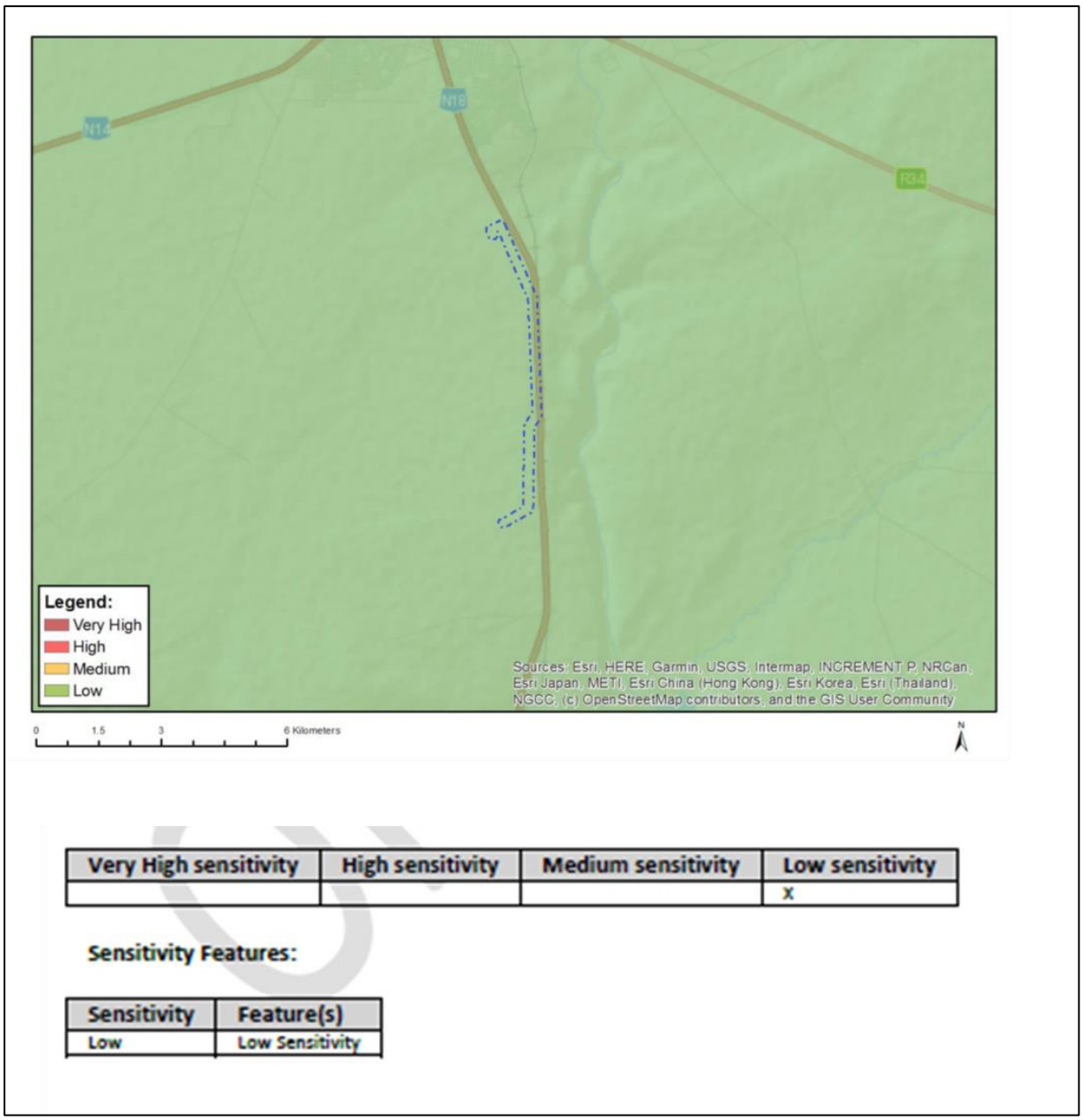


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Low	Subject to confirmation
Medium	Aves-Sagittarius serpentarius

Figure 4-6 Map illustrating the Combined Animal Theme Sensitivity for the proposed project



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			x

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity

Figure 4-7 Map illustrating the Combined Plant Theme Sensitivity for the proposed project

Based on the criteria provided in Section 2.3 of this report, all habitats within the assessment area of the proposed development were allocated a sensitivity category, i.e., a SEI category (Table 4-1). The SEI categories provided are based on a multi-taxon (flora, herpetofauna, mammalia and avifauna) context. The SEI of the habitat types delineated within the assessment area is illustrated in Figure 4-8.

Table 4-1 Summary of the Terrestrial Site Ecological Importance for the proposed development

Habitat	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
***Tarconanthus-Vachellia* Shrubland**	Medium Presence of range-restricted species. > 50% of receptor contains natural habitat with potential to support SCC.	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	Medium
***Vachellia-Searsia* Shrubland**	Medium Presence of range-restricted species. > 50% of receptor contains natural habitat with potential to support SCC.	Medium Mostly minor current negative ecological impacts with some major impacts and a few signs of minor past disturbance. Moderate rehabilitation potential.	Medium	Low Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore	Medium
Water Resources	High 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.	High	Very Low Habitat that is unable to recover from major impacts	Very High
Transformed	Low No confirmed or highly likely populations of SCC.	Low Several minor and major current negative ecological impacts.	Low	High Habitat that can recover relatively quickly (~ 5–10 years)	Very Low

The guidelines for interpreting SEI as provided in the Species Assessment Protocol (SANBI, 2020) in the context of the proposed development is provided in Table 4-2.

Table 4-2 Guidelines for interpreting Site Ecological Importance in the context of the proposed development activities

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

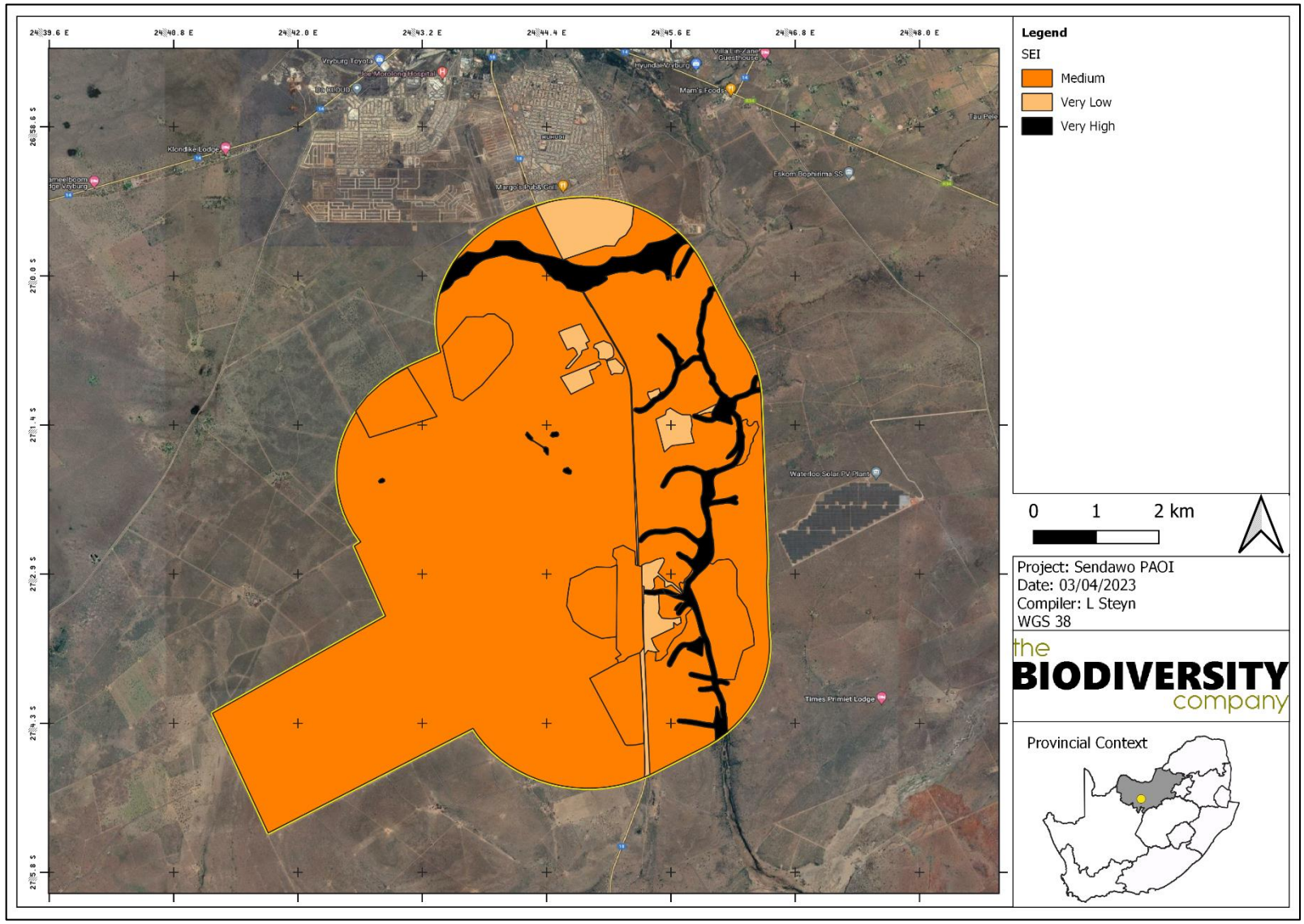


Figure 4-8 Map illustrating the Site Ecological Importance (SEI) of the habitats delineated within the proposed PAOI

5 Impact Assessment

5.1 Present Impacts

Considering the anthropogenic activities and influences within the landscape, several negative impacts to biodiversity were observed within the PAOI and the surrounding landscape (Figure 5-1). These include:

Livestock grazing land-use leading to trampling and exacerbated erosion;

Roads and associated vehicle traffic leading to road kills;

Predator-proof fences;

Powerlines;

Unrehabilitated burrow pits; and

Illegal dumping of solid waste.

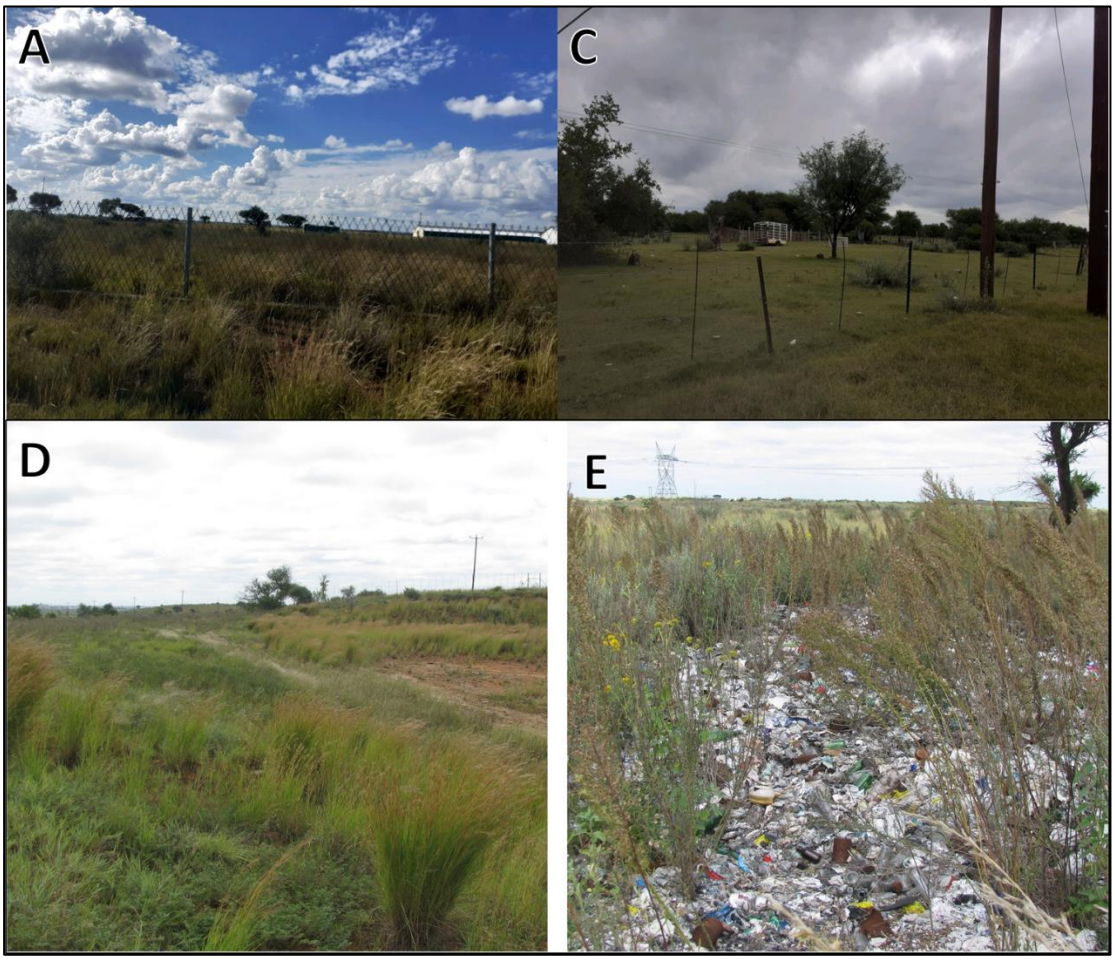


Figure 5-1 ***Photographs illustrating examples of impacts to biodiversity within the proposed PAOI and surrounding landscape. A) Fences, B) Powerlines, C) Burrow pit and E) Solid waste dumping***

5.2 Alternatives considered

Two alternatives for the OHPL were provided along with two collector substation alternatives (Figure 5-2).

