SCIENTIFIC TERRESTRIAL SERVICES

TERRESTRIAL BIODIVERSITY ASSESSMENT

AS PART OF THE ENVIRONMENTAL AUTHORISATION PROCESS FOR THE PROPOSED SOLAR PHOTOVOLTAIC (PV) PLANT, NEAR MOKOPANE AS PART OF THE ENVIRONMENTAL IMPACT ASSESSMENT PHASE, LIMPOPO PROVINCE.

Part C: Faunal Assessment

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Report reference:	STS 222035
Date:	June 2022

Part of the SAS Environmental Group of Companies
Website: http://www.sasenvironmental.co.za

DOCUMENT GUIDE

The table below provides a guide to the reporting of biodiversity impacts as they relate to 1) Government Notice No. 320 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on **Terrestrial Biodiversity** as published in Government Gazette 43110 dated 20 March 2020, and 2) Government Notice No. 1150 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on **Terrestrial Plant and Animal Species** as published in Government Gazette 43855 dated 30 October 2020.

Theme-Specific Requirements as per Government Notice No. 320 Terrestrial Biodiversity Theme – Very High Sensitivity Rating as per Screening Tool Output		
No.	**SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS**	**Section in report/Notes**
2	**Terrestrial Biodiversity Specialist Assessment**	
2.1	The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of terrestrial biodiversity.	**Part A – C:** Cover Page **Part A:** Appendix E
2.2	The assessment must be undertaken on the preferred site and within the proposed development footprint.	**Part A**: Section 1
2.3	**The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects:**	
2.3.1	A description of the ecological drivers or processes of the system and how the proposed development will impact these;	**Part B**: Section 3 (flora) **Part C:** Section 3, 5 (vertebrates) **Part C:** Section 3, 5 (invertebrates)
2.3.2	Ecological functioning and ecological processes (e.g., fire, migration, pollination, etc.) that operate within the preferred site;	**Part B**: Section 3 (flora) **Part C:** Section 3 (vertebrates) **Part C:** Section 3 (invertebrates)
2.3.3	The ecological corridors that the proposed development would impede including migration and movement of flora and fauna;	**Part A:** Section 3 (desktop analysis) **Part B**: Section 3 (flora) **Part C:** Section 3 (vertebrates) **Part C:** Section 3 (invertebrates)
2.3.4	The description of any significant terrestrial landscape features (including rare or important flora-faunal associations, presence of Strategic Water Source Areas (SWSAs) or Freshwater Ecosystem Priority Area (FEPA) sub catchments;	**Part A:** Section 3 (desktop analysis) **Part B:** Section 3.2 (flora) **Part C:** Section 3 (vertebrates) **Part C:** Section 3 (invertebrates) **For descriptions on the presence of FEPAs, please refer to the Freshwater Assessment*
2.3.5	A description of terrestrial biodiversity and ecosystems on the preferred site, including: a) main vegetation types; b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified; c) ecological connectivity, habitat fragmentation, ecological processes and fine scale habitats; and d) species, distribution, important habitats (e.g. feeding grounds, nesting sites, etc.) and movement patterns identified;	**Part A**: Section 3 (desktop analysis) **Part B:** Section 3 (flora) **Part C:** Section 3 (fauna)
2.3.6	The assessment must identify any alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification; and	Not Applicable.
2.3.7	**The assessment must be based on the results of a site inspection undertaken on the preferred site and must identify:**	
2.3.7.1	Terrestrial Critical Biodiversity Areas (CBAs), including:	

	a) the reasons why an area has been identified as a CBA; *b) an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation;* *c) the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s);* *d) the impact on ecosystem threat status;* *e) the impact on explicit subtypes in the vegetation;* *f) the impact on overall species and ecosystem diversity of the site; and* g) *the impact on any changes to threat status of populations of species of conservation concern in the CBA;*	**Part A**: Section 3 (desktop analysis) **Part B**: Section 3 and 5.3.3
2.3.7.2	Terrestrial Ecological Support Areas (ESAs), including: *a) the impact on the ecological processes that operate within or across the site;* *b) the extent the proposed development will impact on the functionality of the ESA; and* c) *loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration and movement of flora and fauna;*	
2.3.7.3	Protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including- *a) an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan;*	**Part A**: Section 3 (desktop analysis) However, not applicable as no study area occur within protected areas.
2.3.7.4	Priority areas for protected area expansion, including- *a) the way in which in which the proposed development will compromise or contribute to the expansion of the protected area network;*	**Part A**: Section 3 (desktop analysis)
2.3.7.5	SWSAs including: *a) the impact(s) on the terrestrial habitat of a SWSA; and* b) *the impacts of the proposed development on the SWSA water quality and quantity (e.g. describing potential increased runoff leading to increased sediment load in water courses);*	Not Applicable
2.3.7.6	FEPA sub catchments, including- *a) the impacts of the proposed development on habitat condition and species in the FEPA sub catchment;*	**For descriptions on the presence of FEPAs, please refer to the Freshwater Assessment*
2.3.7.7	Indigenous forests, including: *a) impact on the ecological integrity of the forest; and* b) *percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.*	Not Applicable
2.4	**The findings of the assessment must be written up in a Terrestrial Biodiversity Specialist Assessment Report.**	
	Part B: Results of the **Floral Assessment** as well as conclusions on Terrestrial Biodiversity as it relates to vegetation communities. **Part C:** Results of the **Faunal Assessment** as well as conclusions on Terrestrial Biodiversity as it relates to faunal communities.	
3	**Terrestrial Biodiversity Specialist Assessment Report**	
3.1	**The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:**	
3.1.1	Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	**Part A:** Appendix E
3.1.2	A signed statement of independence by the specialist;	**Part A:** Appendix E
3.1.3	A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	**Part B:** Section 1.3 (flora) **Part C:** Section 1.3 (fauna)

3.1.4	A description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant;	**Part A**: Appendix C **Part B:** Section 2 (flora) **Part B:** Appendix A (flora) **Part C:** Section 2 (fauna) **Part C**: Appendix A (fauna)
3.1.5	A description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;	**Part B:** Section 1.3 (flora) **Part C:** Section 1.3 (fauna)
3.1.6	A location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);	**Part B:** Section 4 (flora) **Part C:** Section 4 (fauna)
	Impact Assessment Requirements 3.1.7 Additional environmental impacts expected from the proposed development; 3.1.8 Any direct, indirect and cumulative impacts of the proposed development; 3.1.9 The degree to which impacts, and risks can be mitigated; 3.1.10 The degree to which the impacts and risks can be reversed; 3.1.11 The degree to which the impacts and risks can cause loss of irreplaceable resources; 3.1.12 Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	**Part B:** Section 5 (flora) **Part C:** Section 5 (fauna)
3.1.13	A motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a "low" terrestrial biodiversity sensitivity and that were not considered appropriate;	**Not Applicable to this report**
3.1.14	A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not; and	Executive summary **Part B:** Section 6 (flora) **Part C:** Section 6 (fauna)
3.1.15	Any conditions to which this statement is subjected.	**Part B:** Section 5.4 (flora) **Part C:** Section 5.4 (fauna)
3.2	The findings of the Terrestrial Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report, including the mitigation and monitoring measures as identified, which must be incorporated into the EMPr where relevant.	**Not Applicable to this report. Responsibility of the EAP.**
3.3	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	**Not Applicable to this report**

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ACRONYMS

ADU	The Animal Demography Unit online database: http://vmus.adu.org.za/.
AIP/AIPs	Alien Invasive Plant/Alien Invasive Plants
CR	Critically Endangered
DFFE	Department of Forestry, Fisheries and the Environment
EAP	Environmental Assessment Practitioner
EIS	Ecological Importance and Sensitivity
EN	Endangered
GDARD	Gauteng Department of Agriculture and Rural Development
GIS	Geographic Information System
GPS	Global Positioning System
Ha	Hectares
IEM	Integrated Environmental Management
IUCN	International Union for Conservation of Nature and Natural Resources
Km	Kilometres
LC	Least Concern
LEDET	Limpopo Economic Development, Environmental and Tourism
LEMA	Limpopo Environmental Management Act, 2003 (Act No.7 of 2003)
NA	Not Applicable
NBA	National Biodiversity Assessment, as it related to the NEMBA
NT	Near Threatened
NE	Not Evaluated
NEMBA	National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004)
NYBA	Not yet been assessed
OHL	Overhead Transmission Line
P	Protected, according to the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004): Amendment of Critically Endangered, Endangered, Vulnerable and Protected Species List. December 2007
PES	Present Ecological State
POC	Probability of Occurrence
PV	Photovoltaic
QDS	Quarter Degree Square
R	Rare
RDL	Red Data Listed
SABAP2	Southern African Bird Atlas Project 2
SANBI	South Africa National Biodiversity Institute
SP	Specially Protected
STS	Scientific Terrestrial Services
SCC	Species of Conservation Concern
TOPS	Threatened Or Protected Species (list of 2007) according to the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004):
VU	Vulnerable

