The Terrestrial Ecology Baseline & Impact Assessment for the proposed Icarus Solar Power Plant Project

Klerksdorp, North West Province, South Africa

November 2022

CLIENT

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1 Introduction

1.1 Background

The Biodiversity Company was appointed to undertake a terrestrial ecology (fauna and flora) baseline and impact assessment for the proposed Icarus Solar Power Plant (SPP) and infrastructure project. The proposed project involves the development of a solar facility, located between the towns of Klerksdorp and Buffelsvallei in the North West Province (Figure 1-1 and Figure 1-2). The Project Area of Influence (PAOI) is approximately 397,31 ha in size and the assessment and survey were conducted within this area (Figure 1-3).

To assess the baseline ecological state of the area and to present a detailed description of the receiving environment, both a desktop assessment as well as a field survey were conducted during October 2022. Furthermore, the desktop assessment and field survey both involved the detection, identification and description of any locally relevant sensitive receptors and habitats, and the manner in which these sensitive features may be affected by the proposed development was also investigated. It is important to note that this assessment considers terrestrial fauna and flora with the exclusion of avifauna, as this aspect is considered as part of a separate assessment.

This assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations, 2014 (No. 326, 7 April 2017) of the National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998). The approach has taken cognisance of the recently published Government Notice 320 in terms of NEMA dated 20 March 2020 as well as the Government Notice 1150 in terms of NEMA dated 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”. The National Web based Environmental Screening Tool has characterised the terrestrial biodiversity theme for the area as ‘Very High’ sensitivity (National Environmental Screening Tool, 2022).

The purpose of conducting the specialist study is to provide relevant input into the overall Environmental Authorisation application process, with a focus on the proposed activities and their impacts associated with the projects. This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Registered Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making as to the ecological viability of the proposed projects.

1.2 Site Information and Technical Details

The following information (Table 1-1) is as per the technical information provided by Environamics:

Table 1-1 Site information

Description of affected farm portion	Solar Power Plant Remainder of Portion 6 of the Farm Brakspruit No.370 Portion 26 of the Farm Brakspruit No.370 Portion 28 of the Farm Brakspruit No.370 Portion 43 of the Farm Brakspruit No.370 Power Line Portion 43 of the Farm Brakspruit No.370
Province	North West
District Municipality	Dr Kenneth Kaunda District Municipality
Local Municipality	City of Matlosana Local Municipality
Ward numbers	18

Closest towns	Klerksdorp is located approximately 20 km south of the proposed development
21 Digit Surveyor General codes	Solar Power Plant Remainder of Portion 6 of the Farm Brakspruit No.370 T0IP00000000037000006 Portion 26 of the Farm Brakspruit No.370 T0IP00000000037000026 Portion 28 of the Farm Brakspruit No. 370 T0IP00000000037000028 Portion 43 of the Farm Brakspruit No.370 T0IP00000000037000043 Power Line Portion 43 of the Farm Brakspruit No.370 T0IP00000000037000043
Type of technology	Photovoltaic solar facility
Structure Height	Panels ~6m, buildings ~ 6m, power line ~32m and battery storage facility ~8m height
Battery storage	Within a 4-hectare area
Surface area to be covered (Development footprint)	Approximately 392ha
Laydown area dimensions (EIA footprint)	Assessed 392 ha
Structure orientation	The panels will either be fixed to a single-axis horizontal tracking structure where the orientation of the panel varies according to the time of the day, as the sun moves from east to west or tilted at a fixed angle equivalent to the latitude at which the site is located in order to capture the most sun.
Generation capacity	Up to 300 MW (DC) and 250MW (AC)
Expected production	678 GWh per annum (Expected production by 300MWdc modules Considering Bifacial and one-axis tracker)

The term photovoltaic describes a solid-state electronic cell that produces direct current electrical energy from the radiant energy of the sun through a process known as the Photovoltaic Effect. This refers to light energy placing electrons into a higher state of energy to create electricity. Each PV cell is made of silicon (i.e. semiconductors), which is positively and negatively charged on either side, with electrical conductors attached to both sides to form a circuit. This circuit captures the released electrons in the form of an electric current (direct current). The key components of the proposed project are described below:

- PV Panel Array - To produce up to 150MW, the proposed facility will require numerous linked cells placed behind a protective glass sheet to form a panel. Multiple panels will be required to form the solar PV arrays which will comprise the PV facility. The PV panels will be tilted at a northern angle in order to capture the most sun or using one-axis tracker structures to follow the sun to increase the Yield.
- Wiring to Inverters - Sections of the PV array will be wired to inverters. The inverter is a pulse width mode inverter that converts direct current (DC) electricity to alternating current (AC) electricity at grid frequency.
- Connection to the grid - Connecting the array to the electrical grid requires transformation of the voltage from 480V to 33kV to 132kV. The normal components and dimensions of a distribution rated electrical substation will be required. Output voltage from the inverter is 480V and this is fed into step up transformers to 132kV. An onsite substation will be required on the site to step

the voltage up to 132kV, after which the power will be evacuated into the national grid via the proposed power line. It is expected that generation from the facility will tie in with the existing Eskom Brakspruit 132/22kV Substation directly from the on-site substation. The project will inject up to 120MW into the National Grid. The installed capacity will be up to 150MW (Figure 1-1).

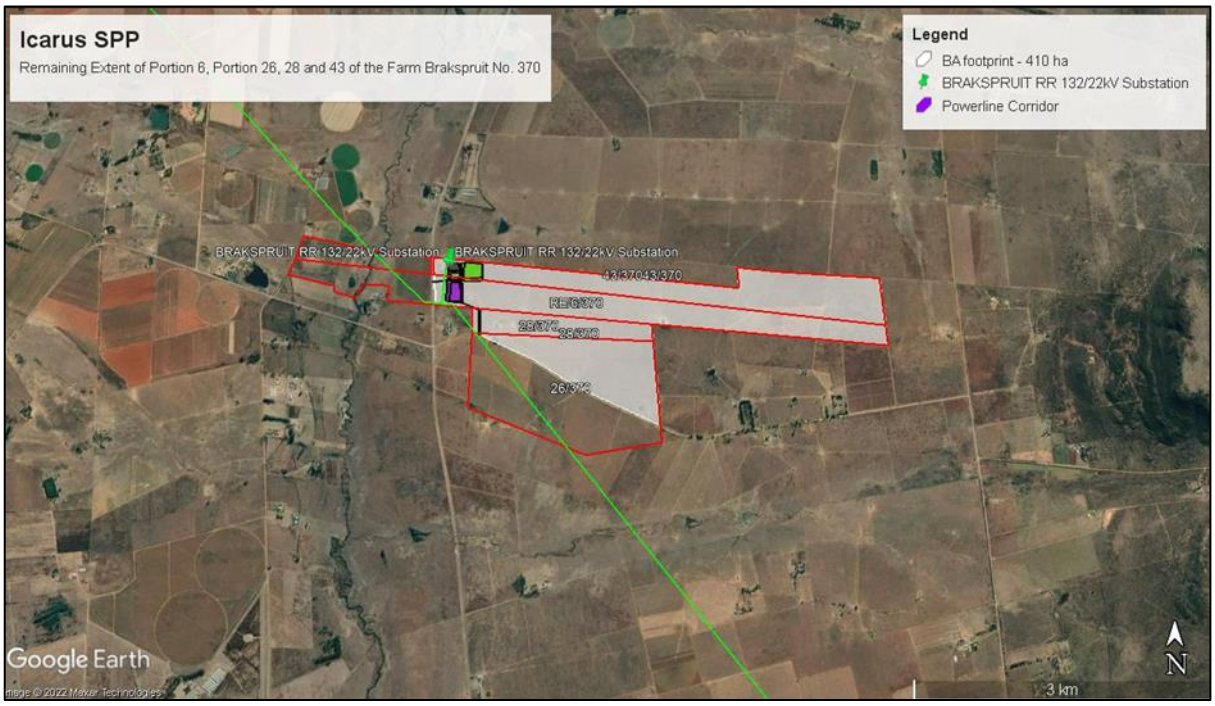


Figure 1-1 Map illustrating the proposed PAOI

- Electrical reticulation network – An internal electrical reticulation network will be required and will be lain ~2-4 m underground as far as practically possible.
- Supporting Infrastructure – The supporting infrastructure such as the auxiliary buildings will be situated in an area measuring up to 1.3 ha.
- Battery storage – A Battery Storage Facility with a maximum height of 8m and a maximum volume of 1,740 m^3 of batteries and associated operational, safety and control infrastructure.
- Roads – Access to the facility will be obtained from the R30 and from the R507. An internal site road network will also be required to provide access to the solar field and associated infrastructure. The access and internal roads will be constructed within a 25-meter corridor. Access Points: coordinates 26°40'31.08"S 26°35'29.28"E and 26°40'49.97"S; 26°35'47.61"E.
- Fencing - For health, safety and security reasons, the facility will be required to be fenced off from the surrounding farm. Fencing with a height of 2.5 meters will be used.

1.3 Consideration of Alternatives

The DEAT 2006 guidelines on ‘assessment of alternatives and impacts’ proposes the consideration of four types of alternatives namely, the no-go, location, activity, and design alternatives. It is however, important to note that the regulation and guidelines specifically state that only ‘feasible’ and ‘reasonable’ alternatives should be explored. It also recognizes that the consideration of alternatives is an iterative process of feedback between the developer and EAP, which in some instances culminates in a single preferred project proposal. An initial site assessment was conducted by the developer the affected properties and the farm portions were found favorable due to its proximity to grid connections, solar radiation, ecology and relative flat terrain. These factors were then taken into consideration and avoided as far as possible.

The following alternatives were considered in relation to the proposed activity and all specialists should also make mention of these:

No-go alternative

This alternative considers the option of 'do nothing' and maintaining the status quo. The site is currently zoned for agricultural and mining land uses. Should the proposed activity not proceed, the site will remain unchanged and will continue to be used for agricultural purposes. The potential opportunity costs in terms of alternative land use income through rental for energy facility and the supporting social and economic development in the area would be lost if the status quo persist.

Location alternatives

No other possible sites were identified on the Remaining Extent of Portion 6, Portion 43,26 & 28 of the farm Brakspruit No. 370. This site is referred to as the preferred site. Some limited sensitive features occur on the site. The size of the site makes provision for the exclusion of any sensitive environmental features that may arise through the EIA proses.

Technical alternatives: Powerlines

One connection option is available. It is expected that generation from the facility will tie in with the existing Eskom Brakspruit RR 132/22kV Substation directly from the on-site substation. The project will inject up to 120MW into the National Grid. The installed capacity will be up to 150MW.

Battery storage facility

It is proposed that a nominal up to 500 MWh Battery Storage Facility for grid storage would be housed in stacked containers, or multi-storey building, with a maximum height of 8m and a maximum volume of 1,740m^3 of batteries and associated operational, safety and control infrastructure. Three types of battery technologies are being considered for the proposed project: Lithium-ion, Sodium-sulphur or Vanadium Redox flow battery. The preferred battery technology is Lithium-ion.

Battery storage offers a wide range of advantages to South Africa including renewable energy time shift, renewable capacity firming, electricity supply reliability and quality improvement, voltage regulation, electricity reserve capacity improvement, transmission congestion relief, load following and time of use energy cost management. In essence, this technology allows renewable energy to enter the base load and peak power generation market and therefore can compete directly with fossil fuel sources of power generation and offer a truly sustainable electricity supply option.

Design and layout alternatives

Design alternatives will be considered throughout the planning and design phase and specialist studies are expected to inform the final layout of the proposed development.

Technology alternatives

There are several types of semiconductor technologies currently available and in use for PV solar panels. Two, however, have become the most widely adopted, namely crystalline silicon (Mono-facial and Bi-facial) and thin film. The technology that (at this stage) proves more feasible and reasonable with respect to the proposed solar facility is crystalline silicon panels, due to it being non-reflective, more efficient, and with a higher durability. However, due to the rapid technological advances being made in the field of solar technology the exact type of technology to be used, such as bifacial panels, will only be confirmed at the onset of the project.

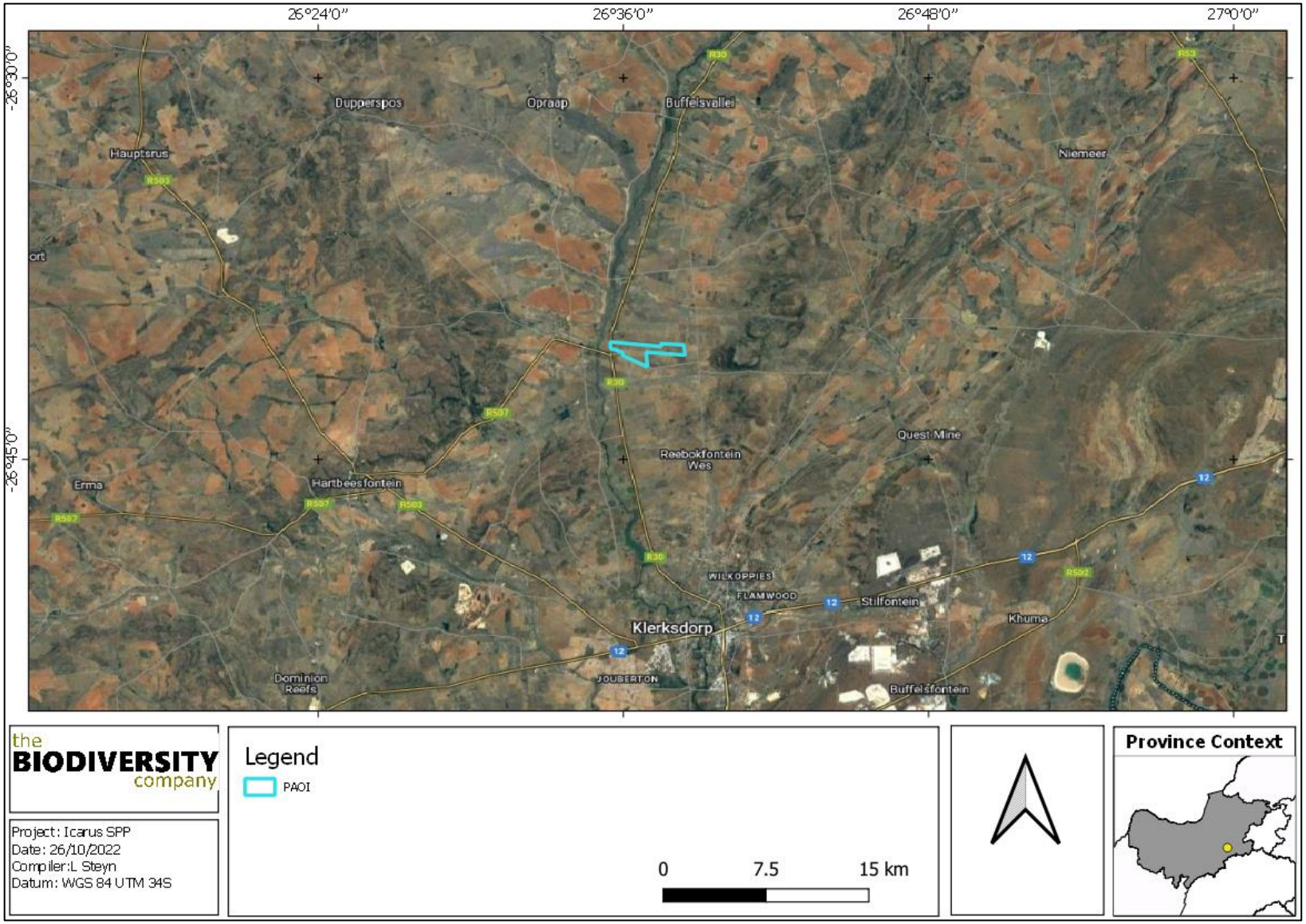


Figure 1-2 Map illustrating the regional context of the PAOI

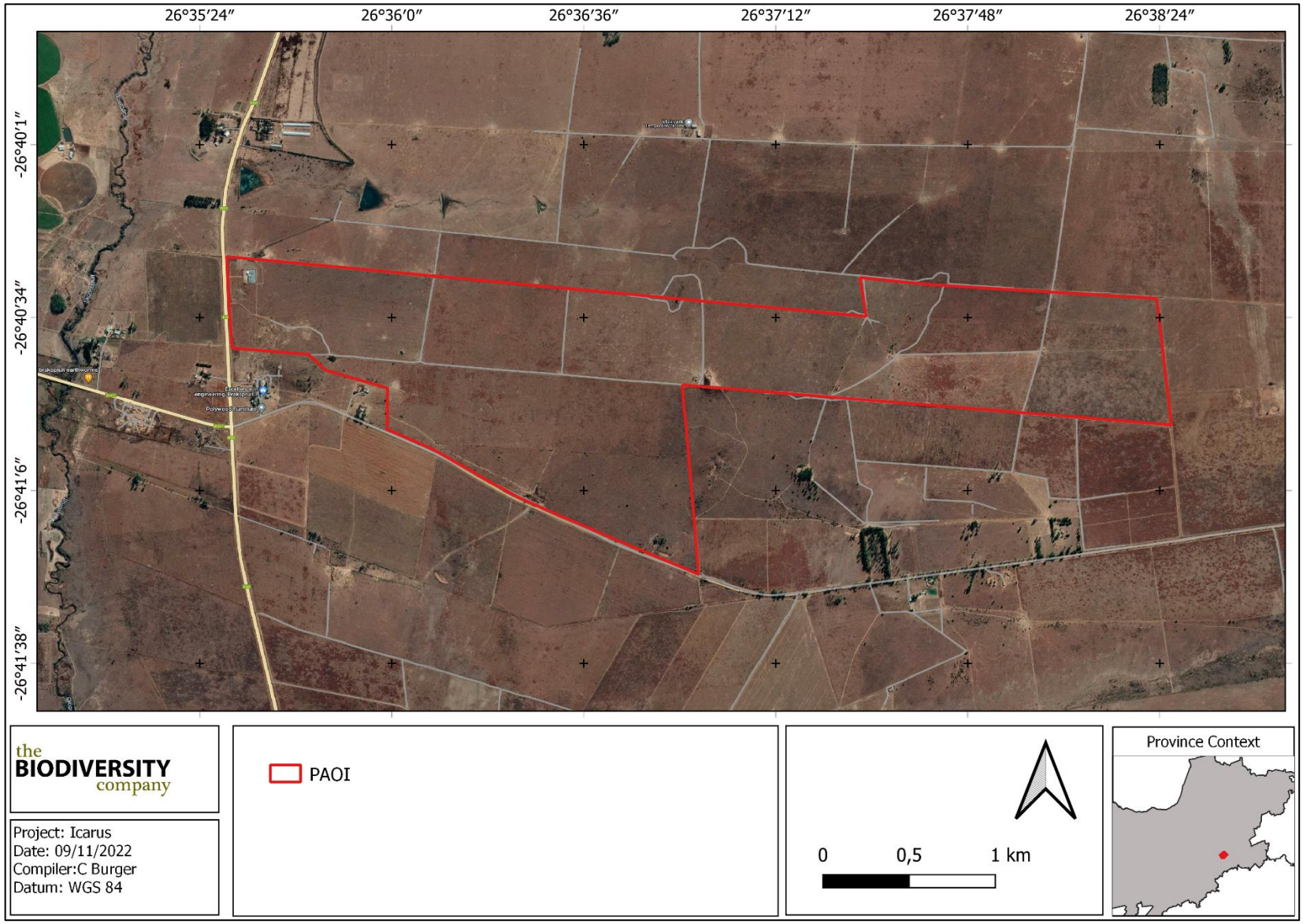
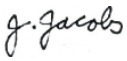


Figure 1-3 Map illustrating the details of the PAOI

1.4 Specialist Details

Report Name	**The Terrestrial Ecology Baseline & Impact Assessment for the proposed Icarus Solar Power Plant Project**
Reference	Icarus Solar Power Plant
Submitted to / Client	ENVIRONAMICS
Fieldwork / Contributor	Jan Jacobs 
	Jan Jacobs completed his BSc Honours degree in Biodiversity and Conservation Biology at the University of the Western Cape in 2016. He completed his Master of Applied Science degree in Nature Conservation on 31 March 2022.
Report Writer	Carami Burger 
	Carami Burger has completed her Bachelor of Science Honours degree in Ecological Interactions and Ecosystem Resilience. Carami is an ecologist and has completed various studies as part of Basic Assessments and Environmental Impact Assessments.
Checked by	Michael Schrenk 
	Michael completed his professional Civil and Environmental engineering degree at the University of the Witwatersrand in 2016. He has been working in the fields of project management, biodiversity and habitat assessment and ecological restoration for over 3 years.
Reviewer	Andrew Husted 
	Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 13 years' experience in the environmental consulting field.
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.

1.5 Scope of Work

The principle aim of the assessment was to provide information to inform on the risk that the proposed activity has on the associated ecosystems within the PAOI. This was achieved through the following:

- Identification and description of any sensitive receptors that occur in the PAOI, and the manner in which these sensitive receptors may be affected by the proposed activity;
- Conducting of a desktop assessment to identify the relevant ecologically important geographical features within or nearby to the PAOI;
- Conducting of a desktop assessment to compile an expected species list and identify flora and fauna Species of Conservation Concern (SCC) that may occur within the PAOI;
- Conducting of a field survey to ascertain the baseline species composition of the present flora and fauna community within the PAOI;
- Delineation and mapping of the habitats and their respective sensitivities that occur within the PAOI;
- Identification of the manners in which the proposed project impacts the flora and fauna communities, and an evaluation of the level of risk that these potential impacts present; and
- The prescription of mitigation measures and associated recommendations for the identified risks.

2 Key Legislative Requirements

The legislation, policies and guidelines listed below in Table 2-1 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 2-1 A list of key legislative requirements relevant to biodiversity and conservation in the North West Province

Region	Legislation / Guideline
National	Constitution of the Republic of South Africa (Act No. 108 of 1996)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management: Biodiversity Act (NEM:BA) (Act No. 10 of 2004)
	The National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
	Threatened or Protected Species Regulations and lists (No. R. 152 of Government Gazette No. 29657 of 23 February 2007, and No. R. 1187 of Government Gazette No. 30568 of 14 December 2007)
	Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 320 of Government Gazette 43110 (March 2020); and GNR 1150 of Government Gazette 43855 (October 2020)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Forest Act (Act No. 84 of 1998)
	National Veld and Forest Fire Act (101 of 1998)
	National Water Act (NWA) (Act No. 36 of 1998)
	World Heritage Convention Act (Act No. 49 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)

	Alien and Invasive Species Regulations and Alien and Invasive Species List 2014-2020, published under NEM:BA
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)
Provincial	North West Biodiversity Management Act (Act No. 4 of 2016) and the Biodiversity Management Amendment Bill, 2017
	North West Biodiversity Sector Plan, 2015
	North West Province Protected Area Expansion Implementation Strategy, 2011

3 Definitions

3.1 Species of Conservation Concern

In accordance with the National Red List of South African Plants website, managed and maintained by the South African National Biodiversity Institute (SANBI), a Species of Conservation Concern (SCC) is a species that has a high conservation importance in terms of preserving South Africa's rich biodiversity. This classification covers a range of red list categories as illustrated in Figure 3-1 below.

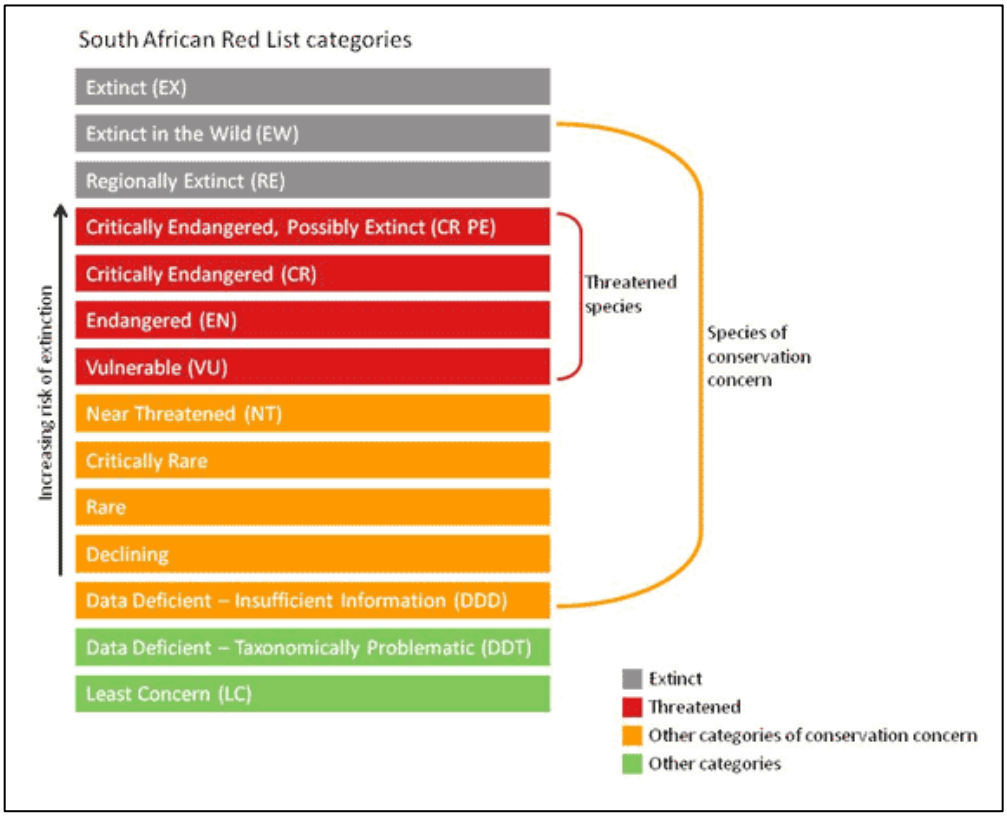


Figure 3-1 Threatened species and Species of Conservation Concern (SANBI, 2016)

South Africa uses the internationally endorsed International Union for Conservation of Nature (IUCN) Red List Categories and Criteria (IUCN, 2012). This scientific system is designed to measure species' risk of extinction and its purpose is to highlight those species that are in need of critical conservation action. As this system has been adopted from the IUCN, the definition of an SCC as described and categorised above is extended to all red list classifications relevant to fauna as well as the IUCN categories, for the purposes of this report.