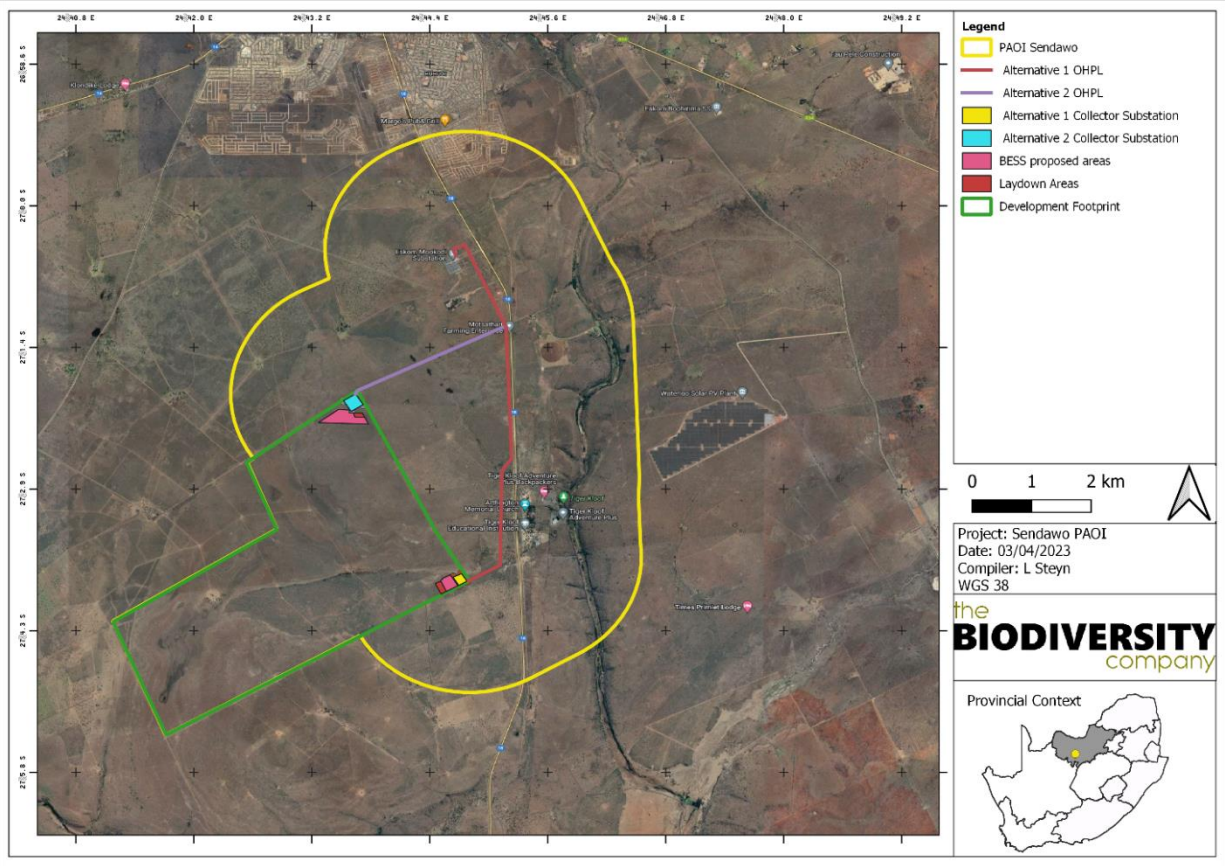


Figure 5-2 Alternatives provided

5.3 Loss of Irreplaceable Resources

The current proposed layout of the development will result in the loss of:

Critical Biodiversity Areas;

Ecological Support Areas;

Priority Focus Areas; and

Possibly Species of Conservation Concern.

5.4 Identification of Additional Potential Impacts

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

Direct impacts – Impacts that result from project activities or operational decisions that can be predicted based on planned activities and knowledge of local biodiversity, such as habitat loss under the project footprint, habitat frag- mentation as a result of project infrastructure and species disturbance or mortality as a result of project operations;

Indirect impacts – Impacts induced by, or 'by-products' of, project activities within a project's area of influence; 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.

As aforementioned, fire is a critical ecosystem process that is essential to retain diversity in renosterveld vegetation types. Fire regimes are affected by development due to the protection of infrastructure (O'Connor and Kuyler, 2005). Accordingly, the proposed development will require infrastructure protection and therefore, shift the natural fire regime and consequently, the floral assemblage and ecological wellbeing of the habitat within the PAOI will be negatively affected.

Additional potential impacts during the construction and operation phases of the proposed development are presented in Table 5-1.

Table 5-1 Potential impacts to biodiversity associated with the proposed development

Main Impact	Project activities that can cause loss of habitat	Secondary impacts anticipated
Habitat Destruction and degradation	Physical removal of vegetation including earthworks for infrastructure construction Physical removal of vegetation including earthworks for road network construction Erosion due to poor stormwater management Dust pollution	• Displacement/loss of flora & fauna (including SCC) • Increased potential for soil erosion • Habitat fragmentation • Increased potential for establishment of invasive vegetation
Main Impact	**Project activities that can cause the spread and/or establishment of alien and/or invasive species**	**Secondary impacts anticipated**
Spread and/or establishment of alien and/or invasive species into disturbed areas	Vegetation removal Vehicles potentially spreading seed Unsanitary conditions surrounding infrastructure promoting the establishment of pest rodents	• Habitat loss for indigenous flora & fauna (including potential SCC) • Spreading of potentially dangerous diseases due to invasive and pest species • Increased potential for soil erosion • Alteration of fauna assemblages due to habitat modification
Main Impact	**Project activities that can cause the direct mortality of fauna**	**Secondary impacts anticipated**
Direct Mortality of fauna	Roadkill due to vehicle collision Intentional killing of fauna for food (hunting and persecution) Earthworks	• Loss of ecosystem services
Main Impact	**Project activities that can cause reduced dispersal/migration of fauna**	**Secondary impacts anticipated**
Reduced dispersal/migration of fauna	Loss of landscape used as corridor Removal of vegetation	• Loss of ecosystem services • Reduced plant seed dispersal • Reduced gene flow
Main Impact	**Project activities that can cause emigration of fauna**	**Secondary impacts anticipated**
Emigration of fauna	Operation of machinery (Large earth moving machinery, generators, blasting) Heavy vehicle use Noise pollution generated during operational phase	• Loss of ecosystem services
Main Impact	**Project activities that can cause collisions and electrocutions**	**Secondary impacts anticipated**

Collisions and Electrocutions	Powerline construction BESS construction Fence construction	• Loss of SCCs and priority species

5.5 Assessment of Impact Significance

5.5.1 Method

The assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct[1], indirect[2], secondary[3] as well as cumulative[4] impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e., residual impact). The significance of environmental aspects is determined and ranked by considering the criteria[5] presented in Table 5-2.

Table 5-2 Impact Assessment Criteria and Scoring System

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				
IMPACT SIGNIFICANCE RATING					
Total Score	0 – 30	31 to 60		61 – 100	

[1] Impacts that arise directly from activities that form an integral part of the Project.
[2] Impacts that arise indirectly from activities not explicitly forming part of the Project.
[3] Secondary or induced impacts caused by a change in the Project environment.
[4] Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.
[5] The definitions given are for guidance only, and not all the definitions will apply to all the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Environmental Significance Rating (Negative (-))	Low (-)		Moderate (-)		High (-)
Environmental Significance Rating (Positive (+))	Low (+)		Moderate (+)		High (+)

5.5.2 Mitigation of Impacts

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this report.

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five (5) different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan. The mitigation sequence/hierarchy is shown in Figure 5-3 below.

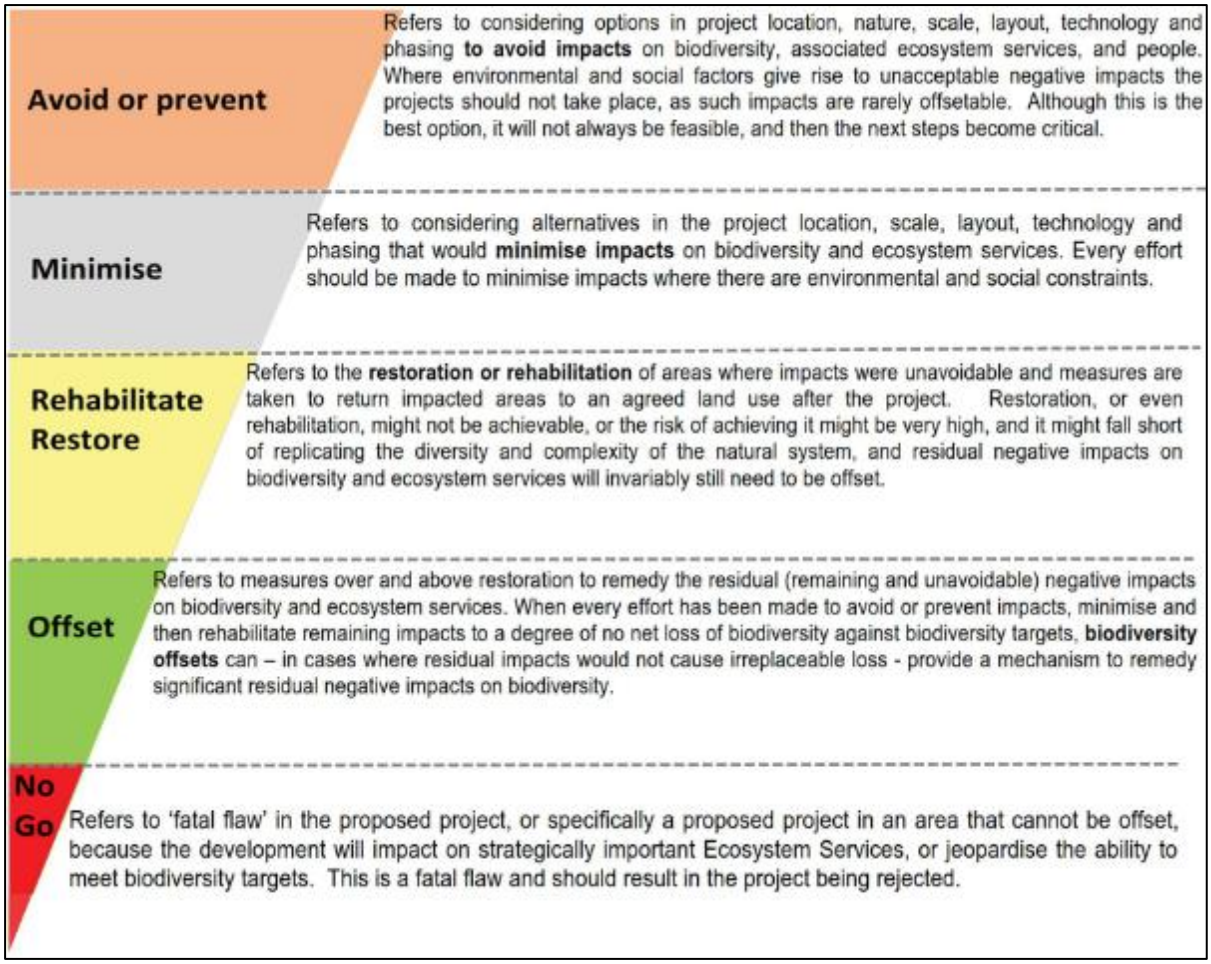


Figure 5-3 Diagram illustrating the Mitigation Hierarchy

5.6 Impact Assessment

The assessment of impact significance considers pre-mitigation as well as implemented post-mitigation scenarios. Two phases were considered for the impact assessment; Construction Phase and Operational Phase, as the development was assumed to be long-lasting. The OHPL alternatives transverse different habitat units, their impacts with relevance to habitat destruction would therefore differ. The impact of the two BESS and Substations alternatives would be similar and their impacts were considered simultaneously.

5.6.1 Construction Phase

5.6.1.1 Loss of habitat due to infrastructure development

The proposed development will result in the loss of habitat due to infrastructure. The significance of the impact is provided in Table 5-3. The two alternative OHPL routes were considered separately.

Table 5-3 Assessment of significance of habitat loss associated with the construction phase of the proposed development of the Alternative 1 OHPL

Potential Impact: Habitat loss due to infrastructure development	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	4	3	4	4	**60**	**Moderate**	(-)	High
With Mitigation	3	2	3	3	3	**33**	**Moderate**	(-)	High
Mitigation and Management Measures **Only those areas earmarked for development must be intruded upon and be clearly demarcated. If the alternative 2 route is used the impact can be mitigated. The post mitigation would still be moderate should this route be chosen.** **See section 5.9.**									

Table 5-4 Assessment of significance of habitat loss associated with the construction phase of the proposed development of the BESS, Substations and Alternative 2 OHPL

Potential Impact: Habitat loss due to infrastructure development	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	3	3	3	4	4	**52**	**Moderate**	(-)	High
With Mitigation	2	2	3	3	3	**30**	**Low**	(-)	High
Mitigation and Management Measures **Only those areas earmarked for development must be intruded upon and be clearly demarcated. Majority of the Alternative 2 roue has been disturbed by the road and the existing powerlines, therefore the impact if the area adjacent to the line is avoided can be reduced to Low.** **See section 5.9.**									

5.6.1.2 Loss of Species of Conservation Concern (SCC)

The vegetation clearance for infrastructure will physically remove vegetation and in areas occupied by flora SCC, will ultimately lead to a loss in the population of these species. In addition, clearing of vegetation will result in exacerbated erosion of working areas. This will result in the destruction and fragmentation of habitats, thereby affecting potential SCC. The significance of the impact is provided in Table 5-5.

Table 5-5 Assessment of significance of potential impacts on flora species of conservation concern associated with the construction phase of the proposed development

Potential Impact:	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Confidence

Loss of SCC due to habitat loss or degradation									
Without Mitigation	4	4	3	4	4	**60**	**Moderate**	(-)	High
With Mitigation	2	2	3	2	2	**18**	**Low**	(-)	High
Mitigation and Management Measures **Areas with threatened flora species should be avoided. Search and Rescue is not a suitable mitigation action for the protected trees.** **See section 5.9.**									

5.6.1.3 Direct mortality of fauna including Species of Conservation Concern (SCC) due to roadkill, poaching and earthworks

The increased traffic due to construction vehicles and the transportation of staff/materials is also a risk, especially along the major roads within the surrounding landscape. The unregulated movement of local people will also increase the likelihood of poaching of fauna. The significance of the direct mortality impact is provided in Table 5-6.