GLOSSARY OF TERMS

Alien and Invasive species	A species that is not an indigenous species; or an indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention.
Carrying Capacity	The maximum population size of a biological species that can be sustained by that specific environment, given the food, habitat, water, and other resources available.
CBA (Critical Biodiversity Area)	A CBA is an area considered important for the survival of threatened species and includes valuable ecosystems such as wetlands, untransformed vegetation and ridges.
Corridor (ecological)	Open areas of native vegetation, providing habitat that connects wildlife populations in isolated areas that are separated by human activities or structures. Corridors provide cohesion in otherwise fragmented ecosystems. Through the connection of fragmented habitats, the viability of animal and plant species is improved by enlarging habitats, for example to improve the search for food, dispersion of young animals and re-use of "empty" habitats (Sicirec, 2009)
Diversity	Abundance and species richness of faunal classes
Ecosystem	A community of living organisms in conjunction with the non-living components of their environment, interacting as a system. These biotic and abiotic components are linked together through nutrient cycles and energy flows.
Endangered (according to IUCN)	Organisms at very high risk of extinction in the wild
Endemic species	Species that are only found within a pre-defined area. There can therefore be sub-continental (e.g., southern Africa), national (South Africa), provincial, regional or even within a particular mountain range.
ESA (Ecological Support Area)	An ESA provides connectivity and important ecological processes between CBAs and is therefore important in terms of habitat conservation.
Faunal Class	In biological classification, class (Latin: classis) is a taxonomic rank, as well as a taxonomic unit. Class specifically refers to major groups, namely: mammals, avifauna (birds), reptiles and invertebrates.
Habitat Integrity (ecological)	The integrity of an ecosystem refers to its functional completeness, including its components (species) its patterns (distribution) and its processes.
Least Concern	Unlikely to become extinct in the near future. A least-concern species is a species that has been categorized by the International Union for Conservation of Nature (IUCN) as evaluated as not being a focus of species conservation. They do not qualify as threatened, near threatened, or (before 2001) conservation dependent.
Least Threatened	Least threatened ecosystems are still largely intact.
Near Threatened (according to IUCN)	Close to being at high risk of extinction in the near future.
Protected	Species of high conservation value or national importance that require protection, according to NEMBA: TOPS 2007 species list
Refugia (ecological)	Refugium (plural: refugia) is a location which supports an isolated or relict population of a once more widespread species. This isolation can be caused by climatic changes, geography, or human activities such as deforestation and overhunting.
Resource (ecological)	In biology and ecology, a resource is a substance or object in the environment required by an organism for normal growth, maintenance, and reproduction.
RDL (Red Data listed) species	Organisms that fall into the Extinct in the Wild (EW), critically endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status.
SCC (Species of Conservation Concern)	The term SCC in the context of this report refers to all RDL (Red Data) and IUCN (International Union for the Conservation of Nature) listed threatened species as well as protected species of relevance to the project.
Termitaria	Colonies of termites, typically within a tall mound of cemented earth.
Vulnerable (according to IUCN)	Species meets one of the 5 red list criteria and thus considered to be at high risk of unnatural (human-caused) extinction without further human intervention.

1. INTRODUCTION

1.1. Background

Scientific Terrestrial Services CC (STS) was appointed by Zutari to conduct a Biodiversity Assessment as part of the Environmental Impact Assessment (EIA) to obtain an Environmental Authorisation (EA) for the proposed development of a Solar Photovoltaic (PV) Plant outside the town of Mokopane at the Mogalakwena Mine, Limpopo Province, henceforth referred to as the "**Study Area**". The Study Area is situated east of the N11 main road, 27 km outside and to the north of the town Mokopane (Figure 1 and 2). The Study Area is south of the Sekuruwe settlement, southwest of the Ga-Sekhaolelo settlement, and east of the Ga-Molekana informal settlement.

Previous studies were undertaken for the proposed Solar PV Plant (refer to STS 210042, 2021) with the layout subsequently updated and amended in 2022. This 2022 study is focused on the amended Study Area boundary (Figure 1) and further includes specific focus areas that were highlighted by the screening tool as potentially sensitive habitat and/or that were not part of the previously assessed area.

The purpose of this report is to define the faunal ecology of the study area as well as mapping and defining areas of increased Ecological Importance and Sensitivity (EIS) and to define the Present Ecological State (PES) of the study area. The objective of this study is:

- To provide inventories of faunal species as encountered within the study area;
- To determine and describe habitat types, communities and the ecological state of the study area and to rank each habitat type based on conservation importance and ecological sensitivity;
- To identify and consider all sensitive landscapes including rocky ridges, wetlands and/ or any other special features;
- To conduct a Red Data Listed (RDL) species assessment as well as an assessment of other Species of Conservation Concern (SCC), including potential for such species to occur within the study area;
- To provide detailed information to guide the activities associated with the proposed development activities associated within the study area; and
- To ensure the ongoing functioning of the ecosystem in such a way as to support local and regional conservation requirements and the provision of ecological services in the local area.

1.2. Project Description

The proposed solar plant footprint, henceforth referred to as the "study area" is expected to have a design lifespan of approximately 30 years (Zutari, 2021a) and will consist of the following, depicted in Figure 1:

- Laydown Areas, which are split into three area namely 1, 2 and 3;
- A substation;
- O&M building;
- Site Camp;
- Focus Areas (1 and 2); and
- Two overhead transmission lines (OHLs) connecting to the existing substations.

The planned number of staff for the construction phase, is 1500 personnel, who will reduce to 50 personnel during the operational phase (Zutari, 2021a).

1.3. Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. It is, however, expected that most faunal communities have been accurately assessed and considered and the information provided is considered sufficient to allow informed decision making to take place and facilitate integrated environmental management;
- Due to the nature and habits of most faunal taxa, the high level of surrounding anthropogenic activities, it is unlikely that all species would have been observed during a field assessment of limited duration. Therefore, site observations were compared with literature studies where necessary;
- The faunal assessment was limited to the study area only and did not assess in detail the surrounding properties. The surrounding properties were noted on an adhoc basis whilst moving to and from the study area, with data extrapolated to these areas through the use of satellite imagery. The four dams, situated outside of the study area were looked at as these are important ecological features that will influence faunal movement and potential abundance and diversity;
- This assessment only focused on mammals, herpetofauna and invertebrates; a separate avifaunal report has been written to assess impacts to bird communities within the study area;

- Sampling by its nature, means that not all individuals are assessed and identified. Some species and taxa within the footprint area may therefore have been missed during the assessment;
- A field assessment was undertaken from the 1st to the 4th of June 2021 (winter season), and again on the 24th of May 2022 (winter season), to verify the 2021 findings, to assess the additional three focus areas, and to "ground-truth" the results of the desktop assessment (presented in Section A). A more accurate assessment would require that assessments take place in all seasons of the year, especially in summer after the rainy season. The dry conditions experienced during this winter field assessment, would have had a significant role in limiting faunal diversity data. However, on-site data was significantly augmented with all available desktop data and specialist experience in the area, and the findings of this assessment are considered to be an accurate reflection of the ecological characteristics of the study area.

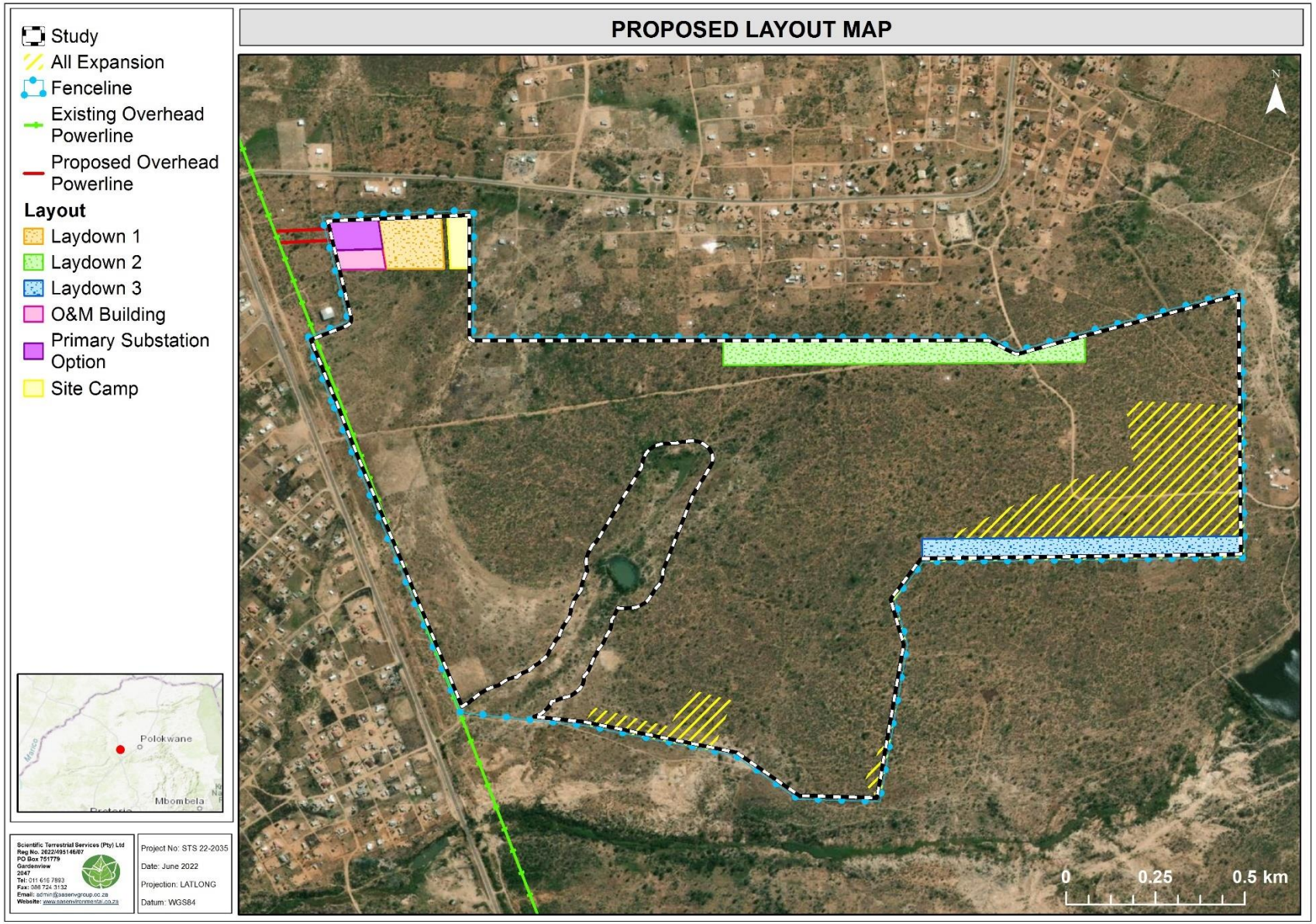


Figure 1: Proposed project layout of the Study Area overlaid on digital satellite imagery.