3.2 Protected Species

Protected species include both floral and faunal species that are protected according to some form of relevant legislation, be it provincial, national, or international. Provincial legislation may include that published in the form of a provincial ordinance, bill, or act, and national legislation includes that which is published in terms of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) or the

National Forest Act (Act No. 84 of 1998). Relevant international legislation includes the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 2021).

4 Methods

4.1 Desktop Assessments

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

4.1.1 Ecologically Important Landscape Features

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

- The North West Biodiversity Sector Plan of 2015 (READ, 2015);
- 2018 National Biodiversity Assessment (NBA, 2018; Skowno *et al.,* 2019);
- Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018);
- South Africa Protected and Conservation Areas Databases, 2022 (DFFE, 2022 & DFFE, 2022a);
- National Protected Areas Expansion Strategy, 2018 (DEA, 2018);
- Important Bird and Biodiversity Areas, 2015 (Marnewick *et al.,* 2015);
- South African Inventory of Inland Aquatic Ecosystems (SAIIAE), NBA 2018 Rivers and Wetlands (Awuah, 2018 & Van Deventer *et al.,* 2019);
- National Freshwater Priority Areas, Rivers and Wetlands, 2011 (Nel *et al.,* 2011); and
- Strategic Water Source Areas, 2021 (Lötter & Le Maitre, 2021).

Descriptions of these datasets, and their associated relevance to terrestrial biodiversity, are provided below.

4.1.1.1 Provincial Conservation Plan

The North West Biodiversity Sector Plan (2015) classifies areas within the province on the basis of their contributions to reaching the associated conservation targets within the province. These areas are primarily classified as either Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs). These biodiversity priority areas, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species, as well as the long-term ecological functioning of the landscape as a whole.

- **CBAs** are areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and healthy functioning of important species and ecosystems and the delivery of ecosystem services. Thus, if these areas are not maintained in a natural or near natural state then provincial biodiversity targets cannot be met (SANBI, 2017).
- **ESAs** are areas that are not essential for meeting biodiversity representation targets but play an important role in supporting the ecological functioning of ecosystems as well as adjacent Critical Biodiversity Areas, and/or in delivering ecosystem services that support socio-economic development (SANBI, 2017).

Provincial CBAs and ESAs are often further classified into sub-categories, such as CBA1 and CBA2 or ESA1 and ESA2. These present fine scale habitat and biodiversity area baseline requirements and associated land management objectives or outcomes. The highest categorisation level is often referred to as an 'Irreplaceable Critical Biodiversity Area' which usually represents pristine natural habitat that is very important for conservation.

4.1.1.2 National Biodiversity Assessment 2018

The National Biodiversity Assessment (NBA) was completed as a collaboration between the South African National Biodiversity Institute (SANBI), the then Department of Environmental Affairs (DEA), and other stakeholders including scientists and biodiversity management experts throughout the country over a three-year period (Skowno *et al.,* 2019).

The purpose of the NBA is to assess the state of South Africa's biodiversity with a view to understanding trends over time and informing policy and decision-making across a range of sectors. The two headline indicators assessed in the NBA are Ecosystem Threat Status and Ecosystem Protection Level (Skowno *et al.,* 2019).

- **Ecosystem Threat Status (ETS)** outlines the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function, and composition, on which their ability to provide ecosystem services ultimately depends. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Concern (LC), based on the proportion of each ecosystem type that remains in a good or healthy ecological condition (Skowno et al., 2019). CR, EN, or VU ecosystem types are collectively referred to as threatened ecosystems.
- **Ecosystem Protection level (EPL)** informs on whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Not Protected (NP), Poorly Protected (PP), Moderately Protected (MP) or Well Protected (WP), based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act (Skowno *et al.,* 2019). NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems.

4.1.1.3 South Africa Protected and Conservation Areas

The South African Protected Areas Database (SAPAD) and the South Africa Conservation Areas Database (SACAD) contains spatial data critical for the conservation of South Africa's natural resources. It includes spatial and attribute information for both formally protected areas and areas that have less formal protection, such as conservation areas. These databases are updated regularly and form 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).

Formally protected areas are categorised according to several different types, and each type is subject to specific legislative restrictions and management guidelines, many of which restrict development to some degree. Generally, these areas are assigned a buffer of influence of between 5 and 10 km (the latter pertaining to National Parks and World Heritage Sites), within which certain laws and management actions may apply. Many of the protected area types are further classified into sub-types as well. Formally protected area types include:

- National Parks;
- Nature Reserves;
- Special Nature Reserves;
- Mountain Catchment Areas;
- World Heritage Sites;

- Protected Environments;
- Forest Nature Reserves and Forest Wilderness Areas;
- Specially Protected Forest Areas; and
- Marine Protected Areas.

4.1.1.3.1 National Protected Areas Expansion Strategy

The Department of Environmental Affairs (now the Department of Forestry, Fisheries and the Environment) led the development of the National Protected Areas Expansion Strategy (NPAES) in consultation with the protected area agencies and other key private and public sector stakeholders. The need for the development of the NPAES was established in the National Biodiversity Framework in 2009. The NPAES is a 20-year strategy with 5-year implementation targets aligned with a 5-year revision cycle (DEA, 2016).

South Africa's protected area network currently falls far short of representing all ecosystems and maintaining healthy functioning ecological processes. In this context, the goal of the NPAES is to achieve cost effective protected area expansion thus enabling better ecosystem representation, ecological sustainability, and resilience to climate change. A comprehensive set of priority areas was compiled based on the priorities identified by provincial and other agencies in their respective protected area expansion strategies. These focus areas are generally large, intact and unfragmented and are therefore of high importance for biodiversity, climate resilience and freshwater protection (DEA, 2016).

4.1.1.4 Important Bird and Biodiversity Areas

Important Bird & Biodiversity Areas (IBAs) are sites of international significance for the conservation of the world's birds, and other conservation significant species, as identified through multi-stakeholder processes using globally standardised, quantitative, and scientifically agreed criteria. These sites are also Key Biodiversity Areas; sites that contribute significantly to the global persistence and health of biodiversity (Birdlife, 2020).

The selection of IBAs is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge on the sizes and trends of bird populations. The criteria ensures that sites selected as IBAs have true significance for the international conservation of bird populations, and it also ensures classification consistency among sites at all geographic levels.

IBAs constitute a global network of over 13 500 sites, of which 112 sites are found in South Africa. Approximately 60% of the IBA network is unprotected, leaving these sites vulnerable to habitat transformation and mismanagement. Additionally, habitats within many IBAs are poorly managed, leading to habitat degradation, especially in unprotected sites (BirdLife SA, 2022)

4.1.1.5 Aquatic Habitats

Three inland aquatic habitat datasets are used to identify the ecological sensitivity of the PAOI with regards to local aquatic habitat, which is critical for the healthy functioning of both aquatic and terrestrial biodiversity. The presence of aquatic ecosystems is often a strong indicator for the presence of unique flora as well as the regular presence of fauna. Many national SCC are only found within or near to aquatic habitat.

- **The South African Inventory of Inland Aquatic Ecosystems (SAIIAE):** Established during the 2018 NBA, the SAIIAE is a collection of spatial data layers that represent the extent of river and inland wetland ecosystem types as well as the pressures on these systems. The same two headline indicators, and their associated categorisations, are applied as with the terrestrial ecosystem NBA, namely Ecosystem Threat Status and Ecosystem Protection Level. The Ecosystem Threat Status of river and wetland ecosystem types are based on the extent to which each ecosystem type had been altered from its natural condition.

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

- **Strategic Water Source Areas (SWSAs):** SWSAs are defined as areas of land that supply a disproportionate quantity of mean annual surface water runoff in relation to their size, and therefore contribute considerably to the overall water supply of the country, as well as national aquatic and terrestrial biodiversity resources. These are considered key ecological infrastructure assets and the effective protection of SWSAs is vital for national security because a lack of water security will compromise national security and human wellbeing on all levels.

4.1.2 Desktop Flora Assessment

The desktop flora assessment encompassed an assessment of all the vegetation units and habitat types within the PAOI as well as the identification of expected plant species and any locally occurring flora SCC.

The Vegetation of South Africa, Lesotho, and Swaziland (Mucina & Rutherford, 2006) and the 2018 Terrestrial & Freshwater Assessment by SANBI (2018) was used to identify the vegetation types that would have occurred under natural or pre-anthropogenically altered conditions. Furthermore, the Plants of Southern Africa (POSA, 2019) database was accessed to compile a list of expected flora species within the PAOI (Figure 4-1). The Red List of South African Plants website (SANBI, 2016) was used to provide the most current account of the national conservation status of flora.

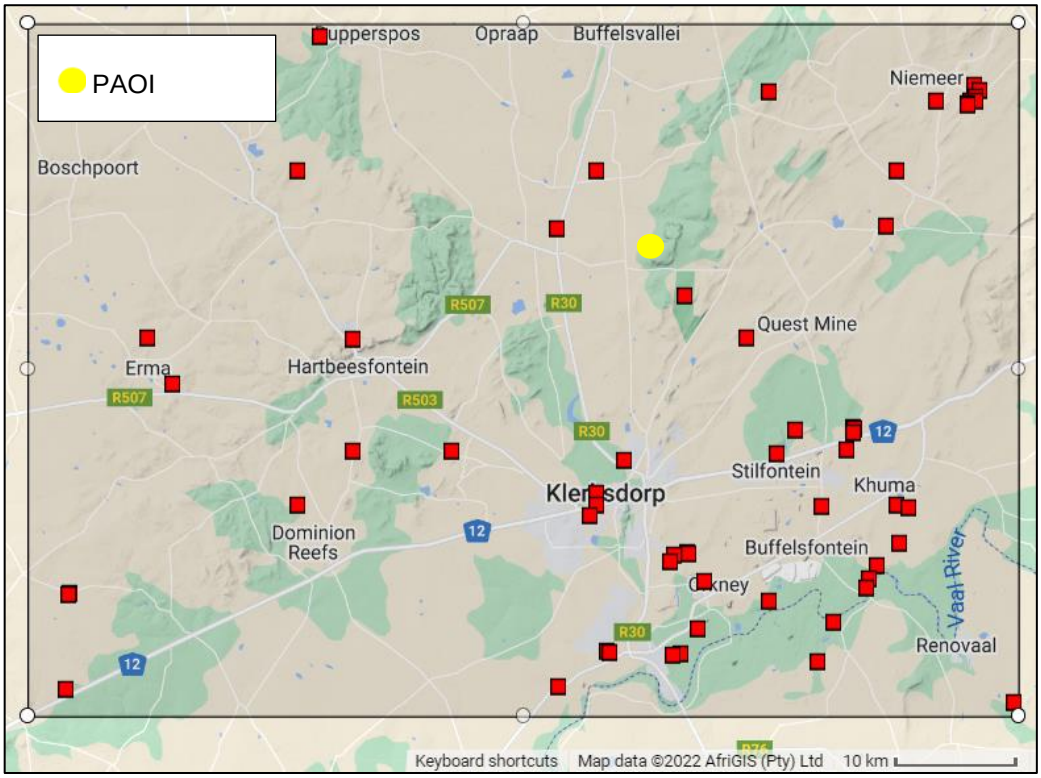


Figure 4-1 ***Map illustrating the extent of area used to obtain the expected flora species list from the Plants of South Africa (POSA) database. The yellow dot indicates the approximate location of the PAOI. The red squares are cluster markers of botanical records as per POSA data***

The latest information regarding provincially, and nationally protected flora was obtained from the following published legislative sources:

- Provincially Protected Plant Species (Schedule 2 of the North West Biodiversity Management Act, No. 4 of 2016); and
- List of Nationally Protected Tree Species (DEFF, 2022).

4.1.3 Desktop Fauna Assessment

The faunal desktop assessment involved the compilation of expected species lists and the identification of any protected and/or SCC fauna potentially occurring in the area. The respective species lists, and international Red-List statuses, were obtained from the IUCN spatial dataset (2017), in addition to the following sources:

- Mammal list: Generated from the ADU MammalMap database using the 2626 Degree Square (ADU, 2020);
- Reptile list: Generated from ADU ReptileMap database using the 2626 Degree Square (ADU, 2020a); and
- Amphibian list: Generated from ADU FrogMap database using the 2626 Degree Square (ADU, 2020b).

For data concerning the expected avifaunal species refer to the project avifaunal assessment.

South Africa's official site for Species Information and National Red Lists (SANBI, 2022) was used to provide the most current national Red-List status of fauna. The latest information regarding provincially, and nationally protected fauna was obtained from the following published legislative lists:

- Provincially Protected Wildlife Species (Schedule 2 of the North West Biodiversity Management Act, No. 4 of 2016); and
- Nationally Protected Wildlife species (The 2007 lists of Threatened or Protected Species (TOPS), published in terms of Section 56(1) of the NEM:BA, No. 10 of 2004).

4.2 Biodiversity Field Survey

A single season field survey was undertaken from the 12th to the 13th of October 2022, which constitutes an early wet season survey, to determine the presence of any local SCC and to achieve the delineation of local habitat types and their associated sensitivities. Effort was made to cover all the different habitat types within the PAOI within the limits of time and access.

4.2.1 Flora Survey

The early wet season fieldwork and sample sites were placed within targeted areas (i.e., target sites) 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. The focus of the fieldwork was therefore to maximise coverage and navigate to each target site in the field in order to perform a rapid vegetation and ecological assessment at each sample site.

Homogenous vegetation units were subjectively identified using satellite imagery and existing land cover maps (confirmed during the field survey). The floristic diversity and search for protected plants and flora SCC were conducted through timed meanders within representative habitat units. Emphasis was placed on sensitive habitats, especially those overlapping with the PAOI.

The timed random meander method is a highly efficient method for conducting floristic analysis, specifically in detecting protected plants and flora SCC and maximising floristic coverage. In addition, the method is

time and cost effective and highly suited for compiling observed flora species lists and therefore gives a rapid indication of flora diversity. The timed meander search was performed based on the original technique described by Goff *et al*. (1982). Suitable habitat for SCC were identified according to Raimondo *et al.* (2009) and targeted as part of the timed meanders.

At each sample site notes were made regarding current impacts (e.g., roads, erosion etc.), and this included the subjective recording of dominant vegetation species and any sensitive features (e.g., wetlands, rock outcrops etc.). In addition, opportunistic observations were made while navigating through the area.

Relevant field guides and texts consulted for identification purposes included the following:

- A field guide to Wild flowers (Pooley, 1998);
- Field Guide to the Wild Flowers of the Highveld (van Wyk & Malan, 1998);
- Orchids of South Africa (Johnson & Bytebier, 2015);
- Guide to the Aloes of South Africa (Van Wyk & Smith, 2014);
- Medicinal Plants of South Africa (Van Wyk *et al*., 2013);
- Freshwater Life: A field guide to the plants and animals of southern Africa (Griffiths & Day, 2016), and Aquatic and Wetland Plants of Southern Africa (van Ginkel & Cilliers, 2020);
- Identification guide to southern African grasses (Fish *et al.,* 2015);
- Field guide to trees of Southern Africa, Struik Publishers (Van Wyk & Van Wyk, 1997); and
- Problem Plants and Alien Weeds of Southern Africa (Bromilow, 2018).

4.2.2 Fauna Survey

The faunal component of this report pertains only to mammals and herpetofauna (reptiles and amphibians). The faunal field survey utilised a variety of sampling techniques, including but not limited to:

- Visual and auditory searches: This involves strategic meandering and the use of binoculars and specialist camera equipment to view species from a distance without them being disturbed;
- Active hand-searches: Used for species that shelter in or under particular micro-habitats (typically rocks, exfoliating rock outcrops, fallen trees, leaf litter, bark etc.);
- The identification of tracks and signs, and listening to species calls; and
- Utilization of local knowledge.

The relevant field guides and texts consulted for identification purposes included the following:

- The Mammals of the Southern African Subregion (Skinner & Chimimba, 2005);
- Bats of Southern and Central Africa (Monadjem *et al*., 2010);
- Spiders of Southern Africa (Leroy & Leroy, 2003);
- A Guide to the Reptiles of Southern Africa (Alexander & Marais, 2007);
- Field Guide to Snakes and other Reptiles of Southern Africa (Branch, 1998);
- Tortoises, Terrapins, and Turtles of Africa (Branch, 2008);

- A Complete Guide to the Frogs of Southern Africa (du Preez & Carruthers, 2009); and
- A Field Guide to the Tracks and Signs of Southern and East African Wildlife (Stuart & Stuart, 2000).

4.3 Terrestrial Site Ecological Importance

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

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 in the PAOI) and Receptor Resilience (RR) (its resilience to impacts).

BI is a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor. The criteria for the CI and FI ratings are provided in Table 4-1 and Table 4-2 respectively.

Table 4-1 Summary of Conservation Importance (CI) criteria

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

Table 4-2 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 4-3.

Table 4-3 Matrix used to derive Biodiversity Importance (BI) from Functional Integrity (FI) and Conservation Importance (CI)

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

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 4-4.

Table 4-4 Summary of Receptor 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: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) returning to a site once the disturbance or impact has been removed.
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: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) returning to a site once the disturbance or impact has been removed.
Medium	Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) returning to a site once the disturbance or impact has been removed.
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: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) returning to a site once the disturbance or impact has been removed.
Very Low	Habitat that is unable to recover from major impacts, or species that are unlikely to: (i) remain at a site even when a disturbance or impact is occurring, or (ii) return to a site once the disturbance or impact has been removed.

After the determination of BI and RR, the SEI can be ascertained using the matrix as provided in Table 4-5.

Table 4-5 Matrix used to derive Site Ecological Importance from Receptor Resilience (RR) and Biodiversity Importance (BI)

Site Ecological Importance		Biodiversity Importance				
		Very high	High	Medium	Low	Very low
Receptor Resilience	Very Low	Very high	Very high	High	Medium	Low
	Low	Very high	Very high	High	Medium	Very low
	Medium	Very high	High	Medium	Low	Very low
	High	High	Medium	Low	Very low	Very low
	Very High	Medium	Low	Very low	Very low	Very low

Interpretation of the SEI in the context of the proposed project is provided in Table 4-6.

Table 4-6 Guideline for interpreting Site Ecological Importance in the context of proposed 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.

4.4 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- It is assumed that all information received from the client and landowner is accurate;
- All datasets accessed and utilised for this assessment are considered to be representative of the most recent and suitable data for the intended purposes;
- The assessment area was based on the footprint areas as provided by the client, and any alterations to the area and/or missing GIS information pertaining to the assessment area would have affected the area surveyed and hence the results of this assessment;

- The area was only surveyed during a single site visit and therefore this assessment does not consider temporal trends (note that the data collected is considered sufficient to derive a meaningful baseline);
- The single site visit was conducted during the early wet season, and this means that certain flora and fauna would not have been present or observable due to seasonal constraints;
- Whilst every effort was made to cover as much of the PAOI as possible, representative sampling is completed, and by its nature it is possible that some plant and animal species that are present within the PAOI were not recorded during the field investigations; and
- The GPS used in the assessment has an accuracy of 5 m and consequently any spatial features may be offset by up to 5 m.

5 Results & Discussion

5.1 Desktop Assessments

5.1.1 Ecologically Important Landscape Features

Table 5-1 below has been produced as a result of the spatial data collected and analysed (as provided by various sources such as the national and provincial environmental authorities and SANBI). It presents a summative breakdown of the ecological boundaries considered and the associated relevance that each has to the region or PAOI. Where a feature is regarded as relevant it is considered an ecologically important landscape feature and discussed further as part of the sub-sections that follow.

Table 5-1 Summary of the spatial relevance of the PAOI to local ecologically important landscape features

Desktop Information Considered	Relevant?	Reasoning	Section
Provincial Conservation Plan	Yes	The PAOI overlaps with CBA1 features	5.1.1.1
NBA 2018: Ecosystem Threat Status	Yes	The PAOI overlaps with an 'Endangered' and 'Least Concern' ecosystem	5.1.1.2
NBA 2018: Ecosystem Protection Level	Yes	The PAOI overlaps with a 'Not protected' and 'Poorly Protected' ecosystem	5.1.1.2
National Protected Areas Expansion Strategy (NPAES)	No	The PAOI is located 1.6 km from the nearest NPAES Priority Focus Area	-
Important Bird and Biodiversity Areas (IBA)	No	The closest IBA, Baberspan and Leeupan IBA, is 97 km from the PAOI	5.1.1.3
South African Inventory of Inland Aquatic Ecosystems (SAIIAE)	Yes	A CR river, the Skoonspruit, can be found west of the PAOI, and LC wetlands are found inside the PAOI	5.1.1.4
National Freshwater Ecosystem Priority Areas	Yes	The PAOI overlaps with an unclassified FEPA wetland	5.1.1.4
Protected and Conservation Areas (SAPAD & SACAD)	Yes	The nearest protected area (Bosworth Private Nature Reserve) is 4.8 km from the PAOI	5.1.1.5
Strategic Transmission Corridors	Yes	The PAOI overlaps with the Central EGI corridor	5.1.1.6
Renewable Energy Zones	Yes	The PAOI falls within the Klerksdorp Solar REDZ	5.1.1.7

5.1.1.1 Provincial Conservation Plan

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).

Figure 5-1 indicates that the PAOI overlaps with CBA1 features.

CBAs are areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and healthy functioning of important species and ecosystems and the delivery of ecosystem services. Thus, if these areas are not maintained in a natural or near natural state then provincial biodiversity targets cannot be met (SANBI, 2017).

ESAs are areas that are not essential for meeting biodiversity representation targets but play an important role in supporting the ecological functioning of ecosystems as well as adjacent Critical Biodiversity Areas, and/or in delivering ecosystem services that support socio-economic development (SANBI, 2017).

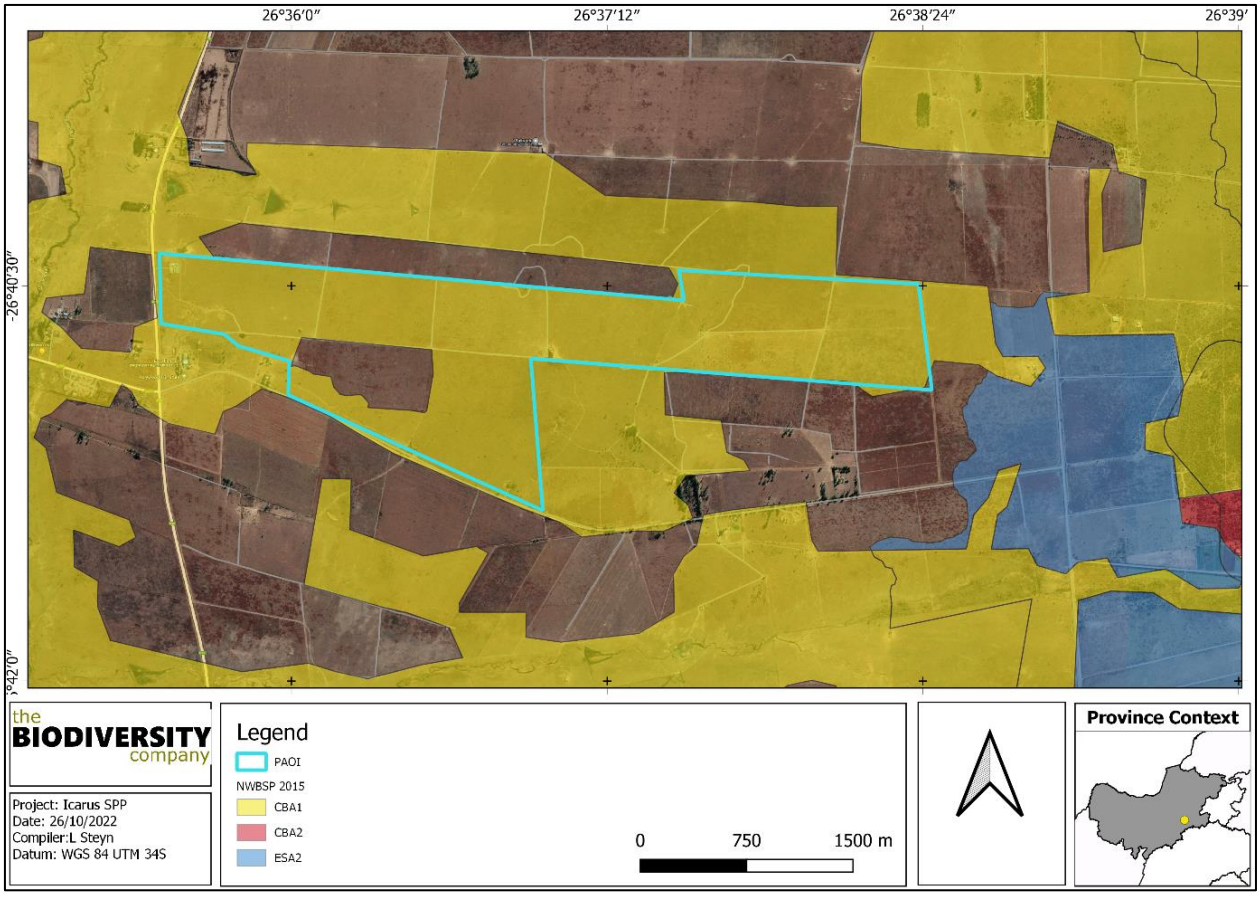


Figure 5-1 Map illustrating the North West CBA and ESA map dataset relevance

5.1.1.2 National Biodiversity Assessment

According to the 2018 NBA spatial dataset the PAOI overlaps with an 'Endangered' and 'Least Concern' ecosystem as well as a 'Not protected' and 'Poorly Protected' ecosystem (Figure 5-2 and Figure 5-3).

A 'Least Concern' ecosystem type is one which has experienced little or no loss of natural habitat or deterioration in condition, and an 'Endangered' ecosystem type is one which is considered to be at a very high risk of collapse (SANBI, 2019).

'Poorly Protected' ecosystems are those which have between five and 50% of their biodiversity target included in one or more protected areas and a 'Not Protected' ecosystem type are those that has less than 5% of its biodiversity target included in one or more protected areas (SANBI, 2019).