Table 5-6 Assessment of significance of direct mortality of fauna including Species of Conservation Concern due to roadkill and earthworks associated with the construction phase of the proposed development

Potential Impact: Direct mortality of fauna including Species of Conservation Concern due to roadkill, and earthworks	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	**Confidence**
Without Mitigation	3	3	3	4	4	**60**	**Moderate**	(-)	High
With Mitigation	2	2	3	2	2	**18**	**Low**	(-)	High
Mitigation and Management Measures **Areas to be cleared must first be checked thoroughly for all fauna species and be allowed to move off or in the case of more secretive species, these must be relocated to appropriate nearby habitats via a Search and Rescue process.** **Speed control measures must be implemented.** **See section 5.9.**									

5.6.1.4 Encroachment of disturbed areas by Invasive Alien Plants (IAPs)

Clearance of vegetation and movement between areas will increase the potential for the establishment of invasive vegetation. The proposed vegetation clearance for the infrastructure will physically remove indigenous vegetation and potentially create an environment where invasive species can be introduced. The “edge effect” caused by these disturbances will likely result in IAP encroachment. The significance of the invasive species impact is provided in Table 5-7.

Table 5-7 Assessment of significance of Invasive Alien Plant (IAP) encroachment associated with the construction phase of the proposed development

Potential Impact:	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	**Confidence**

Encroachment by Invasive Alien Plant species									
Without Mitigation	4	3	3	3	4	52	Moderate	(-)	High
With Mitigation	3	2	3	3	3	33	Moderate	(-)	High
Mitigation and Management Measures An Invasive Alien Plant Management Programme must be developed and implemented. Erosion Control Programme must be developed and implemented. All denuded areas to be rehabilitated using local indigenous species. See section 5.9.									

5.6.1.5 Degradation of surrounding habitats due to dust pollution

Construction activity will lead to dust pollution and degradation of surrounding natural habitat. Wetting of road surfaces may aid in control but the wind and dry season conditions will likely lead to rapid evaporation and therefore, not entirely suitable. The significance of the dust pollution impact is provided in Table 5-8.

Table 5-8 Assessment of significance of dust pollution associated with the construction phase of the proposed development

Potential Impact: Degradation of surrounding habitats due to dust pollution	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	3	3	3	3	3	33	Moderate	(-)	High
With Mitigation	2	2	3	2	2	18	Very Low	(-)	High
Mitigation and Management Measures Dust control measures to be implemented such as wetting of road surfaces. Speed limits must be implemented. See section 5.9.									

5.6.2 Operational Phase

The following potential impacts were considered on biodiversity (fauna and flora) during the operational phase. This phase refers to when construction has been completed and the proposed infrastructure has been built and is functional.

5.6.2.1 Continued encroachment of disturbed areas by Invasive Alien Plants (IAPs)

Areas disturbed during construction will create niches and opportunity for encroachment by IAPs. Due to the vegetation communities that were cleared within the infrastructure footprint, impacts to the surrounding vegetation communities are considered. The significance of the IAP encroachment impact is provided in Table 5-9.

Table 5-9 Assessment of significance of Invasive Alien Plant encroachment associated with the operational phase of the proposed development

Potential Impact:	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Confidence

Continued encroachment of disturbed areas by Invasive Alien Plants (IAPs)									
Without Mitigation	4	3	3	3	4	52	Moderate	(-)	High
With Mitigation	2	2	3	2	2	18	Low	(-)	High
Mitigation and Management Measures Development and implementation of an Invasive Alien Plant Management Programme See section 5.9.									

5.6.2.2 Continued erosion of surrounding habitat due to poor stormwater management

Due to the increase in stormwater generation from impenetrable surfaces or cleared areas, erosion of surrounding natural vegetation is a possible risk. The significance of the erosion impact is provided in Table 5-10.

Table 5-10 Assessment of significance of erosion associated with the operational phase of the proposed development

Potential Impact:	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Continued erosion of surrounding habitat due to poor stormwater management									
Without Mitigation	3	3	3	3	3	36	High	(-)	High
With Mitigation	1	1	1	1	2	8	Very Low	(-)	High
Mitigation and Management Measures Development and implementation of an Erosion Management Programme See section 5.9.									

5.6.2.1 Heat Radiation from the BESS

The BESS radiates heat, it must be enclosed in an insulated building with a non-reflective surface. The significance of the heat radiation impact is provided in Table 5-11**.**

Table 5-11 Assessment of significance of heat radiation from the BESS associated with the operational phase of the proposed development

Potential Impact:	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Heat Radiation from the BESS									
Without Mitigation	4	4	3	3	3	42	Moderate	(-)	Low
With Mitigation	2	2	3	2	2	18	Low	(-)	Low
Mitigation and Management Measures The BESS must be enclosed in a non-reflective surface. The building must be insulated. A fire management plan must be developed and implemented. See section 5.9.									

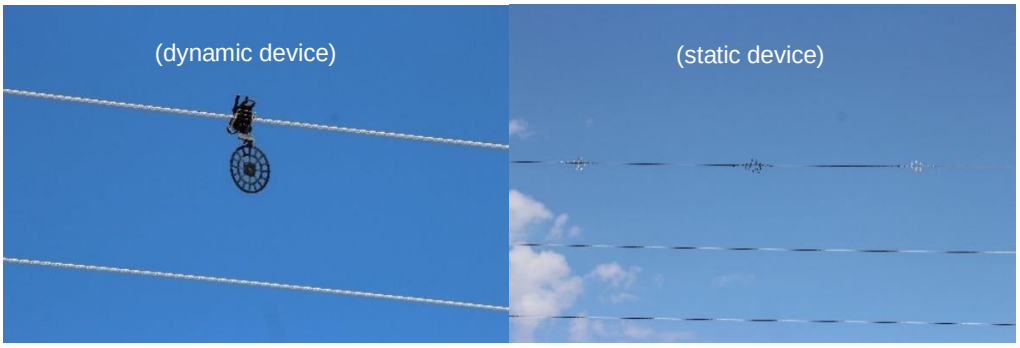
5.6.2.2 Collissions with the powerlines

Birds prone to collisions can be divided into five categories; 1) large species with high body weight ratio to wing span resulting in low manoeuvrability, 2) species that are distracted in flight this include predatory birds and smaller species with areal displays, 3) species flying at high speeds, 4) crepuscular species that are active in low light conditions, and 5) species with limited narrow forward vision (Jenkins *et al.,* 2010; Noguera *et al.,* 2010). Species that tend to fly in flocks also may be influenced more by collisions as the birds flying in the rear will not be able to detect the powerlines. A number of risk species were found. The significance of the heat radiation impact is provided Table 5-12.

Table 5-12 Assessment of significance of collisions associated with the operational phase of the proposed development

Potential Impact: Collisions with the powerlines	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	4	5	4	4	**72**	**High**	(-)	Low
With Mitigation	3	3	3	3	3	**36**	**Moderate**	(-)	Low

Mitigation and Management Measures

- **The air space used by the connection and gridlines must be minimised by burying them as far as possible;**
- **Overhead cables/lines across water resource areas 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;**
- 

See section 5.9.

5.6.2.3 Electrocutions with the OHPL

Large passerines are particularly susceptible to electrocution because owing to their relatively large bodies, they are able to touch conductors and ground/earth wires or earthed devices are simultaneously. The chances of electrocution are increased when feathers are wet, during periods of high humidity or during defecation. Prevailing wind direction also influences the rate of electrocution casualties. Winds parallel or diagonal to cross-arms are the most detrimental, due to exacerbating the difficulty in manoeuvrability during landing or take-off. The significance of this impact is provided in Table 5-13.

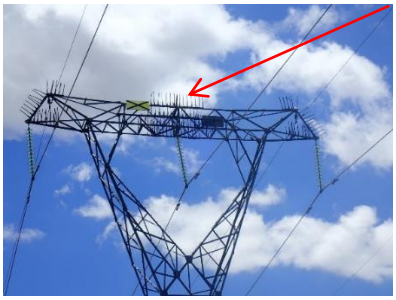
Table 5-13 Assessment of significance of the electrocutions with the operational phase of the proposed development

Potential Impact: Electrocutions with the OHPL	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	4	3	4	4	**64**	**High**	(-)	High
With Mitigation	3	3	3	3	3	**36**	**Moderate**	(-)	Moderate

Mitigation and Management Measures.

Energised parts and/or grounded parts must be insulated appropriately to avoid incidental contact by birds. It is best to use suspended insulators and vertical disconnectors, if upright insulators or horizontal disconnectors are present, these should be covered; and

Perch discouragers can be used such as perch guards or spikes. Considerable success achieved by providing artificial bird safe perches, which are placed at a safe distance from the energised parts (Prinsen *et al,* 2012).



See sections 5.9

5.7 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, 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 (Figure 5-4). 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 Q4 (2022) 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 15% (Table 5-14).

Table 5-14 The cumulative impacts considered for avifauna

Total Area of 30km^2	Intact Remnant Habitat	REEA area that does not overlap with disturbed areas	Total Disturbed/Transformed habitat	Percentage area lost
385070,3 Ha	384647,7 Ha	60081,43 Ha	60504,03 Ha	15%

In consideration of the aforementioned information, the cumulative impact was determined to be of a Negative Moderate significance (Table 5-15)

Table 5-15 Cumulative impact

Potential Impact:	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Cumulative Impact	3	3	3	3	3	36	Moderate	(-)	High

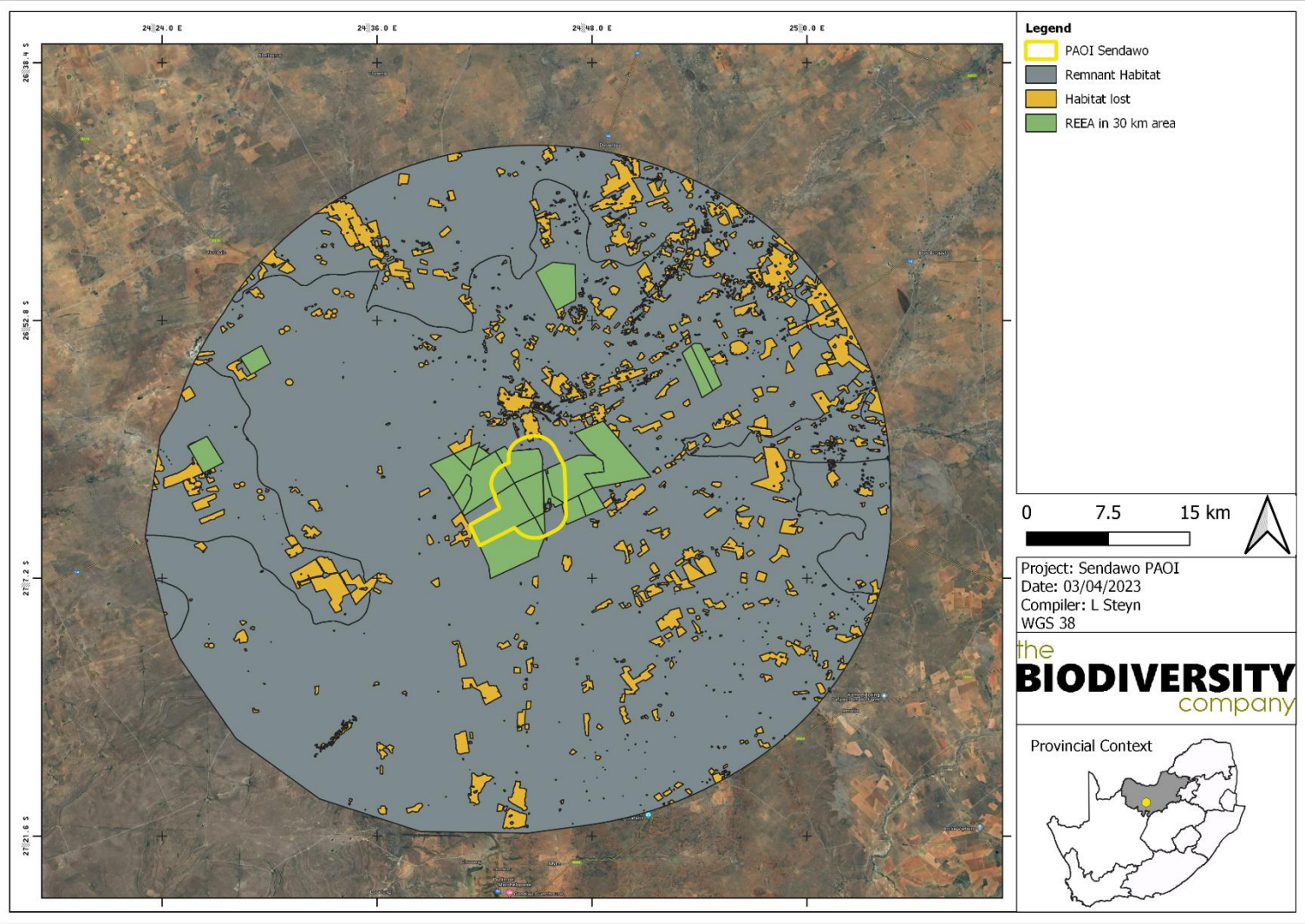


Figure 5-4 Map illustrating renewable energy developments overlapping the remnant habitat in a 30 km area surround the PAOI

5.8 Unplanned Events

The planned activities will have known impacts as discussed above; however, unplanned events may occur on any project and may have potential impacts which will need mitigation and management.

Table 5-16 is a summary of the findings of an unplanned event assessment. Note, not all potential unplanned events may be captured herein, and this must therefore be managed throughout all phases according to recorded events.

Table 5-16 Summary of unplanned events for terrestrial biodiversity

Unplanned Event	Potential Impact	Mitigation
Hydrocarbon spills into the surrounding environment from heavy machinery during the construction phase	Contamination of soil leading to mortality of flora and fauna.	A spill response kit must always be available. The incident must be reported on and if necessary, a biodiversity specialist must investigate the extent of the impact and provide rehabilitation recommendations.
Fire	Uncontrolled/unmanaged fire that spreads to surrounding natural habitats that result in habitat destruction and fauna mortality. Although fires are a feature of savannah habitats, incorrect timing of the fire can have considerably negative effects.	Appropriate/Adequate fire management plan needs to be implemented.