2. ASSESSMENT APPROACH

An initial field assessment was undertaken on the 1st to the 4th of June 2021 (winter season) to assess the study area with a follow-up assessment taking place on the 24th of May 2022, to determine the faunal ecological status of the study area. A reconnaissance 'walkabout' was initially undertaken to determine the general habitat types found throughout the study area, following this, specific study sites were selected that were considered to be representative of the habitats found within the study area, with special emphasis being placed on areas that may potentially support faunal SCC. Sites were investigated on foot in order to identify the occurrence of fauna within the study area. Camera traps were used during the first (2021) field assessment to increase the likelihood of capturing and observing mammal species, notably nocturnal and reclusive mammals. The 2022 assessment primarily looked at the additional focus areas, however the greater study area was also considered in order to verify the previous 2021 results and to further saturate the site data.

A detailed explanation of the method of assessment is provided in Appendix A of this report. The faunal categories covered in this assessment are mammals, reptiles, amphibians, general invertebrates and arachnids. For the methodologies relating to the impact assessment and development of the mitigation measures, please refer to Appendix C of Part A of the study.

2.1 General approach

In order to accurately determine the PES of the study area and capture comprehensive data with respect to faunal taxa, the following methodology were applied:

- Maps and digital satellite images were consulted prior to the field assessment in order to determine broad habitats, vegetation types and potentially sensitive sites. An initial visual on-site assessment of the study area was made in order to confirm the assumptions made during consultation of the digital satellite imagery;
- A literature review with respect to habitats, vegetation types and species distribution was conducted. For a detailed description of the vegetation types and habitats associated with the study area, please refer to Part B report;
- Relevant databases considered during the assessment of the study area included the International Union for Conservation of Nature (IUCN), the Limpopo Conservation Plan V2 (2013) and the National Biodiversity Assessment (NBA, 2018);
- Specific methodologies for the assessment, in terms of field work and data analysis of faunal ecological assemblages are presented in Appendix A of this report; and

- For the methodologies relating to the impact assessment and development of the mitigation measures, please refer to Appendix C of Part A.

2.2 Sensitivity Mapping

All the ecological features associated with the study area was considered, and sensitive areas were assessed. In addition, identified locations of protected species were marked by means of Global Positioning System (GPS). A Geographic Information System (GIS) was used to project these features onto satellite imagery and/or topographic maps. The sensitivity map should guide the final design and layout of the proposed development activities. Please refer to Section 5 of this report for further details.

2.3 Faunal Species of Conservational Concern Assessment

During field assessments, it is not always feasible to identify or observe all species within an area, largely due to the secretive nature of many faunal species, possible low population numbers or varying habits of species. As such, and to specifically assess an area for faunal SCC, a Probability of Occurrence (POC) estimation is used, considering several factors to determine the probability of faunal SCC occurrence within the study area. Species listed in Appendix B whose known distribution ranges and habitat preferences include the proposed infrastructure development sites were taken into consideration. Faunal species likely to occur within the study area is indicated and briefly discussed within each of the relevant dashboards, along with their POC.

3. FAUNAL ASSESSMENT RESULTS

3.1 Faunal Habitat

Four broad habitat units are associated with the study area. These habitat units are discussed briefly in terms of faunal utilisation and importance below. For a more detailed description and discussion of these habitat units please refer to the Part B: Floral Report. Figure 2 provides a visual representation of the various habitats within the study area.

1. Bushveld habitat, comprising three habitat subunits:

1.1. ***Dichrostachys* Bushveld -** this subunit comprises the largest extent of the Bushveld Habitat Unit and supports a moderately low to moderate species richness as a result of bush encroachment. Thorny, woody species, particularly *Dichrostachys cinerea*, dominated within this habitat subunit. This habitat is currently utilised for grazing purposes and the grass layer, throughout the subunit, is dominated by species that are indicative of overgrazing, including *Heteropogon contortus* and *Aristida congesta* subsp. *barbicollisis*. This habitat unit has a moderately low importance from a faunal perspective, as bush encroachment makes the area inaccessible to larger species, and grazing capacity for wild grazers is considerably depleted. Some smaller species will still use this habitat as shelter and to hide from predators.

1.2. Degraded Bushveld - this subunit comprises the second largest extent of the Bushveld Habitat Unit and supports a low diversity of floral species. This habitat subunit is largely degraded in nature and has historically been subjected to edge effects, including dumping, soil disturbance (attributed to vegetation clearing and excavation activities), historic and increased current grazing pressures, AIP infestation, wood harvesting, and frequent fires by local communities. Despite its disturbed condition, habitat remains that will support an increased diversity of common invertebrates and small mammals are still present.

1.3. Mixed Bushveld - this subunit comprises the smallest extent of the Bushveld Habitat Unit and supports a higher diversity of floral species, particularly broad-leaf woody species. The subunit has, however, been subjected to grazing pressures and grass species that are indicative of overgrazing, including *Heteropogon contortus* and *Aristida congesta* subsp. *barbicollisis* are common. The unpalatable grass layer renders this habitat unit unfavourable to grazers, which is an important limiting factor on potential faunal diversity herein, although the habitat is suitable to browsers and smaller species that feed on invertebrates.

2. **Freshwater habitat**, comprising two subunits, namely the Seep Wetland and Riverine Habitat. These habitat units do not fall into the footprint area of the development but are still important from a faunal perspective and are therefore discussed accordingly. In addition to the below freshwater habitats, within the greater areas surrounding the study area there were four dams. These were assessed from a faunal use perspective in terms of movement and water provision to species within the study area, and as such, not included in the maps as they do not form part of the overall study area habitat assessments within this or the floral report.

2.1. **Riverine habitat –**drainage lines that represent the largest extent of the Freshwater Habitat. Although not fully riparian in nature (due to the episodic nature of the system – please refer to the Freshwater ecological report compiled by SAS 202186, 2021), the floral community within this subunit indicates seasonal water flow. The Riverine habitat also provides important migratory corridors for mammals in the area and serves as a seasonal water source (when water is available therein).

2.2. **Seep Wetland -** This Habitat subunit is located within the central portion of the study area and supports floral species that favour moist soils, including species such as *Sporobolus africanus, Schizachyrium jeffreysii*, *Cyperus laevigatus* and *Cyperus sexangulari*. Grasses here are therefore more palatable and will attract a higher diversity of grazers and graminivorous species. The seep is considered an important source of freshwater for fauna, with an increased likelihood of amphibian SCC occurring herein.

3. **Transformed Habitat** - includes areas associated with the surrounding settlements (e.g., infrastructure associated with houses and buildings), and associated mining development within the study area. Due to anthropogenic activities this habitat unit has an altered physical environment and is scarcely vegetated. As such, it has a moderately low ecological importance from a faunal perspective with species occurring herein restricted to common, resilient species.

4. **Donga Habitat -** This habitat unit was characterised by steep-sided erosion gulley's that have formed within the landscape. This habitat is likely to be associated with increased moisture (seasonally). Overall vegetation cover within this habitat is scarce and is dominated by plant species such as *Eleodendron transvaalense, Dodonaea viscosa, Carissa bispinosa* and *Aristida congesta* subsp. *congesta*. Due to the lack of vegetative cover and food resources, this habitat unit is not considered important from a faunal perspective.

Figures 2 below provides a visual representation of the above-mentioned habitat units while Sections 3.2 - 3.4 provide a dashboard report of the findings of each faunal class.