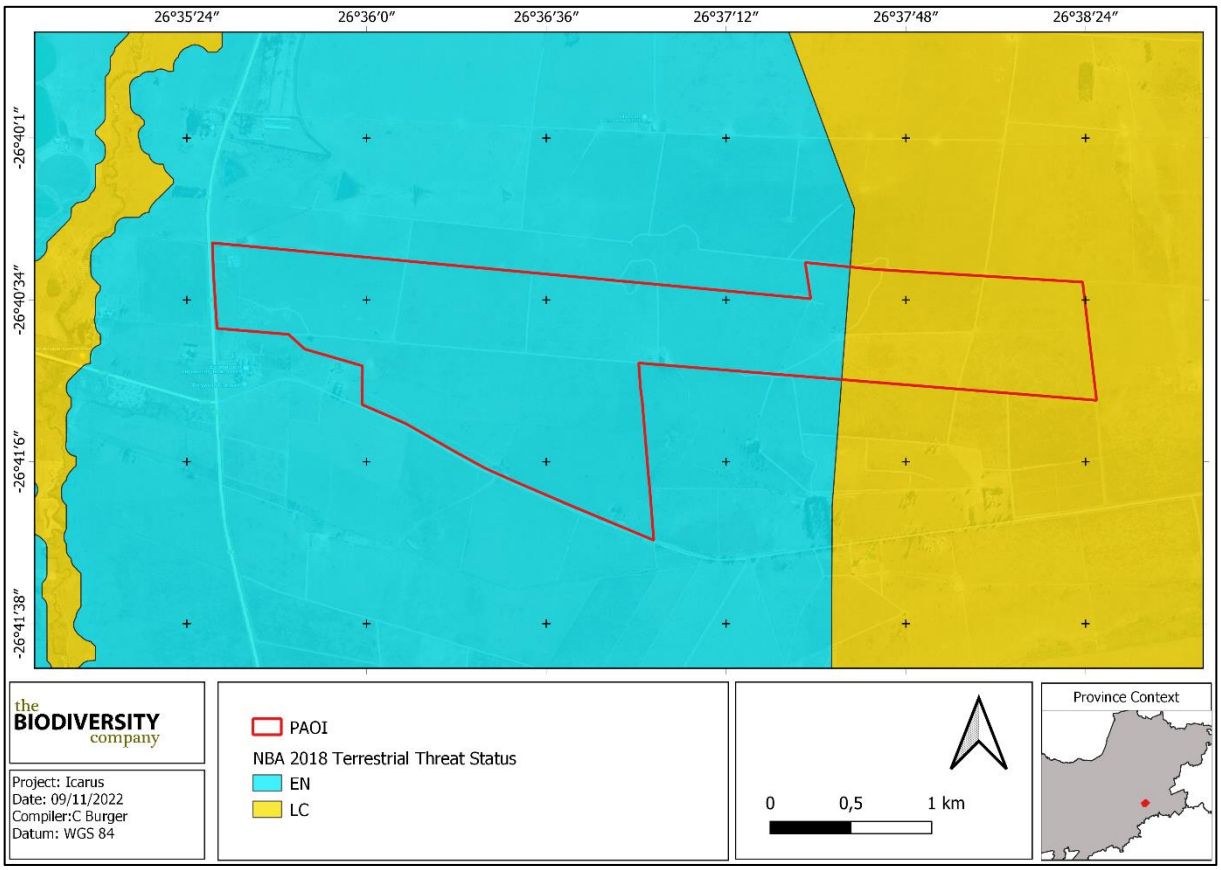


Figure 5-2 Map illustrating the Ecosystem Threat Status associated with the PAOI

Figure 5-3 Map illustrating the Ecosystem Protection Level associated with the PAOI

5.1.1.3 Important Bird and Biodiversity Areas

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

The selection of IBAs is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge of the sizes and trends of bird populations. The criteria ensure that the sites selected as IBAs have true significance for the international conservation of bird populations and provide a common currency that all IBAs adhere to, thus creating consistency among, and enabling comparability between, sites at national, continental and global levels.

Figure 5-4 illustrates that the proposed development does not overlap any IBAs. The closest IBA, Baberspan and Leeupan IBA, is 97 km from the PAOI.

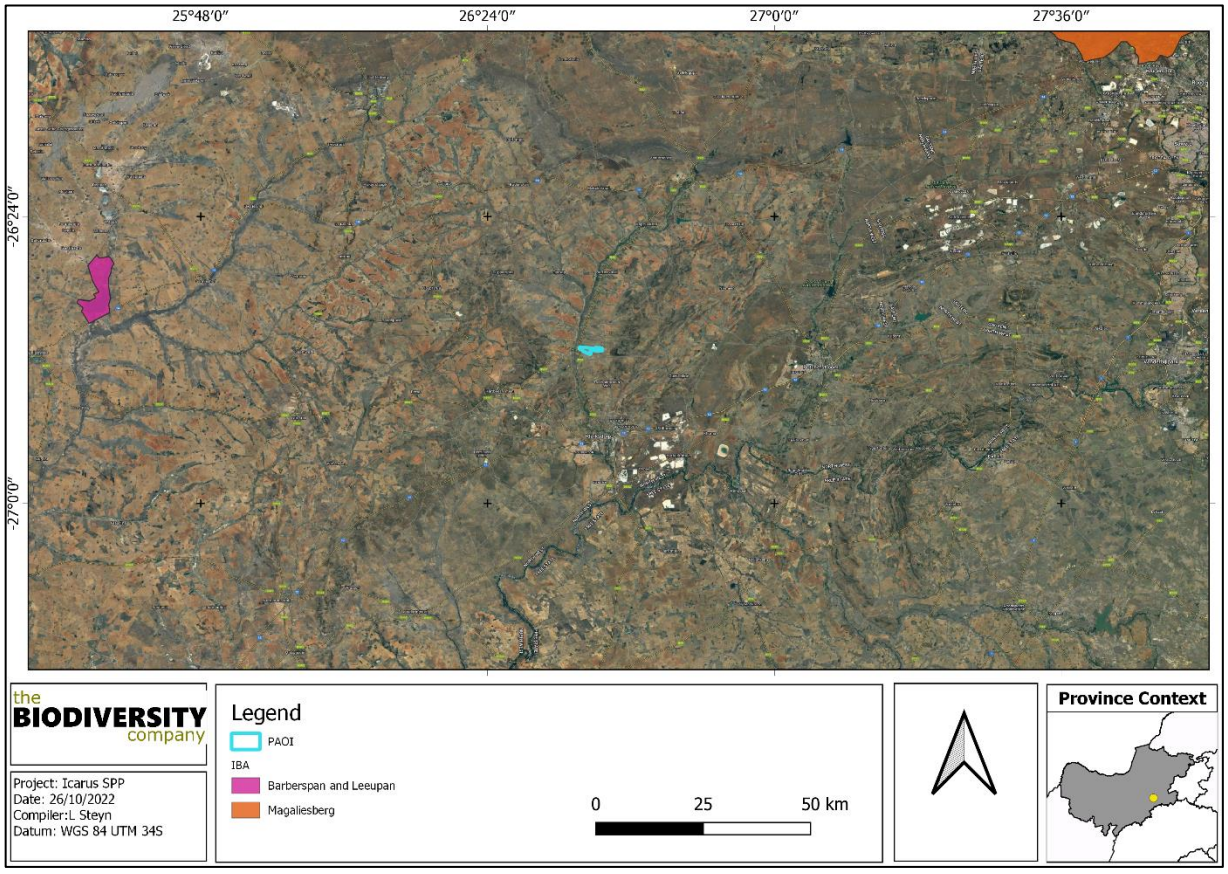


Figure 5-4 Map illustrating the PAOI location in relation to the 2015 IBA dataset

5.1.1.4 Aquatic Habitats

According to the SAIIAE, wetland systems within the PAOI is classified as LC (Figure 5-5). A CR river, the Skoonspruit, can be found to the west of the PAOI. Figure 5-6 shows that PAOI overlaps with an unclassified FEPA wetland and is in close proximity to a Phase 2 FEPA river considered to be within a sub-quaternary catchment where experts identified it as of biodiversity importance.

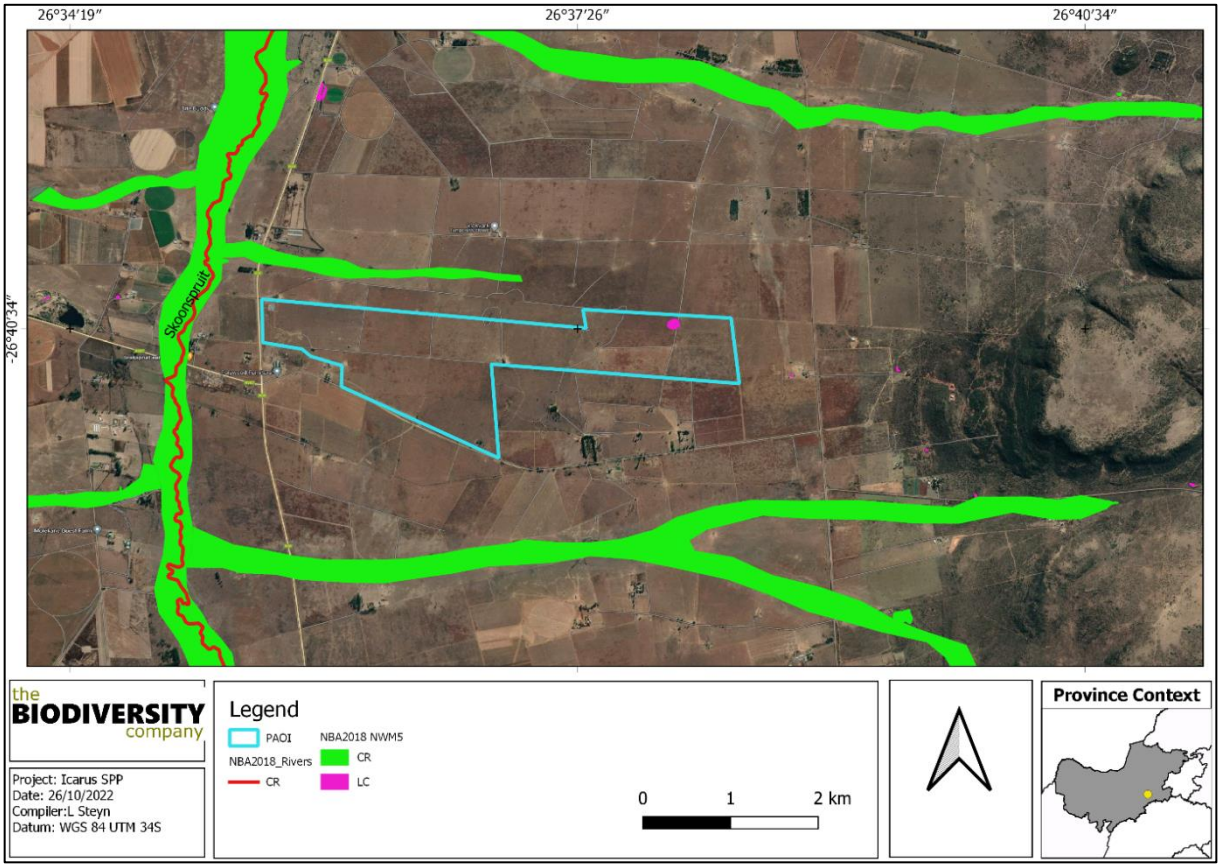


Figure 5-5 Map illustrating the PAOI location in relation to the SAIIAE dataset

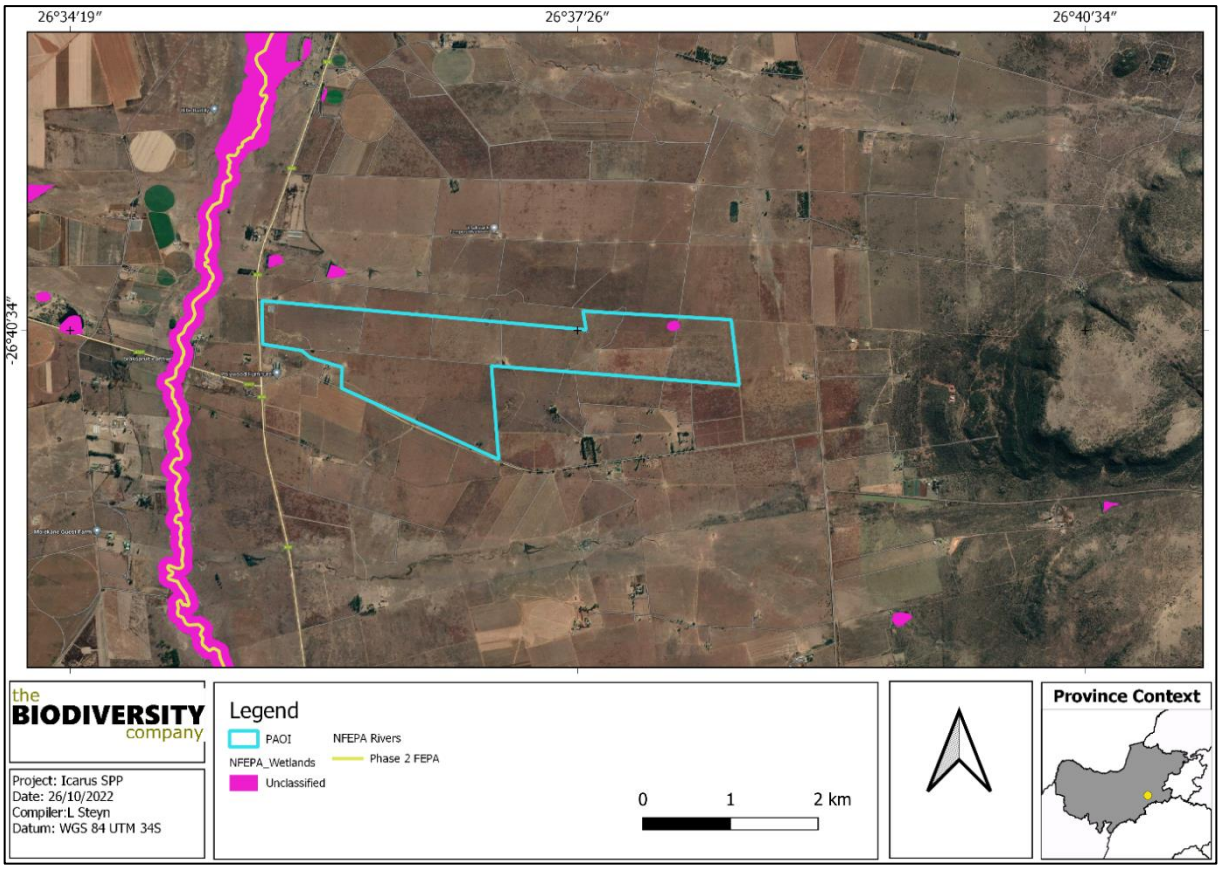


Figure 5-6 Map illustrating the PAOI location in relation to the NFEPA dataset

5.1.1.5 Protected Areas

According to the protected area spatial datasets from SACAD (2022) and SAPAD (2022), The nearest protected area (Bosworth Private Nature Reserve) is 4.8 km from the PAOI (Figure 5-7).

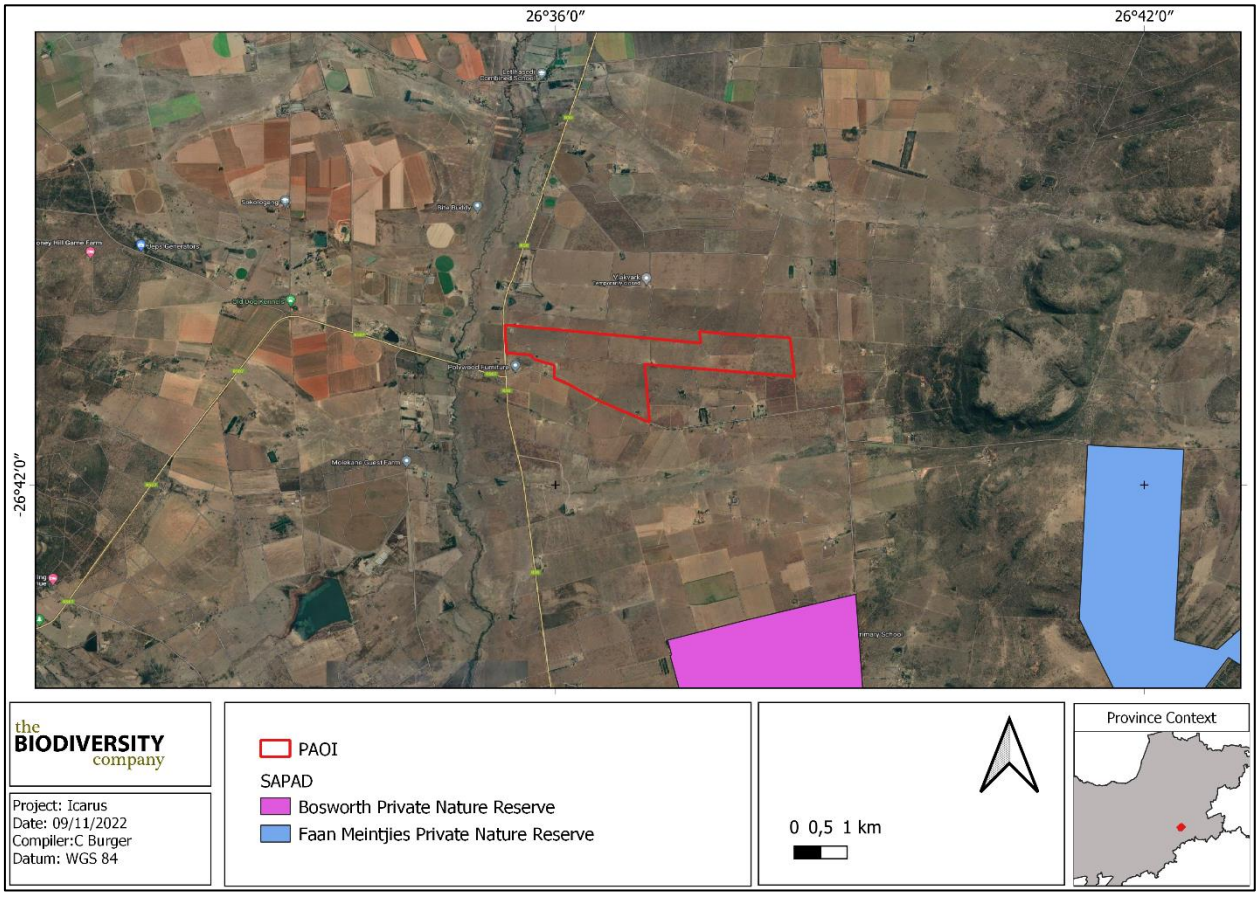


Figure 5-7 Map illustrating the PAOI in relation to the protected areas

5.1.1.6 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. As can be seen in Figure 5-8 the PAOI overlaps with the Central EGI corridor.

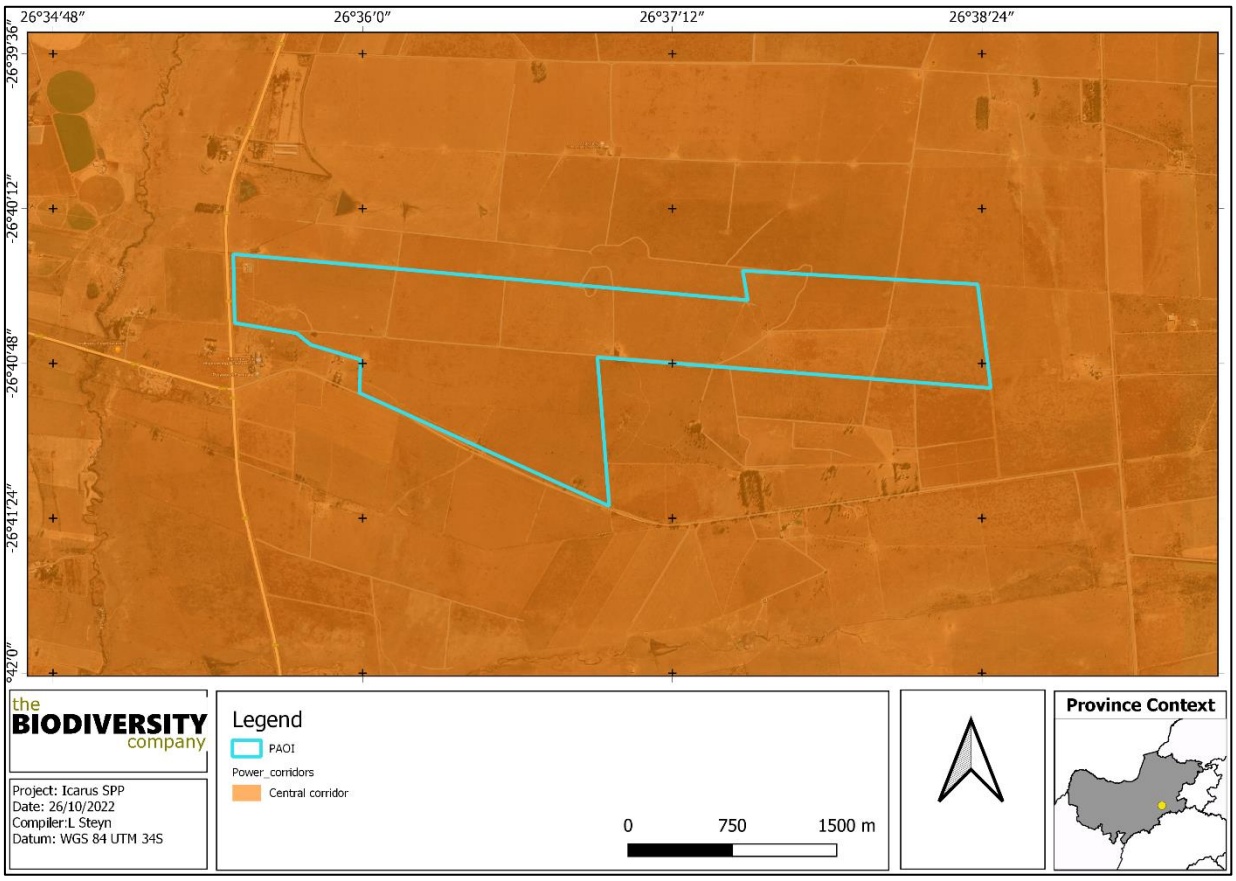


Figure 5-8 Map illustrating the project in relation to the Strategic Transmission Corridors

5.1.1.7 Renewable Energy Development Zones (REDZ)

In 2018 the Government Notice No. 114 in Government Gazette No. 41445 was published where 8 renewable energy development zones important for the development of large-scale wind and solar photovoltaic facilities were identified. In 2021 an additional 3 sites were included. The REDZs were identified through the undertaking of 2 Strategic Environmental Assessments.

More detailed information can be obtained from https://egis.environment.gov.za/redz. Information here includes the Government Notice No. 142, 144 and 145 in Government Gazette No. 44191 that specifies the procedures to be followed when applying for environmental authorisation for electricity transmission or distribution infrastructure for large-scale wind and solar photovoltaic energy facilities in these REDZs.

The PAOI falls within the Klerksdorp Solar REDZ (Figure 5-9).

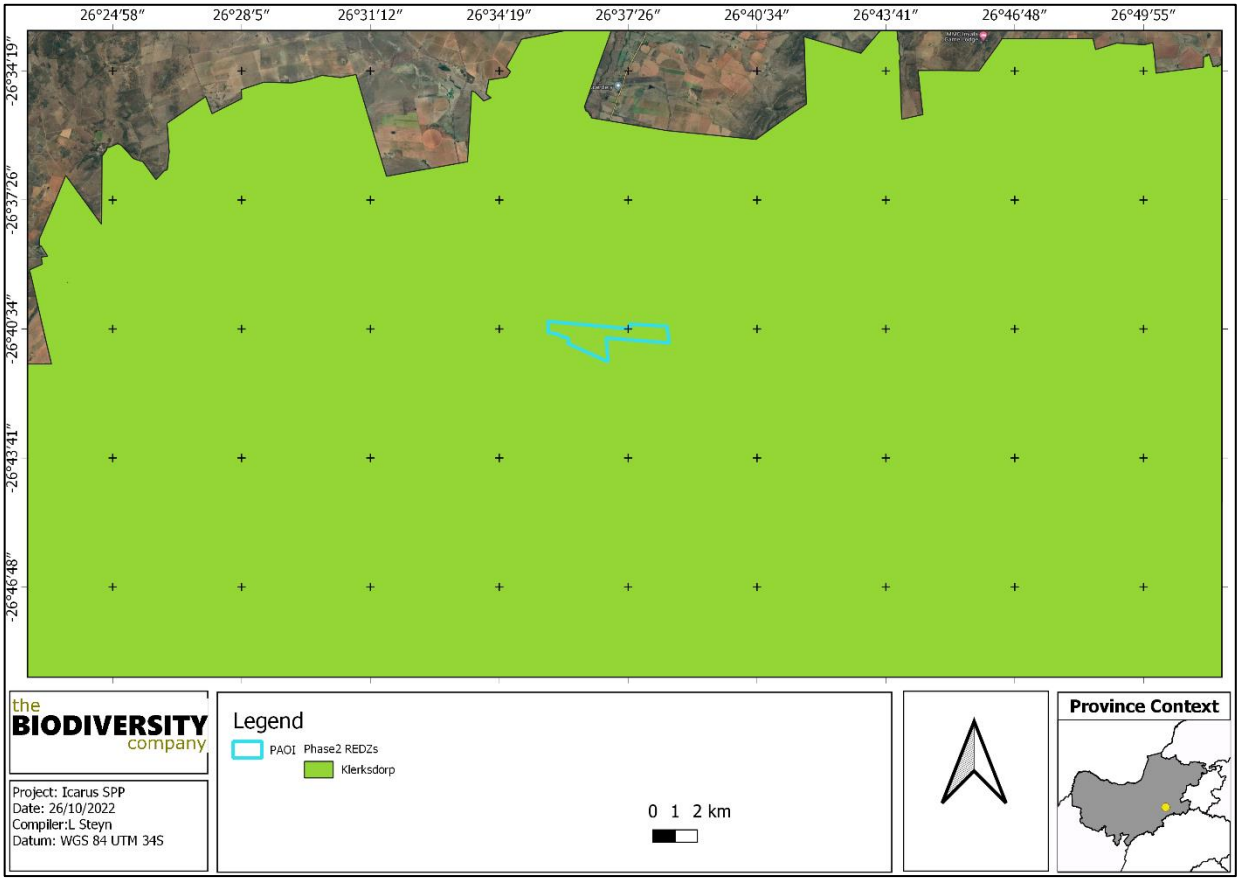


Figure 5-9 The PAOI in relation to the Renewable Energy Development Zone dataset

5.1.2 Flora Assessment

This section is divided into a description of the local vegetation type that would be expected under natural conditions, and the expected flora species.