5.9 Biodiversity Impact Management Actions

The purpose of the Biodiversity Impact Management Actions is to inform on the mitigations required to lower the risk of the impacts associated with the proposed development, provide measures for improving the conservation value of the property and to be able to be inserted into the Environmental Management Programme (EMPr) should the proposed development be granted authorisation. The mitigation actions required to reduce the significance of the impacts associated with the development are provided in Table 5-17.

Table 5-17 The Biodiversity Impact Management Actions for the proposed Sendawo project

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
	Management outcome: Vegetation and Habitats			
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, should under no circumstances be fragmented or disturbed further.	Life of Operation	Project Manager Environmental Officer	Areas of indigenous vegetation	Ongoing
Alternative 2 of the OHPL is the preferred option and the other option must be avoided due to the wetland areas it crosses.	Life of Operation	Project Manager Environmental Officer	Powerline route	Ongoing
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.	Life of Operation	Project Manager Environmental Officer	Assess the state of rehabilitation and encroachment of alien vegetation	Quarterly for up to three years after the closure
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
Leaking equipment and vehicles must be repaired immediately or be removed from project area to facilitate repair.	Life of Operation	Environmental Officer Contractor	Leaks and spills	Ongoing
A Fire Management Plan needs to be compiled to restrict the impact of fire. This is especially concerning stochastic fire events such as discarding of lit cigarette butts and/or glowing embers from cooking fires. The fire management plan must ensure that natural fire regimes of the surrounding vegetation is not affected.	Life of Operation	Environmental Officer Contractor	Fire Management	During Phase
Poaching of plants must not be tolerated and made a punishable offence.	Life of Operation	Environmental Officer	Evidence of plant removal and digging of soil outside of demarcated areas	Ongoing

Several Search and Rescue operations must occur in the proposed infrastructure footprint to ensure that species are relocated to proximal natural areas.	Pre-construction	Project Manager Environmental Officer	Relocated flora	Search and Rescue to occur 1 week monthly from Spring to Summer
Management outcome: Fauna				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Several Search and Rescue operations must occur in the proposed infrastructure footprint to ensure that species are relocated to proximal natural areas.	Pre-construction	Project Manager Environmental Officer	Relocated fauna	Search and Rescue to occur 1 week monthly from Spring to Summer
Noise must be kept to an absolute minimum during the evenings and at night to minimize all possible disturbances to amphibian species and nocturnal mammals.	Construction Phase	Environmental Officer	Noise levels	Ongoing
No trapping, killing, or poisoning of any wildlife is to be allowed Signs must be put up to enforce this and must be made a punishable offence.	Life of operation	Environmental Officer	Evidence of trapping, dead animals, etc.	Ongoing
The duration of the construction should be minimized to as short term as possible, to reduce the period of disturbance on fauna.	Construction/Operational Phase	Project Manager Environmental Officer	Construction/Closure Phase	Ongoing
Outside lighting should be designed and limited to minimize impacts on fauna. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (yellow) lights should be used wherever possible.	Construction/Operational Phase	Project Manager Environmental Officer	Light pollution and period of light.	Ongoing
Anti-perching devices must be installed on overhead powerlines	Operational Phase	Project Manager Environmental Officer	Pied Crow Density	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
Management outcome: Invasive Alien Species				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Compilation of and implementation of an Invasive Alien Plant Management Plan	Life of Operation	Project Manager Environmental Officer	Assess presence and encroachment of alien vegetation	Quarterly monitoring
A pest control plan must be put in place and implemented; it is imperative that poisons not be used due to the presence of indigenous fauna.	Life of Operation	Environmental Officer Health and Safety Officer	Evidence or presence of pests	Ongoing
Management outcome: Dust				
Impact Management Actions	Implementation		Monitoring	

	Phase	Responsible Party	Aspect	Frequency
Reducing the dust generated by construction activities, especially the earth moving machinery, through wetting the soil surface (with "dirty water") and putting up signs to enforce speed limit as well as speed. It is recommended that a wind fence be constructed to prevent excessive dust pollution.	Construction Phase	Project Manager Environmental Officer	Dust pollution levels	Ongoing
Topsoil and construction stockpiles must be kept covered with a suitable material or be bordered by sheets to impede or prevent dust pollution into surrounding vegetation.	Construction Phase	Project Manager Environmental Officer	Dust pollution levels	Ongoing
Management outcome: Waste Management				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Waste management must be a priority and all waste must be collected and stored adequately. Refuse bins must be secured. Temporary storage of domestic waste shall be in covered waste skips.	Life of Operation	Environmental Officer Health and Safety Officer	Presence of waste	Life of operation
The ratio of toilets to staff must be provided as per the requirements in the Health and Safety Act. Portable toilets must be pumped dry to ensure the system does not degrade over time and spill into the surrounding area.	Life of Operation	Environmental Officer Health and Safety Officer	Number of toilets per staff member. Waste levels	Daily
Refuse bins must be secured. Temporary storage of domestic waste shall be in covered waste skips. Maximum domestic waste storage period will be 10 days.	Life of Operation	Environmental Officer Contractor Health and Safety Officer	Management of bins and collection of waste	Ongoing, every 10 days
All solid waste collected shall be disposed of at a licensed disposal facility. Under no circumstances may domestic waste be burned on site	Life of Operation	Environmental Officer Health and Safety Officer	Availability of bins and the collection of the waste.	Ongoing
Management outcome: Environmental awareness training				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the project area to inform contractors and site staff on the importance, biology, habitat requirements and management requirements of the Environmental Authorisation.	Life of Operation	Health and Safety Officer Environmental Officer	Compliance to the training.	Ongoing
Management outcome: Erosion				
Impact Management Actions	Implementation		Monitoring	

	Phase	Responsible Party	Aspect	Frequency
An Erosion Management Plan must be developed and implemented.	Life of Operation	Project Manager Design Engineer Environmental Officer	Erosion	Ongoing
Appropriate drainage must be constructed along the access roads in order to slow the flow of water run-off from the road surface.	Operational	Project Manager Design Engineer	Water runoff from road surfaces	Ongoing
Areas that are denuded during construction that do not have infrastructure during the operational phase must be re-vegetated with indigenous vegetation to prevent erosion.	Operational	Project Manager Environmental Officer	Re-establishment of indigenous vegetation	Quarterly for the first 2 years. Thereafter, annually for the life of the project
All areas affected by the development must be re-vegetated with indigenous vegetation to prevent erosion on an extensive temporal scale.	Life of Operation	Project Manager Environmental Officer	Re-establishment of indigenous vegetation	Quarterly for 3 years after decommissioning
Management outcome: BESS Heat radiation				
The BESS must be placed in a structure with non reflective surfaces after being insulated	Operational	Project Manager Design Engineer	Heat radiation	Ongoing
Management outcome: Avifauna Collisions and Electrocutions				
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;	Life of operation	Project Manager Environmental Officer	Bird collisions.	Life of operation
The design of the proposed grid lines must be of a type or similar structure as endorsed by the Eskom-EWT Strategic Partnership on Birds and Energy, considering the mitigation guidelines recommended by Birdlife South Africa (Jenkins *et al.,* 2015).	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

6 Conclusion and Impact Statement

6.1 Conclusion

The PAOI overlaps with a CBA2, ESA1 and ESA2 classified area, a CR river transverse the area and a portion is classified as a NPAES focus area.Based on this desktop information, the project components only interact with designated ESA areas, with the proximal river and wetland systems not being traversed.

During the field assessment two flora SCCs were recorded *Vachellia erioloba* that is protected under the National Forests Act, 1998 (ACT No 84 of 1998). and *Ammocharis coranica* that is provincially protected. From a fauna and avifauna perspective no SCCs were recorded, however twelve SCCs were given a high likelihood of occurrence. Four habitats were identified namely *Vachellia - Searsia* Shrubland, *Tarchonanthus - Vachellia* Shrubland, Water resources and Transformed areas. The two shrubland habitats had a “Moderate” sensitivity, while the Water Resources were given a “Very High” sensitivity and the transformed in turn a “Very Low” sensitivity. Majority of the PAOI was found to be of a “moderate” sensitivity which differs to that of the screening tool.

The main impacts in this study was the loss of habitat, the risk of displacement/death of fauna, collision risk and electrocution risk. Should the mitigations be implemented the overall impacts can be reduced to a Low- Moderate level. Two OHPL alternatives were assessed to evacuate power to the Mokodi SS and both with mitigations implemented can be reduced to Low - Moderate level. With regards to the alternatives provided, the OHPL alternative 2 is the preferred option from an ecological perspective as it follows an already disturbed route (next to the road) and is likely to mostly avoid more sensitive habitats. The substations, BESS and laydown areas will all have a similar impact level and no preferred option was identified.

6.2 Impact Statement

The main expected impacts of the proposed gridline will include the following:

- Habitat loss and fragmentation;
- Displacement and death of fauna;
- Electrocutions; and
- Collisions.

Mitigation measures as described in this report can be implemented to reduce the significance of the risk to an acceptable residual risk level. Considering the above-mentioned information, it is the opinion of the specialist that the project may be favourably considered, on condition that all the mitigation provided in this report are implemented.

7 References

ADU (Animal Demography Unit). (2022). ReptileMap – Virtual Museum. http://vmus.adu.org.za/

Alexander, G. & Marais, J. (2007). A guide to the Reptiles of Southern Africa. Struik, Cape Town.

Bates, M.F., Branch, W.R., Bauer, A.M., Burger, M., Marais, J., Alexander, G.J & de Villiers, M.S. (Eds). (2014). Atlas and Red List of Reptiles of South Africa, Lesotho and Swaziland. Suricata 1. South African Biodiversity Institute, Pretoria.

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.

David Hoare Consulting cc (2016a). Ecological study on the potential impacts of the proposed BioTherm Sendawo Project 1 Solar 75MW Solar PV Energy Facility near Vryburg in the North West Province.. May 2016;

David Hoare Consulting cc (2016b). Ecological study on the potential impacts of the proposed BioTherm Sendawo power line and substation near Vryburg in the North West Province. David Hoare Consulting cc. March 2016;

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). 2021a. 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. Renewable Energy EIA Application Database. http://egis.environment.gov.za.

Driver, A., Nel, J.L., Snaddon, K., Murray, K., Roux, D.J., Hill, L., Swartz, E.R., Manuel, J. & Funke, N. (2011). Implementation Manual for Freshwater Ecosystem Priority Areas. Report to the Water Research Commission, Pretoria.

Du Preez, L. & Carruthers, V. (2009). A Complete Guide to the Frogs of Southern Africa. Struik Nature, Cape Town.

Fish, L., Mashau, A.C., Moeaha, M.J. & Nembudani, M.T. (2015). Identification Guide to Southern African Grasses: An Identification Manual with Keys, Descriptions, and Distributions. SANBI, Pretoria.

Goff, F., Dawson, G., & Rochow, J. (1982). Site examination for threatened and endangered plant species. *Environmental Management, 6*(4), 307-316.

Griffiths, C., Day, J. & Picker, M. (2016). Freshwater Life: A Field Guide to the Plants and Animals of Southern Africa. Struik Nature, Cape Town.

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.

IUCN. (2017). The IUCN Red List of Threatened Species. www.iucnredlist.org (Accessed: March 2021).

Johnson, S. & Bytebier, B. (2015). Orchids of South Africa: A Field Guide. Struik publishers, Cape Town.

Le Maitre, D.C., Seyler, H., Holland, M., Smith-Adao, L.B., Nel, J.L., Maherry, A. & Witthüser. K. 2018. Identification, Delineation and Importance of the Strategic Water Source Areas of South Africa, Lesotho and Swaziland for Surface Water and Groundwater. WRC Report No TT 754/1/18, Water Research Commission, Pretoria.

Marais, J. 2004. A Complete Guide to the Snakes of Southern Africa. Struik Nature, Cape Town.

Measey, G.J. (2011). Ensuring a Future for South Africa's Frogs: A Strategy for Conservation Research. South African National Biodiversity Institute, Pretoria.

Minter, L., Burger, M., Harrison, J.A. & Kloepfer, D. (2004). Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland. Smithsonian Institute Avian Demography Unit, Washington; Cape Town.

Mucina, L. & Rutherford, M.C. (Eds.). (2006). The vegetation of South Africa, Lesotho and Swaziland. Strelizia 19. South African National Biodiversity Institute, Pretoria South African.

Nel, J. L., Driver, A., Strydom, W. F., Maherry, A. M., Petersen, C. P., Hill, L., Roux, D. J., Nienaber, S., van Deventer, H., Swartz, E. R. & Smith-Adao, L. B. (2011). Atlas of Freshwater

Ecosystem Priority Areas in South Africa: Maps to support sustainable development of water resources, WRC Report No. TT 500/11. Water Research Commission, Pretoria.

NPAES. (2021). National Protected Areas Expansion Strategy. www.environment.gov.za

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.

POSA. 2016. Plants of South Africa - an online checklist. POSA ver. 3.0. http://newposa.sanbi.org/.

Raimondo, D., von Staden, L., Foden, W., Victor, J.E., Helme, N.A., Turner, R.C., Kamundi, D.A. and Manyama, P.A. 2009. Red List of South African Plants. Strelitzia 25. 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.

Skinner, J.D. & Chimimba, C.T. (2005). The Mammals of the Southern African Subregion (New Edition). Cambridge University Press, South Africa.

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). 2020. Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa. South African National Biodiversity Institute, Pretoria. Version 1.2020.

Stuart, C and Stuart, M. A. 2013. Field guide to the tracks & signs of Southern, Central & East African Wildlife. Penguin Random House, Cape Town.

Stuart, C & Stuart, M. A. 2015. Stuarts' Field Guide to Mammals of Southern Africa including Angola, Zambia & Malawi. Struik Nature, Cape Town.

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.

Van Rooyen (2016a). Bird impact assessment study. Proposed Sendawo Solar Photovoltaic (PV) Project 1 near Vryburg in the North-West Province. May 2015. Chris van Rooyen Consulting; and

Van Rooyen (2016b). Bird impact assessment study. Grid connection for the proposed three phase 225 MW Sendawo Solar Photovoltaic (PV) Plant near Vryburg in the North West Province. February 2016. Chris van Rooyen Consulting.