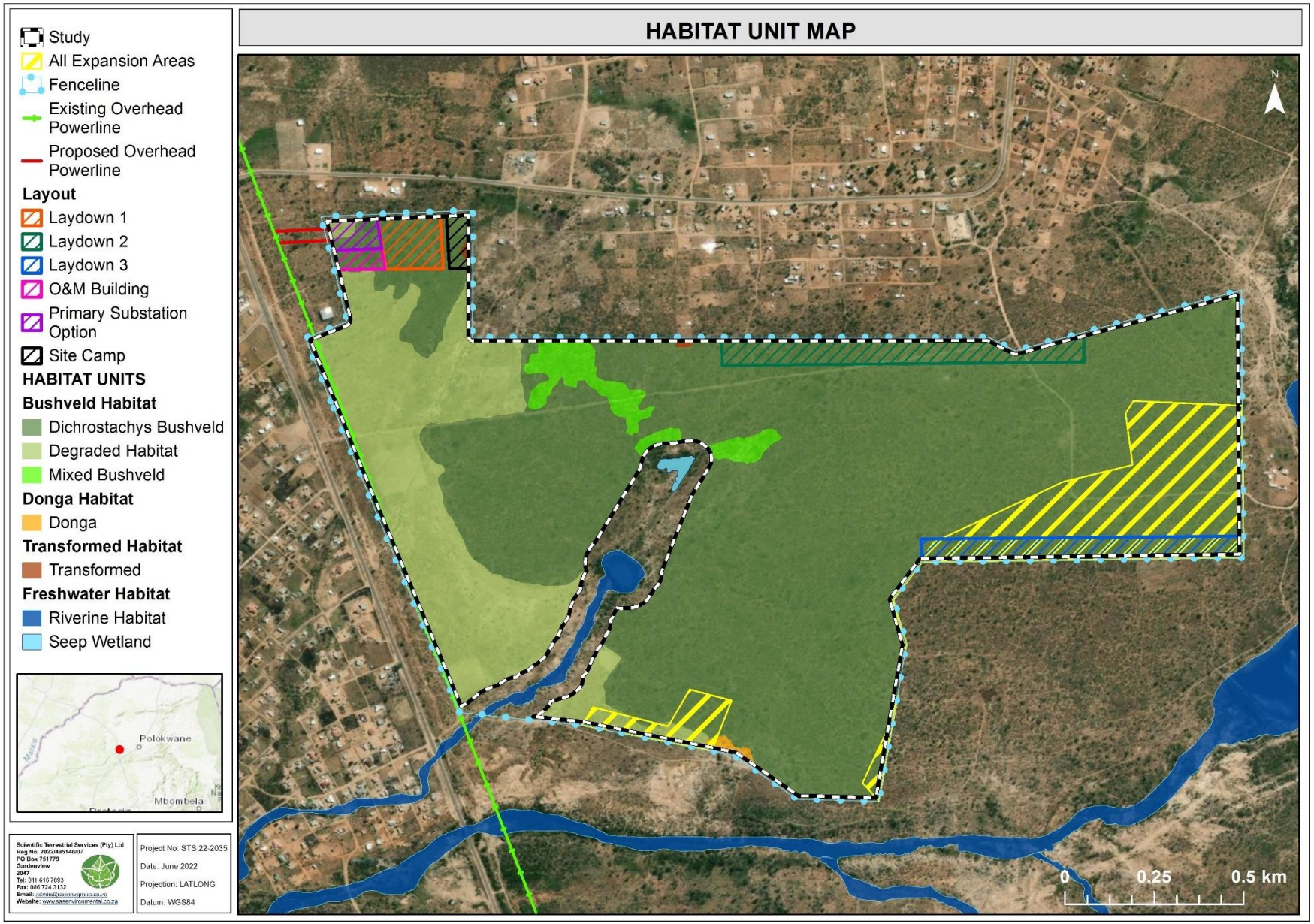


Figure 2: Overview of the habitat units associated with the study area.

3.2 Mammals

Table 1: Field assessment results pertaining to mammal species within the study area.

Photograph Notes:

Top: Left – (African Mole rat heaps, LC) were observed in several localities within the study area. Centre – scat of *Lepus saxatilis* (African Scrub Hare, LC) and a quill from *Hystrix africaeaustralis* (African Porcupine, LC) observed in the bushveld habitat. Right – the scat of (Black-backed Jackal, LC) observed near a drainage line associated with the riverine habitat in the northern portion of the study area. **Centre:** Left – scat of *Sylvicapra grimmia* (Bush duiker, LC) was widespread in the study area. Centre – spoor of a domestic herd dog, which were widespread in the study area. Right – the scat of *Aonyx capensis* (Cape Clawless Otter, NT) observed downstream of a large dam situated outside eastern border of the proposed development footprint.
Bottom: Left – many cattle paths, covered with human boot prints, dog prints, and dung of cattle, goats and donkeys run throughout the study area, indicating widespread and frequent disturbance by existing anthropogenic related activities. Centre – burrows of varying sizes, from small to fairly large were observed throughout the study area which are likely used by smaller mammal species. Right – Snare found within the study area close to the Watercourse habitat.

Mammal Species of Conservation Concern (SCC)

Species	Habitat and Resources in the study area	Conservation Status	POC
Felis lybica (African Wild Cat)	The distribution range of this species overlaps the study area and has a wide habitat tolerance but frequents tall grass and thick bush, which is present in the Bushveld habitat in the study area. The presence of humans and dogs in the area will lower the chances for this species to be there although they may opportunistically hunt within the study area. The study area likely forms part of this species greater foraging range but is unlikely to be used as permanent habitat. Additionally, this species is known to hybridise with domestic cats, placing further strain on the genetic fitness of this species, notably in peri-urban areas where this species may occur.	VU (Limpopo)	Medium
Panthera pardus (Leopard)	Leopards occur in a wide range of habitats, including bushveld and cliffs which are present in the area surrounding the study area. They are able to live amidst high human densities (Singh 2005) and readily prey on livestock and domestic animals (Mukherjee et al. 2001), which is available in the study area. The presence of humans and dogs in the area will lower the chances for this species to be there although they may opportunistically hunt within the study area. The study area may form part of a movement corridor, however more suitable corridors likely occur further north. As such, the proposed development is unlikely to impact this species.	VU (IUCN)	Medium

	Species	Habitat and Resources in the Study area	Conservation Status	POC
Mammalian SCC continued	*Parahyaena brunnea* (Brown Hyena)	Its distribution range overlaps the study area, and it is able to survive close to human settlements. It is primarily a scavenger of a wide range of vertebrate remains, notably any carcasses of livestock that may occur in the study area. When not scavenging this species will also prey upon small mammals and reptiles to supplement its carrion intake. Fruit and seeds when and where available will also be eaten as part of their diet. This species is known to occur in the larger region, with individuals previously being recorded from the granite domes to the east of Mogalakwena Mine as well as the Witvinger Nature Reserve south east of the study area. As such, the study area may be used as a movement corridor by this species. The solar farm is likely to impact on this species in terms of potential foraging grounds and also movement corridors, though, due to the likely low population density and the fact that it is unlikely that the study area forms part of individuals core home ranges, impacts to this species are likely to be minimal. More suitable corridors for movement are located to the north of the study area with more suitable foraging grounds also located herein.	NT	Medium
	Aonyx capensis (Cape Clawless Otter)	Selects rocky shores near permanent water but can tolerate episodic rivers, even those that are polluted. Evidence of this species (scat) was observed by the freshwater habitat to the east of the study area, where suitable surface water systems provide habitat for this species. It is unlikely that the development will have an impact on this species provided that edge effects are controlled, and the freshwater habitat, notably the larger river system to the east and south, is not impacted upon.	NT	Confirmed
	Dasymys robertsii (Robert's Shaggy Rat)	Prefers swamps and wet areas along rivers and streams, which are predominantly found to the east of the study area as well as within the central area during summer months following sufficient rainfall. The avoidance of these habitats and their stipulated buffers as per the freshwater report as well as the management of impacts and edge effects will ensure that the perceived impacts to this species, should they occur on site, are minimised.	DD	Medium
Mammal Discussion	No mammalian SCC were observed in the direct study area. Although the SCC, *Aonyx capensis* (Cape, Clawless Otter, NT) was observed in the adjacent freshwater systems but outside of the footprint and as such, development is unlikely to impact on the species required habitat. Overall, mammalian diversity in the study area is considered to be moderate and restricted to resilient, common species that are adapted to a variety of habitats and can persist amongst disturbance. The encroachment of existing informal settlements into the study area poses a major threat and deterrent to most wildlife and would play a significant role in limiting overall mammal abundance and diversity levels, including the presence of the abovementioned SCC. Cows, donkeys and goats that are associated with subsistence livestock farming of the surrounding informal communities have outcompeted larger game species that could potentially occupy the area. During the field assessment we found snares for small mammals and observed herdsmen along with their dogs and livestock regularly passing through the study area. As such, the study area is considered to be notably disturbed from a mammal species perspective, with many mammals likely been lost due to subsistence hunting and a decrease in suitable food resources. As a result of intense overgrazing and the thick bush encroachment, the veld condition has been degraded for grazers. While there is an abundance of grass in the study area, it is dominated by unpalatable species, therefore, the capacity of the study area to support large wild grazers is considerably depleted. Only browsers, such as *Tragelaphus strepsiceros* (Greater Kudu, LC), which was observed during the field assessment, will benefit from available browsing within the bushveld habitat, and if they occur on site, they will be in areas away from increased human habitation due to threats from poaching and hunting. The lack of large herbivores and continuous human persecution is likely the reason why no large mammalian predators were observed on site. There was, however evidence of small to medium mammal abundance, which will attract meso-predators, such as *Canis mesomelas* (Black-backed Jackal, LC) into the study area. Overall, considering the abovementioned conditions, the study area is considered to have low conservation value from a mammal perspective. Bushveld habitat is available for savannah dwelling mammals, but it is limited by bush encroachment making access through these areas difficult. The drainage lines (associated with the Riverine Habitat) that run concurrently amidst the study area, may provide suitable movement corridors, through which larger mammals may move more easily, especially when dry (due to the ephemeral nature of these systems). Other areas within the study area or just outside of it, that are considered important to mammals on site, are the Freshwater Habitat and the four dams \ situated outside of the study area. The wetland and dams, although frequently disturbed by humans and livestock, are an important freshwater resource. As such, it is recommended to keep the development footprint and possible edge effects away from these areas, as far as possible, to maintain mammalian movement corridors and resources.		

Conclusion	Due to the highly disturbed condition of most habitats within the study area the proposed solar development, is unlikely to have a significant impact on mammal communities, as mammal species observed on site were of low abundance and diversity and those that are within the study area will likely move into the adjacent habitats, away from disturbance. Nonetheless, the proponent should consider maintaining movement corridors and areas within or in close proximity to the study area, that are considered to be important to preserve existing mammalian diversity amidst development. These areas include all areas associated with the freshwater habitat located in the central, eastern and southern portion of the study area. The screening tool highlighted one SCC the *Dasymys robertsii* (Robert's Shaggy Rat, DD) which have a medium POC for the study area. There will not be significant impact on this species as it is associated with the Watercourse habitat and the planned development does not fall within this habitat. Edge effects and impacts associated with the proposed development, as stipulated in section 6 should be prevented from encroaching into these sensitive areas. Please see section 6 for a detailed list of mitigatory measures to minimise impacts to mammals and general fauna.

3.3 Herpetofauna

Table 2: Field assessment results pertaining to reptile and amphibian species within the study area.

Photograph Notes:

Top: Left – areas of ponding such as pictured are situated along drainage lines that runs between the middle and southern portions of the study area, provide suitable amphibian breeding habitat and may attract higher amphibian diversity to the study area. Centre – a wetland located in the central portion of the study area, provides additional amphibian habitat. Right – the frog, *Ptychadena anchietae* (Anchieta's Ridged Frog, LC) was observed at the dam between the middle portions of the study area.
Middle: Left, Centre and right – termite mounds provide ideal habitat in which amphibians and reptiles may aestivate during the winter **Bottom – not observed** – Left to right representative photographs of the SCC *Python natalensis*, *Pyxicephalus adspersus* and *Homoroselaps dorsalis* which all have a medium probability of occurrence within the study area.