5.1.2.1 Vegetation Type

The PAOI is situated within the grassland biome. This biome is centrally located in southern Africa, and adjoins all except the desert, fynbos and succulent Karoo biomes (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the grassland biome include:

a) Seasonal precipitation; and

b) The minimum temperatures in winter (Mucina & Rutherford, 2006).

The grassland biome is found chiefly on the high central plateau of South Africa, and the inland areas of KwaZulu-Natal and the Eastern Cape. The topography is mainly flat and rolling but includes the escarpment itself. Altitude varies from near sea level to 2 850 m above sea level.

Grasslands are dominated by a single layer of grasses. The amount of cover depends on rainfall and the degree of grazing. The grassland biome experiences summer rainfall and dry winters with frost (and fire), which are unfavourable for tree growth. Thus, trees are typically absent, except in a few localized habitats. Geophytes (bulbs) are often abundant. Frosts, fire and grazing maintain the grass dominance and prevent the establishment of trees.

On a fine-scale vegetation type, the PAOI overlaps with the Vaal-Vet Sandy Grassland and the Klerksdorp Thornveld vegetation type (Figure 5-10).

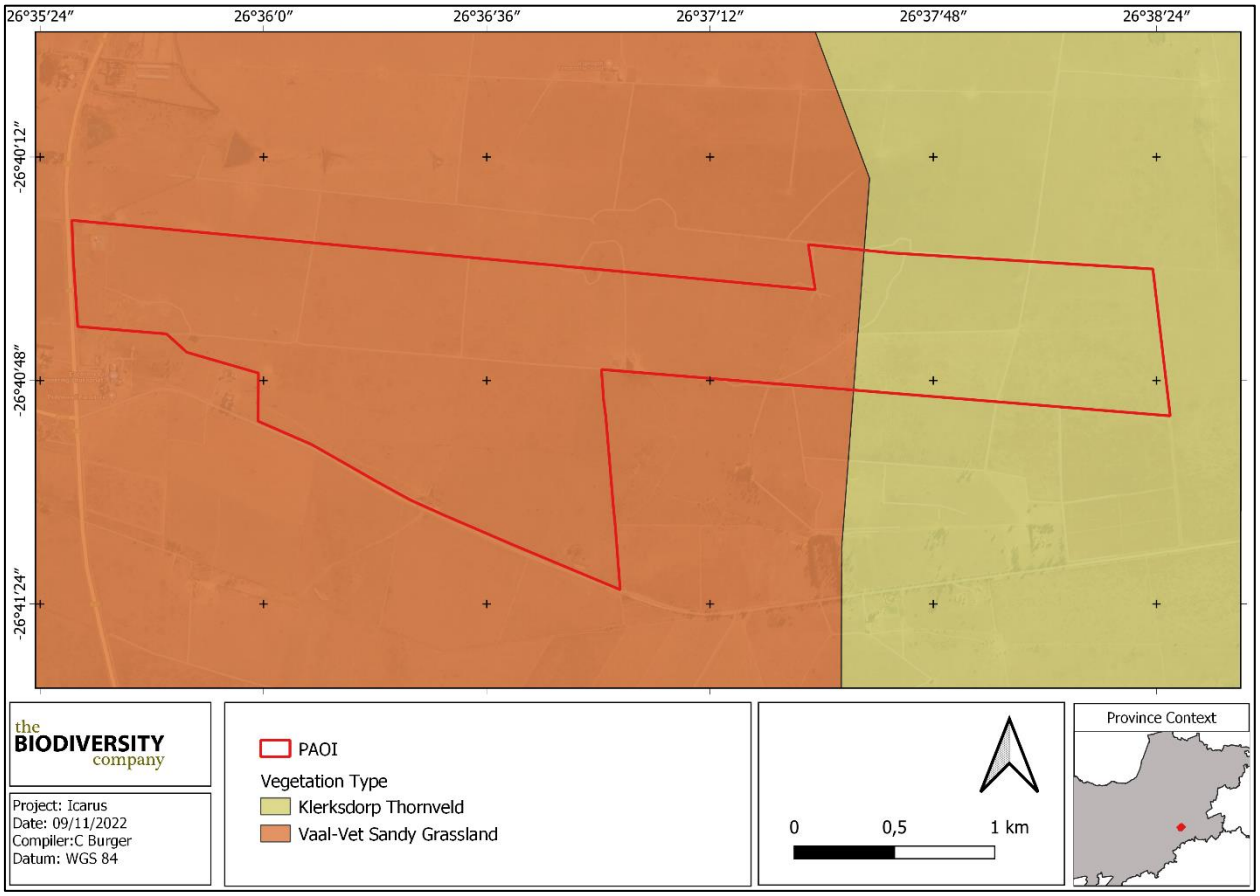


Figure 5-10 Map illustrating the vegetation types associated with the region

5.1.2.1.1 Vaal-Vet Sandy Grassland

The Vaal-Vet Sandy Grassland occurs on a plains-dominated landscape with some scattered, slightly irregular undulating plains and hills (Mucina & Rutherford, 2006). In terms of plant types, it consists mainly of low-tussock grasslands with an abundant karroid element (Mucina & Rutherford, 2006). It occurs in the North-West and Free State Provinces at altitudes of 1 260 to 1 360 m (Mucina & Rutherford, 2006).

Important Taxa (d = dominant)

Graminoids: *Anthephora pubescens* (d), *Aristida congesta* (d), *Chloris virgata* (d), *Cymbopogon caesius* (d), *Cynodon dactylon* (d), *Digitaria argyrograpta* (d), *Elionurus muticus* (d), *Eragrostis chloromelas* (d), *E. lehmanniana* (d), *E. plana* (d), *E. trichophora* (d), *Heteropogon contortus* (d), *Panicum gilvum* (d), *Setaria sphacelata* (d), *Themeda triandra* (d), *Tragus berteronianus* (d), *Brachiaria serrata*, *Cymbopogon pospischilii*, *Digitaria eriantha, Eragrostis curvula*, *E. obtusa*, *E. superba*, *Panicum coloratum*, *Pogonarthria squarrosa*, *Trichoneura grandiglumis*, *Triraphis andropogonoides*.

Herbs: *Stachys spathulata* (d), *Barleria macrostegia*, *Berkheya onopordifolia* var. *onopordifolia*, *Chamaesyce inaequilatera*, *Geigeria aspera* var. *aspera*, *Helichrysum caespititium*, *Hermannia depressa*, *Hibiscus pusillus*, *Monsonia burkeana, Rhynchosia adenodes*, *Selago densiflora*, *Vernonia oligocephala*.

Geophytic Herbs: *Bulbine narcissifolia*, *Ledebouria marginata*.

Succulent Herb: *Tripteris aghillana* var. *integrifolia*.

Low Shrubs: *Felicia muricata* (d), *Pentzia globosa* (d), *Anthospermum rigidum* subsp. *pumilum*, *Helichrysum dregeanum*, *H. paronychioides*, *Ziziphus zeyheriana*.

Endemic Taxa

Herb: *Lessertia phillipsiana*.

Conservation Status

This vegetation is classified as EN, with a conservation target of 24% (Mucina & Rutherford, 2006).

5.1.2.2 Klerksdorp Thornveld

This vegetation type occurs on plains or slightly irregular undulating plains with open to dense *Vachellia karroo* bush clumps in dry grassland (Mucina & Rutherford, 2006). This vegetation type occurs in the North-West Province: In two sets of patches, one in the Wolmaransstad, Ottosdal and Hartbeesfontein region, and the other from the Botsolano Game Park north of Mafikeng to the vicinity of Madibogo in the south.

Important Plant Taxa

Important plant taxa are those species that have a high abundance, a frequent occurrence or are prominent in the landscape within a particular vegetation type (Mucina & Rutherford, 2006).

The following species are important in the **Klerksdorp Thornveld** vegetation type:

Small Trees: *Vachellia karroo (d), V. caffra, Celtis africana, Searsia lancea, Ziziphus mucronata.*

Tall Shrubs: *Vachellia hebeclada, Diospyros lycioides subsp. lycioides, Ehretia rigida, Grewia flava, Gymnosporia buxifolia, Rhus pyroides, Tarchonanthus camphoratus.*

Woody Climber: *Asparagus africanus.*

Low Shrubs: *Asparagus laricinus (d), A. suaveolens (d), Felicia muricata (d), Anthospermum hispidulum, A. rigidum subsp. pumilum, Aptosimum elongatum, Gnidia capitata, Gomphocarpus fruticosus subsp. fruticosus, Helichrysum dregeanum, Leucas capensis, Pavonia burchellii, Pentzia globosa, Solanum supinum var. supinum, Triumfetta sonderi, Ziziphus zeyheriana.*

Graminoids: *Aristida congesta (d), Cynodon dactylon (d), Eragrostis lehmanniana (d), E. trichophora (d), Microchloa caffra (d), Panicum coloratum (d), Sporobolus fimbriatus (d), Themeda triandra (d), Andropogon schirensis, Anthephora pubescens, Aristida junciformis subsp. galpinii, A. stipitata subsp. graciliflora, Brachiaria nigropedata, B. serrata, Bulbostylis burchellii, Cymbopogon pospischilii, Digitaria eriantha, Diheteropogon amplectens, Elionurus muticus, Eragrostis curvula, E. obtusa, E. racemosa, E. superba, Eustachys paspaloides, Heteropogon contortus, Setaria sphacelata, Sporobolus africanus, Tragus berteronianus, Trichoneura grandiglumis, Triraphis andropogonoides.*

Herbs: *Acalypha angustata, Acanthospermum australe, Berkheya onopordifolia var. onopordifolia, B. setifera, Blepharis integrifolia var. clarkei, Chamaesyce inaequilatera, Chascanum adenostachyum, Dicoma macrocephala, Helichrysum nudifolium var. nudifolium, Hermannia lancifolia, Hibiscus pusillus, Justicia anagalloides, Lippia scaberrima, Nidorella microcephala, Nolletia ciliaris, Pollichia campestris, Rhynchosia adenodes, Salvia radula, Selago densiflora, Teucrium trifidum, Tolpis capensis.*

Geophytic Herbs: *Bulbine narcissifolia, Ledebouria marginata, Ornithogalum tenuifolium subsp. tenuifolium, Raphionacme hirsuta.*

Herbaceous Climber: *Rhynchosia venulosa.*

Conservation Status of the Vegetation Type

According to Mucina and Rutherford (2006), this vegetation type is classified as Vulnerable (VU). The national target for conservation protection for the vegetation type is 24%. Only about 2.5% is conserved in the statutory Mafikeng Game Reserve, private Botsolano Game Park and Faan Meintjes Nature Reserve. Almost a third is already transformed for cultivation and by urban sprawl. This vegetation unit has a high grazing capacity and this leads to overutilization and degradation, and subsequent invasion of *Vachellia karroo* into adjacent dry grassland.

5.1.2.3 Expected Flora Species

The POSA database indicates that over 400 species of plants could be expected to occur within and around the PAOI (Appendix B). Two (2) of the expected species is classified as SCC, based on its conservation status (Table 5-2).

Table 5-2 SCC flora species that may occur within the PAOI

Family	Species	Author	IUCN	Ecology
Asteraceae	*Gnaphalium declinatum*	L.f.	NT	Indigenous; Endemic
Fabaceae	*Pearsonia bracteata*	(Benth.) Polhill	NT	Indigenous; Endemic

5.1.3 Fauna Assessment

This section of the report details the lists of expected SCC fauna species that may occur within the PAOI, where the fauna species considered include mammals, reptiles, and amphibians. Where the likelihood of a particular species occurring within the PAOI is rated by the specialist as being either moderate or high, based on the known habitat and prey/forage preferences of a particular species (linked with the field survey data obtained), the relevant species is then further discussed below a given table.

5.1.3.1 Mammals

The IUCN Red List Spatial Data lists 113 mammal species that could be expected to occur within the area (Appendix C). This excludes large mammal species that are typically limited to reserves. Twenty (20) (small -medium non protected area restricted species) of these expected species are regarded as threatened (Table 5-3), seventeen of these have a low likelihood of occurrence based on the lack of suitable habitat and food sources in the PAOI. Descriptions of species with a moderate likelihood of occurrence are discussed below.

Table 5-3 SCC mammal species that may occur within the PAOI

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2021)	
Aonyx capensis	Cape Clawless Otter	NT	NT	Low
Atelerix frontalis	South Africa Hedgehog	NT	LC	Moderate
Crocidura maquassiensis	Makwassie musk shrew	VU	LC	Low
Crocidura mariquensis	Swamp Musk Shrew	NT	LC	Low
Damaliscus lunatus	Tsessebe	VU	LC	Low
Damaliscus pygargus pygargus	Bontebok	VU	VU	Low
Equus zebra	Mountain Zebra	VU	VU	Low
Felis nigripes	Black-footed Cat	VU	VU	Moderate
Hippotragus equinus	Roan Antelope	EN	LC	Low
Hippotragus niger	Sable Antelope	VU	LC	Low
Parahyaena brunnea	Brown Hyaena	NT	NT	Low
Hydrictis maculicollis	Spotted-necked Otter	VU	NT	Low
Leptailurus serval	Serval	NT	LC	Moderate
Mystromys albicaudatus	White-tailed Rat	VU	EN	Low
Otomys auratus	Vlei Rat (Grassland type)	NT	NT	Low
Panthera pardus	Leopard	VU	VU	Low

Parahyaena brunnea	Brown Hyaena	NT	NT	Low
Pelea capreolus	Grey Rhebok	NT	NT	Low
Poecilogale albinucha	African Striped Weasel	NT	LC	Low
Redunca fulvorufula	Mountain Reedbuck	EN	EN	Low

Atelerix frontalis (South African Hedgehog) has a tolerance to a degree for 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. Suitable grasslands occur in the PAOI, although somewhat disturbed, that can function as habitat for this species, as such the likelihood of occurrence is rated as moderate.

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 highest densities of this species have been recorded in the more arid Karoo region of South Africa. The habitat in the PAOI can be considered to be somewhat suitable for the species and the likelihood of occurrence is therefore rated as moderate.

Leptailurus serval (Serval) occurs widely through sub-Saharan Africa and is commonly recorded from most major national parks and reserves (IUCN, 2017). The Serval's status outside reserves is not certain, but they are inconspicuous and may be common in suitable habitat as they are tolerant of farming practices provided there is cover and food available. In sub-Saharan Africa, they are found in habitat with well-watered savanna long-grass environments and are particularly associated with reedbeds and other riparian vegetation types. Large areas of grasslands are present in the PAOI and as such the likelihood of occurrence is rated as moderate.

5.1.3.2 Reptiles

Based on the IUCN Red List spatial database and the ReptileMap database, over 40 reptile species may be expected to occur within and nearby to the PAOI (Appendix D). One (1) of these species are regarded as SCC and has a low likelihood of occurrence since it is endemic to the western regions of the Western Cape (Table 5-4).

Table 5-4 SCC reptile species that may occur within the PAOI

Species	Common Name	Conservation Status		Likelihood of Occurrence
		SANBI (2022)	IUCN (2021)	
Psammophis leightoni	Cape Sand Snake	VU	LC	Low

5.1.3.3 Amphibians

Based on the IUCN Red List Spatial Data and AmphibianMap, 20 amphibian species are expected to occur within the area (Appendix E). One (1) is regarded as threatened (Table 5-5).

Table 5-5 SCC amphibian species that may occur within the PAOI

Species	Common Name	Conservation Status		Likelihood of Occurrence
		SANBI (2022)	IUCN (2021)	
Pyxicephalus adspersus	Giant Bull Frog	NT	LC	Low

Pyxicephalus adspersus (Giant Bullfrog) is listed as NT on a regional scale. It is a species that inhabits drier savannahs where it is fossorial for most of the year, remaining buried in cocoons. They emerge at the start of the rain season and breed in shallow, temporary waters in pools, pans and ditches (IUCN, 2017).

The lack of suitable aquatic habitat across the PAOI contributed to a low likelihood of occurrence for this species.

5.2 Biodiversity Field Survey

The following sections discuss the results from the field survey that was conducted for the proposed project, which was undertaken during the 12th to the 13th of October 2022.

5.2.1 Flora Survey

This section is further divided into two subsections:

- Indigenous flora recorded; and
- Invasive Alien Plants (IAPs) of the PAOI.

5.2.1.1 Indigenous Flora

The vegetation assessment was conducted throughout the extent of the PAOI. A total of 86 trees, shrubs, herbaceous and graminoid plant species were recorded in the PAOI during the field assessment (Table 5-6). Plants listed as Category 1 alien or invasive species under the NEMBA appear in green text and non-indigenous species appear in blue text.

The list of plant species recorded is by no means comprehensive, a survey conducted under guard may likely yield up to 40% additional flora species for the PAOI. However, floristic analysis conducted to date is regarded as a sound representation of the local flora for the PAOI. Some of the plants recorded can be seen in Figure 5-11.

No red-listed SCC flora species were recorded, however, *Euphorbia inaequilatera* was recorded along the PAOI and is protected under Schedule 2 of the North West Biodiversity Management Act No 4 (2016). Refer to the Figure 5-11 for photos of flora species recorded across the PAOI.

Table 5-6 Trees, shrubs and herbaceous plant species recorded in the PAOI. Plants listed as Category 1 alien or invasive species under the NEMBA appear in green text.

Family	Species	Threat Status (SANBI, 2017)	SA Ecology	NEMBA Alien Category
Agavaceae	*Agave americana*	NE	Not indigenous; Naturalized exotic weed	
Asphodelaceae	*Aloe greatheadii*	LC	Indigenous; Not endemic	
Asteraceae	*Arctotheca calendula*	LC	Indigenous; Not endemic	
Papaveraceae	*Argemone mexicana*	NE	Not indigenous; Naturalized exotic weed	NEMBA 1b
Poaceae	*Aristida congesta subsp. barbicollis*	LC	Indigenous; Not endemic	
Apocynaceae	*Asclepias stellifera*	LC	Indigenous; Not endemic	
Asparagoideae	*Asparagus sp.laricinus*		Indigenous; Not endemic	
Acanthaceae	*Barleria macrostegia*	LC	Indigenous; Not endemic	
Asteraceae	*Berkheya radula*	LC	Indigenous; Not endemic	
Asteraceae	*Berkheya setifera*	LC	Indigenous; Not endemic	
Asteraceae	*Bidens pilosa*	NE	Not indigenous; Naturalized exotic weed	
Asphodelaceae	*Bulbine abyssinica*	LC	Indigenous; Not endemic	
Asphodelaceae	*Bulbine narcissifolia*	LC	Indigenous; Not endemic	
Agavaceae	*Chlorophytum saundersiae*	LC	SA endemic	

Asteraceae	*Cirsium vulgare*	NE	Not indigenous; Naturalized exotic weed	NEMBA 1b
Convolvulaceae	*Convolvulus farinosus*	LC	Indigenous; Not endemic	
Asteraceae	*Conyza sumatrensis*	NE	Not indigenous; Naturalized exotic weed	
Malvaceae	*Corchorus asplenifolius*	LC	Indigenous; Not endemic	
Apiaceae	*Cyclospermum leptophyllum*	NE	Not indigenous; Naturalized exotic weed	
Poaceae	*Cynodon dactylon*	LC	Indigenous; Not endemic	
Poaceae	*Digitaria eriantha*	LC	Indigenous; Not endemic	
Ebenaceae	*Diospyros lycioides*	LC	Indigenous; Not endemic	
Hyacinthaceae	*Dipcadi viride*	LC	Indigenous; Not endemic	
Acanthaceae	*Dyschoriste setigera*	LC	Indigenous; Not endemic	
Boraginaceae	*Ehretia rigida*	LC	Indigenous; Not endemic	
Poaceae	*Elionurus muticus*	LC	Indigenous; Not endemic	
Poaceae	*Eragrostis lehmanniana*	LC	Indigenous; Not endemic	
Poaceae	*Eragrostis superba*	LC	Indigenous; Not endemic	
Euphorbiaceae	*Euphorbia inaequilatera*	LC	Indigenous; Not endemic	
Asteraceae	*Gazania krebsiana*	LC	Indigenous; Not endemic	
Apocynaceae	*Gomphocarpus fruticosus*	LC	Indigenous; Not endemic	
Amaranthaceae	*Gomphrena celosioides*	NE	Not indigenous; Naturalized exotic weed	
Amaranthaceae	*Guilleminea densa*	NE	Not indigenous; Naturalized exotic weed	
Asteraceae	*Helichrysum argyrosphaerum*	LC	Indigenous; Not endemic	
Asteraceae	*Helichrysum caespititium*	LC	Indigenous; Not endemic	
Asteraceae	*Helichrysum rugulosum*	LC	Indigenous; Not endemic	
Asteraceae	*Helminthotheca echioides*	NE	Not indigenous; Naturalized exotic weed	
Malvaceae	*Hermannia depressa*	LC	SA endemic	
Poaceae	*Heteropogon contortus*	LC	Indigenous; Not endemic	
Malvaceae	*Hibiscus calyphyllus*	LC	Indigenous; Not endemic	
Malvaceae	*Hibiscus pusillus*	LC	Indigenous; Not endemic	
Asteraceae	*Hilliardiella elaeagnoides*	LC	Indigenous; Not endemic	
Brassicaceae	*Hirschfeldia incana*	NE	Not indigenous; Naturalized exotic weed	
Poaceae	*Hyparrhenia hirta*	LC	Indigenous; Not endemic	
Hypoxidaceae	*Hypoxis obtusa*	LC	Indigenous; Not endemic	
Fabaceae	*Indigofera daleoides*	LC	Indigenous; Not endemic	
Scrophulariaceae	*Jamesbrittenia aurantiaca*	LC	Indigenous; Not endemic	
Acanthaceae	*Justicia anagalloides*	LC	Indigenous; Not endemic	
Asteraceae	*Lactuca inermis*	LC	Indigenous; Not endemic	
Verbenaceae	*Lantana rugosa*	LC	Indigenous; Not endemic	
Thymeleaceae	*Lasiosiphon kraussianus*	LC	Indigenous; Not endemic	
Hyacinthaceae	*Ledebouria marginata*	LC	Indigenous; Not endemic	

Meliaceae	*Melia azedarach*	NE	Not indigenous; Naturalized exotic weed	NEMBA 1b-Urban Areas
Poaceae	*Melinis repens subsp. repens*	LC	Indigenous; Not endemic	
Moraceae	*Morus nigra*	NE	Not indigenous; Naturalized exotic weed	
Asteraceae	*Nidorella hottentotica*	LC	Indigenous; Not endemic	
Asteraceae	*Nidorella podocephala*	LC	Indigenous; Not endemic	
Onagraceae	*Oenothera tetraptera*	NE	Not indigenous; Naturalized exotic weed	
Cactaceae	*Opuntia ficus-indica*	NE	Not indigenous; Naturalized exotic weed	NEMBA 1b
Asteraceae	*Osteospermum scariosum*	LC	Indigenous; Not endemic	
Malvaceae	*Pavonia burchellii*	LC	Indigenous; Not endemic	
Apocynaceae	*Pentarrhinum insipidum*	LC	Indigenous; Not endemic	
Solanaceae	*Physalis viscosa*	NE	Not indigenous; Naturalized exotic weed	
Plantaginaceae	*Plantago lanceolata*	LC	Indigenous; Not endemic	
Poaceae	*Pogonarthia squarrosa*	LC	Indigenous; Not endemic	
Fabaceae	*Prosopis glandulosa*	NE	Not indigenous; Naturalized exotic weed	NEMBA 1b in North-West
Fagaceae	*Quercus robur*	NE	Not indigenous; Naturalized exotic weed	
Fabaceae	*Robinia pseudoacacia*	NE	Not indigenous; Naturalized exotic weed	NEMBA 1b
Lamiaceae	*Salvia sp.*			
Anacardiaceae	*Searsia lancea*	LC	Indigenous; Not endemic	
Anacardiaceae	*Searsia pyroides*	LC	Indigenous; Not endemic	
Asteraceae	*Senecio coronatus*	LC	Indigenous; Not endemic	
Asteraceae	*Seriphium plumosum*	LC	Indigenous; Not endemic	
Solanaceae	*Solanum lichtensteinii*	LC	Indigenous; Not endemic	
Poaceae	*Sporobolus africanus*	LC	Indigenous; Not endemic	
Asteraceae	*Stoebe plumosum*	LC	Indigenous; Not endemic	
Asteraceae	*Tagetes minuta*	NE	Not indigenous; Naturalized exotic weed	
Fabaceae	*Tephrosia capensis*	LC	Indigenous; Not endemic	
Poaceae	*Themeda triandra*	LC	Indigenous; Not endemic	
Poaceae	*Urochloa serrata*	LC	Indigenous; Not endemic	
Fabaceae	*Vachellia karroo*	LC	Indigenous; Not endemic	
Verbenaceae	*Verbena bonariensis*	NE	Not indigenous; Naturalized exotic weed	NEMBA 1b
Verbenaceae	*Verbena brasiliensis*	NE	Not indigenous; Naturalized exotic weed	NEMBA 1b
Campanulaceae	*Wahlenbergia undulata*	LC	Indigenous; Not endemic	
Asteraceae	*Xanthium spinosum*	NE	Not indigenous; Naturalized exotic weed	NEMBA 1b
Rhamnaceae	*Ziziphus mucronata*	LC	Indigenous; Not endemic	

Figure 5-11 ***Photographs illustrating some of the indigenous flora species recorded – A) Helichrysum argyrosphaerum; B) Ledebouria marginata; C) Euphorbia inaequilatera (protected under Schedule 2 of the North West Biodiversity Management Act No 4 (2016); and D) Hypoxis obtusa.***

5.2.1.2 Invasive Alien Plants

The National Environmental Management: Biodiversity Act, Act No. 10 of 2004, (NEM:BA) is the national legislation that incorporates the mandatory regulation of Invasive Alien Plant (IAP) species, and in September 2020 the most current lists of IAP Species were published in terms of NEM:BA (in Government Gazette No. 43726 of 18 September 2020). The Alien and Invasive Species Regulations serve to define and regulate the various categories of Alien and Invasive Species and were recently updated and published in terms of NEM:BA in the Government Gazette No. 43735 of 25 September 2020. The 2020 Alien and Invasive Species Regulations and Lists were recently extended as published in the Government Gazette No. 44182, 24th of February 2021.