Van Deventer H, Smith-Adao L, Collins NB, Grenfell M, Grundling A, Grundling P-L, Impson D, Job N, Lötter M, Ollis D, Petersen C, Scherman P, Sieben E, Snaddon K, Tererai F. and Van der Colff D. 2019. *South African National Biodiversity Assessment 2018: Technical Report.* Volume 2b: Inland Aquatic (Freshwater) Realm. CSIR report number CSIR/NRE/ECOS/IR/2019/0004/A. South African National Biodiversity Institute, Pretoria. http://hdl.handle.net/20.500.12143/6230.

Van Oudtshoorn, F. (2004). Guide to the Grasses of Southern Africa. Second Edition. Briza Publikasies, Pretoria.

8 Appendix Items

8.1 Appendix A – Flora species expected to occur in the PAOI

Family	Taxon	Author	IUCN	Ecology
Euphorbiaceae	*Acalypha segetalis*	Mull.Arg.	LC	Indigenous
Pteridaceae	*Actiniopteris radiata*	(J.Koenig ex Sw.) Link	LC	Indigenous
Amaranthaceae	*Aerva leucura*	Moq.	LC	Indigenous
Cyperaceae	*Afroscirpoides dioeca*	(Kunth) Garcia-Madr.		Indigenous
Anacampserotaceae	*Anacampseros filamentosa subsp. filamentosa*	(Haw.) Sims		Indigenous; Endemic
Poaceae	*Andropogon schirensis*	Hochst. ex A.Rich.	LC	Indigenous
Poaceae	*Anthephora pubescens*	Nees	LC	Indigenous
Rubiaceae	*Anthospermum rigidum subsp. rigidum*	Eckl. & Zeyh.	LC	Indigenous
Scrophulariaceae	*Aptosimum albomarginatum*	Marloth & Engl.	LC	Indigenous
Scrophulariaceae	*Aptosimum elongatum*	(Hiern) Engl.	LC	Indigenous
Asteraceae	*Arctotis arctotoides*	(L.f.) O.Hoffm.	LC	Indigenous
Asteraceae	*Arctotis venusta*	Norl.	LC	Indigenous
Poaceae	*Aristida bipartita*	(Nees) Trin. & Rupr.	LC	Indigenous
Poaceae	*Aristida canescens subsp. canescens*	Henrard	LC	Indigenous
Poaceae	*Aristida congesta subsp. barbicollis*	Roem. & Schult.	LC	Indigenous
Poaceae	*Aristida congesta subsp. congesta*	Roem. & Schult.	LC	Indigenous
Poaceae	*Aristida meridionalis*	Henrard	LC	Indigenous
Poaceae	*Aristida stipitata subsp. graciliflora*	Hack.	LC	Indigenous
Poaceae	*Aristida vestita*	Thunb.	LC	Indigenous
Asparagaceae	*Asparagus setaceus*	(Kunth) Jessop	LC	Indigenous
Asparagaceae	*Asparagus suaveolens*	Burch.	LC	Indigenous
Iridaceae	*Babiana bainesii*	Baker	LC	Indigenous
Acanthaceae	*Barleria macrostegia*	Nees	LC	Indigenous
Apiaceae	*Berula thunbergii*	(DC.) H.Wolff	LC	Indigenous
Acanthaceae	*Blepharis integrifolia var. integrifolia*	(L.f.) E.Mey. ex Schinz	LC	Indigenous
Capparaceae	*Boscia foetida subsp. minima*	Schinz	LC	Indigenous
Poaceae	*Brachiaria brizantha*	(A.Rich.) Stapf	LC	Indigenous
Poaceae	*Brachiaria deflexa*	(Schumach.) C.E.Hubb. ex Robyns	LC	Indigenous
Poaceae	*Brachiaria marlothii*	(Hack.) Stent	LC	Indigenous
Poaceae	*Brachiaria nigropedata*	(Ficalho & Hiern) Stapf	LC	Indigenous
Asphodelaceae	*Bulbine abyssinica*	A.Rich.	LC	Indigenous
Cyperaceae	*Bulbostylis burchellii*	(Ficalho & Hiern) C.B.Clarke	LC	Indigenous
Pteridaceae	*Cheilanthes dolomiticola*	(Schelpe) Schelpe & N.C.Anthony	LC	Indigenous; Endemic
Pteridaceae	*Cheilanthes hirta var. brevipilosa*	Sw.	LC	Indigenous

Pteridaceae	*Cheilanthes hirta var. hirta*	Sw.	LC	Indigenous
Agavaceae	*Chlorophytum fasciculatum*	(Baker) Kativu	LC	Indigenous
Asteraceae	*Chrysocoma obtusata*	(Thunb.) Ehr.Bayer	LC	Indigenous
Poaceae	*Chrysopogon serrulatus*	Trin.	LC	Indigenous
Asteraceae	*Cineraria vallis-pacis*	Dinter ex Merxm.	LC	Indigenous
Cleomaceae	*Cleome angustifolia subsp. petersiana*	Forssk.	LC	Indigenous
Colchicaceae	*Colchicum burkei*	(Baker) J.C.Manning & Vinn.	LC	Indigenous
Colchicaceae	*Colchicum melanthioides subsp. melanthioides*	(Willd.) J.C.Manning & Vinn.	LC	Indigenous
Commelinaceae	*Commelina livingstonii*	C.B.Clarke	LC	Indigenous
Nyctaginaceae	*Commicarpus pentandrus*	(Burch.) Heimerl	LC	Indigenous
Burseraceae	*Commiphora glandulosa*	Schinz	LC	Indigenous
Burseraceae	*Commiphora pyracanthoides*	Engl.	LC	Indigenous
Convolvulaceae	*Convolvulus ocellatus*	Hook.		Indigenous
Convolvulaceae	*Convolvulus sagittatus*	Thunb.	LC	Indigenous
Acanthaceae	*Crabbea angustifolia*	Nees	LC	Indigenous; Endemic
Apiaceae	*Cyclospermum leptophyllum*	(Pers.) Sprague ex Britton & P.Wilson		Not indigenous; Naturalised
Poaceae	*Cymbopogon pospischilii*	(K.Schum.) C.E.Hubb.	NE	Indigenous
Cyperaceae	*Cyperus atriceps*	(Kuk.) C.Archer & Goetgh.	LC	Indigenous
Cyperaceae	*Cyperus bellus*	Kunth	LC	Indigenous
Cyperaceae	*Cyperus marginatus*	Thunb.	LC	Indigenous
Cyperaceae	*Cyperus sphaerospermus*	Schrad.	LC	Indigenous
Asteraceae	*Dicoma anomala subsp. gerrardii*	Sond.	LC	Indigenous
Asteraceae	*Dicoma macrocephala*	DC.	LC	Indigenous
Pottiaceae	*Didymodon tophaceus*	(Brid.) Lisa		Indigenous
Poaceae	*Digitaria eriantha*	Steud.	LC	Indigenous
Poaceae	*Diheteropogon amplectens var. amplectens*	(Nees) Clayton	LC	Indigenous
Ebenaceae	*Diospyros lycioides subsp. lycioides*	Desf.	LC	Indigenous
Hyacinthaceae	*Dipcadi viride*	(L.) Moench	LC	Indigenous
Acanthaceae	*Dyschoriste transvaalensis*	C.B.Clarke	LC	Indigenous
Boraginaceae	*Ehretia alba*	Retief & A.E.van Wyk	LC	Indigenous
Poaceae	*Elionurus muticus*	(Spreng.) Kunth	LC	Indigenous
Poaceae	*Enneapogon scoparius*	Stapf	LC	Indigenous
Poaceae	*Eragrostis barrelieri*	Daveau	NE	Not indigenous; Naturalised
Poaceae	*Eragrostis bicolor*	Nees	LC	Indigenous
Poaceae	*Eragrostis chloromelas*	Steud.	LC	Indigenous
Poaceae	*Eragrostis curvula*	(Schrad.) Nees	LC	Indigenous
Poaceae	*Eragrostis echinochloidea*	Stapf	LC	Indigenous
Poaceae	*Eragrostis gummiflua*	Nees	LC	Indigenous
Poaceae	*Eragrostis homomalla*	Nees	LC	Indigenous

Poaceae	*Eragrostis lehmanniana var. lehmanniana*	Nees	LC	Indigenous
Poaceae	*Eragrostis nindensis*	Ficalho & Hiern	LC	Indigenous
Poaceae	*Eragrostis pseudobtusa*	De Winter	NE	Indigenous; Endemic
Poaceae	*Eragrostis rigidior*	Pilg.	LC	Indigenous
Poaceae	*Eragrostis sp.*			
Poaceae	*Eragrostis superba*	Peyr.	LC	Indigenous
Poaceae	*Eragrostis truncata*	Hack.	LC	Indigenous
Euphorbiaceae	*Euphorbia inaequilatera*	Sond.	LC	Indigenous
Euphorbiaceae	*Euphorbia pseudotuberosa*	Pax	LC	Indigenous
Euphorbiaceae	*Euphorbia spartaria*	N.E.Br.	LC	Indigenous
Convolvulaceae	*Evolvulus alsinoides*	(L.) L.	LC	Indigenous
Asteraceae	*Felicia muricata subsp. muricata*	(Thunb.) Nees	LC	Indigenous
Poaceae	*Fingerhuthia africana*	Lehm.	LC	Indigenous
Asteraceae	*Geigeria ornativa subsp. ornativa*	O.Hoffm.	LC	Indigenous
Iridaceae	*Gladiolus permeabilis subsp. edulis*	D.Delaroche	LC	Indigenous
Fabaceae	*Gleditsia triacanthos*	L.	NE	Not indigenous; Naturalised; Invasive
Apocynaceae	*Gomphocarpus tomentosus subsp. tomentosus*	Burch.	LC	Indigenous
Amaranthaceae	*Gomphrena celosioides*	Mart.		Not indigenous; Naturalised
Malvaceae	*Grewia flava*	DC.	LC	Indigenous
Asteraceae	*Helichrysum argyrosphaerum*	DC.	LC	Indigenous
Boraginaceae	*Heliotropium nelsonii*	C.H.Wright	LC	Indigenous
Boraginaceae	*Heliotropium ovalifolium*	Forssk.	LC	Indigenous
Malvaceae	*Hermannia bicolor*	Engl. & Dinter	LC	Indigenous
Malvaceae	*Hermannia eenii*	Baker f.	LC	Indigenous
Malvaceae	*Hermannia quartiniana*	A.Rich.	LC	Indigenous
Malvaceae	*Hermannia sp.*			
Amaranthaceae	*Hermbstaedtia fleckii*	(Schinz) Baker & C.B.Clarke	LC	Indigenous
Amaranthaceae	*Hermbstaedtia odorata*	(Burch.) T.Cooke	LC	Indigenous
Amaranthaceae	*Hermbstaedtia odorata var. odorata*	(Burch.) T.Cooke	NE	Indigenous
Poaceae	*Heteropogon contortus*	(L.) Roem. & Schult.	LC	Indigenous
Malvaceae	*Hibiscus marlothianus*	K.Schum.	LC	Indigenous; Endemic
Malvaceae	*Hibiscus pusillus*	Thunb.	LC	Indigenous
Malvaceae	*Hibiscus trionum*	L.		Not indigenous; Naturalised
Poaceae	*Hyparrhenia hirta*	(L.) Stapf	LC	Indigenous
Fabaceae	*Indigastrum costatum subsp. macrum*	(Guill. & Perr.) Schrire	LC	Indigenous
Fabaceae	*Indigofera cryptantha var. cryptantha*	Benth. ex Harv.	LC	Indigenous
Fabaceae	*Indigofera heterotricha*	DC.	LC	Indigenous
Fabaceae	*Indigofera sessilifolia*	DC.	LC	Indigenous
Convolvulaceae	*Ipomoea bolusiana*	Schinz	LC	Indigenous

Convolvulaceae	*Ipomoea obscura var. obscura*	(L.) Ker Gawl.	LC	Indigenous
Convolvulaceae	*Ipomoea oenotheroides*	(L.f.) Raf. ex Hallier f.	LC	Indigenous
Cyperaceae	*Isolepis sp.*			
Scrophulariaceae	*Jamesbrittenia atropurpurea*	(Benth.) Hilliard		Indigenous
Scrophulariaceae	*Jamesbrittenia atropurpurea subsp. pubescens*	(Benth.) Hilliard	LC	Indigenous
Scrophulariaceae	*Jamesbrittenia aurantiaca*	(Burch.) Hilliard	LC	Indigenous
Scrophulariaceae	*Jamesbrittenia integerrima*	(Benth.) Hilliard	LC	Indigenous
Scrophulariaceae	*Jamesbrittenia sp.*			
Juncaceae	*Juncus exsertus*	Buchenau	LC	Indigenous
Acanthaceae	*Justicia divaricata*	Licht. ex Roem. & Schult.		Indigenous
Rubiaceae	*Kohautia cynanchica*	DC.	LC	Indigenous
Cyperaceae	*Kyllinga alba*	Nees	LC	Indigenous
Cyperaceae	*Kyllinga erecta var. erecta*	Schumach.	LC	Indigenous
Verbenaceae	*Lantana rugosa*	Thunb.	LC	Indigenous
Asteraceae	*Lasiopogon muscoides*	(Desf.) DC.	LC	Indigenous
Thymelaeaceae	*Lasiosiphon burchellii*	Meisn.	LC	Indigenous
Poaceae	*Leptochloa fusca*	(L.) Kunth	LC	Indigenous
Limeaceae	*Limeum viscosum subsp. viscosum*	(J.Gay) Fenzl	NE	Indigenous
Scrophulariaceae	*Limosella sp.*			
Verbenaceae	*Lippia scaberrima*	Sond.	LC	Indigenous
Boraginaceae	*Lithospermum cinereum*	A.DC.	LC	Indigenous
Lobeliaceae	*Lobelia erinus*	L.	LC	Indigenous
Lobeliaceae	*Lobelia thermalis*	Thunb.	LC	Indigenous
Malvaceae	*Melhania prostrata*	DC.	LC	Indigenous
Poaceae	*Melinis repens subsp. repens*	(Willd.) Zizka	LC	Indigenous
Oleaceae	*Menodora africana*	Hook.	LC	Indigenous
Iridaceae	*Moraea polystachya*	(Thunb.) Ker Gawl.	LC	Indigenous
Scrophulariaceae	*Nemesia lilacina*	N.E.Br.	LC	Indigenous
Asteraceae	*Nolletia ciliaris*	(DC.) Steetz	LC	Indigenous
Ophioglossaceae	*Ophioglossum polyphyllum var. polyphyllum*	A.Braun	LC	Indigenous
Asteraceae	*Osteospermum muricatum subsp. muricatum*	E.Mey. ex DC.	LC	Indigenous
Asteraceae	*Osteospermum scariosum var. scariosum*	DC.	NE	Indigenous
Fabaceae	*Otoptera burchellii*	DC.	LC	Indigenous
Polygonaceae	*Oxygonum alatum var. alatum*	Burch.	LC	Indigenous
Poaceae	*Panicum coloratum*	L.	LC	Indigenous
Poaceae	*Panicum maximum*	Jacq.	LC	Indigenous
Poaceae	*Panicum stapfianum*	Fourc.	LC	Indigenous