Herpetofauna SCC

Species	Habitat and Resources in the Study area	Conservation Status	POC
Python natalensis (Southern African Python)	Found in a wide variety of habitats and often in association with large animal burrows which appear to form a critical microhabitat for reproduction. May occur in the Bushveld habitat within the study area. It is highly unlikely that larger numbers of Southern African Pythons will be found in the study area due to human presences and likely persecution thereof.	VU (Limpopo, 2004)	Medium
Homoroselaps dorsalis (Striped Harlequin Snake)	The study area falls into the know distribution range of this species. The Striped Harlequin Snake is known to shelter in termiteria mounds, which were present in the Bushveld habitat unit and may be found within the study area.	R (Limpopo, 2004)	Medium
Pyxicephalus adspersus (Giant African Bullfrog)	Occurs in dry savannas. When not breeding, it can travel up to 4 km from water, foraging for insects at night and as such, may venture into the study area. Their breeding habitat, in the form of shallow, stagnant temporary waters in wetlands and pans, are present in or close to the study area. Adults may be buried (aestivating) beneath the soil in the dry season in close proximity to the freshwater systems. As such, development in the freshwater buffers must not occur.	NT (RSA)	Medium

Herpetofauna Discussion	Reptile and amphibian species are notoriously hard to detect, owing to their secretive nature, and as a result, only one common amphibian and no reptiles were observed during the field assessment. As reptile habitat and amphibian (four dams and one wetland) habitat were observed within or in close proximity to the study area, it is anticipated that a higher diversity of common herpetofauna will inhabit the area during the summer months, with the POC of the three SCC described above. A limited number of amphibians are expected to occur within the study area, as all freshwater habitat, with the exception of the wetland, are located outside the study area and therefore are excluded from the proposed solar development footprint. However, some species, such as the African Giant Bullfrog and toads listed in Appendix C, are capable of travelling far from water, and may venture into the study area to forage or to aestivate in termitaria. The wetland in the central portion of the study area, is considered important amphibian habitat that may host higher amphibian diversity in the wet season. Food resources in the study area, are not considered to be a limiting factor for herpetofauna.
Conclusion	Fewer than expected herpetofaunal species were observed furing the field assessment, however, a higher diversity is anticipated in the summer months, owing to increased habitat, temperature and food resources. As such, installation of the proposed solar plant and associated infrastructure may impact potentially occurring herpetofaunal species as a result of widespread vegetation clearing that will lead to the direct habitat loss, and may disturb habitats that are located immediately outside of the footprint area. As a result, herpetofauna may become displaced as they are forced to migrate out of the areas of disturbance. The movement of herpetofauna out of the disturbance footprint areas will result in higher levels of competition for food resources and habitat, which can lead to a decrease in herpetofaunal abundance levels, including potential SCC. Additionally, the increased movement of vehicles traveling to and from the study area as well as increased conflict with humans will likely increase the risk of persecution for herpetofauna species. Please see section 6 for a detailed list of mitigatory measures pertaining to herpetofaun.

3.4 Invertebrates

Table 3: Field assessment results pertaining to insect species within the study area.

Photograph Notes:

Top: Left - *Phymateus viridipes* (Green Stinkweed Locust, NYBA), centre – the pupae of a *Sphodromantis gastrica* (Common Green Mantid, NYBA) and right – a robber fly of the Subfamily Asilidae were all observed in the Degraded bushveld habitat in the northern portion of the study area. **Middle:** Butterfly species: Left - *Belenois aurota* (Brown-veined Butterfly, LC), centre - *Hamanumida daedalus* (Guineafowl Butterfly, LC), and right - *Colotis euippe* (Smoky Orange, LC). **Bottom:** Some of the arachnid species observed within the study area include Left - *Trichonephila senegalensis* (Banded-legged Orb-web spider, NYBA), centre – a burrow of a baboon spider (*Ceratogyrus darlingi*, P); Right – scorpion species belonging to the genus *Uroplectes* spp observed in the study area.

Invertebrate SCC

Species	Habitat and Resources in the Study area	Conservation Status	POC
Ceratogyrus darlingi (Horned Baboon Spider)	Occupy round, silk-lined burrows in lightly wooded areas, beneath rocks and logs. On each of the site visits in 2021 and 2022 such burrows were observed in the bushveld habitat. Although trampling from high livestock numbers and overgrazing cause a great risk to the species, they may still be found in relative high abundance throughout the study area.	VU & P according to NEMBA: TOPS 2007	Confirmed
Opistophthalmus glabrifrons (Rough Burrower)	This species is active on warm nights and burrows under rocks and in open grasslands within the bushveld habitat. They may be found within the study area but not in great abundances due to the degraded nature of the study area.	P according to NEMBA: TOPS 2007	Medium
Anthene minima minima (Little Hairtail Butterfly)	This is a low-density, wide-ranging species and in South Africa the taxon appears to be restricted to *Vachellia* savanna. *Vachellia* trees were found in the Bushveld habitat unit within the study area. Given the higher density of *Dichrostachys cinerea* in the study area and the highly encroached nature of much of the area, this species may be found here but in low numbers and likely whilst transitioning between more suitable areas of habitat.	DD	Medium

Invertebrate Discussion	Observed invertebrate diversity was considerably lower than expected, which is significantly influenced by the cold, dry season, in which the field assessment was conducted. Many insects are inactive during the winter, as they survive this period as larvae, or are in low abundances as a result of low temperatures and food resources. Considering the availability of bushveld, grassland and sandy microhabitats in the study area, it is anticipated that invertebrate diversity will be substantially higher following rains in the summer season. All invertebrates observed are considered common widespread species. The burrows of *Ceratogyrus darlingi* (Horned Baboon Spider, P&VU) was found in the *Dichrostachys* bushveld habitat on both site visits and is a notable find. This species is a slow-moving species that does not venture far from its burrow. Earth works and vegetation clearance will pose a significant threat to this species. *Opistophthalmus glabrifrons* (Rough burrowing scorpion, P) may also occur on site as suitable habitat is available. The screening tool highlighted *Anthene minima minima* (Little Hairtail Butterfly, DD) which has a medium POC to occur within the study area as they are restricted to *Vachellia* trees which were present in the study area.
Conclusion	The proposed development and associated infrastructure will lead to widescale loss of habitat and food resources, reducing the diversity of insects and arachnids that were observed on the study area or will occur during the summer months. In general, and with the exception of one arachnid SCC, species observed were commonly occurring and may persist in the surrounding landscape but will be faced with increased competition and potential lack of resources, putting strain on future insect populations. The arachnid, *Ceratogyrus darlingi* (Horned Baboon Spider, P&VU) is confirmed to occur on site and development poses a major risk to this species due to its poor dispersal abilities and inability to flee disturbance. The loss of insect abundance and diversity may have a negative cascading effect on other faunal species in the study area. Please refer to section 6. for a detailed list of recommended mitigatory measures.

4. IFC PS6 STANDARDS

This section serves to address the application of Performance Standard 6 (Biodiversity Conservation and Sustainable Management of Living Natural Resources) of the International Finance Corporation (IFC) and to categorise the observed habitat units into the relevant IFC defined habitat categories.

The IFC habitat categories are defined as follows:

Modified Habitat

Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands.

- This Performance Standard applies to those areas of modified habitat that include significant biodiversity value, as determined by the risks and impacts identification process required in Performance Standard 1. The client should minimize impacts on such biodiversity and implement mitigation measures as appropriate.

Natural Habitat

Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.

The client will not significantly convert or degrade natural habitats, unless all of the following are demonstrated:

- No other viable alternatives within the region exist for development of the project on modified habitat;
- Consultation has established the views of stakeholders, including Affected Communities, with respect to the extent of conversion and degradation; and
- Any conversion or degradation is mitigated according to the mitigation hierarchy.

In areas of natural habitat, mitigation measures will be designed to achieve no net loss of biodiversity where feasible. Appropriate actions include:

- Avoiding impacts on biodiversity through the identification and protection of set-asides;
- Implementing measures to minimize habitat fragmentation, such as biological corridors;
- Restoring habitats during operations and/or after operations; and
- Implementing biodiversity offsets.

Critical Habitat

Critical habitats are areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes.

In areas of critical habitat, the client will not implement any project activities unless all of the following are demonstrated:

- No other viable alternatives within the region exist for development of the project on modified or natural habitats that are not critical;
- The project does not lead to measurable adverse impacts on those biodiversity values for which the critical habitat was designated, and on the ecological processes supporting those biodiversity values;
- The project does not lead to a net reduction in the global and/or national/regional population of any Critically Endangered or Endangered species over a reasonable period of time; and
- A robust, appropriately designed, and long-term biodiversity monitoring and program is integrated into the client's management program.

In such cases where a client is able to meet the requirements defined in paragraph 17, the project's mitigation strategy will be described in a Biodiversity Action Plan and will be designed to achieve net gains of those biodiversity values for which the critical habitat was designated.

In instances where biodiversity offsets are proposed as part of the mitigation strategy, the client must demonstrate through an assessment that the project's significant residual impacts on biodiversity will be adequately mitigated to meet the requirements of paragraph 17.

GN9. The requirements for the baseline study will vary depending on the nature and scale of the project. For sites with potentially significant impacts on natural and critical habitats and ecosystem services, the baseline should include field surveys over multiple seasons, to be undertaken by competent professionals and with the involvement of external experts, as necessary. Field surveys and assessments should be recent, and data should be acquired for the direct project footprint, including related and associated facilities, the project's area of influence, and potentially beyond.