The legislation calls for the removal and/or control of IAP species (Category 1 species). In addition, unless authorised thereto in terms of the National Water Act, 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 NEM:BA:

- **Category 1a:** Invasive species requiring compulsory eradication. 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. Species existing outside of a regulated area shall be classified as category 1b.

- **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 as these will be classified as category 1b species.

Note that according to the regulations, any 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 NEM:BA;
    - The relevant local invasive species management programme developed in terms of regulation 4; and
    - Any directive issued in terms of section 73(3) of the NEMBA.

Twenty-two (22) IAP species were recorded during the field survey, of which nine (9) are Category 1b species which must be controlled through the implementation of an IAP Management Programme. Photographs of the observed species are presented in Figure 5-12 below.

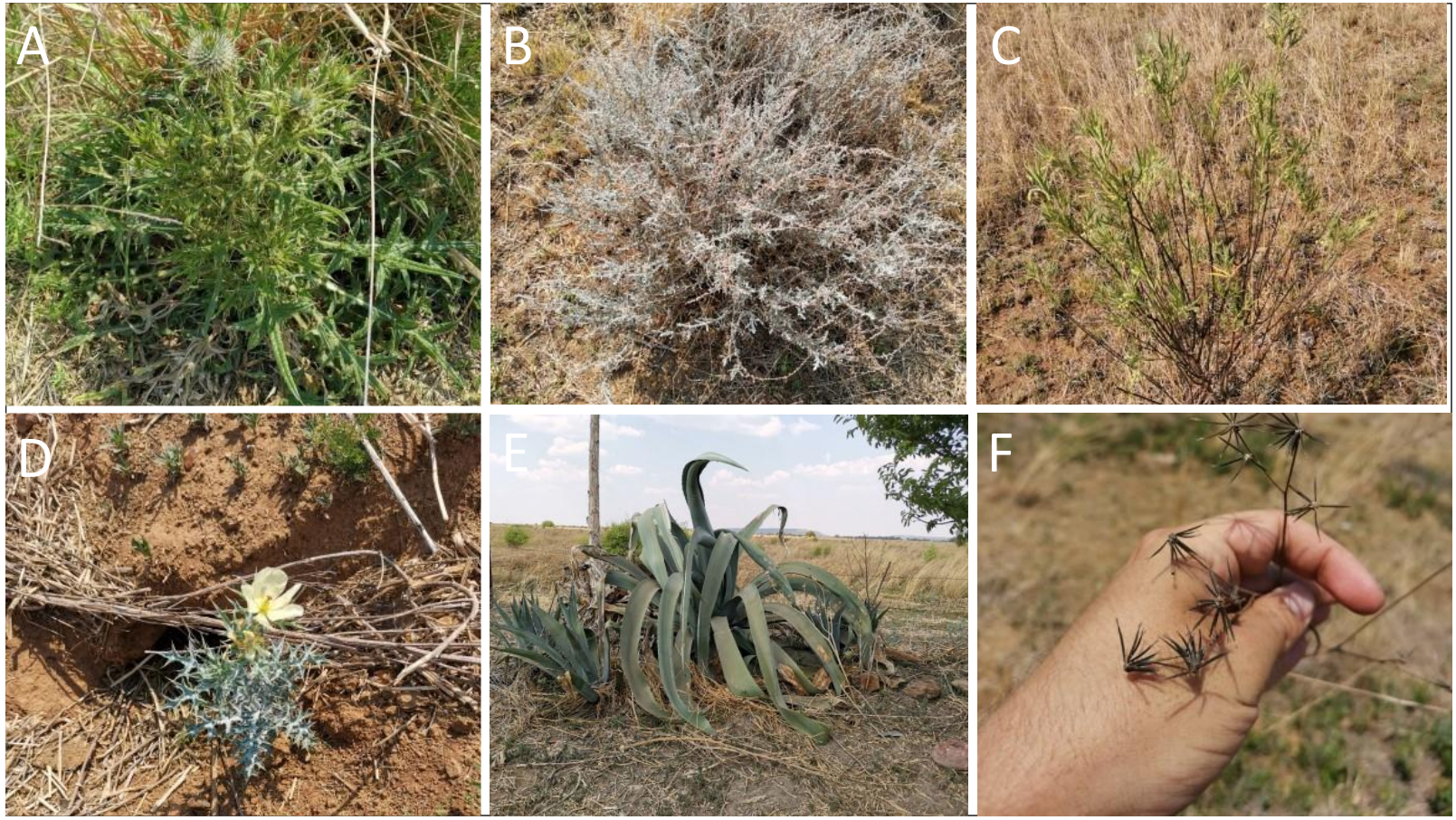


Figure 5-12 Photographs illustrating the alien and invasive flora species recorded within the PAOI – A) Cirsium vulgare; B) Seriphium plumosum; C) Gomphocarpus fruticosus; D) Argemone mexicana; E) Agave americana and F) Bidens Pilosa.

5.2.2 Fauna Survey

Mammal activity was low, where seven (7) mammal species were recorded, either through direct observations or evidence of species (Table 5-7). No reptile or amphibian species were observed during the survey. However, there is the possibility of at least several reptile species being present, as certain reptile species are secretive and require longer-term surveys in order to ensure adequate sampling. Due to the lack of suitable aquatic habitat across the PAOI limited amphibian species are expected to occur.

No fauna SCC were recorded, however, evidence of *Connochaetes taurinus* (Blue Wildebeest) were recorded and is listed as protected under Schedule 2 of the North West Biodiversity Management Act No 4 (2016). Refer to Figure 5-13 for photographs of some of the recorded fauna species.

Table 5-7 The fauna species recorded during the field survey

Species	Common Name	Conservation Status	
		SANBI (2022)	IUCN (2021)
Connochaetes taurinus	Blue Wildebeest (Protected, Schedule 2)	LC	LC
Cynictis penicillata	Yellow Mongoose	LC	LC
Geosciurus inauris	South African Ground Squirrel	Unlisted	Unlisted
Hystrix africaeaustralis	Cape Porcupine	LC	LC
Lepus saxatilis	Scrub Hare	LC	LC
Raphicerus campestris	Steenbok	LC	LC
Sylvicapra grimmia	Common Duiker	LC	LC
Tragelaphus strepsiceros	Greater Kudu	LC	LC

Note: For results pertaining to the avifaunal species of the area refer to the avifaunal specialist assessment report.

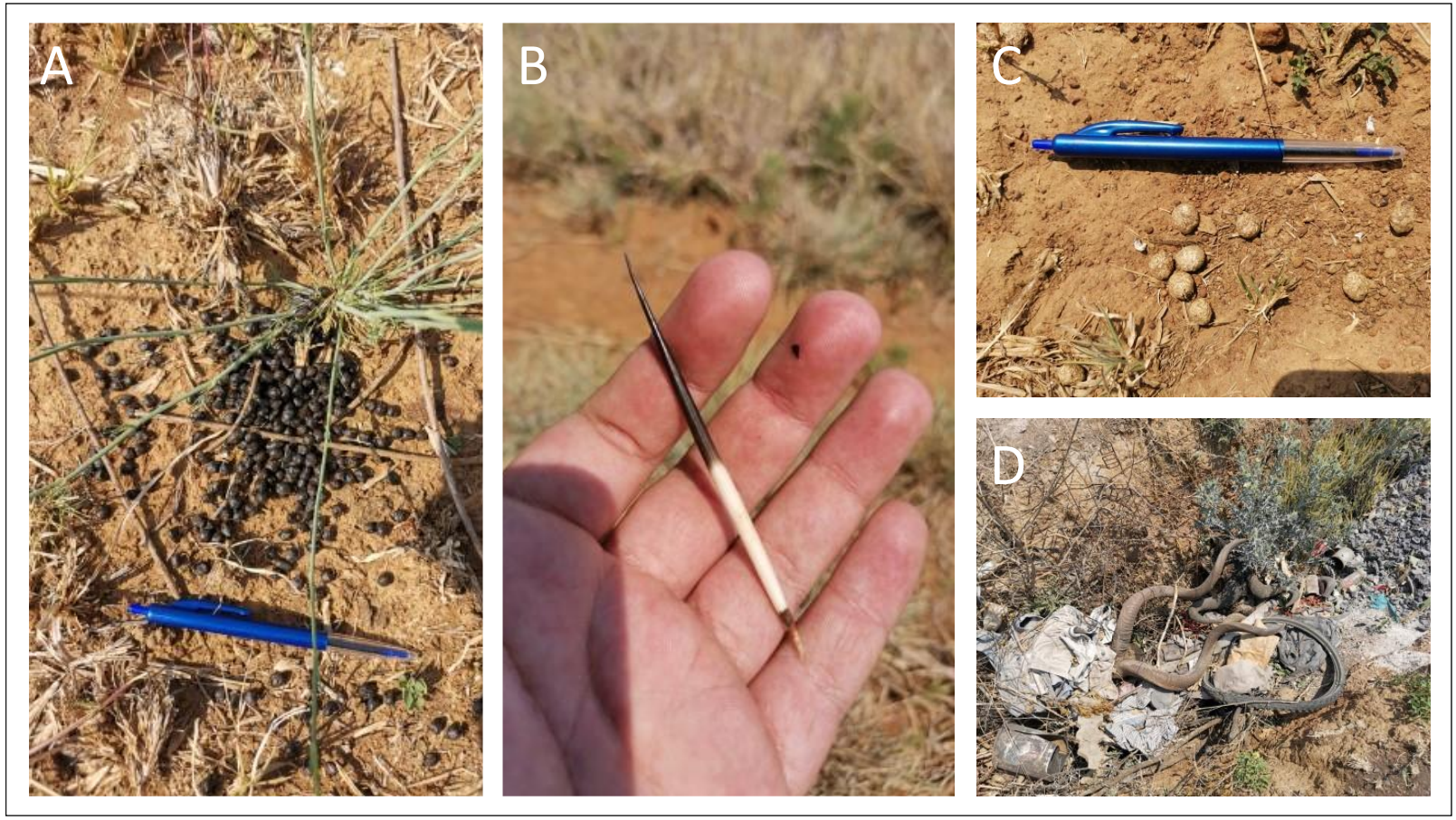


Figure 5-13 ***Photographs: Mammal species and/or sign thereof recorded during the survey – A) Sylvicapra grimmia (Common Duiker); B) Hystrix africaeaustralis (Cape Porcupine); C) Lepus saxatilis (Scrub Hare); D) Tragelaphus strepsiceros (Greater Kudu) and Connochaetes taurinus (Blue Wildebeest) (Protected, Schedule 2).***

5.3 Habitat Assessment

The main habitat types identified across the PAOI were initially identified largely based on aerial imagery. These main habitat types were refined based on the field coverage and data collected during the survey; the delineated habitats can be seen in Figure 5-14. Emphasis was placed on limiting timed meander searches along the proposed PAOI within the natural habitats and therefore habitats with a higher potential of hosting SCC.

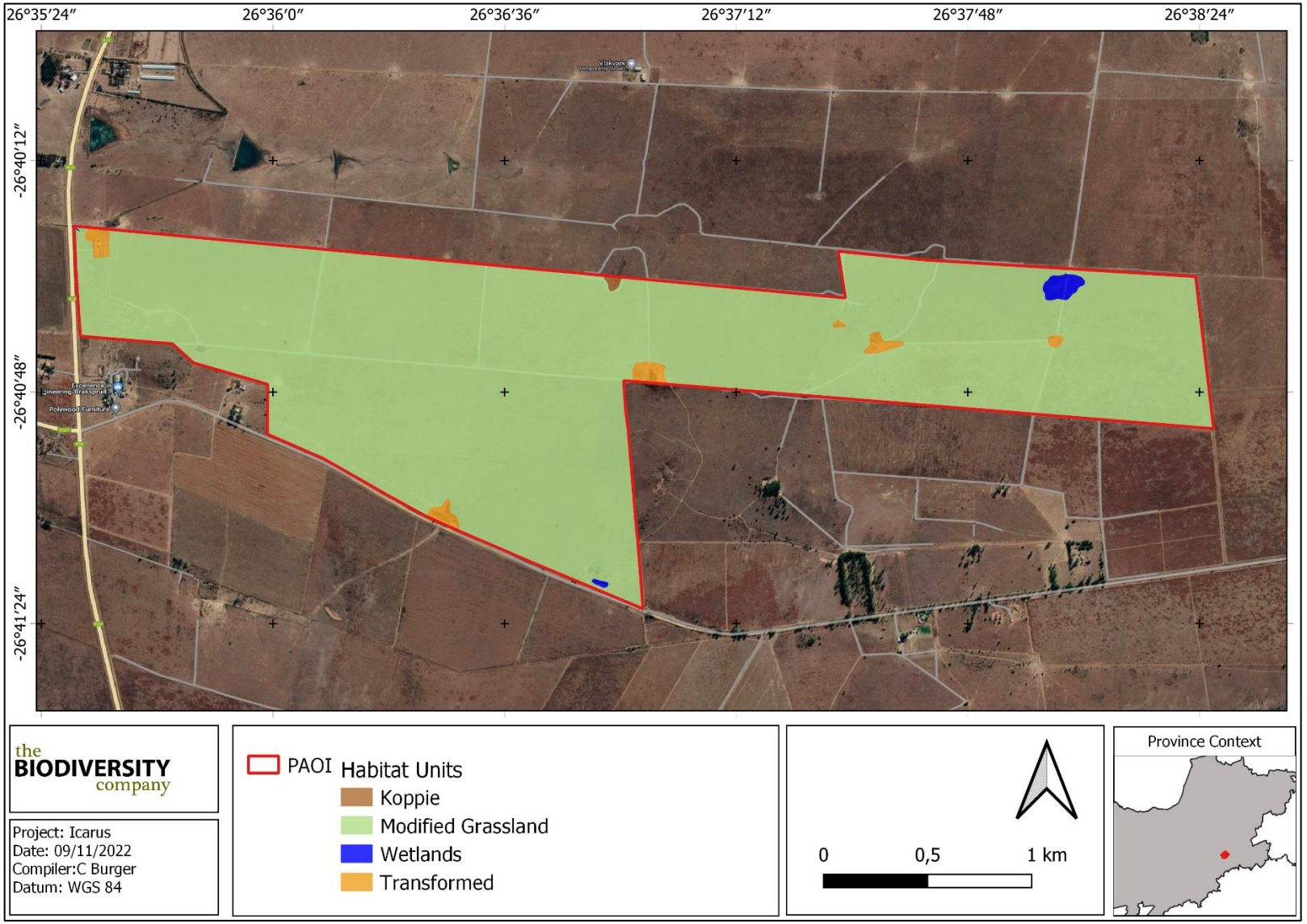


Figure 5-14 Map illustrating the habitats identified in the PAOI

5.3.1 Koppie

A koppie area was identified within the central portion of the PAOI. This feature is typically associated with a higher elevation, rocky foot slope and a higher diversity of floral species (Figure 5-15). This area also provides unique habitat to faunal species especially reptiles. Vegetation associated with this habitat unit included *Asparagus laricinus, Aloe greatheadii, Ziziphus mucronate and Tagetes minuta.*

Figure 5-15 A representative photograph of the Koppie habitat

5.3.2 Modified Grassland Habitat

The majority of the PAOI comprised of modified grassland habitat. This habitat is associated with grassland that has been exposed to modifications due to land use and mismanagement. The dominant vegetation across the habitat unit included species such as *Themeda triandra, Aristida congesta, Cynodon dactylon, Digitaria eriantha, Elionurus muticus, Eragrostis lehmanniana, Bulbine abyssinica, Aloe greatheadii, Asparagus laricinus* and *Pogonarthia squarrosa.* The area is also heavily invaded by the alien and invasive species *Tagetes minuta*.

Due to the current land uses the ecological condition across this habitat unit is inconsistent. The condition difference within this habitat depends on the extent of the disturbance in some areas being more severe, usually related to one being more overgrazed and exposed to current anthropogenic activities than the other.

This habitat unit can be regarded as important, not only within the local landscape, but also regionally. The unit functions as remaining greenlands which supports viable indigenous plant species populations and is also used for foraging. The unit also serves as a movement corridor for fauna within a landscape mainly fragmented by agricultural practices.

Figure 5-16 presents a representative photograph of this habitat type.

Figure 5-16 A representative photograph of the Modified Grassland habitat

5.3.3 Transformed Habitat

The transformed habitat is associated with an existing substation, residential buildings and areas of bare ground. The transformed area has little to no remaining natural vegetation due to land transformation to accommodate anthropogenic activities. This habitat exists in a constant disturbed state as it cannot recover to a more natural state unless through human intervention.

Figure 5-17 presents a photograph of the Transformed habitat type.

Figure 5-17 A representative photograph of the Transformed habitat

5.3.4 Wetland Habitat

This habitat unit represents the wetlands/water resources found along the PAOI. These habitats are discussed in detail in the most recent wetland assessment – conducted by The Biodiversity Company (2022). The ecological integrity, importance and functioning of these areas play an important role as a water resource system, important habitat and movement corridor for various fauna and flora. This habitat needs to be protected and improved due to the role of this habitat as a water resource.

Figure 5-18 presents a representative photograph of the wetland habitat associated with the PAOI.

Figure 5-18 A representative photograph of the wetland habitat

5.4 Site Ecological Importance

Based on the criteria provided in section 4.3 of this report, the four delineated habitat types have each been allocated a sensitivity category, or SEI, and this breakdown is presented in Table 5-8 below. In order to identify and spatially present sensitive features in terms of the relevant specialist discipline, the sensitivities of each of the habitat types delineated within the PAOI are mapped in Figure 5-19 below.

It is important to note that this map does not replace any local, provincial, or national government legislation relating to these areas or the land use capabilities or sensitivities of these environments.

Table 5-8 Sensitivity summary of the habitat types delineated within the PAOI

Habitat	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Kopppie	Medium	High	**Medium**	Low	**High**
Modified Grassland	Medium	Medium	**Medium**	Medium	**Medium**
Wetlands	Medium	Medium	**Medium**	Medium	**Medium**
Transformed	Low	Low	**Low**	High	**Very Low**

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

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

- Medium: Minimisation and restoration mitigation – Development activities of medium impact acceptable followed by appropriate restoration activities.
- 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.

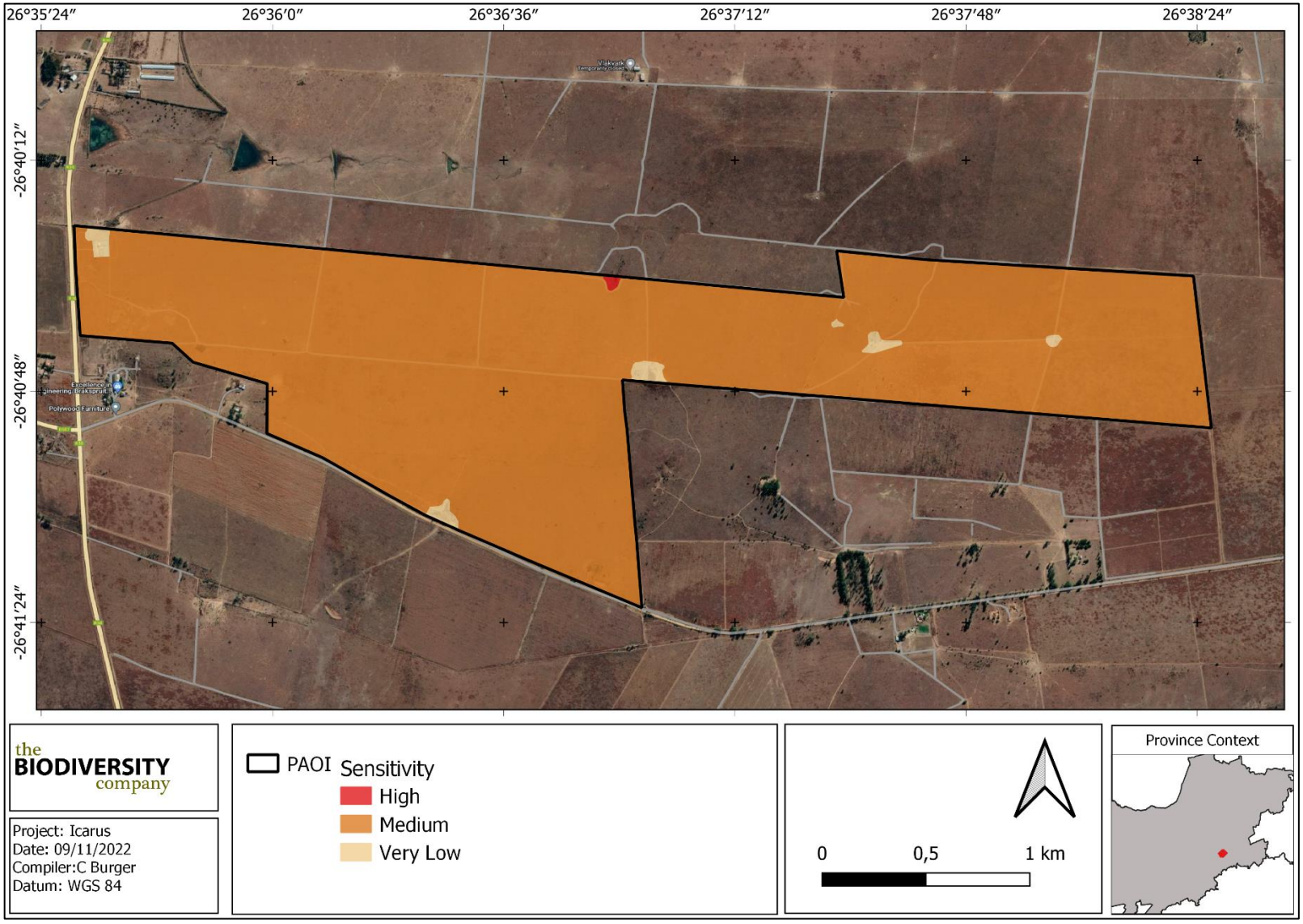
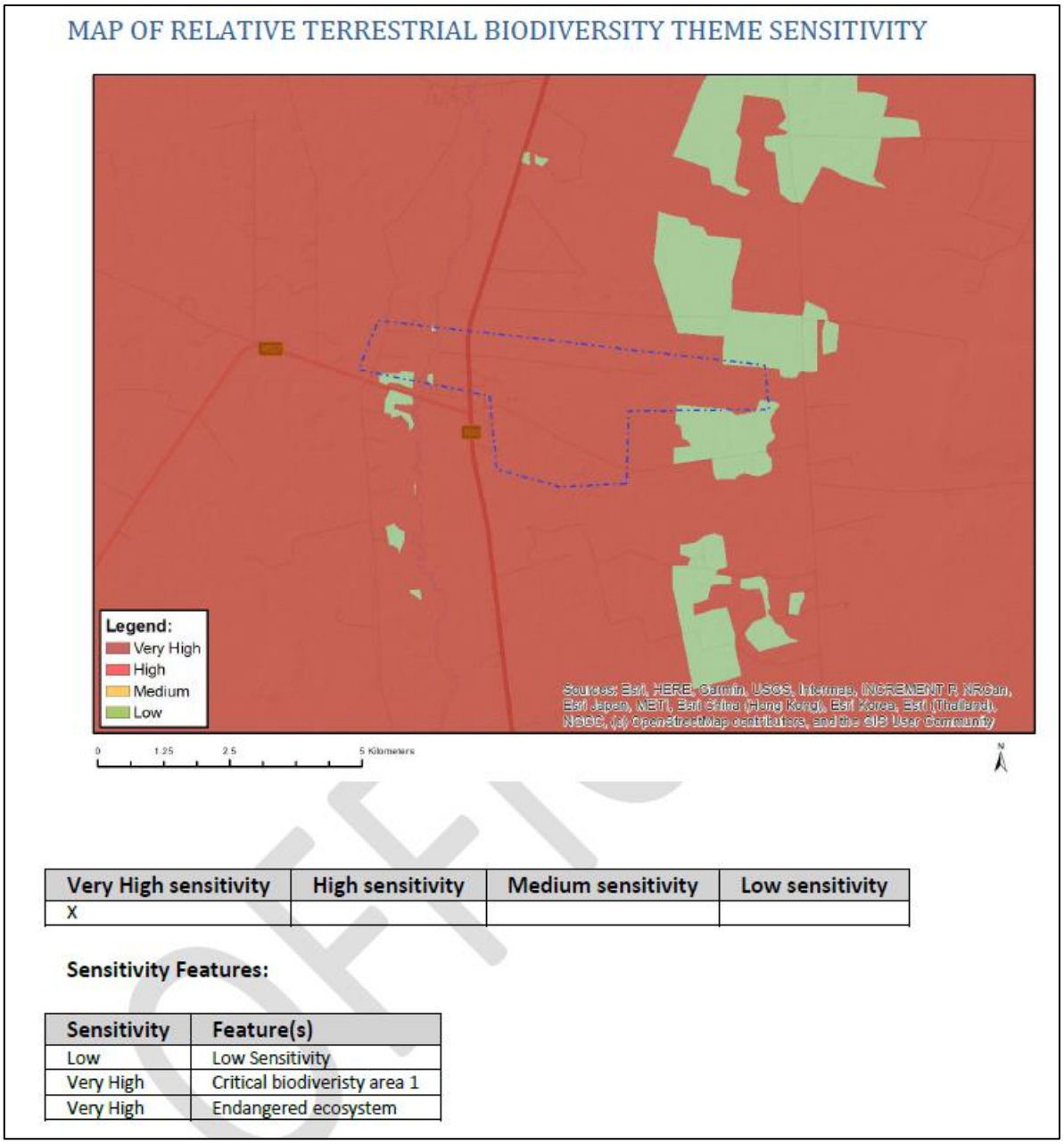


Figure 5-19 Map illustrating the sensitivities of the habitats delineated within the overall PAOI

5.4.1 Screening Tool Comparison

The terrestrial biodiversity theme sensitivity as indicated by the screening tool report for the PAOI was derived to be 'Very High' (Figure 5-20), due to the presence of CBA1 and an Endangered Ecosystem.