Scrophulariaceae	*Peliostomum leucorrhizum*	E.Mey. ex Benth.	LC	Indigenous
Pteridaceae	*Pellaea calomelanos*	(Sw.) Link		Indigenous
Pteridaceae	*Pellaea calomelanos var. calomelanos*	(Sw.) Link	LC	Indigenous
Apocynaceae	*Pentarrhinum insipidum*	E.Mey.	LC	Indigenous
Asteraceae	*Pentzia calcarea*	Kies	LC	Indigenous
Asteraceae	*Pentzia stellata*	(P.P.J.Herman) Magee		Indigenous; Endemic
Phyllanthaceae	*Phyllanthus incurvus*	Thunb.	LC	Indigenous
Poaceae	*Pogonarthria squarrosa*	(Roem. & Schult.) Pilg.	LC	Indigenous
Caryophyllaceae	*Pollichia campestris*	Aiton	LC	Indigenous
Caryophyllaceae	*Pollichia sp.*			
Poaceae	*Polypogon monspeliensis*	(L.) Desf.	NE	Not indigenous; Naturalised
Aizoaceae	*Prepodesma orpenii*	(N.E.Br.) N.E.Br.	LC	Indigenous; Endemic
Asteraceae	*Pseudognaphalium luteoalbum*	(L.) Hilliard & B.L.Burtt	LC	Cryptogenic
Fabaceae	*Rhynchosia confusa*	Burtt Davy	NE	Indigenous
Fabaceae	*Rhynchosia totta var. totta*	(Thunb.) DC.	LC	Indigenous
Ricciaceae	*Riccia argenteolimbata*	O.H.Volk & Perold		Indigenous
Acanthaceae	*Ruelliopsis setosa*	(Nees) C.B.Clarke	LC	Indigenous
Aizoaceae	*Ruschia sp.*			
Lamiaceae	*Salvia disermas*	L.	LC	Indigenous
Lamiaceae	*Salvia radula*	Benth.	LC	Indigenous
Lamiaceae	*Salvia repens var. transvaalensis*	Burch. ex Benth.	LC	Indigenous
Lamiaceae	*Salvia stenophylla*	Burch. ex Benth.		Indigenous
Poaceae	*Schizachyrium sanguineum*	(Retz.) Alston	LC	Indigenous
Poaceae	*Schmidtia pappophoroides*	Steud.	LC	Indigenous
Anacardiaceae	*Searsia ciliata*	(Licht. ex Schult.) A.J.Mill.	LC	Indigenous
Anacardiaceae	*Searsia leptodictya forma leptodictya*	(Diels) T.S.Yi, A.J.Mill. & J.Wen	NE	Indigenous
Anacardiaceae	*Searsia pyroides var. pyroides*	(Burch.) Moffett	LC	Indigenous
Gentianaceae	*Sebaea pentandra var. pentandra*	E.Mey.	LC	Indigenous
Convolvulaceae	*Seddera suffruticosa*	(Schinz) Hallier f.	LC	Indigenous
Scrophulariaceae	*Selago albomarginata*	Hilliard	LC	Indigenous
Scrophulariaceae	*Selago mixta*	Hilliard	LC	Indigenous; Endemic
Fabaceae	*Senna italica subsp. arachoides*	Mill.	LC	Indigenous
Pedaliaceae	*Sesamum triphyllum var. triphyllum*	Welw. ex Asch.	LC	Indigenous
Malvaceae	*Sida chrysantha*	Ulbr.	LC	Indigenous
Solanaceae	*Solanum catombelense*	Peyr.	LC	Indigenous
Solanaceae	*Solanum tomentosum*	L.		Indigenous
Poaceae	*Sporobolus fimbriatus*	(Trin.) Nees	LC	Indigenous
Lamiaceae	*Stachys spathulata*	Burch. ex Benth.	LC	Indigenous

Poaceae	*Stipagrostis uniplumis var. neesii*	(Licht.) De Winter	LC	Indigenous
Asteraceae	*Symphyotrichum squamatum*	(Spreng.) G.L.Nesom		Not indigenous; Naturalised; Invasive
Pottiaceae	*Syntrichia ammonsiana*	(H.A.Crum & L.E.Anderson) Ochyra		Indigenous
Asteraceae	*Tarchonanthus camphoratus*	L.	LC	Indigenous
Lamiaceae	*Teucrium trifidum*	Retz.	LC	Indigenous
Poaceae	*Themeda triandra*	Forssk.	LC	Indigenous
Santalaceae	*Thesium resedoides*	A.W.Hill	LC	Indigenous
Asphodelaceae	*Trachyandra laxa var. rigida*	(N.E.Br.) Oberm.	LC	Indigenous
Asphodelaceae	*Trachyandra saltii var. saltii*	(Baker) Oberm.	LC	Indigenous
Boraginaceae	*Trichodesma angustifolium subsp. angustifolium*	Harv.	LC	Indigenous
Poaceae	*Trichoneura grandiglumis*	(Nees) Ekman	LC	Indigenous
Poaceae	*Triraphis andropogonoides*	(Steud.) E.Phillips	LC	Indigenous
Poaceae	*Urochloa panicoides*	P.Beauv.	LC	Indigenous
Fabaceae	*Vachellia karroo*	(Hayne) Banfi & Galasso	LC	Indigenous
Fabaceae	*Vachellia robusta subsp. robusta*	(Burch.) Kyal. & Boatwr.	LC	Indigenous
Vahliaceae	*Vahlia capensis subsp. vulgaris*	(L.f.) Thunb.	NE	Indigenous
Verbenaceae	*Verbena officinalis*	L.		Not indigenous; Naturalised
Asteraceae	*Verbesina encelioides subsp. encelioides*	(Cav.) Benth. & Hook.f. ex A.Gray		Not indigenous; Naturalised; Invasive
Plantaginaceae	*Veronica anagallis-aquatica*	L.	LC	Indigenous
Campanulaceae	*Wahlenbergia denticulata var. denticulata*	(Burch.) A.DC.	LC	Indigenous
Campanulaceae	*Wahlenbergia undulata*	(L.f.) A.DC.	LC	Indigenous
Convolvulaceae	*Xenostegia tridentata subsp. angustifolia*	(L.) D.F.Austin & Staples	LC	Indigenous
Fabaceae	*Zornia milneana*	Mohlenbr.	LC	Indigenous

8.2 Appendix B – Amphibian species expected to occur in the PAOI

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Amietia delalandii	Delalande's River Frog	LC	Unlisted
Amietia fuscigula	Cape River Frog	LC	LC
Breviceps adspersus	Bushveld Rain Frog	LC	LC
Cacosternum boettgeri	Common Caco	LC	LC
Kassina senegalensis	Bubbling Kassina	LC	LC
Phrynomantis bifasciatus	Banded Rubber Frog	LC	LC
Pyxicephalus adspersus	Giant Bullfrog	NT	LC
Schismaderma carens	African Red Toad	LC	LC
Sclerophrys capensis	Raucous Toad	LC	LC
Sclerophrys garmani	Olive Toad	LC	LC

Sclerophrys gutturalis	Guttural Toad	LC	LC
Sclerophrys poweri	Power's Toad	LC	LC
Tomopterna cryptotis	Tremelo Sand Frog	LC	LC
Tomopterna tandyi	Tandy's Sand Frog	LC	LC
Vandijkophrynus gariepensis gariepensis	Karoo Toad	Not listed	Not listed
Xenopus laevis	Common Platanna	LC	LC

8.3 Appendix C – Reptile species expected to occur in the PAOI

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Acontias gracilicauda	Thin-tailed Legless Skink	LC	LC
Acontias occidentalis	Savanna Legless Skink	LC	Unlisted
Acontias percivali	Percival's legless lizard	Unlisted	LC
Afrotyphlops schlegelii	Schlegel's Beaked Blind Snake	LC	Unlisted
Aparallactus capensis	Black-headed Centipede-eater	LC	LC
Atractaspis bibronii	Bibron's Stiletto Snake	LC	Unlisted
Bitis arietans arietans	Puff Adder	LC	Unlisted
Boaedon capensis	Brown House Snake	LC	LC
Chamaeleo dilepis	Common Flap-neck Chameleon	LC	LC
Chondrodactylus bibronii	Bibron's Gecko	LC	Unlisted
Dasypeltis scabra	Rhombic Egg-eater	LC	LC
Dispholidus typus	Boomslang	LC	Unlisted
Gerrhosaurus flavigularis	Yellow-throated Plated Lizard	LC	Unlisted
Karusasaurus polyzonus	Southern Karusa Lizard	LC	LC
Leptotyphlops scutifrons scutifrons	Peters' Thread Snake	LC	Unlisted
Lycophidion capense capense	Cape Wolf Snake	LC	Unlisted
Lygodactylus capensis capensis	Common Dwarf Gecko	LC	Unlisted
Monopeltis infuscata	Dusky Worm Lizard	LC	Unlisted
Naja nivea	Cape Cobra	LC	Unlisted
Nucras holubi	Holub's Sandveld Lizard	LC	Unlisted
Nucras intertexta	Spotted Sandveld Lizard	LC	Unlisted
Pachydactylus capensis	Cape Gecko	LC	Unlisted
Panaspis wahlbergi	Wahlberg's Snake-eyed Skink	LC	Unlisted
Pedioplanis namaquensis	Namaqua Sand Lizard	LC	Unlisted
Pelomedusa galeata	South African Marsh Terrapin	Not evaluated	Unlisted
Philothamnus semivariegatus	Spotted Bush Snake	LC	Unlisted
Psammobates oculifer	Serrated Tent Tortoise	LC	Unlisted
Psammophis brevirostris	Short-snouted Grass Snake	LC	Unlisted

Psammophis leightoni	Cape Sand Snake	VU	LC
Psammophylax tritaeniatus	Striped Grass Snake	LC	LC
Pseudaspis cana	Mole Snake	LC	Unlisted
Stigmochelys pardalis	Leopard Tortoise	LC	LC
Trachylepis capensis	Cape Skink	LC	Unlisted
Trachylepis punctatissima	Speckled Rock Skink	LC	LC
Trachylepis varia	Variable Skink	LC	LC
Varanus albigularis albigularis	Southern Rock Monitor	LC	Unlisted
Varanus niloticus	Water Monitor	LC	Unlisted
Zygaspis quadrifrons	Kalahari Dwarf Worm Lizard	LC	Unlisted

8.4 Appendix D – Mammal species expected to occur within the PAOI

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Aethomys ineptus	Tete Veld Rat	LC	LC
Aethomys namaquensis	Namaqua rock rat	LC	LC
Alcelaphus buselaphus	Hartebeest	LC	LC
Antidorcas marsupialis	Springbok	LC	LC
Aonyx capensis	Cape Clawless Otter	NT	NT
Atelerix frontalis	South Africa Hedgehog	NT	NT
Atilax paludinosus	Water Mongoose	LC	LC
Canis mesomelas	Black-backed Jackal	LC	LC
Caracal caracal	Caracal	LC	LC
Ceratotherium simum	White Rhinoceros	NT	NT
Connochaetes taurinus	Blue Wildebeest	LC	LC
Crocidura cyanea	Reddish-grey Musk Shrew	LC	LC
Cynictis penicillata	Yellow Mongoose	LC	LC
Desmodillus auricularis	Short-tailed Gerbil	LC	LC
Diceros bicornis	Black Rhinoceros	EN	EN
Eidolon helvum	African Straw-colored Fruit Bat	LC	LC
Elephantulus myurus	Eastern Rock Sengi	LC	LC
Eptesicus hottentotus	Long-tailed Serotine Bat	LC	LC
Equus quagga	Plains Zebra	LC	LC
Felis nigripes	Black-footed Cat	VU	VU
Felis silvestris	African Wildcat	LC	LC
Genetta genetta	Small-spotted Genet	LC	LC
Gerbilliscus brantsii	Highveld Gerbil	LC	LC
Gerbilliscus leucogaster	Bushveld Gerbil	LC	LC
Gerbillurus paeba	Hairy-footed Gerbil	LC	LC
Herpestes sanguineus	Slender Mongoose	LC	LC
Hystrix africaeaustralis	Cape Porcupine	LC	LC
Ictonyx striatus	Striped Polecat	LC	LC
Lepus capensis	Cape Hare	LC	LC
Lepus saxatilis	Scrub Hare	LC	LC
Lepus victoriae	African Savanna Hare	LC	LC
Malacothrix typica	Gerbil Mouse	LC	LC
Mastomys coucha	Multimammate Mouse	LC	LC
Mellivora capensis	Honey Badger	LC	LC
Mus musculus	House Mouse	Unlisted	Unlisted
Mystromys albicaudatus	White-tailed Rat	VU	VU