GN22. For projects located in critical habitats (including legally protected and internationally recognized areas), clients must ensure that external experts with regional experience are involved in the biodiversity and/or critical habitat assessment. If habitat is critical due to the presence of critically endangered or endangered species, recognized species specialists must be involved (for example, including individuals from IUCN Species Survival Commission Specialist Groups). In areas of critical habitat, clients will benefit from establishing a mechanism for external review of the project's risks and impacts identification process and proposed mitigation strategy. This is especially relevant where uncertainty is high, where potential impacts are complex and/or controversial, and/or where no precedent exists for proposed mitigations (such as some types of offsets). Such a mechanism would also promote the sharing of good international practice between projects and improve transparency in decision making.

GN28. Both natural and modified habitats may contain high biodiversity values, thereby qualifying as critical habitat. Performance Standard 6 does not limit its definition of critical habitat to critical natural habitat. An area may just as well be critical modified habitat. The extent of human-induced modification of the habitat is therefore not necessarily an indicator of its biodiversity value or the presence of critical habitat.

GN36. Clients should endeavour to site the project in modified habitat rather than on natural or critical habitat and demonstrate this effort through a project alternatives analysis conducted during the risks and impacts identification process.

GN37. Performance Standard 6 requires that projects with significant biodiversity values in modified habitats minimize their impacts and implement mitigation and management measures as needed to conserve those values. Significant biodiversity values that might occur in modified habitat include species of conservation concern (for example, species that are threatened or otherwise identified as important by stakeholders) and remnant ecological features that persist in the modified landscape, especially those that perform important

ecological functions. In some cases, significant biodiversity values may cause natural or critical habitat requirements to be applied, in which case they should be treated using the guidelines for those habitat designations.

GN58. Relatively broad landscape and seascape units might qualify as critical habitat. The scale of the critical habitat assessment depends on the biodiversity attributes particular to the habitat in question and the ecological patterns and processes required to maintain them. Even within a single site designated as critical habitat there might be areas or features of higher or lower biodiversity value. There also will be cases where a project is sited within a greater area recognized as critical habitat, but the project site itself has been highly modified. A critical habitat assessment therefore must not focus solely on the project site. The client should be prepared to conduct desktop assessments, consult with experts and other relevant stakeholders to obtain an understanding of the relative importance or uniqueness of the site with respect to the regional and even the global scale, and/or conduct field surveys beyond the boundaries of the project site. These considerations would form part of the landscape/seascape analyses as referred to in paragraph 6 of Performance Standard 6 and in paragraph GN17 of this note.

GN104. In many cases, invasive species will have already been established in the region in which the project is located. In these cases, the client has the responsibility to take measures to prevent the species from further spread into areas in which it has not already been established. For example, in the case of linear infrastructure, invasive weeds might be spread into forested habitats, especially if the forest canopy is not able to re-establish itself (due to maintenance of the right-of-way for operational purposes). This is exacerbated if opportunistic agricultural or logging activities further widen the right-of-way, thereby facilitating spread. In these cases, the client is expected to determine the severity of the threat and the mode of spread of that species. The situation should be monitored as part of the overall ESMS, and the client should seek effective mitigation measures in coordination with local and national authorities.

GN106. Performance Standard 6 defines ecosystem services as “the benefits that people, including businesses, obtain from ecosystems” (paragraph 2), which is in line with the definition provided by the Millennium Ecosystem Assessment (GN23). As described in paragraph 2 and footnote 1 of Performance Standard 6, ecosystem services are organized into four major categories:

- Provisioning ecosystem services, include, among others, (i) agricultural products, seafood and game, wild foods, and ethnobotanical plants; (ii) water for drinking,

irrigation, and industrial purposes; and (iii) forest areas, which provide the basis for many biopharmaceuticals, construction materials, and biomass for renewable energy;

- Regulating ecosystem services, include, among others, (i) climate regulation and carbon;
- storage and sequestration; (ii) waste decomposition and detoxification; (iii) purification of water and air; (iv) control of pests, disease, and pollination; and (v) natural hazard mitigation;
- Cultural services, include, among others, (i) spiritual and sacred sites; (ii) recreational such as sport, hunting, fishing, and ecotourism; and(iii) scientific exploration and education; and
- Supporting services, are the natural processes that maintain the other services, such as (i) nutrient capture and recycling, (ii) primary production, and (iii) pathways for genetic exchange.

Results and Conclusion

The table below lists the various habitat units as discussed in this report with reference to the IFC habitat units mentioned above.

Table 4: Habitat Units as identified in this report in relation to the relevant IFC Habitat Categories.

Terrestrial Habitat		
Habitat Unit of the study area	**Applicable IFC Habitat and applicable Criteria**	**IFC Habitat Unit Discussion**
Mixed Bushveld	**Natural Habitat** Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition. **Additional Considerations:** GN37, GN104 and GN106	This subunit comprises the smallest extent of the Bushveld Habitat Unit and supports a higher diversity of floral species, particularly broad-leaf woody species and therefore a higher faunal diversity can be expected than in the rest of the study area. Therefore considered to be Natural as per the IFC guidelines. The subunit has, however, been subjected to grazing pressures and grass species that are indicative of overgrazing, including *Heteropogon contortus* and *Aristida congesta* subsp. *barbicollisis* are common. The unpalatable grass layer renders this habitat unit unfavourable to grazers, which is an important limiting factor on potential faunal diversity herein, although the habitat is suitable to browsers and smaller species that feed on invertebrates. This habitat unit consists of ??ha within the ??ha study area which give a ??% natural habitat loss within a already degraded environment. **Additional Considerations:** • GN37 states that significant biodiversity values that might occur in modified habitat include species of conservation concern (for example, species that are threatened or otherwise identified as important by stakeholders) and remnant ecological features that persist in the modified landscape, especially those that perform important ecological functions. *Felis lybica* (African Wild cat), *Panthera pardus* (Leopard, VU), *Parahyaena brunnea* (Brown Hyena, NT), *Python natalensis* (Southern African Python, VU), *Homoroselaps dorsalis* (Striped Harlequin Snake, R), *Opistophthalmus glabrifrons* (Rough Burrower, P) and the confirmed *Ceratogyrus darlingi* (Horned Baboon Spider, VU&P) are SCC that may occur within the study area, either permanently or temporarily; • GN104 states that all measures must be put in place to ensure the adequate control of alien plant species proliferation, ensuring that natural habitats are not further degraded to such a state that they will be considered modified; and • GN106 defines ecosystem services as "the benefits that people, including businesses, obtain from ecosystems". The Mixed Bushveld habitat is utilised by the people from surrounding areas as grazing fields for their livestock, firewood collecting and hunting.
Degraded Bushveld	**Modified Habitat** Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands. **Additional Considerations:** GN37, GN104 and GN106	This subunit comprises the second largest extent of the Bushveld Habitat Unit and supports a low diversity of floral species. This habitat subunit is largely degraded in nature and has historically been subjected to edge effects, including dumping, soil disturbance (attributed to vegetation clearing and excavation activities), historic and increased current grazing pressures, AIP infestation, wood harvesting, and frequent fires by local communities. Therefore this habitat is considered to be modified as per the IFC guidelines. Despite its disturbed condition, habitat remains that will support an increased diversity of common invertebrates and small mammals. **Additional Considerations:** • GN37 states that significant biodiversity values that might occur in modified habitat include species of conservation concern (for example, species that are threatened or otherwise identified as important by stakeholders) and remnant ecological features that persist in the modified landscape, especially those that perform important ecological functions. *Felis lybica* (African Wild cat), *Panthera pardus* (Leopard, VU), *Parahyaena brunnea* (Brown Hyena, NT), *Python natalensis* (Southern African Python, VU), *Homoroselaps dorsalis* (Striped Harlequin Snake, R), *Opistophthalmus glabrifrons* (Rough Burrower, P) and the confirmed *Ceratogyrus darlingi* (Horned Baboon Spider, VU&P) are SCC that may occur within the study area, either permanently or temporarily;