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Very High	Critical biodiveristy area 1
Very High	Endangered ecosystem

Figure 5-20 Terrestrial Biodiversity Theme Sensitivity for the PAOI (National Environmental Screening Tool, 2022)

The completion of the terrestrial desktop and field studies disputes the 'Very High' sensitivity presented by the screening report. As discussed above, most of the area represents Modified Grassland habitat which has been exposed to varying levels of disturbance and is regarded as having a "Medium" sensitivity. A small portion of a koppie was found along the central portion of the PAOI and is considered to be of 'high' sensitivity. Additionally, wetland habitat was also found along the PAOI and is also considered to have a "Medium" sensitivity from a terrestrial perspective. The transformed habitat is regarded as having a "Very Low" sensitivity as no natural habitat remains in this area.

The screening report classified both the animal and plant species them as “medium” sensitivity. Following the findings of the field survey, the animal species theme (from a mammal and herpetofauna perspective) and the plant species theme should retain its “Medium” sensitivity.

6 Impact Assessment and Management Plan

The sections below serve to outline and summarise the types of perceived impacts from the proposed activities on the terrestrial biodiversity and ecology of the PAOI. The associated significance of each impact is evaluated as relevant to the local biodiversity and the likely project activities.

6.1 Biodiversity Risk Assessment

6.1.1 Impact Assessment Considerations and Procedure

The project activities will have a negative effect on the natural environment of the area. Anthropogenic activities drive habitat destruction leading to the displacement of fauna and flora and possibly causing direct mortality. Land clearing destroys local wildlife habitat and can lead to the loss of local breeding grounds, foraging and nesting/burrowing sites, and wildlife movement corridors such as rivers, streams and drainage lines, or other locally important features. The removal of natural vegetation is likely to reduce the habitat available for all types of fauna species and hence reduce animal populations and species compositions within the area.

Potential impacts were evaluated against the data captured during the desktop assessment and field survey to identify associated relevance to the habitats within the PAOI. The impacts associated with the proposed activities were then subjected to a prescribed impact assessment methodology as provided by the client, which is available on request. The planning, decommissioning and/or rehabilitation phases were not considered based on the nature of the likely activities and the associated negatable impacts expected during these phases. Refer to section 6.2 below for the full impact assessment.

6.1.2 Present Impacts to Biodiversity

Considering the fact that anthropogenic activities have historically taken place throughout most of the region, and continue to do so, several significantly negative impacts to biodiversity were observed within and adjacent to the PAOI. These include:

- Historic land modification largely in the form of road and residential infrastructure, and the associated land clearing and edge effects;
- Livestock grazing;
- Minor and major gravel roads (and associated vehicle traffic and the possibility of wildlife road mortalities);
- Invasive Alien Plant infestations; and
- Fences and the associated infrastructure.

Figure 6-1 illustrates some of the negative impacts to biodiversity currently observed within and adjacent to the PAOI.

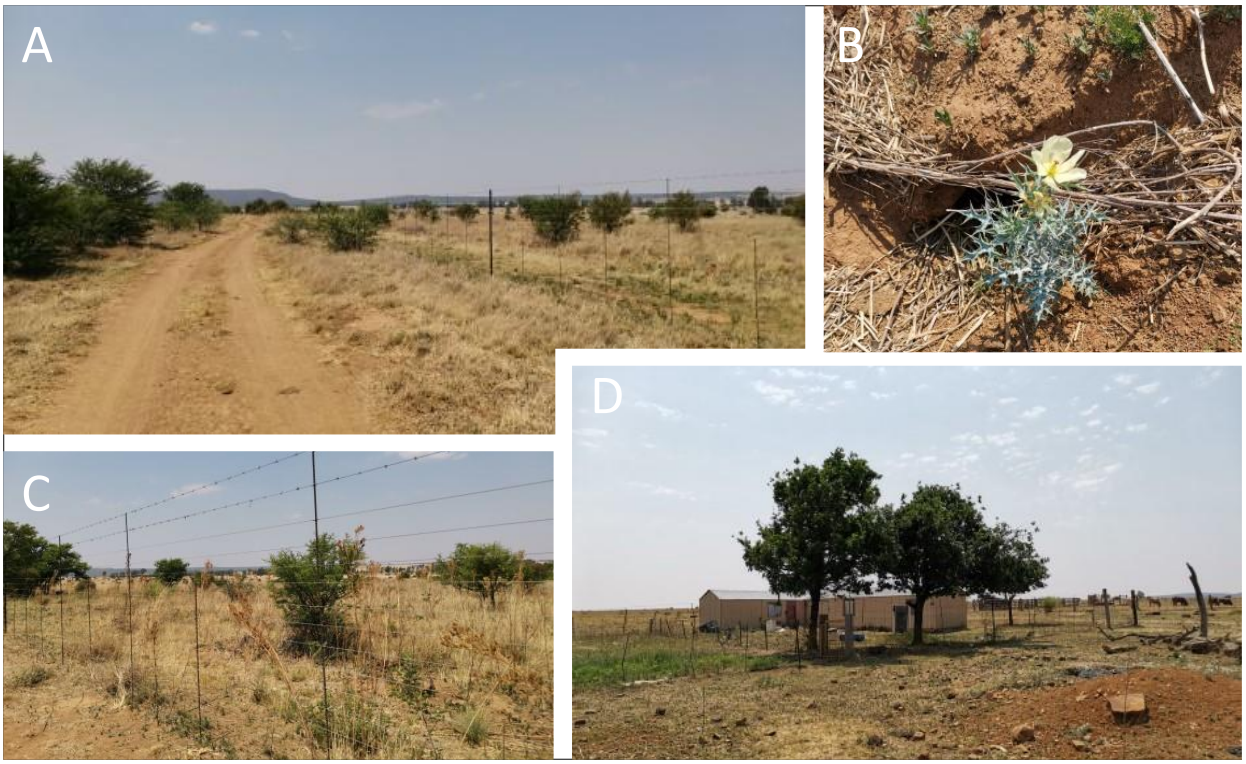


Figure 6-1 ***Photograph illustrating current negative impacts associated with the PAOI: A) Secondary roads, B) Alien and invasive species, C) Fences; and D) Existing buildings and livestock grazing.***

6.1.3 Loss of Irreplaceable Resources

The proposed activities are likely to be of a high impact and relatively large footprint, and the careful placement of certain developments is therefore important so as to minimise the damage to natural resources.

The proposed activities will be conducted over portions of the PAOI that are comprised of modified grassland habitat, koppie habitat and wetland areas and these sections encompass indigenous vegetation that may be considered functional in nature. Thus, any irresponsible and/or medium to high impact activities will likely result in the loss of the following resources:

- Critical Biodiversity Areas / Ecological Support Areas;
- Wetland areas providing important foraging resources;
- Protected flora;
- Fauna species (through direct mortality during clearing and construction activities, or through indirect mortality via the inappropriate control of waste material); and
- Foraging and traversing routes, and/or nesting/burrowing sites, relevant to the wide diversity of fauna that will occasionally make use of the areas.

As certain areas are in a functional state, the loss of these resources would be considered significant. Therefore, mitigations must be put in place and implemented to prevent the total and widespread destruction of valuable natural resources (see section 6.4).

6.1.4 Anticipated Impacts

The project activities will lead to several significant impacts to terrestrial biodiversity, which are presented as an overview in Table 6-1 below. It is important to predict and quantify these impacts so as to assess the magnitude and effect that each may have on the local terrestrial biodiversity and ecology.

The impacts described are to be used as a guideline for the main impact assessment procedure that is to be followed.

Table 6-1 Anticipated impacts for the proposed activities on terrestrial biodiversity

Main Impact	Project activities that are likely to cause the impact	Secondary impacts anticipated
Destruction, fragmentation and degradation of habitats and ecosystems	Physical removal of vegetation, including protected species Development of access roads and servitudes Soil dust precipitation Dumping of waste products Random events such as fire (cooking fires or cigarettes) Walking and driving outside of demarcated routes (roads and paths)	• Displacement/loss of flora & fauna (including possible SCC); • Loss of protected species; • Increased potential for soil erosion; • Habitat fragmentation; and • Increased potential for the establishment of IAP vegetation.
Spread and/or establishment of Invasive Alien Plants	The removal of indigenous vegetation Vehicles and people spreading seed Unsanitary conditions surrounding infrastructure, promoting the establishment of alien and/or invasive rodents Creation of infrastructure suitable for breeding activities of alien and/or invasive birds	• Habitat loss for native flora & fauna (including possible SCC); • Spreading of potentially dangerous diseases due to invasive and pest species; • Alteration of fauna assemblages due to habitat modification; and • Displacement of indigenous bird species
Direct mortality of fauna	Clearing of vegetation and the mass dumping of earth waste Roadkill due to vehicle collision (non-compliance with speed limits etc.) Pollution of water resources due to dust effects, chemical spills, etc. Intentional killing of fauna for food or sale	• Loss of habitat; • Loss of ecosystem services; • Increase in rodent populations and associated disease risk; and • Deterioration of local ecology
Reduced dispersal/migration of fauna	Activities causing significant noise (heavy machinery) Construction of linear infrastructure (large roads and powerlines) Compacted roads Removal of vegetation	• Loss of landscape used as a corridor; • Reduced dispersal/migration of fauna; • Loss of ecosystem services; and • Reduced plant seed dispersal
Environmental pollution due to water runoff, spills from vehicles and erosion	Chemical (organic/inorganic) spills Erosion Poor maintenance and control of vehicles and machinery Pipe leaks (poor maintenance)	• Faunal mortality (direct and indirect – such as through poisoning); • Groundwater pollution; • Pollution of wetlands and the surrounding environment; and • Loss of ecosystem services

Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to noise, dust, and light pollution	Operation of machinery (Large earth moving machinery, vehicles)	• Disruption/alteration of ecological life cycles due to noise; • Loss of ecosystem services; and • Loss of local faunal community
	Vehicle traffic	
	Large, intense fluorescent and mercury vapor lighting	
Loss of SCCs and/or protected species	All unregulated/unsupervised activities outdoors	• Loss of SCCs and/or protected species; and • Harm to people (dangerous fauna)
	Poaching and trapping	
	Staff and others interacting directly with fauna (potentially dangerous), or flora	

6.1.5 Unplanned Events

The planned activities will have anticipated impacts as discussed above; however, unplanned events may occur on any project, and these could lead to potential impacts which will require appropriate management and response.

Table 6-2 is a summary of the findings of an unplanned event assessment conducted from a terrestrial ecology perspective. Note that not all potential unplanned events may be captured herein, and this process must therefore be managed throughout all phases and according to events that take place or have a high likelihood of taking place.

Table 6-2 Summary of unplanned events, potential impacts and mitigations

Unplanned Event	Potential Impact	Mitigation
Spills into the surrounding environment	Contamination of habitat as well as water resources associated with a spillage.	A spill response kit must be available at all times. 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 the surrounding natural savannah.	An appropriate fire management plan needs to be compiled and implemented.
Erosion caused by water runoff from the surface	Erosion on the side of the roads and cleared areas.	A storm water management plan must be compiled and implemented.

6.1.6 Alternatives considered

No alternative footprint layout options were provided by the client and thus it is anticipated that most of the PAOI will be developed.

6.2 Quantitative Biodiversity Impact Assessment

6.2.1 Overview: Assessment of Impact Significance

The assessment of impact significance considers both pre-mitigation as well as post-mitigation scenarios as relevant to each potential impact. Construction phase, operational phase, and cumulative impacts are discussed and assessed below, and the project specific mitigation actions required to lower the risks of the impacts are provided in section 6.4 of this report. No planning or decommissioning/rehabilitation phases were considered based on the nature of the activities.

Certain details have been provided by the client with regards to the nature of the intended development activities, and these have been used as part of the assessment process to aid in the estimation of the likely significance ratings for each predicted impact type.

6.2.2 Construction Phase Impacts

Four main impacts on the terrestrial biodiversity of the PAOI were considered for the construction phase of the proposed activities (based on the framework discussed above). This phase refers to the period during site preparation, clearing and construction and is considered to have the largest short-term and direct impact on biodiversity - partly as a result of the high levels of regular activity, and the extensive clearing that usually takes place. The following potential impacts to terrestrial biodiversity were considered, and these are each assessed for their significance in Table 6-3 and Table 6-4 that follows:

- Destruction, loss and fragmentation of habitats, ecosystems and the vegetation community;
- Introduction of IAP species and invasive fauna;
- Destruction of protected plant species; and
- Displacement of the indigenous faunal community (including possible SCC) due to habitat loss, direct mortalities, and disturbance (road collisions, noise, dust, light, vibration, and poaching).

All likely impacts are rated as Medium-Highly negative pre-mitigation but may be reduced to Medium-Low significance through the proper implementation of effective mitigation measures. The most important mitigation measures for this phase are as follows:

- Ensure that the site footprint is as small as possible and responsibly positioned, the development area must be properly fenced off during construction;
- Protected flora must be avoided or responsibly transplanted according to a search and rescue plan and all relevant permits must be obtained prior to the relocation;
- Land clearing must be done over at least three days and conducted linearly and successively from the west to the east or vice versa; and
- No trapping, killing, or poisoning of any wildlife is to be allowed and signs must be put up to enforce this. Monitoring must take place in this regard.

Table 6-3 Construction phase Impact Assessment – Pre Mitigation

Impact	Pre Mitigation							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
Destruction, loss and fragmentation of habitats, ecosystems and the vegetation community.	2	4	3	3	3	4	3	
	Local/district: Will affect the local area or district.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	High cumulative impact: The impact would result in significant cumulative effects	High: Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.	**Negative High Impact**
Introduction of IAP species and invasive fauna.	2	4	3	2	3	4	2	
	Local/district: Will affect the local area or district.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Significant loss of resources: The impact will result in significant loss of resources.	High cumulative impact: The impact would result in significant cumulative effects	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Medium Impact**
Destruction of protected plant species	2	4	3	3	3	3	2	
	Local/district: Will affect the local area or district.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Medium Impact**
	3	3	4	3	3	4	3	

Displacement of the indigenous faunal community (including possible SCC) due to habitat loss, direct mortalities, and disturbance (road collisions, noise, dust, light, vibration, and poaching).	Province/region: Will affect the entire province or region.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Permanent: The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	High cumulative impact: The impact would result in significant cumulative effects	High: Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.	**Negative High Impact**

Table 6-4 Construction phase Impact Assessment – Post Mitigation

Impact	Post Mitigation							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
Destruction, loss and fragmentation of habitats, ecosystems and the vegetation community.	1	4	2	3	3	3	2	
	Site: The impact will only affect the site.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Medium Impact**
Introduction of IAP species and invasive fauna.	1	3	2	2	2	3	2	
	Site: The impact will only affect the site.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Marginal loss of resource: The impact will result in marginal loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Low Impact**
Destruction of protected plant species	1	3	2	3	2	3	2	
	Site: The impact will only affect the site.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Marginal loss of resource: The impact will result in marginal loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains	**Negative Low Impact**

							general integrity (some impact on integrity).	
Displacement of the indigenous faunal community (including possible SCC) due to habitat loss, direct mortalities, and disturbance (road collisions, noise, dust, light, vibration, and poaching).	2	2	3	2	3	3	2	
	Local/district: Will affect the local area or district.	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Significant loss of resources: The impact will result in significant loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Medium Impact**

6.2.3 Operational Phase Impacts

The impacts of daily activities associated with the operational phase of the project are anticipated to further spread the IAP species, and lead to the further deterioration of habitats due to the continuing presence of dust and other edge effect impacts. Dust inhibits the ability of plants to photosynthesize and thus leads to the degradation of surrounding natural areas. Additionally, moving maintenance vehicles do not only cause sensory disturbances to fauna, affecting their life cycles and movement, but will also lead to displacement and direct faunal mortalities due to collisions.

The operational phase is often the longest phase of a project and as such the effects from impacts have the opportunity to cumulate over long periods of time and cause significant cumulative damage to the environment. It is important to actively and continuously implement and update the relevant mitigation measures for this phase so as to effectively reduce this compounding effect.

The following potential impacts were considered for this phase of the project, and these are each assessed for their significance in Table 6-5 and Table 6-6 below:

- Continued fragmentation and degradation of natural habitats and ecosystems;
- Continuing spread of IAP and weed species; and
- Ongoing displacement and direct mortalities of the faunal community (including SCC) due to continued disturbance (road collisions, noise, light, dust, vibration, poaching, erosion, etc.).

All potential impacts may be reduced from a significance rating of High-Medium to Low with the proper implementation of ongoing mitigation measures. The most important mitigation measures to implement during this phase include:

- The continual usage of the same roadways, parking areas and walkways, and the following of speed limits;
- The monitoring of, and enforcement against, any illegal hunting, poaching, and/or trapping activities;
- The responsible management of all waste; and
- An IAP management and habitat rehabilitation plan must be implemented and updated annually.

Table 6-5 Operational phase Impact Assessment – Pre-Mitigation

Impact	Pre Mitigation							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
Continued fragmentation and degradation of natural habitats and ecosystems.	2	3	3	2	3	4	2	
	Local/district: Will affect the local area or district.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Significant loss of resources: The impact will result in significant loss of resources.	High cumulative impact: The impact would result in significant cumulative effects	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Medium Impact**
Continuing spread of IAP and weed species.	2	3	3	2	3	4	3	
	Local/district: Will affect the local area or district.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Significant loss of resources: The impact will result in significant loss of resources.	High cumulative impact: The impact would result in significant cumulative effects	High: Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.	**Negative Medium Impact**
Ongoing displacement and direct mortalities of the faunal community (including possible SCC) due to continued disturbance (road collisions, noise, light, dust, vibration, poaching, erosion, etc.).	3	3	3	3	3	4	2	
	Province/region: Will affect the entire province or region.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	High cumulative impact: The impact would result in significant cumulative effects	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Medium Impact**

Table 6-6 Operational phase Impact Assessment – Post Mitigation

Impact	Post Mitigation							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
Continued fragmentation and degradation of natural habitats and ecosystems.	1	2	2	2	2	3	2	
	Site: The impact will only affect the site.	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Marginal loss of resource: The impact will result in marginal loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Low Impact**
Continuing spread of IAP and weed species.	1	3	2	2	2	3	2	
	Site: The impact will only affect the site.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Marginal loss of resource: The impact will result in marginal loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Low Impact**
Ongoing displacement and direct mortalities of the faunal community (including possible SCC) due to continued disturbance (road collisions, noise, light, dust, vibration, poaching, erosion, etc.).	2	2	3	2	2	3	2	
	Local/district: Will affect the local area or district.	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Marginal loss of resource: The impact will result in marginal loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Low Impact**

6.2.4 Cumulative Impacts

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 pre-existing 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 local fauna and flora specifically.

Cumulative impacts are assessed within the context of the extent of the proposed PAOI, other similar developments and activities in the area (existing and in-process), and general habitat loss and transformation resulting from any other activities in the area. Localised cumulative impacts include those from operations that are close enough (within 30 km) to potentially cause additive effects on the local environment or any sensitive receptors (relevant operations include nearby large road networks, other solar PV facilities, and power infrastructure). Relevant impacts include the overall reduction of foraging and nesting/burrowing habitat, dust deposition, noise and vibration, disruption of functional corridors of habitat important for movement and migration, disruption of waterways, groundwater drawdown, and groundwater and surface water quality depletion.

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.

In order to spatially quantify the cumulative effects of the proposed development, the project in isolation is compared with the overall effects of surrounding development (including total transformation and transformation as a result of new and proposed developments of a similar type, i.e., solar).

According to the 2018 National Biodiversity Assessment, the total amount of Vaal Vet Sandy Grassland habitat within 30 km of the project amounts to 217 368,58 ha, but when considering the transformation that has taken place within this radius – only 104 720,19 ha remains. Therefore, the area within 30 km of the project has experienced approximately 48,17% loss in natural habitat. Considering this context, the project footprint is 397,31 ha (assuming the total extent of the PAOI is developed), and fifteen (15) additional similar project exists in the 30 km region measuring a maximum of 32 459,02 ha (as per the latest South African Renewable Energy EIA Application Database). This means that the total amount of remaining habitat lost as a result of solar projects in the region amounts to 31,37 % (the sum of all related developments as a percentage of the total remaining habitat). Table 6-7 outlines the calculation procedure for the spatial assessment of cumulative impacts.

Table 6-7 Loss of Vaal Vet Sandy Grassland habitat within a 30 km radius of the project

	Total Habitat (ha)	Tot. Remaining Habitat (ha)	Total Historical Loss	Project Footprint (ha)	Similar Projects (ha)	Cumulative Habitat Lost
Solar development cumulative effects (Spatial)	217 368,58	104 720,19	**48,17%**	397,31	32 459,02	**31,37%**

The overall cumulative impact assessment is presented in Table 6-8 and Table 6-9 below. Note that this also accounts for the relative importance of the habitats within and adjacent to the PAOI, in the context of the value of the regional habitat.

Approximately 48,17 % of the Vaal Vet Sandy Grassland vegetation type has been lost, and as discussed above the proposed development will result in a further loss of approximately 31,37 % from only similar developments (Solar) in the area, as such the cumulative impact from the proposed development is rated as "high". This means that the careful spatial management and planning of the

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

Table 6-8 Cumulative Impacts to biodiversity associated with the proposed project – Project in Isolation

Impact	Project in Isolation							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
	2	4	3	3	2	3	2	
Loss of habitat, and disruption of surrounding ecological corridors. As well as the influences of pollution (water, noise, air, etc.).	Local/district: Will affect the local area or district.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Marginal loss of resource: The impact will result in marginal loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Medium Impact**

Table 6-9 Cumulative Impacts to biodiversity associated with the proposed project – Cumulative Effect

Impact	Cumulative Effect							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
	3	4	3	3	3	4	3	
Loss of habitat, and disruption of surrounding ecological corridors. As well as the influences of pollution (water, noise, air, etc.).	Province/region : Will affect the entire province or region.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development,	Barely reversible: The impact is unlikely to be reversed even with intense	Significant loss of resources: The impact will result in significant loss of resources.	High cumulative impact: The impact would result in significant	High: Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is	**Negative High Impact**

			but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	mitigation measures.		cumulative effects	severely impaired and may temporarily cease. High costs of rehabilitation and remediation.	

6.3 No-Go Scenario

The current land use is predominantly grazing and foraging habitat for local indigenous fauna (as well as herds of livestock), and the associated impacts caused by this to the terrestrial ecology is considered to be low. If the land use is well managed, then the long-term impacts to the local ecology will continue to be low - this will require that grazing areas are rotated, grazing capacities are sustained, and stocking densities are controlled. Under the current circumstances, the 'no-go' alternative is considered to represent a low long-term negative impact on the environment. However, it is noted that if the grazing land use is left unmanaged for the foreseeable future, it is probable that the ecological integrity and functioning of the grassland area will deteriorate.

6.4 Impact Management and Mitigation Plan

The aim of the management outcomes is to present mitigation actions in such a way that they can be incorporated into the Environmental Management Programme (EMPr), and possible biodiversity management programme, for the project, which should in turn allow for a more successful implementation and auditing of the mitigations and monitoring guidelines. Table 6-10 presents the recommended mitigation measures and the respective timeframes, targets, and performance indicators relative to the terrestrial assessment.

The focus of mitigation measures is to reduce the significance of the likely impacts associated with the development, and thereby to:

- Prevent the significant loss and fragmentation of vegetation communities within the CBA areas in the vicinity of the PAOI;
- Reduce the negative fragmentation effects of the development and enable the safe movement of fauna species;
- Prevent the direct and indirect loss and disturbance of flora and fauna species and communities, including possible SCC and protected species; and
- Adequately follow the guidelines for interpreting the Site Ecological Importance ratings assigned to the PAOI (see Table 4-6).

Special attention must be paid to the 'Vegetation and Habitats' and 'Fauna' sections below as these sections provide recommended and important mitigation measures pertaining to the confirmed protected species.