Neoromicia capensis	Cape Serotine Bat	LC	LC
Orycteropus afer	Aardvark	LC	LC
Oryx gazella	Gemsbok	LC	LC
Otocyon megalotis	Bat-eared Fox	LC	LC
Panthera pardus	Leopard	VU	VU
Papio ursinus	Chacma Baboon	LC	LC
Parahyaena brunnea	Brown Hyaena	NT	NT
Pedetes capensis	Springhare	LC	LC
Phacochoerus africanus	Common Warthog	LC	LC
Poecilogale albinucha	African Striped Weasel	NT	NT
Procavia capensis	Rock Hyrax	LC	LC
Proteles cristata	Aardwolf	LC	LC
Raphicerus campestris	Steenbok	LC	LC
Rhabdomys pumilio	Xeric Four-striped Mouse	LC	LC
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	LC	LC
Rhinolophus darlingi	Darling's Horseshoe Bat	LC	LC
Rhinolophus denti	Dent's Horseshoe Bat	NT	NT
Saccostomus campestris	Pouched Mouse	LC	LC
Smutsia temminckii	Temminck's Ground Pangolin	VU	VU
Steatomys krebsii	Krebs's Fat Mouse	LC	LC
Suncus varilla	Lesser Dwarf Shrew	LC	LC
Suricata suricatta	Suricate	LC	LC
Sylvicapra grimmia	Common Duiker	LC	LC
Syncerus caffer	African Buffalo	LC	LC
Tadarida aegyptiaca	Egyptian Free-tailed Bat	LC	LC
Tragelaphus oryx	Common Eland	LC	LC
Vulpes chama	Cape Fox	LC	LC
Xerus inauris	Cape Ground Squirrel	LC	LC

8.5 Appendix E – Avifauna expected

Familie Name	Common Name	Species	Regional (SANBI)	Global (IUCN)
Lybiidae	Acacia Pied Barbet	*Tricholaema leucomelas*	Unlisted	Unlisted
Lybiidae	Black-collared Barbet	*Lybius torquatus*	Unlisted	Unlisted
Lybiidae	Crested Barbet	*Trachyphonus vaillantii*	Unlisted	Unlisted
Platysteiridae	Pririt Batis	*Batis pririt*	Unlisted	Unlisted
Meropidae	European Bee-eater	*Merops apiaster*	Unlisted	Unlisted
Meropidae	Little Bee-eater	*Merops pusillus*	Unlisted	Unlisted
Meropidae	Swallow-tailed Bee-eater	*Merops hirundineus*	Unlisted	Unlisted
Ploceidae	Southern Red Bishop	*Euplectes orix*	Unlisted	Unlisted
Ploceidae	Yellow-crowned Bishop	*Euplectes afer*	Unlisted	Unlisted
Pycnonotidae	African Red-eyed Bulbul	*Pycnonotus nigricans*	Unlisted	Unlisted
Emberizidae	Cinnamon-breasted Bunting	*Emberiza tahapisi*	Unlisted	Unlisted
Emberizidae	Golden-breasted Bunting	*Emberiza flaviventris*	Unlisted	Unlisted
Emberizidae	Lark-like Bunting	*Emberiza impetuani*	Unlisted	Unlisted
Otididae	Kori Bustard	*Ardeotis kori*	NT	NT
Turnicidae	Kurrichane Buttonquail	*Turnix sylvaticus*	Unlisted	Unlisted
Accipitridae	Common Buzzard	*Buteo buteo*	Unlisted	Unlisted
Fringillidae	Black-throated Canary	*Crithagra atrogularis*	Unlisted	Unlisted
Fringillidae	Yellow Canary	*Crithagra flaviventris*	Unlisted	Unlisted
Muscicapidae	Ant-eating Chat	*Myrmecocichla formicivora*	Unlisted	Unlisted
Muscicapidae	Familiar Chat	*Oenanthe familiaris*	Unlisted	Unlisted
Cisticolidae	Desert Cisticola	*Cisticola aridulus*	Unlisted	Unlisted
Cisticolidae	Levaillant's Cisticola	*Cisticola tinniens*	Unlisted	Unlisted
Cisticolidae	Rattling Cisticola	*Cisticola chiniana*	Unlisted	Unlisted
Cisticolidae	Tinkling Cisticola	*Cisticola rufilatus*	Unlisted	Unlisted
Cisticolidae	Zitting Cisticola	*Cisticola juncidis*	Unlisted	Unlisted
Rallidae	Red-knobbed Coot	*Fulica cristata*	Unlisted	Unlisted
Phalacrocoracidae	Reed Cormorant	*Microcarbo africanus*	Unlisted	Unlisted
Cuculidae	Burchell's Coucal	*Centropus burchellii*	Unlisted	Unlisted
Glareolidae	Temminck's Courser	*Cursorius temminckii*	Unlisted	Unlisted
Rallidae	Black Crake	*Zapornia flavirostra*	Unlisted	Unlisted
Macrosphenidae	Long-billed Crombec	*Sylvietta rufescens*	Unlisted	Unlisted
Corvidae	Cape Crow	*Corvus capensis*	Unlisted	Unlisted
Corvidae	Pied Crow	*Corvus albus*	Unlisted	Unlisted
Cuculidae	Diederik Cuckoo	*Chrysococcyx caprius*	Unlisted	Unlisted
Cuculidae	Great Spotted Cuckoo	*Clamator glandarius*	Unlisted	Unlisted
Cuculidae	Jacobin Cuckoo	*Clamator jacobinus*	Unlisted	Unlisted
Cuculidae	Klaas's Cuckoo	*Chrysococcyx klaas*	Unlisted	Unlisted

Columbidae	Ring-necked Dove	*Streptopelia capicola*	Unlisted	Unlisted
Columbidae	Laughing Dove	*Spilopelia senegalensis*	Unlisted	Unlisted
Columbidae	Namaqua Dove	*Oena capensis*	Unlisted	Unlisted
Columbidae	Red-eyed Dove	*Streptopelia semitorquata*	Unlisted	Unlisted
Columbidae	Rock Dove	*Columba livia*	Unlisted	Unlisted
Dicruridae	Fork-tailed Drongo	*Dicrurus adsimilis*	Unlisted	Unlisted
Anatidae	Maccoa Duck	*Oxyura maccoa*	NT	EN
Anatidae	White-faced Whistling Duck	*Dendrocygna viduata*	Unlisted	Unlisted
Anatidae	Yellow-billed Duck	*Anas undulata*	Unlisted	Unlisted
Accipitridae	African Fish Eagle	*Haliaeetus vocifer*	Unlisted	Unlisted
Accipitridae	Black-chested Snake Eagle	*Circaetus pectoralis*	Unlisted	Unlisted
Accipitridae	Martial Eagle	*Polemaetus bellicosus*	EN	EN
Strigidae	Spotted Eagle-Owl	*Bubo africanus*	Unlisted	Unlisted
Ardeidae	Little Egret	*Egretta garzetta*	Unlisted	Unlisted
Ardeidae	Western Cattle Egret	*Bubulcus ibis*	Unlisted	Unlisted
Cisticolidae	Yellow-bellied Eremomela	*Eremomela icteropygialis*	Unlisted	Unlisted
Falconidae	Amur Falcon	*Falco amurensis*	Unlisted	Unlisted
Falconidae	Lanner Falcon	*Falco biarmicus*	VU	LC
Estriididae	Red-headed Finch	*Amadina erythrocephala*	Unlisted	Unlisted
Estriididae	Jameson's Firefinch	*Lagonosticta rhodopareia*	Unlisted	Unlisted
Estriididae	Red-billed Firefinch	*Lagonosticta senegala*	Unlisted	Unlisted
Laniidae	Southern Fiscal	*Lanius collaris*	Unlisted	Unlisted
Monarchidae	African Paradise Flycatcher	*Terpsiphone viridis*	Unlisted	Unlisted
Muscicapidae	Chat Flycatcher	*Melaenornis infuscatus*	Unlisted	Unlisted
Muscicapidae	Fiscal Flycatcher	*Melaenornis silens*	Unlisted	Unlisted
Muscicapidae	Marico Flycatcher	*Melaenornis mariquensis*	Unlisted	Unlisted
Muscicapidae	Spotted Flycatcher	*Muscicapa striata*	Unlisted	Unlisted
Phasianidae	Orange River Francolin	*Scleroptila gutturalis*	Unlisted	Unlisted
Musophagidae	Grey Go-away-bird	*Corythaixoides concolor*	Unlisted	Unlisted
Anatidae	Egyptian Goose	*Alopochen aegyptiaca*	Unlisted	Unlisted
Anatidae	Spur-winged Goose	*Plectropterus gambensis*	Unlisted	Unlisted
Accipitridae	Gabar Goshawk	*Micronisus gabar*	Unlisted	Unlisted
Accipitridae	Pale Chanting Goshawk	*Melierax canorus*	Unlisted	Unlisted
Podicipedidae	Little Grebe	*Tachybaptus ruficollis*	Unlisted	Unlisted
Numididae	Helmeted Guineafowl	*Numida meleagris*	Unlisted	Unlisted
Laridae	Grey-headed Gull	*Chroicocephalus cirrocephalus*	Unlisted	Unlisted
Accipitridae	African Harrier-Hawk	*Polyboroides typus*	Unlisted	Unlisted
Ardeidae	Black-headed Heron	*Ardea melanocephala*	Unlisted	Unlisted
Ardeidae	Grey Heron	*Ardea cinerea*	Unlisted	Unlisted

Ardeidae	Striated Heron	*Butorides striata*	Unlisted	Unlisted
Indicatoridae	Lesser Honeyguide	*Indicator minor*	Unlisted	Unlisted
Upupidae	African Hoopoe	*Upupa africana*	Unlisted	Unlisted
Bucerotidae	African Grey Hornbill	*Lophoceros nasutus*	Unlisted	Unlisted
Bucerotidae	Southern Yellow-billed Hornbill	*Tockus leucomelas*	Unlisted	Unlisted
Threskiornithidae	African Sacred Ibis	*Threskiornis aethiopicus*	Unlisted	Unlisted
Threskiornithidae	Glossy Ibis	*Plegadis falcinellus*	Unlisted	Unlisted
Threskiornithidae	Hadada Ibis	*Bostrychia hagedash*	Unlisted	Unlisted
Viduidae	Village Indigobird	*Vidua chalybeata*	Unlisted	Unlisted
Falconidae	Greater Kestrel	*Falco rupicoloides*	Unlisted	Unlisted
Falconidae	Lesser Kestrel	*Falco naumanni*	Unlisted	Unlisted
Falconidae	Rock Kestrel	*Falco rupicolus*	Unlisted	Unlisted
Alcedinidae	Brown-hooded Kingfisher	*Halcyon albiventris*	Unlisted	Unlisted
Alcedinidae	Pied Kingfisher	*Ceryle rudis*	Unlisted	Unlisted
Alcedinidae	Woodland Kingfisher	*Halcyon senegalensis*	Unlisted	Unlisted
Accipitridae	Black-winged Kite	*Elanus caeruleus*	Unlisted	Unlisted
Accipitridae	Yellow-billed Kite	*Milvus aegyptius*	Unlisted	Unlisted
Otididae	Northern Black Korhaan	*Afrotis afraoides*	Unlisted	Unlisted
Otididae	Red-crested Korhaan	*Lophotis ruficrista*	Unlisted	Unlisted
Charadriidae	Blacksmith Lapwing	*Vanellus armatus*	Unlisted	Unlisted
Charadriidae	Crowned Lapwing	*Vanellus coronatus*	Unlisted	Unlisted
Alaudidae	Eastern Clapper Lark	*Mirafra fasciolata*	Unlisted	Unlisted
Alaudidae	Fawn-colored Lark	*Calendulauda africanoides*	Unlisted	Unlisted
Alaudidae	Red-capped Lark	*Calandrella cinerea*	Unlisted	Unlisted
Alaudidae	Rufous-naped Lark	*Mirafra africana*	Unlisted	Unlisted
Alaudidae	Sabota Lark	*Calendulauda sabota*	Unlisted	Unlisted
Alaudidae	Spike-heeled Lark	*Chersomanes albofasciata*	Unlisted	Unlisted
Estrildidae	Bronze Mannikin	*Spermestes cucullata*	Unlisted	Unlisted
Hirundinidae	Brown-throated Martin	*Riparia paludicola*	Unlisted	Unlisted
Hirundinidae	Rock Martin	*Ptyonoprogne fuligula*	Unlisted	Unlisted
Rallidae	Common Moorhen	*Gallinula chloropus*	Unlisted	Unlisted
Coliidae	Red-faced Mousebird	*Urocolius indicus*	Unlisted	Unlisted
Coliidae	Speckled Mousebird	*Colius striatus*	Unlisted	Unlisted
Coliidae	White-backed Mousebird	*Colius colius*	Unlisted	Unlisted
Sturnidae	Common Myna	*Acridotheres tristis*	Unlisted	Unlisted
Caprimulgidae	Rufous-cheeked Nightjar	*Caprimulgus rufigena*	Unlisted	Unlisted
Struthionidae	Common Ostrich	*Struthio camelus*	Unlisted	Unlisted
Strigidae	Western Barn Owl	*Tyto alba*	Unlisted	Unlisted
Strigidae	Pearl-spotted Owlet	*Glaucidium perlatum*	Unlisted	Unlisted