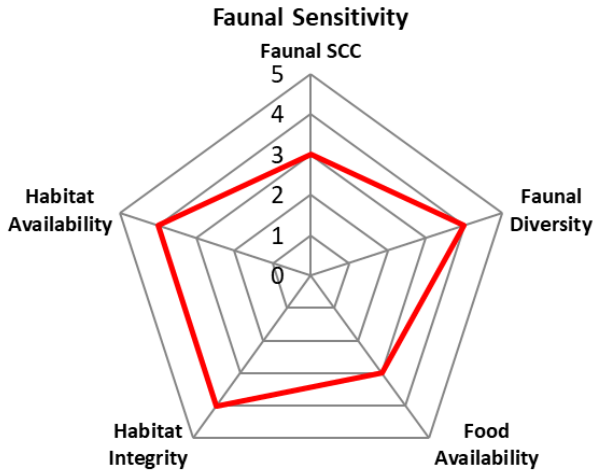
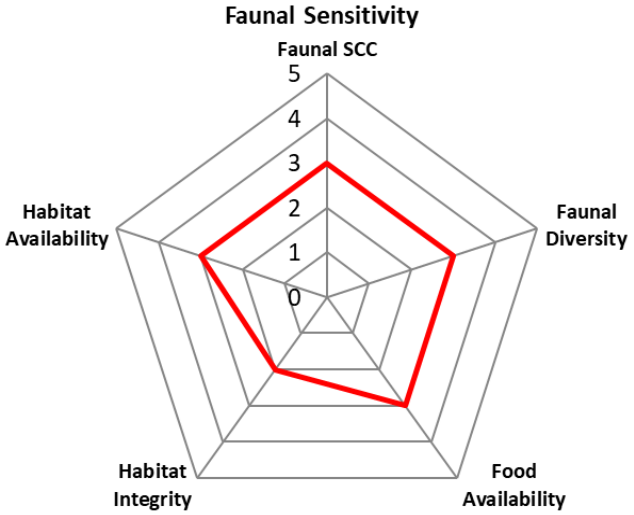
		• GN104 states that all measures must be put in place to ensure the adequate control of alien plant species proliferation, ensuring that natural habitats are not further degraded to such a state that they will be considered modified; and • GN106 defines ecosystem services as "the benefits that people, including businesses, obtain from ecosystems". The Degraded Bushveld habitat is utilised by the people from surrounding areas as grazing fields for their livestock, firewood collecting and hunting.
***Dichrostachys* Bushveld**	**Modified Habitat** Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands. **Additional Considerations:** GN37, GN104 and GN106	This subunit comprises the largest extent of the Bushveld Habitat Unit and supports a moderately low to moderate species richness as a result of bush encroachment. Thorny, woody species, particularly *Dichrostachys cinerea*, dominated within this habitat subunit. This habitat is currently utilised for grazing purposes and the grass layer, throughout the subunit, is dominated by species that are indicative of overgrazing, including *Heteropogon contortus* and *Aristida congesta* subsp. *barbicollisis*. This habitat unit has a moderately low importance from a faunal perspective, as bush encroachment makes the area inaccessible to larger species, and grazing capacity for wild grazers is considerably depleted. Some smaller species will still use this habitat as shelter and to hide from predators. Therefore considered to be modified as per the IFC guidelines. **Additional Considerations:** • GN37 states that significant biodiversity values that might occur in modified habitat include species of conservation concern (for example, species that are threatened or otherwise identified as important by stakeholders) and remnant ecological features that persist in the modified landscape, especially those that perform important ecological functions. *Felis lybica* (African Wild cat), *Panthera pardus* (Leopard, VU), *Parahyaena brunnea* (Brown Hyena, NT), *Python natalensis* (Southern African Python, VU), *Homoroselaps dorsalis* (Striped Harlequin Snake, R), *Opistophthalmus glabrifrons* (Rough Burrower, P) and the confirmed *Ceratogyrus darlingi* (Horned Baboon Spider, VU&P) are SCC that may occur within the study area, either permanently or temporarily; • GN104 states that all measures must be put in place to ensure the adequate control of alien plant species proliferation, ensuring that natural habitats are not further degraded to such a state that they will be considered modified; and • GN106 defines ecosystem services as "the benefits that people, including businesses, obtain from ecosystems". The *Dichrostachys* Bushveld habitat is utilised by the people from surrounding areas as grazing fields for their livestock, firewood collecting and hunting.
Transformed Habitat	**Modified Habitat** Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands. **Additional Considerations:** GN104.	This habitat unit is considered to be modified as per the IFC guidelines due to the increased levels of alien plant proliferation, loss of native species, the continuous ground disturbances associated with agricultural activities and infrastructure associated with houses and buildings. The ecological functions of this habitat unit have been significantly altered from their natural state, providing limited habitat for faunal and floral species associated with the region. **Additional Considerations:** • GN104 states that all measures must be put in place to ensure the adequate control of alien plant species proliferation, ensuring that surrounding natural habitats are not further degraded to such a state that they will in turn be considered modified;

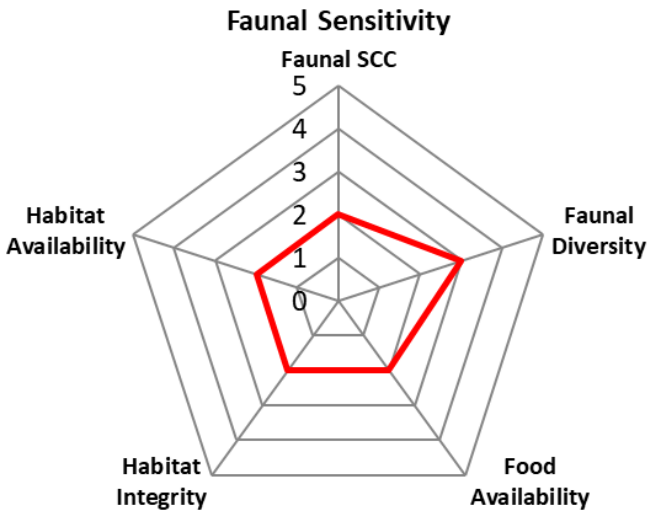
Donga Habitat	**Modified Habitat** Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands. **Additional Considerations:** GN104	This habitat unit was characterised by steep-sided erosion gulley's that have formed within the landscape. This habitat is likely to be associated with increased moisture (seasonally for short periods of time). Overall vegetation cover within this habitat is scarce and is dominated by plant species such as *Eleodendron transvaalense, Dodonaea viscosa, Carissa bispinosa* and *Aristida congesta* subsp. *congesta*. Due to the lack of vegetative cover and food resources, this habitat unit is not considered important from a faunal perspective. **Additional Considerations:** ● GN104 states that all measures must be put in place to ensure the adequate control of alien plant species proliferation, ensuring that surrounding natural habitats are not further degraded to such a state that they will in turn be considered modified;

5. SENSITIVITY MAPPING

Figure 3 conceptually illustrates the faunal ecological sensitivity for the various areas. The areas are depicted according to their sensitivity in terms of the presence or potential for faunal SCC, habitat integrity, levels of disturbance and overall levels of diversity. Table 5 below presents the sensitivity of each habitat along with an associated conservation objective and implications for the proposed activities.

Table 5: A summary of the sensitivity of each habitat unit and implications for the proposed activities.

Habitat Unit	Habitat Sensitivity Graph	Sensitivity	Development Implications
Freshwater Habitat: Seep wetland & Riverine Habitat		**MODERATELY HIGH** Conservation Objective Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance.	The Freshwater habitat functions as an important ecological system and irreplaceable migratory corridor for fauna. The riverine habitat, although ephemeral in nature, currently connects natural areas surrounding the focus area and should any development infringe into this habitat unit, may alter faunal movement patterns and potentially lead to local population fragmentation. The seep wetland, located in the central portion of the study area, is frequently disturbed by livestock, but it still provides an important freshwater resource and breeding habitat for fauna, including amphibians, such as *Pyxicephalus adspersus* (Giant African Bullfrog, NT) amongst other wetland associated fauna.
Mixed Bushveld		**INTERMEDIATE** Conservation Objective Preserve and enhance biodiversity of the habitat unit and surrounds while optimising development potential	This habitat are considered to be of an intermediate faunal sensitivity with moderate faunal diversity levels, with mostly common species observed at the time of the field assessment. A higher diversity, is however, anticipated for this habitat in the summer months. Limiting factors of diversity in this habitat include frequent anthropogenic disturbances and highly seasonal water and food resources. The open herbaceous areas are currently being outcompeted by woody vegetation, limiting suitable herbaceous material for herbivorous and granivorous species. Nonetheless, the well developed woody localities within these habitats are able to support reptiles, arachnids and common mammal browsers that can adapt to rural settlements. SCC that may utilise these habitat unit for foraging purposes, is the *Felis lybica* (African Wild Cat, VU), *Panthera pardus* (Leopard, VU) and *Parahyaena brunnea* (Brown Hyena, NT).

Degraded Bushveld **&** ***Dichrostachys* Bushveld** **&** **Donga Habitat** **&** **Transformed Habitat**		**MODERATELY LOW** <u>Conservation Objective</u> Optimise development potential while improving biodiversity intactness of surrounding natural habitat and managing edge effects.	These habitats are considered to be of a moderately low sensitivity from a faunal perspective due to thick bush encroachment of *Dichrostachys* trees, limiting the movement and abundance of all but smaller faunal species such as rodents and invertebrates. In the Donga habitat, much of the grass layer has been removed or has been outcompeted by unpalatable grasses as a result of over-grazing, leaving large, denuded patches of soil, with a subsequent loss of food resources for herbivorous species. The already altered and degraded environmental state as a result of informal settlements and high human presence renders the Transformed habitat unsuitable for most faunal classes. Ground clearing activities within this habitat will subsequently have limited to low impacts to the receiving environment. The arachnid SCC *Ceratogyrus darlingi* (Horned Baboon Spider, P&VU) was confirmed to occur in *Dichrostachys* Bushveld, and as such a legal search and rescue plan for this species will have to be developed.