Table 6-10 Project specific mitigation measures including requirements for timeframes, roles and responsibilities

Management outcome: Vegetation and Habitats				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
Bruch cutting should be implemented beneath the panels, no vegetation clearing should be permitted.	Construction Phase	Project manager & Environmental Officer	Development footprint	Ongoing
Laydown and construction preparation activities (such as cement mixing, temporary toilets, etc.) must be limited to the 'Very Low' sensitivity areas as far as possible.	Construction Phase	Project manager, Environmental Officer	Development footprint	Ongoing
The clearing of vegetation must be minimized where possible. All activities must be restricted to within the authorised areas. It is recommended that areas to be developed be specifically and responsibly demarcated so that during the construction phase only the demarcated areas be impacted upon.	Life of operation	Project manager, Environmental Officer	Areas of indigenous vegetation	Ongoing
All protected flora must be clearly demarcated prior to the commencement of site clearing. If construction activities are likely to affect any protected plants, these individuals should be relocated as part of a plant search and rescue plan and a permit must be obtained before doing so.	Planning Phase	Environmental Officer	Protected plants	During phase
Existing access routes, especially roads, must be made use of.	Construction/Operational Phase	Environmental Officer & Design Engineer	Roads and paths used	Ongoing
Any materials may not be stored for extended periods of time and must be removed from the PAOI once the construction phase has been concluded. No permanent construction phase structures should be permitted. Construction buildings should preferably be prefabricated or constructed of re-usable/recyclable materials. No storage of vehicles or equipment will be allowed outside of the designated laydown areas.	Construction and Operational Phase	Environmental Officer, Design Engineer, and Contractor	Laydown areas	Ongoing
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation according to a habitat rehabilitation plan, to prevent erosion during flood and wind events and to promote the regeneration of functional habitat. This will also reduce the likelihood of encroachment by invasive alien plant species. All grazing mammals must be kept out of the areas that have recently been re-planted.	Operational phase	Environmental Officer & Contractor	Assess the state of rehabilitation and encroachment of alien vegetation	Quarterly for up to two 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 from leaking and entering the environment.** • **Construction activities and vehicles could cause spillages of lubricants, fuels and waste material negatively affecting the functioning of the ecosystem.** • **All vehicles and equipment must be maintained, and all re-fuelling and servicing of equipment is to take place in demarcated areas outside of the PAOI.**	Life of operation	Environmental Officer & Contractor	Spill events, Vehicles dripping.	Ongoing
It must be made an offence for any staff to take/ bring any plant species into/out of any portion of the PAOI. No plant species whether indigenous or exotic should be brought into/taken from the PAOI, to prevent the spread of exotic or invasive species or the illegal collection of plants.	Life of operation	Project manager, Environmental Officer	Any instances	Ongoing
A fire management plan needs to be complied and implemented to restrict the impact fire would have on the surrounding areas.	Life of operation	Environmental Officer & Contractor	Fire Management	During Phase
All construction waste must be removed from site at the closure of the construction phase.	Construction phase	Environmental Officer & Contractor	Construction waste	During Phase
Management outcome: Fauna				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency

A qualified environmental control officer must be on site when activities begin. A site walk through is recommended by a suitably qualified ecologist prior to any activities taking place. In situations where SCC/protected species are observed and must be removed, the proponent may only do so after the required permission/permits have been obtained in accordance with national and provincial legislation. In the abovementioned situation the development and implementation of a search, rescue and recovery program is suggested for the protection of these species. Should animals not move out of the area on their own relevant specialists must be contacted to advise on how the species can be relocated.	Construction Phase	Environmental Officer, Contractor	Presence of any floral or faunal SCC	During phase
Clearing and disturbance activities must be conducted in a progressive linear manner, from the west to the east of the PAOI or wise versa and over several days, so as to provide an easy escape route for all small mammals and herpetofauna.	Construction Phase	Environmental Officer & Contractor	Progressive land clearing operations and the movement of fauna	Ongoing
The areas to be disturbed must be specifically and responsibly demarcated to prevent the movement of staff or any individual into the surrounding environments, signs must be put up to enforce this.	Construction/Operational Phase	Project manager, Environmental Officer	Infringement into these areas	Ongoing
The duration of the activities should be minimized to as short a term as possible, to reduce the period of disturbance on fauna.	Construction	Project manager, Environmental Officer & Design Engineer	Construction/Closure Phase	Ongoing
Noise must be kept to an absolute minimum during the evenings and at night to minimize all possible disturbances to reptile species and nocturnal mammals.	Construction/Operational Phase	Environmental Officer	Noise levels	Ongoing
No trapping, killing, or poisoning of any wildlife is to be allowed and Signs must be put up to enforce this. Monitoring must take place in this regard.	Life of operation	Environmental Officer	Evidence of trapping etc	Ongoing
Outside lighting should be designed and limited to minimize impacts on fauna. All outside lighting should be directed away from highly sensitive areas. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (green/red) lights should be used wherever possible.	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Light pollution and period of light	Ongoing
All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must be enforced to ensure that road killings and erosion is limited.	Life of operation	Health and Safety Officer	Compliance to the training	Ongoing

Schedule activities and operations during least sensitive periods, to avoid migration, nesting, and breeding seasons.	Life of operation	Project manager, Environmental Officer & Design Engineer	Activities should take place during the day	Ongoing
Any holes/deep excavations must be dug and planted in a progressive manner and shouldn't be left open overnight. Should any holes remain open overnight they must be properly covered temporarily to ensure that no small fauna species fall in, and subsequently inspected prior to backfilling.	Planning and Construction	Environmental Officer & Contractor, Engineer	Presence of trapped animals and open holes	Ongoing
Wildlife-permeable fencing with holes large enough for mongoose and other smaller mammals should be installed every 100 m, the holes must not be placed in the fence where it is next to a major road as this will increase road killings in the area.	Planning and construction	Environmental Officer & Contractor, Engineer	Fauna movement corridor	Ongoing
Use environmentally friendly cleaning and dust suppressant products.	Construction and operation	Environmental Officer & Contractor, Engineer	Presence of chemicals in and around the PAOI	Ongoing
Once the development layout has been confirmed, the footprint area must be fenced off appropriately in segments pre-construction to allow animals to move or be moved out of these areas before breaking ground activities occur. Construction activities must take place systemically and the perimeter fence should not be completed (i.e., leaving sections unfenced to allow fauna to escape) until systematic clearing is completed.	Planning/Construction Phase	Environmental Officer & Design Engineer	Areas not to be developed and construction direction	Ongoing
Management outcome: Alien species				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
An Invasive Alien Plant Management Plan must be compiled and implemented. This should regularly be updated to reflect the annual changed in IAP composition.	Life of operation	Project manager, Environmental Officer & Contractor	Manage and assess presence and encroachment of alien vegetation	Twice a year
The footprint area of the construction should be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas. Footprints of the roads must be kept to prescribed widths.	Construction/Operational Phase	Project manager, Environmental Officer & Contractor	Footprint Area	Life of operation

Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site. A location specific waste management plan must be put in place to limit the presence of rodents and pests and waste must not be allowed to enter surrounding areas.	Life of operation	Environmental Officer & Health and Safety Officer	Presence of waste	Life of operation
A pest control plan must be put in place and implemented; it is imperative that poisons not be used to control pests.	Life of operation	Environmental Officer & Health and Safety Officer	Evidence or presence of pests	Life of operation

Management outcome: Dust				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
Dust-reducing mitigation measures must be put in place and must be strictly adhered to. This includes the wetting of exposed soft soil surfaces. **No non-environmentally friendly suppressants may be used as this could result in the pollution of water sources.**	Construction phase	Contractor	Dustfall	Dust monitoring program.

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 effectively and responsibly according to a site-specific waste management plan. Dangerous waste such as metal wires and glass must only be stored in fully sealed and secure containers, before being moved off site as soon as possible.	Life of operation	Environmental Officer & Contractor	Waste Removal	Weekly
Litter, spills, fuels, chemical and human waste in and around the PAOI must be minimised and controlled according to the waste management plan.	Construction/Closure Phase	Environmental Officer & Health and Safety Officer	Presence of Waste	Daily
Cement mixing may not be performed on the ground. It is recommended that only closed side drum or pan type concrete mixers be utilised. Any spills must be immediately contained and isolated from the natural environment, before being removed from site.	Construction Phase	Environmental Officer & Contractor	Cement mixing and spills	Every occurrence

A minimum of one toilet must be provided per 10 persons. 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
The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility within every 10 days at least.	Life of operation	Environmental Officer & Health and Safety Officer	Availability of bins and the collection of the waste	Ongoing
Where a registered disposal facility is not available close to the PAOI, the Contractor shall provide a method statement with regards to waste management. Under no circumstances may domestic waste be burned on site or buried on open pits.	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Collection/handling of the waste	Ongoing
Refuse bins will be responsibly emptied and secured. Temporary storage of domestic waste shall be in covered and secured 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

Management outcome: Environmental awareness training				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
All personnel and contractors are to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. **Discussions are required on sensitive environmental receptors within the PAOI to inform contractors and site staff of the presence of sensitive flora and fauna species, their identification, conservation status and importance, biology, habitat requirements and management requirements in line with the Environmental Authorisation and within the EMPr.** **Contractors and employees must all undergo the induction and must be made aware of the sensitive areas to be avoided.**	Pre-construction phase	Health and Safety Officer, Environmental Officer	Compliance to the training	Ongoing

Management outcome: Erosion				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency

Speed limits must be put in place to reduce erosion. Soil surfaces must be wetted as necessary to reduce the dust generated by the project activities. Speed bumps and signs must be erected to enforce slow speeds.	Life of operation	Project manager, Environmental Officer	Water Runoff from road surfaces	Ongoing
Only existing access routes and walking paths may be made use of.	Life of operation	Project manager, Environmental Officer	Routes used within the area	Ongoing
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events etc.	Life of operation	Project manager, Environmental Officer	Re-establishment of indigenous vegetation	Progressively
A stormwater management plan must be compiled and implemented.	Life of operation	Project manager, Environmental Officer	Management plan	Before construction phase: Ongoing

7 Conclusion and Impact Statement

The majority of the PAOI was comprised of modified grassland habitat, which has been impacted upon by anthropogenic related activities, but still serves as an important greenlands area that supports indigenous flora and fauna, including protected species. As such it is important that the management outcomes presented above be adhered to, in order to properly mitigate the negative environmental impacts that will stem from the project activities.

No red-listed SCC flora species were recorded, however, *Euphorbia inaequilatera* was recorded along the PAOI and is protected under Schedule 2 of the North West Biodiversity Management Act No 4 (2016). The relevant permit applications should be submitted for the species mentioned above along with a search and rescue plan.

Completion of the terrestrial biodiversity assessment led to a disputing of the 'Very High' classification for the terrestrial biodiversity theme sensitivity as allocated by the National Environmental Screening Tool. The majority of the PAOI is instead assigned an overall sensitivity of 'Medium', which means as per the SEI guidelines the following is applicable to the PAOI:

- Minimisation and restoration mitigation – Development activities of medium impact acceptable followed by appropriate restoration activities.

Development within the high sensitivity area (Koppie) within the PAOI will lead to the direct destruction and loss of functional habitats; and the faunal species that are expected to utilise this habitat. Thus, if these areas are not maintained in a natural or near natural state, destroyed or fragmented, then meeting targets for biodiversity features will not be achieved. The mitigation measures, management and associated monitoring regarding the expected impacts will be the most important factor of this project and must be considered by the issuing authority.

7.1 Impact Statement

The main impacts that may be expected to occur, as a result of the proposed activities, include the following:

- Direct habitat loss and fragmentation (including the loss of Degraded CBA1 areas);
- Degradation of surrounding habitat;
- Destruction of protected flora;
- Disturbance and displacement of fauna (including direct mortality of fauna); and
- Introduction and further spreading of IAP and weed species.

All mitigation measures as described in this report must be implemented so as to reduce the significance of all anticipated impacts to an acceptable level (from 'Medium' – 'High' to 'Medium-Low'). The cumulative impact of the project, taking into account the transformation of surrounding land, is rated as 'High' and as such it is important to consider careful regional spatial planning and management in order to maintain the functionality of the remaining corridors of habitat.

Considering the assessment findings, no fatal flaws are evident for the proposed project. It is the opinion of the specialists that the project may be favourably considered, on condition that all prescribed mitigation measures are implemented.

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9 Appendix Items

9.1 Appendix A – Specialist Declarations

DECLARATION

I, Carami Burger, 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.

Carami Burger

Ecologist

The Biodiversity Company

November 2022

DECLARATION

I, Andrew Husted, declare that:

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

Andrew Husted

Terrestrial Ecologist

The Biodiversity Company

November 2022

9.2 Appendix B: Expected Flora

Family	Taxon	IUCN	Ecology
Acanthaceae	*Barleria obtusa*	LC	Indigenous
Acanthaceae	*Barleria macrostegia*	LC	Indigenous
Acanthaceae	*Crabbea angustifolia*	LC	Indigenous; Endemic
Acanthaceae	*Blepharis angusta*	LC	Indigenous; Endemic
Acanthaceae	*Dicliptera leistneri*	LC	Indigenous; Endemic
Acanthaceae	*Dyschoriste burchellii*	LC	Indigenous
Agavaceae	*Chlorophytum fasciculatum*	LC	Indigenous
Aizoaceae	*Delosperma sp.*		
Amaranthaceae	*Guilleminea densa*		Not indigenous; Naturalised; Invasive
Amaranthaceae	*Amaranthus praetermissus*	LC	Indigenous
Amaranthaceae	*Dysphania schraderiana*		Indigenous
Amaranthaceae	*Amaranthus thunbergii*	LC	Indigenous
Amaranthaceae	*Chenopodium sp.*		
Amaranthaceae	*Dysphania multifida*		Not indigenous; Naturalised; Invasive
Amaranthaceae	*Celosia argentea forma argentea*		Not indigenous; Naturalised
Amaranthaceae	*Aerva leucura*	LC	Indigenous
Amaranthaceae	*Dysphania carinata*		Not indigenous; Naturalised; Invasive
Amaryllidaceae	*Gethyllis transkarooica*	LC	Indigenous
Amaryllidaceae	*Nerine krigei*	LC	Indigenous; Endemic
Amaryllidaceae	*Crinum bulbispermum*	LC	Indigenous
Amaryllidaceae	*Nerine frithii*	LC	Indigenous; Endemic
Anacampserotaceae	*Anacampseros sp.*		
Anacardiaceae	*Searsia ciliata*	LC	Indigenous
Anacardiaceae	*Searsia leptodictya forma leptodictya*	NE	Indigenous
Anacardiaceae	*Searsia lancea*	LC	Indigenous
Anacardiaceae	*Searsia rigida var. margaretae*	LC	Indigenous; Endemic
Anacardiaceae	*Searsia rigida var. rigida*	LC	Indigenous; Endemic
Anacardiaceae	*Searsia pyroides var. pyroides*	LC	Indigenous
Apiaceae	*Conium chaerophylloides*	LC	Indigenous
Apiaceae	*Deverra burchellii*	LC	Indigenous
Apiaceae	*Choritaenia capensis*	LC	Indigenous; Endemic
Apiaceae	*Apium graveolens*		Not indigenous; Naturalised; Invasive
Apiaceae	*Berula repanda*	LC	Indigenous
Apocynaceae	*Raphionacme hirsuta*	LC	Indigenous
Apocynaceae	*Riocreuxia polyantha*	LC	Indigenous
Apocynaceae	*Pentarrhinum insipidum*	LC	Indigenous
Apocynaceae	*Asclepias eminens*	LC	Indigenous

Apocynaceae	*Stenostelma capense*	LC	Indigenous
Apocynaceae	*Asclepias gibba var. gibba*	LC	Indigenous
Apocynaceae	*Raphionacme velutina*	LC	Indigenous
Apocynaceae	*Carissa bispinosa*	LC	Indigenous
Apocynaceae	*Orbea lutea subsp. lutea*	LC	Indigenous
Apocynaceae	*Ceropegia barberae*		Indigenous
Apocynaceae	*Asclepias gibba var. media*	LC	Indigenous
Apocynaceae	*Cordylogyne globosa*	LC	Indigenous
Apocynaceae	*Ceropegia circinata*		Indigenous
Apocynaceae	*Asclepias meyeriana*	LC	Indigenous
Apocynaceae	*Pachycarpus schinzianus*	LC	Indigenous
Apocynaceae	*Aspidoglossum biflorum*	LC	Indigenous
Apocynaceae	*Ceropegia rehmannii*		Indigenous
Apocynaceae	*Asclepias aurea*	LC	Indigenous
Apocynaceae	*Ceropegia ramosissima*		Indigenous; Endemic
Apocynaceae	*Brachystelma sp.*		
Apocynaceae	*Parapodium costatum*	LC	Indigenous
Apocynaceae	*Asclepias fulva*	LC	Indigenous
Araceae	*Lemna gibba*	LC	Indigenous
Araceae	*Lemna minor*	LC	Indigenous
Asphodelaceae	*Trachyandra saltii var. saltii*	LC	Indigenous
Asphodelaceae	*Trachyandra asperata var. macowanii*	LC	Indigenous
Asphodelaceae	*Trachyandra erythrorrhiza*	LC	Indigenous; Endemic
Asphodelaceae	*Bulbine abyssinica*	LC	Indigenous
Asphodelaceae	*Bulbine narcissifolia*	LC	Indigenous
Asphodelaceae	*Kniphofia ensifolia subsp. ensifolia*	LC	Indigenous
Aspleniaceae	*Asplenium cordatum*	LC	Indigenous
Asteraceae	*Lactuca serriola*		Not indigenous; Naturalised
Asteraceae	*Gnaphalium filagopsis*	LC	Indigenous
Asteraceae	*Rhaponticum repens*		Not indigenous; Naturalised
Asteraceae	*Dicoma sp.*		
Asteraceae	*Chrysocoma sp.*		
Asteraceae	*Helichrysum argyrosphaerum*	LC	Indigenous
Asteraceae	*Pseudognaphalium luteoalbum*	LC	Cryptogenic
Asteraceae	*Xanthium strumarium*		Not indigenous; Naturalised; Invasive
Asteraceae	*Helichrysum nudifolium var. nudifolium*	LC	Indigenous
Asteraceae	*Centaurea melitensis*		Not indigenous; Naturalised
Asteraceae	*Galinsoga parviflora*		Not indigenous; Naturalised; Invasive
Asteraceae	*Osteospermum scariosum var. scariosum*	NE	Indigenous

Asteraceae	*Osteospermum muricatum subsp. muricatum*	LC	Indigenous
Asteraceae	*Erigeron bonariensis*		Not indigenous; Naturalised; Invasive
Asteraceae	*Nolletia annetjieae*	LC	Indigenous
Asteraceae	*Cotula microglossa*	LC	Indigenous; Endemic
Asteraceae	*Artemisia afra var. afra*	LC	Indigenous
Asteraceae	*Cineraria lyratiformis*	LC	Indigenous
Asteraceae	*Xanthium spinosum*		Not indigenous; Naturalised; Invasive
Asteraceae	*Berkheya radula*	LC	Indigenous
Asteraceae	*Senecio reptans*	LC	Indigenous; Endemic
Asteraceae	*Senecio harveianus*	LC	Indigenous
Asteraceae	*Helichrysum paronychioides*	LC	Indigenous
Asteraceae	*Foveolina dichotoma*	LC	Indigenous
Asteraceae	*Helichrysum callicomum*	LC	Indigenous
Asteraceae	*Polydora angustifolia*	LC	Indigenous
Asteraceae	*Tragopogon porrifolius*		Not indigenous; Naturalised
Asteraceae	*Seriphium plumosum*		Indigenous
Asteraceae	*Tolpis capensis*	LC	Indigenous
Asteraceae	*Litogyne gariepina*	LC	Indigenous
Asteraceae	*Acanthospermum glabratum*		Not indigenous; Naturalised
Asteraceae	*Pentzia globosa*	LC	Indigenous
Asteraceae	*Geigeria brevifolia*	LC	Indigenous
Asteraceae	*Hilliardiella elaeagnoides*		Indigenous
Asteraceae	*Dicoma anomala subsp. anomala*	LC	Indigenous
Asteraceae	*Gnaphalium declinatum*	NT	Indigenous; Endemic
Asteraceae	*Cirsium vulgare*		Not indigenous; Naturalised; Invasive
Asteraceae	*Geigeria aspera var. aspera*	LC	Indigenous
Asteraceae	*Senecio coronatus*	LC	Indigenous
Asteraceae	*Geigeria ornativa*		Indigenous
Asteraceae	*Helichrysum setosum*	LC	Indigenous
Asteraceae	*Senecio erubescens var. erubescens*	NE	Indigenous; Endemic
Asteraceae	*Sonchus asper subsp. glaucescens*		Not indigenous; Naturalised
Asteraceae	*Denekia capensis*	LC	Indigenous
Asteraceae	*Nidorella resedifolia subsp. resedifolia*	LC	Indigenous
Asteraceae	*Tarchonanthus camphoratus*	LC	Indigenous
Asteraceae	*Symphyotrichum squamatum*		Not indigenous; Naturalised; Invasive
Asteraceae	*Cotula sp.*		
Asteraceae	*Mesogramma apiifolium*	LC	Indigenous
Asteraceae	*Zinnia peruviana*		Not indigenous; Naturalised; Invasive
Asteraceae	*Platycarphella parvifolia*	LC	Indigenous; Endemic

Asteraceae	*Pseudognaphalium oligandrum*	LC	Indigenous
Asteraceae	*Helichrysum zeyheri*	LC	Indigenous
Asteraceae	*Cotula anthemoides*	LC	Indigenous
Asteraceae	*Schkuhria pinnata*		Not indigenous; Naturalised
Asteraceae	*Arctotis arctotoides*	LC	Indigenous
Asteraceae	*Berkheya carlinoides*	LC	Indigenous; Endemic
Asteraceae	*Tagetes minuta*		Not indigenous; Naturalised; Invasive
Asteraceae	*Helichrysum caespititium*	LC	Indigenous
Asteraceae	*Acanthospermum hispidum*		Not indigenous; Naturalised
Asteraceae	*Nidorella sp.*		
Asteraceae	*Cineraria erodioides*		Indigenous
Asteraceae	*Felicia muricata subsp. muricata*	LC	Indigenous
Asteraceae	*Sonchus oleraceus*		Not indigenous; Naturalised; Invasive
Asteraceae	*Senecio consanguineus*	LC	Indigenous
Asteraceae	*Helichrysum rugulosum*	LC	Indigenous
Asteraceae	*Helichrysum dregeanum*	LC	Indigenous
Asteraceae	*Haplocarpha scaposa*	LC	Indigenous
Aytoniaceae	*Mannia capensis*		Indigenous
Boraginaceae	*Trichodesma angustifolium subsp. angustifolium*	LC	Indigenous
Boraginaceae	*Anchusa azurea*		Not indigenous; Naturalised
Boraginaceae	*Lithospermum cinereum*	LC	Indigenous
Boraginaceae	*Cynoglossum hispidum*	LC	Indigenous
Brassicaceae	*Capsella bursa-pastoris*		Not indigenous; Naturalised
Brassicaceae	*Lepidium didymum*		Not indigenous; Naturalised; Invasive
Brassicaceae	*Rorippa fluviatilis var. fluviatilis*	LC	Indigenous
Bryaceae	*Bryum argenteum*		Indigenous
Campanulaceae	*Wahlenbergia denticulata var. transvaalensis*	LC	Indigenous; Endemic
Campanulaceae	*Wahlenbergia magaliesbergensis*	LC	Indigenous; Endemic
Campanulaceae	*Wahlenbergia undulata*	LC	Indigenous
Campanulaceae	*Wahlenbergia krebsii subsp. krebsii*	LC	Indigenous
Cannabaceae	*Celtis africana*	LC	Indigenous
Caryophyllaceae	*Silene burchellii subsp. pilosellifolia*		Indigenous
Caryophyllaceae	*Pollichia campestris*	LC	Indigenous
Caryophyllaceae	*Stellaria apetala*		Not indigenous; Naturalised; Invasive
Celastraceae	*Gymnosporia buxifolia*	LC	Indigenous
Ceratophyllaceae	*Ceratophyllum muricatum subsp. muricatum*	LC	Indigenous
Cleomaceae	*Cleome rubella*	LC	Indigenous
Cleomaceae	*Cleome monophylla*	LC	Indigenous
Colchicaceae	*Camptorrhiza strumosa*	LC	Indigenous

Commelinaceae	*Commelina africana var. krebsiana*	LC	Indigenous
Commelinaceae	*Commelina africana var. barberae*	LC	Indigenous
Commelinaceae	*Commelina livingstonii*	LC	Indigenous
Convolvulaceae	*Ipomoea bathycolpos*	LC	Indigenous; Endemic
Convolvulaceae	*Xenostegia tridentata subsp. angustifolia*	LC	Indigenous
Convolvulaceae	*Cuscuta campestris*		Not indigenous; Naturalised; Invasive
Convolvulaceae	*Seddera capensis*	LC	Indigenous
Convolvulaceae	*Convolvulus sagittatus*	LC	Indigenous
Convolvulaceae	*Ipomoea crassipes var. crassipes*	LC	Indigenous
Convolvulaceae	*Ipomoea oenotheroides*	LC	Indigenous
Crassulaceae	*Kalanchoe rotundifolia*	LC	Indigenous
Crassulaceae	*Adromischus sp.*		
Crassulaceae	*Crassula lanceolata subsp. transvaalensis*	LC	Indigenous
Crassulaceae	*Kalanchoe thyrsiflora*	LC	Indigenous
Cucurbitaceae	*Coccinia sessilifolia*	LC	Indigenous
Cucurbitaceae	*Trochomeria debilis*	LC	Indigenous
Cucurbitaceae	*Cucumis zeyheri*	LC	Indigenous
Cyperaceae	*Cyperus difformis*	LC	Indigenous
Cyperaceae	*Schoenoplectus muricinux*	LC	Indigenous
Cyperaceae	*Cyperus rotundus subsp. rotundus*	LC	Indigenous
Cyperaceae	*Cyperus fastigiatus*	LC	Indigenous
Cyperaceae	*Kyllinga pulchella*	LC	Indigenous
Cyperaceae	*Schoenoplectus triqueter*		Not indigenous; Naturalised
Cyperaceae	*Cyperus margaritaceus var. margaritaceus*	LC	Indigenous
Cyperaceae	*Cyperus uitenhagensis*	LC	Indigenous
Cyperaceae	*Cyperus sphaerospermus*	LC	Indigenous
Cyperaceae	*Cyperus capensis*	LC	Indigenous; Endemic
Cyperaceae	*Eleocharis dregeana*	LC	Indigenous
Cyperaceae	*Bulbostylis burchellii*	LC	Indigenous
Cyperaceae	*Cyperus obtusiflorus var. flavissimus*	LC	Indigenous
Dipsacaceae	*Scabiosa columbaria*	LC	Indigenous
Ebenaceae	*Diospyros austroafricana var. microphylla*	LC	Indigenous
Ebenaceae	*Diospyros lycioides subsp. lycioides*	LC	Indigenous
Ebenaceae	*Euclea undulata*	LC	Indigenous
Elatinaceae	*Bergia decumbens*	LC	Indigenous
Euphorbiaceae	*Acalypha depressinervia*	LC	Indigenous
Euphorbiaceae	*Euphorbia inaequilatera*	LC	Indigenous
Euphorbiaceae	*Euphorbia indica*	NE	Not indigenous; Naturalised
Euphorbiaceae	*Euphorbia serpens*	NE	Not indigenous; Naturalised