Phasianidae	Indian Peafowl	*Pavo cristatus*	Unlisted	Unlisted
Columbidae	Speckled Pigeon	*Columba guinea*	Unlisted	Unlisted
Motacillidae	African Pipit	*Anthus cinnamomeus*	Unlisted	Unlisted
Motacillidae	Buffy Pipit	*Anthus vaalensis*	Unlisted	Unlisted
Motacillidae	Plain-backed Pipit	*Anthus leucophrys*	Unlisted	Unlisted
Charadriidae	Three-banded Plover	*Charadrius tricollaris*	Unlisted	Unlisted
Anatidae	Southern Pochard	*Netta erythrophthalma*	Unlisted	Unlisted
Cisticolidae	Black-chested Prinia	*Prinia flavicans*	Unlisted	Unlisted
Estrildidae	Green-winged Pytilia	*Pytilia melba*	Unlisted	Unlisted
Ploceidae	Red-billed Quelea	*Quelea quelea*	Unlisted	Unlisted
Muscicapidae	Cape Robin-Chat	*Cossypha caffra*	Unlisted	Unlisted
Coraciidae	European Roller	*Coracias garrulus*	NT	LC
Coraciidae	Lilac-breasted Roller	*Coracias caudatus*	Unlisted	Unlisted
Coraciidae	Purple Roller	*Coracias naevius*	Unlisted	Unlisted
Pteroclidae	Burchell's Sandgrouse	*Pterocles burchelli*	Unlisted	Unlisted
Pteroclidae	Namaqua Sandgrouse	*Pterocles namaqua*	Unlisted	Unlisted
Scolopacidae	Common Sandpiper	*Actitis hypoleucos*	Unlisted	Unlisted
Scolopacidae	Marsh Sandpiper	*Tringa stagnatilis*	Unlisted	Unlisted
Phoeniculidae	Common Scimitarbill	*Rhinopomastus cyanomelas*	Unlisted	Unlisted
Muscicapidae	Kalahari Scrub Robin	*Cercotrichas paena*	Unlisted	Unlisted
Malaconotidae	Crimson-breasted Shrike	*Laniarius atrococcineus*	Unlisted	Unlisted
Laniidae	Lesser Grey Shrike	*Lanius minor*	Unlisted	Unlisted
Laniidae	Red-backed Shrike	*Lanius collurio*	Unlisted	Unlisted
Passeridae	Cape Sparrow	*Passer melanurus*	Unlisted	Unlisted
Passeridae	House Sparrow	*Passer domesticus*	Unlisted	Unlisted
Passeridae	Southern Grey-headed Sparrow	*Passer diffusus*	Unlisted	Unlisted
Alaudidae	Grey-backed Sparrow-Lark	*Eremopterix verticalis*	Unlisted	Unlisted
Ploceidae	White-browed Sparrow-Weaver	*Plocepasser mahali*	Unlisted	Unlisted
Phasianidae	Swainson's Spurfowl	*Pternistis swainsonii*	Unlisted	Unlisted
Sturnidae	Cape Starling	*Lamprotornis nitens*	Unlisted	Unlisted
Sturnidae	Wattled Starling	*Creatophora cinerea*	Unlisted	Unlisted
Recurvirostridae	Black-winged Stilt	*Himantopus himantopus*	Unlisted	Unlisted
Muscicapidae	African Stonechat	*Saxicola torquatus*	Unlisted	Unlisted
Ciconiidae	Black Stork	*Ciconia nigra*	VU	LC
Nectariniidae	Marico Sunbird	*Cinnyris mariquensis*	Unlisted	Unlisted
Nectariniidae	White-bellied Sunbird	*Cinnyris talatala*	Unlisted	Unlisted
Hirundinidae	Barn Swallow	*Hirundo rustica*	Unlisted	Unlisted
Hirundinidae	Greater Striped Swallow	*Cecropis cucullata*	Unlisted	Unlisted
Hirundinidae	Red-breasted Swallow	*Cecropis semirufa*	Unlisted	Unlisted

Hirundinidae	South African Cliff Swallow	*Petrochelidon spilodera*	Unlisted	Unlisted
Hirundinidae	White-throated Swallow	*Hirundo albigularis*	Unlisted	Unlisted
Rallidae	African Swamphen	*Porphyrio madagascariensis*	Unlisted	Unlisted
Apodidae	African Black Swift	*Apus barbatus*	Unlisted	Unlisted
Apodidae	African Palm Swift	*Cypsiurus parvus*	Unlisted	Unlisted
Apodidae	Bradfield's Swift	*Apus bradfieldi*	Unlisted	Unlisted
Apodidae	Little Swift	*Apus affinis*	Unlisted	Unlisted
Apodidae	White-rumped Swift	*Apus caffer*	Unlisted	Unlisted
Malaconotidae	Brown-crowned Tchagra	*Tchagra australis*	Unlisted	Unlisted
Anatidae	Cape Teal	*Anas capensis*	Unlisted	Unlisted
Anatidae	Red-billed Teal	*Anas erythrorhyncha*	Unlisted	Unlisted
Burhinidae	Spotted Thick-knee	*Burhinus capensis*	Unlisted	Unlisted
Turdidae	Groundscraper Thrush	*Turdus litsitsirupa*	Unlisted	Unlisted
Turdidae	Karoo Thrush	*Turdus smithi*	Unlisted	Unlisted
Paridae	Ashy Tit	*Melaniparus cinerascens*	Unlisted	Unlisted
Remizidae	Cape Penduline Tit	*Anthoscopus minutus*	Unlisted	Unlisted
Motacillidae	Cape Wagtail	*Motacilla capensis*	Unlisted	Unlisted
Sylviidae	Chestnut-vented Warbler	*Curruca subcoerulea*	Unlisted	Unlisted
Acrocephalidae	Lesser Swamp Warbler	*Acrocephalus gracilirostris*	Unlisted	Unlisted
Phylloscopidae	Willow Warbler	*Phylloscopus trochilus*	Unlisted	Unlisted
Estrildidae	Black-faced Waxbill	*Brunhilda erythronotos*	Unlisted	Unlisted
Estrildidae	Blue Waxbill	*Uraeginthus angolensis*	Unlisted	Unlisted
Estrildidae	Common Waxbill	*Estrilda astrild*	Unlisted	Unlisted
Estrildidae	Violet-eared Waxbill	*Granatina granatina*	Unlisted	Unlisted
Ploceidae	Scaly-feathered Weaver	*Sporopipes squamifrons*	Unlisted	Unlisted
Ploceidae	Southern Masked Weaver	*Ploceus velatus*	Unlisted	Unlisted
Muscicapidae	Capped Wheatear	*Oenanthe pileata*	Unlisted	Unlisted
Zosteropidae	Cape White-eye	*Zosterops virens*	Unlisted	Unlisted
Zosteropidae	Orange River White-eye	*Zosterops pallidus*	Unlisted	Unlisted
Viduidae	Long-tailed Paradise Whydah	*Vidua paradisaea*	Unlisted	Unlisted
Viduidae	Pin-tailed Whydah	*Vidua macroura*	Unlisted	Unlisted
Viduidae	Shaft-tailed Whydah	*Vidua regia*	Unlisted	Unlisted
Ploceidae	Long-tailed Widowbird	*Euplectes progne*	Unlisted	Unlisted
Phoeniculidae	Green Wood Hoopoe	*Phoeniculus purpureus*	Unlisted	Unlisted
Picidae	Cardinal Woodpecker	*Dendropicos fuscescens*	Unlisted	Unlisted
Picidae	Golden-tailed Woodpecker	*Campethera abingoni*	Unlisted	Unlisted
Malaconotidae	Bokmakierie	*Telophorus zeylonus*	Unlisted	Unlisted
Malaconotidae	Brubru	*Nilaus afer*	Unlisted	Unlisted
Scopidae	Hamerkop	*Scopus umbretta*	Unlisted	Unlisted

Cisticolidae	Neddicky	*Cisticola fulvicapilla*	Unlisted	Unlisted
Estrildidae	Quailfinch	*Ortygospiza atricollis*	Unlisted	Unlisted

8.6 Appendix F- Avifauna observed in the point counts

Common Name	Scientific Name	RD (Regional, Global)	Guild	Relative abundance	Frequency (%)
Acacia Pied Barbet	*Tricholaema leucomelas*	Lybiidae	OMD	0,006	6,82
African Sacred Ibis	*Threskiornis aethiopicus*	Threskiornithidae	CGD	0,002	2,27
Barn Swallow	*Hirundo rustica*	Hirundinidae	IAD	0,036	18,18
Black-winged Kite	*Elanus caeruleus*	Accipitridae	CGD	0,004	4,55
Cape Penduline Tit	*Anthoscopus minutus*	Remizidae	IGD	0,012	4,55
Cape Robin-Chat	*Cossypha caffra*	Muscicapidae	OMD	0,002	2,27
Cape Sparrow	*Passer melanurus*	Passeridae	GGD	0,012	6,82
Chestnut-vented Warbler	*Curruca subcoerulea*	Sylviidae	IGD	0,042	38,64
Crowned Lapwing	*Vanellus coronatus*	Charadriidae	IGD	0,006	4,55
Hadada Ibis	*Bostrychia hagedash*	Threskiornithidae	OMD	0,004	2,27
Helmeted Guineafowl	*Numida meleagris*	Numididae	OMD	0,002	2,27
Laughing Dove	*Spilopelia senegalensis*	Columbidae	GGD	0,004	4,55
Little Swift	*Apus affinis*	Apodidae	IAD	0,020	9,09
Long-billed Crombec	*Sylvietta rufescens*	Macrosphenidae	IGD	0,014	11,36
Namaqua Dove	*Oena capensis*	Columbidae	GGD	0,002	2,27
Pied Crow	*Corvus albus*	Corvidae	OMD	0,069	43,18
Ring-necked Dove	*Streptopelia capicola*	Columbidae	GGD	0,047	27,27
Rock Martin	*Ptyonoprogne fuligula*	Hirundinidae	IAD	0,004	4,55
Southern Fiscal	*Lanius collaris*	Laniidae	IAD	0,008	9,09
Southern Grey-headed Sparrow	*Passer diffusus*	Passeridae	GGD	0,010	6,82
Speckled Pigeon	*Columba guinea*	Columbidae	FFD	0,077	11,36
Spotted Thick-knee	*Burhinus capensis*	Burhinidae	OMD	0,004	2,27
Yellow Canary	*Crithagra flaviventris*	Fringillidae	GGD	0,040	18,18
European Bee-eater	*Merops apiaster*	Meropidae	IAD	0,077	25,00
South African Cliff Swallow	*Petrochelidon spilodera*	Hirundinidae	IAD	0,008	4,55
Red-breasted Swallow	*Cecropis semirufa*	Hirundinidae	IAD	0,002	2,27
Rufous-naped Lark	*Mirafra africana*	Alaudidae	IGD	0,018	15,91
Lesser Grey Shrike	*Lanius minor*	Laniidae	IGD	0,012	13,64
Desert Cisticola	*Cisticola aridulus*	Cisticolidae	IGD	0,024	11,36
Northern Black Korhaan	*Afrotis afraoides*	Otididae	IGD	0,008	9,09
Amur Falcon	*Falco amurensis*	Falconidae	CGD	0,008	6,82
Lilac-breasted Roller	*Coracias caudatus*	Coraciidae	IAD	0,002	2,27
Shaft-tailed Whydah	*Vidua regia*	Viduidae	GGD	0,016	4,55
White-browed Sparrow-Weaver	*Plocepasser mahali*	Ploceidae	OMD	0,026	2,27
Red-billed Firefinch	*Lagonosticta senegala*	Estriididae	GGD	0,012	4,55
Black-chested Prinia	*Prinia flavicans*	Cisticolidae	IGD	0,107	68,18
Orange River Francolin	*Scleroptila gutturalis*	Phasianidae	GGD	0,002	2,27
Tinkling Cisticola	*Cisticola rufilatus*	Cisticolidae	IGD	0,034	22,73
Brown-crowned Tchagra	*Tchagra australis*	Malaconotidae	OMD	0,008	9,09

Scaly-feathered Weaver	*Sporopipes squamifrons*	Ploceidae	GGD	0,045	11,36
Black-faced Waxbill	*Brunhilda erythronotos*	Estrildidae	GGD	0,014	6,82
Tawny-flanked Prinia	*Prinia subflava*	Cisticolidae	IGD	0,002	2,27
Violet-eared Waxbill	*Granatina granatina*	Estrildidae	GGD	0,002	2,27
Greater Striped Swallow	*Cecropis cucullata*	Hirundinidae	IAD	0,010	9,09
Blue Waxbill	*Uraeginthus angolensis*	Estrildidae	GGD	0,008	4,55
Crested Barbet	*Trachyphonus vaillantii*	Lybiidae	FFD	0,002	2,27
Common Myna	*Acridotheres tristis*	Sturnidae	OMD	0,008	2,27
White-bellied Sunbird	*Cinnyris talatala*	Nectariniidae	NFD	0,012	6,82
Black-throated Canary	*Crithagra atrogularis*	Fringillidae	OMD	0,016	6,82
Red-billed Quelea	*Quelea quelea*	Ploceidae	GGD	0,073	4,55
Village Indigobird	*Vidua chalybeata*	Viduidae	GGD	0,002	2,27
African Hoopoe	*Upupa africana*	Upupidae	IGD	0,002	2,27
Greater kestrel	*Falco rupicoloides*	Falconidae	CGD	0,002	2,27
Brubru	*Nilaus afer*	Malaconotidae	IGD	0,002	2,27
Red-backed Shrike	*Lanius collurio*	Laniidae	IGD	0,004	4,55
Red-crested Korhaan	*Lophotis ruficrista*	Otididae	IGD	0,010	11,36

8.7 Appendix G - Avifauna observed in the incidental records

Common Name	Scientific Name
Rock Dove	*Columba livia*
Speckled Pigeon	*Columba guinea*
Cape Turtle Dove	*Streptopelia capicola*
Laughing Dove	*Streptopelia senegalensis*
Namaqua Dove	*Oena capensis*
Red-faced Mousebird	*Urocolius indicus*
Pied crow	*Corvus albus*
Familiar Chat	*Cercomela familiaris*
Ant-eating Chat	*Myrmecocichla formicivora*
Kalahari Scrub Robin	*Erythropygia coryphoeus*
Chestnut-vented Tit-Babbler	*Sylvia subcaerulea*
Zitting Cisticola	*Cisticola juncidis*
African Pied Wagtail	*Motacilla aguimp*
Bokmakierie	*Telophorus zeylonus*
Cape Sparrow	*Passer melanurus*
Southern Grey-headed Sparrow	*Passer diffusus*
White-browed Sparrow-Weaver	*Plocepasser mahali*
Sociable Weaver	*Philetairus socius*

8.8 Appendix H - Specialists Declarations

I, Lindi Steyn, 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.

Lindi Steyn

Biodiversity Specialist

The Biodiversity Company

April 2023

I, **Rudolph Greffrath**, 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.

Rudolph Greffrath

Biodiversity Specialist

The Biodiversity Company

April 2023