Euphorbiaceae	*Acalypha segetalis*	LC	Indigenous
Euphorbiaceae	*Acalypha angustata*	LC	Indigenous
Euphorbiaceae	*Leidesia procumbens*	LC	Indigenous
Euphorbiaceae	*Jatropha zeyheri*	LC	Indigenous
Euphorbiaceae	*Acalypha caperonioides var. caperonioides*	DD	Indigenous
Fabaceae	*Vicia sativa subsp. sativa*	NE	Not indigenous; Naturalised; Invasive
Fabaceae	*Vachellia robusta subsp. robusta*	LC	Indigenous
Fabaceae	*Indigofera cryptantha var. cryptantha*	LC	Indigenous
Fabaceae	*Crotalaria distans subsp. distans*	LC	Indigenous
Fabaceae	*Crotalaria burkeana*	LC	Indigenous
Fabaceae	*Mundulea sericea subsp. sericea*	LC	Indigenous
Fabaceae	*Crotalaria lotoides*	LC	Indigenous
Fabaceae	*Crotalaria sp.*		
Fabaceae	*Lessertia phillipsiana*	DD	Indigenous; Endemic
Fabaceae	*Erythrina zeyheri*	LC	Indigenous
Fabaceae	*Mimosa pigra*		Not indigenous; Naturalised; Invasive
Fabaceae	*Crotalaria sphaerocarpa subsp. sphaerocarpa*	LC	Indigenous
Fabaceae	*Senegalia hereroensis*	LC	Indigenous
Fabaceae	*Crotalaria magaliesbergensis*	LC	Indigenous; Endemic
Fabaceae	*Indigofera dimidiata*	LC	Indigenous
Fabaceae	*Indigofera vicioides subsp. vicioides*	LC	Indigenous
Fabaceae	*Vachellia erioloba*	LC	Indigenous
Fabaceae	*Tephrosia capensis var. hirsuta*	LC	Indigenous
Fabaceae	*Dichilus strictus*	LC	Indigenous
Fabaceae	*Indigofera heterotricha*	LC	Indigenous
Fabaceae	*Indigofera oxalidea*	LC	Indigenous
Fabaceae	*Rhynchosia minima var. prostrata*	NE	Indigenous
Fabaceae	*Elephantorrhiza elephantina*	LC	Indigenous
Fabaceae	*Vachellia karroo*	LC	Indigenous
Fabaceae	*Senna italica subsp. arachoides*	LC	Indigenous
Fabaceae	*Listia bainesii*	LC	Indigenous
Fabaceae	*Pearsonia bracteata*	NT	Indigenous; Endemic
Fabaceae	*Medicago laciniata var. laciniata*	NE	Not indigenous; Naturalised
Fabaceae	*Rhynchosia sp.*		
Fabaceae	*Tephrosia semiglabra*	LC	Indigenous
Fabaceae	*Neorautanenia ficifolia*	LC	Indigenous
Fabaceae	*Sesbania bispinosa var. bispinosa*	NE	Not indigenous; Naturalised
Fabaceae	*Zornia glochidiata*	LC	Indigenous
Fabaceae	*Vigna unguiculata subsp. stenophylla*	LC	Indigenous

Fabaceae	*Desmodium repandum*	LC	Indigenous
Fabaceae	*Tephrosia lupinifolia*	LC	Indigenous
Fabaceae	*Listia heterophylla*	LC	Indigenous
Fabaceae	*Trifolium africanum var. africanum*	NE	Indigenous
Gentianaceae	*Sebaea filiformis*	LC	Indigenous
Geraniaceae	*Pelargonium auritum var. carneum*	LC	Indigenous
Geraniaceae	*Pelargonium malacoides*		Indigenous
Geraniaceae	*Monsonia emarginata*	LC	Indigenous; Endemic
Geraniaceae	*Geranium multisectum*	LC	Indigenous
Geraniaceae	*Pelargonium nelsonii*	LC	Indigenous; Endemic
Geraniaceae	*Pelargonium sidoides*	LC	Indigenous
Geraniaceae	*Monsonia angustifolia*	LC	Indigenous
Gisekiaceae	*Gisekia pharnaceoides var. pharnaceoides*	LC	Indigenous
Gisekiaceae	*Gisekia africana var. africana*	LC	Indigenous
Haloragaceae	*Myriophyllum spicatum*		Not indigenous; Cultivated; Naturalised; Invasive
Hyacinthaceae	*Ledebouria burkei subsp. burkei*	LC	Indigenous
Hyacinthaceae	*Ledebouria marginata*	LC	Indigenous
Hyacinthaceae	*Daubenya comata*	LC	Indigenous; Endemic
Hyacinthaceae	*Ledebouria luteola*	LC	Indigenous
Hydrocharitaceae	*Lagarosiphon muscoides*	LC	Indigenous
Hypoxidaceae	*Hypoxis hemerocallidea*	LC	Indigenous
Hypoxidaceae	*Hypoxis filiformis*	LC	Indigenous
Hypoxidaceae	*Hypoxis acuminata*	LC	Indigenous
Hypoxidaceae	*Hypoxis rigidula var. rigidula*	LC	Indigenous
Hypoxidaceae	*Hypoxis argentea var. sericea*	LC	Indigenous
Iridaceae	*Dierama reynoldsii*	LC	Indigenous; Endemic
Iridaceae	*Babiana bainesii*	LC	Indigenous
Iridaceae	*Gladiolus permeabilis subsp. edulis*	LC	Indigenous
Iridaceae	*Gladiolus crassifolius*	LC	Indigenous
Juncaceae	*Juncus rigidus*	LC	Indigenous
Juncaceae	*Juncus exsertus*	LC	Indigenous
Lamiaceae	*Acrotome inflata*	LC	Indigenous
Lamiaceae	*Leonotis pentadentata*	LC	Indigenous
Lamiaceae	*Stachys spathulata*	LC	Indigenous
Lamiaceae	*Ocimum angustifolium*	LC	Indigenous
Lamiaceae	*Acrotome hispida*	LC	Indigenous
Lamiaceae	*Salvia runcinata*	LC	Indigenous
Lamiaceae	*Stachys hyssopoides*	LC	Indigenous
Lentibulariaceae	*Utricularia stellaris*	LC	Indigenous

Lobeliaceae	*Lobelia erinus*	LC	Indigenous
Lobeliaceae	*Lobelia sonderiana*	LC	Indigenous
Lobeliaceae	*Cyphia persicifolia*	LC	Indigenous; Endemic
Lobeliaceae	*Lobelia thermalis*	LC	Indigenous
Lythraceae	*Ammannia baccifera*		Indigenous
Lythraceae	*Ammannia anagalloides*		Indigenous
Malvaceae	*Dombeya rotundifolia*		Indigenous
Malvaceae	*Hibiscus calyphyllus*	LC	Indigenous
Malvaceae	*Hermannia quartiniana*	LC	Indigenous
Malvaceae	*Hermannia stellulata*	LC	Indigenous
Malvaceae	*Mahernia sp.*		
Malvaceae	*Grewia occidentalis var. occidentalis*	LC	Indigenous
Malvaceae	*Hibiscus microcarpus*	LC	Indigenous
Malvaceae	*Pavonia burchellii*	LC	Indigenous
Malvaceae	*Hibiscus trionum*		Not indigenous; Naturalised
Malvaceae	*Dombeya rotundifolia var. rotundifolia*	LC	Indigenous
Malvaceae	*Grewia flava*	LC	Indigenous
Malvaceae	*Corchorus aspleniifolius*	LC	Indigenous
Malvaceae	*Hermannia grandistipula*	LC	Indigenous
Malvaceae	*Hermannia depressa*	LC	Indigenous
Marsileaceae	*Marsilea sp.*		
Marsileaceae	*Marsilea farinosa subsp. farinosa*	LC	Indigenous
Marsileaceae	*Marsilea macrocarpa*	LC	Indigenous
Melianthaceae	*Melianthus comosus*	LC	Indigenous
Molluginaceae	*Pharnaceum sp.*		
Nyctaginaceae	*Commicarpus pentandrus*	LC	Indigenous
Nyctaginaceae	*Mirabilis jalapa*		Not indigenous; Naturalised; Invasive
Oleaceae	*Menodora heterophylla var. australis*	LC	Indigenous
Oleaceae	*Menodora africana*	LC	Indigenous
Onagraceae	*Oenothera rosea*		Not indigenous; Naturalised; Invasive
Onagraceae	*Oenothera tetraptera*		Not indigenous; Naturalised; Invasive
Orchidaceae	*Bonatea antennifera*	LC	Indigenous
Orobanchaceae	*Striga elegans*	LC	Indigenous
Orobanchaceae	*Buchnera reducta*	LC	Indigenous
Oxalidaceae	*Oxalis depressa*	LC	Indigenous
Oxalidaceae	*Oxalis corniculata*		Not indigenous; Naturalised; Invasive
Pedaliaceae	*Dicerocaryum eriocarpum*	LC	Indigenous
Pedaliaceae	*Dicerocaryum senecioides*	LC	Indigenous
Pedaliaceae	*Pterodiscus speciosus*	LC	Indigenous

Phrymaceae	*Mimulus gracilis*	LC	Indigenous
Phyllanthaceae	*Phyllanthus maderaspatensis*	LC	Indigenous
Phyllanthaceae	*Phyllanthus parvulus var. parvulus*	LC	Indigenous
Phyllanthaceae	*Phyllanthus incurvus*	LC	Indigenous
Plantaginaceae	*Veronica anagallis-aquatica*	LC	Indigenous
Plantaginaceae	*Veronica agrestis*	NE	Not indigenous; Naturalised
Plumbaginaceae	*Plumbago auriculata*	LC	Indigenous
Poaceae	*Setaria incrassata*	LC	Indigenous
Poaceae	*Eragrostis superba*	LC	Indigenous
Poaceae	*Aristida adscensionis*	LC	Indigenous
Poaceae	*Aristida stipitata subsp. graciliflora*	LC	Indigenous
Poaceae	*Eragrostis obtusa*	LC	Indigenous
Poaceae	*Setaria pumila*	LC	Indigenous
Poaceae	*Setaria sphacelata var. torta*	LC	Indigenous
Poaceae	*Aristida bipartita*	LC	Indigenous
Poaceae	*Ischaemum afrum*	LC	Indigenous
Poaceae	*Sporobolus stapfianus*	LC	Indigenous
Poaceae	*Digitaria eriantha*	LC	Indigenous
Poaceae	*Eragrostis plana*	LC	Indigenous
Poaceae	*Panicum coloratum*	LC	Indigenous
Poaceae	*Andropogon schirensis*	LC	Indigenous
Poaceae	*Urochloa oligotricha*	LC	Indigenous
Poaceae	*Aristida canescens subsp. canescens*	LC	Indigenous
Poaceae	*Andropogon appendiculatus*	LC	Indigenous
Poaceae	*Bromus sp.*		
Poaceae	*Sporobolus albicans*	LC	Indigenous
Poaceae	*Eragrostis sp.*		
Poaceae	*Brachiaria eruciformis*	LC	Indigenous
Poaceae	*Panicum maximum*	LC	Indigenous
Poaceae	*Anthephora pubescens*	LC	Indigenous
Poaceae	*Harpochloa falx*	LC	Indigenous
Poaceae	*Eragrostis trichophora*	LC	Indigenous
Poaceae	*Triraphis andropogonoides*	LC	Indigenous
Poaceae	*Aristida congesta subsp. congesta*	LC	Indigenous
Poaceae	*Leersia hexandra*	LC	Indigenous
Poaceae	*Pogonarthria squarrosa*	LC	Indigenous
Poaceae	*Digitaria sp.*		
Poaceae	*Monocymbium ceresiiforme*	LC	Indigenous
Poaceae	*Perotis patens*	LC	Indigenous

Poaceae	*Panicum novemnerve*	LC	Indigenous
Poaceae	*Agrostis lachnantha var. lachnantha*	LC	Indigenous
Poaceae	*Phragmites mauritianus*	LC	Indigenous
Poaceae	*Eragrostis curvula*	LC	Indigenous
Poaceae	*Eleusine coracana subsp. africana*	LC	Indigenous
Poaceae	*Aristida diffusa subsp. burkei*	LC	Indigenous
Poaceae	*Tragus berteronianus*	LC	Indigenous
Poaceae	*Trichoneura grandiglumis*	LC	Indigenous
Poaceae	*Stipagrostis uniplumis var. neesii*	LC	Indigenous
Poaceae	*Setaria nigrirostris*	LC	Indigenous
Poaceae	*Eragrostis gummiflua*	LC	Indigenous
Poaceae	*Hemarthria altissima*	LC	Indigenous
Poaceae	*Schizachyrium sanguineum*	LC	Indigenous
Poaceae	*Digitaria ciliaris*	NE	Not indigenous; Naturalised
Poaceae	*Cynodon hirsutus*	LC	Indigenous
Poaceae	*Cynodon dactylon*	LC	Indigenous
Poaceae	*Paspalum scrobiculatum*	LC	Indigenous
Polygalaceae	*Polygala hottentotta*	LC	Indigenous
Polygalaceae	*Polygala sp.*		
Polygonaceae	*Polygonum plebeium*	LC	Indigenous
Polygonaceae	*Rumex lanceolatus*	LC	Indigenous
Polygonaceae	*Persicaria lapathifolia*		Not indigenous; Naturalised; Invasive
Polygonaceae	*Persicaria nepalensis*		Not indigenous; Naturalised
Polygonaceae	*Polygonum aviculare*		Not indigenous; Naturalised
Polygonaceae	*Persicaria amphibia*	LC	Not indigenous; Naturalised
Polygonaceae	*Persicaria hystricula*	LC	Indigenous
Polygonaceae	*Rumex conglomeratus*	LC	Indigenous
Polygonaceae	*Persicaria limbata*		Cryptogenic
Potamogetonaceae	*Potamogeton pectinatus*	LC	Indigenous
Potamogetonaceae	*Potamogeton schweinfurthii*	LC	Indigenous
Pteridaceae	*Cheilanthes involuta var. obscura*	LC	Indigenous
Pteridaceae	*Cheilanthes hirta var. hirta*	LC	Indigenous
Pteridaceae	*Pellaea calomelanos var. calomelanos*	LC	Indigenous
Ranunculaceae	*Thalictrum minus*	LC	Indigenous
Ranunculaceae	*Ranunculus multifidus*	LC	Indigenous
Ranunculaceae	*Clematis brachiata*	LC	Indigenous
Resedaceae	*Oligomeris dregeana*	LC	Indigenous
Rhamnaceae	*Ziziphus zeyheriana*	LC	Indigenous
Rhamnaceae	*Ziziphus mucronata*		Indigenous

Ricciaceae	*Riccia okahandjana*		Indigenous
Rubiaceae	*Vangueria pygmaea*	LC	Indigenous
Rubiaceae	*Kohautia amatymbica*	LC	Indigenous
Rubiaceae	*Kohautia caespitosa subsp. brachyloba*	LC	Indigenous
Rubiaceae	*Anthospermum spathulatum subsp. saxatile*	LC	Indigenous; Endemic
Rubiaceae	*Cordylostigma virgatum*		Indigenous
Rubiaceae	*Afrocanthium mundianum*	LC	Indigenous
Rubiaceae	*Anthospermum rigidum subsp. pumilum*	LC	Indigenous
Ruscaceae	*Eriospermum sp.*		
Rutaceae	*Zanthoxylum capense*	LC	Indigenous
Salicaceae	*Salix mucronata subsp. mucronata*	LC	Indigenous
Salicaceae	*Populus deltoides subsp. deltoides*		Not indigenous; Naturalised; Invasive
Salviniaceae	*Azolla filiculoides*	NE	Not indigenous; Naturalised; Invasive
Santalaceae	*Viscum verrucosum*	LC	Indigenous
Santalaceae	*Thesium utile*	LC	Indigenous
Santalaceae	*Thesium procerum*	LC	Indigenous; Endemic
Santalaceae	*Thesium transvaalense*	LC	Indigenous; Endemic
Scrophulariaceae	*Jamesbrittenia aurantiaca*	LC	Indigenous
Scrophulariaceae	*Chaenostoma sp.*		
Scrophulariaceae	*Selago burkei*	LC	Indigenous; Endemic
Scrophulariaceae	*Gomphostigma virgatum*	LC	Indigenous
Scrophulariaceae	*Limosella africana var. africana*	LC	Indigenous
Scrophulariaceae	*Jamesbrittenia montana*	LC	Indigenous
Scrophulariaceae	*Aptosimum indivisum*	LC	Indigenous
Scrophulariaceae	*Aptosimum elongatum*	LC	Indigenous
Scrophulariaceae	*Jamesbrittenia sp.*		
Scrophulariaceae	*Selago tenuifolia*	LC	Indigenous; Endemic
Scrophulariaceae	*Selago welwitschii var. australis*	LC	Indigenous
Scrophulariaceae	*Selago mixta*	LC	Indigenous; Endemic
Scrophulariaceae	*Aptosimum procumbens*	LC	Indigenous
Scrophulariaceae	*Nemesia fruticans*	LC	Indigenous
Scrophulariaceae	*Jamesbrittenia burkeana*	LC	Indigenous
Solanaceae	*Lycium arenicola*	LC	Indigenous
Solanaceae	*Physalis angulata*		Not indigenous; Naturalised; Invasive
Solanaceae	*Lycium pilifolium*	LC	Indigenous
Solanaceae	*Solanum tomentosum*		Indigenous
Solanaceae	*Solanum lichtensteinii*	LC	Indigenous
Solanaceae	*Solanum catombelense*	LC	Indigenous
Solanaceae	*Physalis viscosa*		Not indigenous; Naturalised; Invasive

Solanaceae	*Solanum campylacanthum*		Indigenous
Solanaceae	*Withania somnifera*	LC	Indigenous
Solanaceae	*Datura ferox*		Not indigenous; Naturalised; Invasive
Thymelaeaceae	*Lasiosiphon capitatus*	LC	Indigenous
Thymelaeaceae	*Lasiosiphon burchellii*	LC	Indigenous
Thymelaeaceae	*Lasiosiphon anthylloides*	LC	Indigenous; Endemic
Thymelaeaceae	*Lasiosiphon kraussianus*		Indigenous
Verbenaceae	*Chascanum hederaceum var. natalense*	LC	Indigenous
Verbenaceae	*Verbena officinalis*		Not indigenous; Naturalised
Verbenaceae	*Verbena brasiliensis*		Not indigenous; Naturalised; Invasive
Verbenaceae	*Chascanum hederaceum var. hederaceum*	LC	Indigenous
Verbenaceae	*Lippia scaberrima*	LC	Indigenous
Vitaceae	*Cissus sp.*		
Vitaceae	*Cyphostemma hereroense*	LC	Indigenous
Zygophyllaceae	*Tetraena simplex*		Indigenous
Zygophyllaceae	*Tribulus terrestris*	LC	Indigenous

9.3 Appendix C: Mammals expected

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Aepyceros melampus	Impala	LC	LC
Aethomys ineptus	Tete Veld Rat	LC	LC
Aethomys namaquensis	Namaqua rock rat	LC	LC
Alcelaphus buselaphus	Hartebeest	LC	LC
Alcelaphus buselaphus caama	Red Hartebeest	LC	LC
Antidorcas marsupialis	Springbok	LC	LC
Aonyx capensis	Cape Clawless Otter	NT	NT
Atelerix frontalis	South Africa Hedgehog	NT	LC
Atilax paludinosus	Water Mongoose	LC	LC
Canis mesomelas	Black-backed Jackal	LC	LC
Caracal caracal	Caracal	LC	LC
Ceratotherium simum	White Rhinoceros	NT	NT
Chaerephon pumilus	Little Free-tailed Bat	LC	LC
Chlorocebus pygerythrus	Vervet Monkey	LC	LC
Connochaetes gnou	Black Wildebeest	LC	LC
Connochaetes taurinus	Blue Wildebeest	LC	LC
Crocidura cyanea	Reddish-grey Musk Shrew	LC	LC
Crocidura fuscomurina	Tiny Musk Shrew	LC	LC

Crocidura maquassiensis	Makwassie musk shrew	VU	LC
Crocidura mariquensis	Swamp Musk Shrew	NT	LC
Cryptomys hottentotus	Common Mole-rat	LC	LC
Cryptomys pretoriae	Highveld Mole-rat	Unlisted	LC
Cynictis penicillata	Yellow Mongoose	LC	LC
Damaliscus lunatus	Tsessebe	VU	LC
Damaliscus pygargus	Blesbok	LC	LC
Damaliscus pygargus pygargus	Bontebok	VU	VU
Dendromus melanotis	Grey Climbing Mouse	LC	LC
Desmodillus auricularis	Short-tailed Gerbil	LC	LC
Diceros bicornis	Black Rhinoceros	EN	CR
Eidolon helvum	African Straw-colored Fruit Bat	LC	NT
Elephantulus myurus	Eastern Rock Sengi	LC	LC
Epomophorus wahlbergi	Wahlberg's epauletted fruit bat	LC	LC
Eptesicus hottentotus	Long-tailed Serotine Bat	LC	LC
Equus quagga	Plains Zebra	LC	NT
Equus zebra	Mountain Zebra	VU	VU
Felis nigripes	Black-footed Cat	VU	VU
Felis silvestris	African Wildcat	LC	LC
Genetta genetta	Small-spotted Genet	LC	LC
Genetta maculata	Rusty-spotted Genet	LC	LC
Genetta tigrina	Cape Genet	LC	LC
Gerbilliscus brantsii	Highveld Gerbil	LC	LC
Gerbilliscus leucogaster	Bushveld Gerbil	LC	LC
Giraffa camelopardalis	Giraffe	LC	VU
Graphiurus platyops	Rock Dormouse	LC	LC
Herpestes sanguineus	Slender Mongoose	LC	LC
Hippotragus equinus	Roan Antelope	EN	LC
Hippotragus niger	Sable Antelope	VU	LC
Parahyaena brunnea	Brown Hyaena	NT	NT
Hydrictis maculicollis	Spotted-necked Otter	VU	NT
Hystrix africaeaustralis	Cape Porcupine	LC	LC
Ichneumia albicauda	White-tailed Mongoose	LC	LC
Ictonyx striatus	Striped Polecat	LC	LC
Kobus ellipsiprymnus	Common Waterbuck	LC	LC
Leptailurus serval	Serval	NT	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
Mastomys natalensis	Natal Multimammate Mouse	LC	LC
Mellivora capensis	Honey Badger	LC	LC
Miniopterus natalensis	Natal long-fingered bat	LC	LC
Mus indutus	Desert Pygmy Mouse	LC	LC
Mus minutoides	Pygmy Mouse	LC	LC
Mus musculus	House Mouse	Unlisted	LC
Myosorex varius	Forest Shrew	LC	LC
Myotis tricolor	Temminck's Hairy Bat	LC	LC
Mystromys albicaudatus	White-tailed Rat	VU	EN
Neoromicia capensis	Cape Serotine Bat	LC	LC
Neoromicia zuluensis	Aloe Bat	LC	LC
Nycteris thebaica	Egyptian Slit-faced Bat	LC	LC
Orycteropus afer	Aardvark	LC	LC
Oryx gazella	Gemsbok	LC	LC
Otocyon megalotis	Bat-eared Fox	LC	LC
Otomys auratus	Vlei Rat (Grassland type)	NT	NT
Otomys irroratus	Vlei Rat (Fynbos type)	LC	LC
Panthera leo	Lion	LC	VU
Panthera pardus	Leopard	VU	VU
Papio ursinus	Chacma Baboon	LC	LC
Parahyaena brunnea	Brown Hyaena	NT	NT
Paraxerus cepapi	Tree Squirrel	LC	LC
Pedetes capensis	Springhare	LC	LC
Pelea capreolus	Grey Rhebok	NT	NT
Phacochoerus africanus	Common Warthog	LC	LC
Poecilogale albinucha	African Striped Weasel	NT	LC
Potamochoerus larvatus	Bushpig	LC	LC
Potamochoerus porcus	Red River Hog	Unlisted	LC
Procavia capensis	Rock Hyrax	LC	LC
Pronolagus randensis	Jameson's Red Rock Rabbit	LC	LC
Proteles cristata	Aardwolf	LC	LC
Raphicerus campestris	Steenbok	LC	LC
Rattus rattus	House Rat	Exotic (Not listed)	LC
Redunca arundinum	Southern Reedbuck	LC	LC
Redunca fulvorufula	Mountain Reedbuck	EN	EN
Rhabdomys pumilio	Xeric Four-striped Mouse	LC	LC
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	LC	LC

Rhinolophus darlingi	Darling's Horseshoe Bat	LC	LC
Saccostomus campestris	Pouched Mouse	LC	LC
Scotophilus dinganii	Yellow House Bat	LC	LC
Steatomys krebsii	Krebs's Fat Mouse	LC	LC
Steatomys pratensis	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
Thryonomys swinderianus	Greater Cane Rat	LC	LC
Tragelaphus angasii	Nyala	LC	LC
Tragelaphus oryx	Common Eland	LC	LC
Tragelaphus scriptus	Cape Bushbuck	LC	LC
Tragelaphus strepsiceros	Greater Kudu	LC	LC
Vulpes chama	Cape Fox	LC	LC
Xerus inauris	Cape Ground Squirrel	LC	LC

9.4 Appendix D: Reptiles Expected

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Acontias gracilicauda	Thin-tailed Legless Skink	LC	LC
Afrotyphlops bibronii	Bibron's Blind Snake	LC	LC
Agama aculeata distanti	Eastern Ground Agama	LC	LC
Agama atra	Southern Rock Agama	LC	LC
Aparallactus capensis	Black-headed Centipede-eater	LC	LC
Boaedon capensis	Brown House Snake	LC	LC
Causus rhombeatus	Rhombic Night Adder	LC	LC
Chamaeleo dilepis	Common Flap-neck Chameleon	LC	LC
Cordylus vittifer	Common Girdled Lizard	LC	LC
Dasypeltis scabra	Rhombic Egg-eater	LC	LC
Hemachatus haemachatus	Rinkhals	LC	LC
Kinixys lobatsiana	Lobatse hinged-back Tortoise	LC	LC
Lamprophis aurora	Aurora House Snake	LC	LC
Lygodactylus capensis	Common Dwarf Gecko	LC	LC
Monopeltis capensis	Cape Worm Lizard	LC	LC
Panaspis wahlbergii	Wahlberg's Snake-eyed Skink	LC	LC
Prosymna sundevallii	Sundevall's Shovel-snout	LC	LC

Psammophis leightoni	Cape Sand Snake	VU	LC
Psammophylax tritaeniatus	Striped Grass Snake	LC	LC
Stigmochelys pardalis	Leopard Tortoise	LC	LC
Trachylepis punctatissima	Speckled Rock Skink	LC	LC
Trachylepis punctulata	Speckled Sand Skink	LC	LC
Trachylepis varia	Variable Skink	LC	LC

9.5 Appendix E: Amphibians Expected

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Amietia angolensis	Angolan River Frog	Unlisted	LC
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
Phrynobatrachus natalensis	Snoring Puddle Frog	LC	LC
Phrynomantis bifasciatus	Banded Rubber Frog	LC	LC
Ptychadena anchietae	Plain Grass 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
Strongylopus fasciatus	Striped Stream Frog	LC	LC
Tomopterna cryptotis	Tremelo Sand Frog	LC	LC
Tomopterna natalensis	Natal Sand Frog	LC	LC
Tomopterna tandyi	Tandy's Sand Frog	LC	LC
Xenopus laevis	Common Platanna	LC	LC