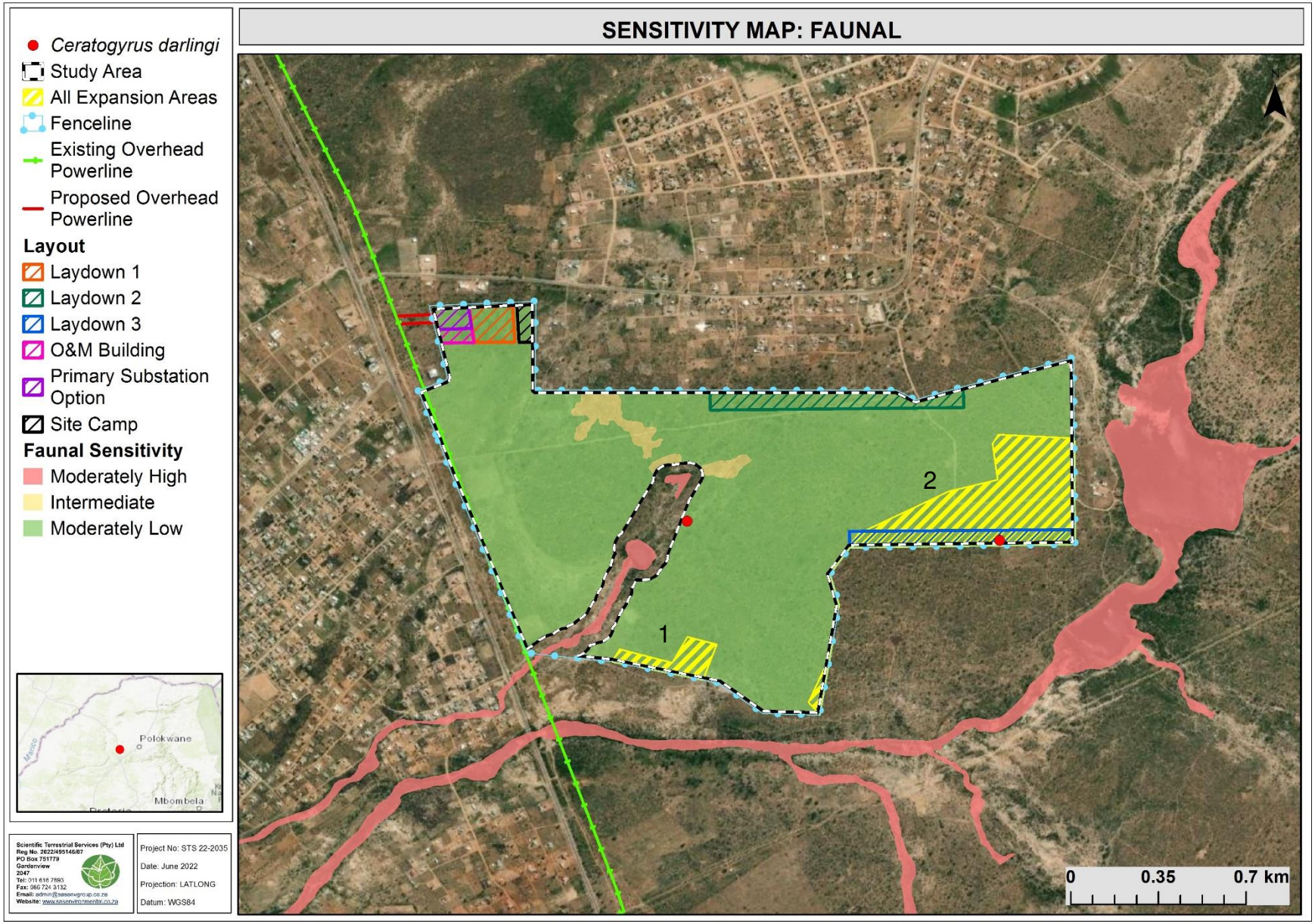


Figure 3: Overview of the faunal habitat sensitivity map for the study area, showing burrow location of the SCC *Ceratogyrus* Horned baboon spider.

6. IMPACT ASSESSMENT

The sections below provide the significance of perceived impacts arising from the proposed infrastructure development for the study area.

An impact discussion and assessment of all potential construction, operational and maintenance phase impacts are provided in Section 6.2. All mitigatory measures required to minimise the perceived impacts are presented in Section 6.

6.1 Activities and Aspect Register

The table below indicates the perceived risks to faunal species associated with the activities pertaining to the proposed solar development associated with the existing Mogalakwena Platinum Mine within the study area.

Table 6: Aspects and activities register considering faunal resources during the pre-construction and planning phases.

ACTIVITIES AND ASPECTS REGISTER
Pre-construction and Construction Phase
- Inconsiderate planning of infrastructure placement and design, leading to the loss of potential sensitive faunal species and/or habitat (Seep Wetland and Riverine habitat) for such species, as well as unnecessary edge effect impacts on areas outside of the proposed development footprint. - **Impact:** Degradation and modification of the receiving environment, loss of faunal habitat diversity and SCC.
- Potential failure to implement the required mitigation measures before and at the commencement of construction activities: • Potential failure to have an action plan for the likelihood of encountering a SCC during construction activities and • Failure to develop a rescue and relocation plan for SCC and inadequate liaison and applications with DFFE and LEDET with regards to permits, resulting in potential failure to obtain the necessary permits for the removal of protected faunal species. - **Impact**: Long-term or permanent degradation and modification of the receiving environment, resulting in displacement or loss of faunal SCC during the construction phase, increasing pressure on SCC populations.
- Potential failure to design and implement an Alien and Invasive Plant (AIP) Management/Control plan before the commencement of construction activities, resulting in the spread of AIPs from the development footprint to surrounding natural habitat. - **Impact:** Spreads of AIPs, leading to potential loss of faunal habitat and diversity from surrounding natural habitat.
- Potential inadequate design of lighting within the PV facility leading to invertebrates being attracted to lights resulting in the attraction of insect predators, increasing the potential for fauna, particularly bats, to collide with and be electrocuted by overhead transmission lines and cables. - **Impact:** Long-term collision and electrocution risks or destruction of habitat could lead leading to a reduction in diversity.
- Inadequate layout optimisation, resulting in extensive site clearing and the removal of indigenous vegetation. - **Impact:** Loss of important faunal habitat and the potential loss of faunal SCC.
- Site clearing - **Impact:** Loss of faunal habitat, diversity, including potentially occurring SCC.
- Uncontrolled and unplanned site clearing and the removal of vegetation and destruction of faunal habitat outside of the footprint area. - **Impact:** Loss of sensitive faunal habitat and faunal species reliant on specific habitats on site for survival.
- Proliferation of AIP species that colonise areas of increased disturbances and may outcompete indigenous plant species, including further transformation of adjacent, undeveloped habitat. - **Impact:** Degradation of favourable faunal habitat outside of the direct construction footprint, leading to a decrease in faunal diversity at a local scale and loss of land to meet biodiversity targets.
- Potential dumping of excavated and construction material outside of designated areas, promoting the establishment of AIPs. - **Impact:** unnecessary disturbance to, and potential loss of faunal habitat, diversity and species abundance, including and potentially occurring faunal SCC.
- Possible increased fire frequency during construction. - **Impact:** Loss or alteration of faunal habitat and species diversity
- Increased risk of faunal collisions with construction vehicles. - **Impact:** Local loss of faunal SCC abundance and diversity.
- Additional pressure on faunal habitat as a result of an increased human presence associated with the proposed development, contributing to: • Potential hunting/trapping/removal/collection of faunal species or potential SCC; and • Increased human activity will lead to the displacement and/or loss of potential faunal SCC. - **Impact:** Loss of sensitive faunal habitat and the potential loss of faunal SCC.
- Excavation and compaction of soils leading to increased runoff and sedimentation of downslope habitat during times of high rainfall. - **Impact:** Loss of favourable faunal habitat and decline in faunal species diversity due to sedimentation and potential pollution of the watercourses.
- Potential failure to implement a rehabilitation and an alien floral control plan after the construction phase. - **Impact:** Potentially leading to permanent transformation of faunal habitat and long-term degradation of important faunal habitat within the region, i.e. faunal SCC associated with the Freshwater Habitat.

ACTIVITIES AND ASPECTS REGISTER
- Impaired water quality and altered flow of water within watercourses due to the proposed activities. - **Impact:** Loss of ecologically important faunal habitat and consequently a further loss of diversity and species reliant on the Freshwater Habitats. Potential loss of the habitat for faunal SCC such as *Pyxicephalus adspersus* (Giant Bullfrog). Desiccation and/or pollution of the freshwater habitat will have a detrimental impact to the faunal assemblages utilising this habitat.
- Potential failure to concurrently rehabilitate bare or disturbed sites as soon as the construction activities have occurred will potentially result in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs. - **Impact:** Long-term loss of favourable habitat for historically recorded faunal species. Loss of faunal diversity and potential SCC which will disperse into the surrounding area in search of favourable habitat.
Operational and Maintenance Phase
- Poorly implemented and monitored AIP Management programme leading to the reintroduction and proliferation of AIP species. - **Impact:** Permanent loss of surrounding faunal niche habitat, diversity and SCC.
- Risk of faunal collisions with operational and maintenance vehicles. - **Impact:** Continued loss of faunal SCC abundance and diversity.
- Potential indiscriminate movement of vehicles and personnel through the terrestrial habitat as well as vegetation trampling during maintenance activities, leading to increased soil compaction and disturbance. - Impact: Ongoing disturbance to faunal habitat, including the proliferation of alien floral species.
- Potential overexploitation through the removal and/or collection of important or sensitive faunal SCC on the property. - **Impact:** Local loss of faunal SCC abundance and diversity.
- Potential poor management and failure to monitor rehabilitation efforts, leading to: - Landscapes being left fragmented, resulting in reduced migration capabilities of faunal species, isolation of faunal populations and a decrease in faunal diversity; - Compacted soils limiting the re-establishment of natural vegetation; and - Increased risk of erosion in areas left disturbed. - **Impact:** Long-term (or permanent) loss of faunal habitat, diversity and SCC.
- Potentially poorly managed edge effects: - Ineffective rehabilitation of compacted areas, bare soils, or eroded areas, leading to vegetation succession and a possible reduction of faunal diversity and occurrence of potential faunal SCC over the long-term. - Proliferation of AIP species in disturbed areas and subsequent spread to surrounding natural areas altering the faunal habitat; and - On-going disturbance during operational phase may lead to erosion stemming from soil left bare leading to sedimentation of downslope faunal habitat. - **Impact:** Permanent loss of faunal habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural faunal habitat of increased sensitivity. Further reduction of available habitat in the long-term, compounding the limiting factors to faunal assemblages. Loss of surrounding faunal diversity and faunal SCC through the displacement of indigenous flora by AIP species - especially in response to disturbance in natural areas. Limited potential for faunal habitat and species re-establishment.

6.2 Faunal Impact Assessment Results

The following table indicates the perceived risks to the faunal ecology associated with all phases of the proposed infrastructure development. The table also provides the findings of the impact assessment undertaken with reference to the perceived impacts prior to the implementation of mitigation measures and following the implementation of mitigation measures. The mitigated results of the impact assessment have been calculated on the premise that ALL mitigation measures as stipulated in this report are adhered to and implemented. Should such actions not be adhered to, it is highly likely that post-mitigation impact scores will increase.

Table 7: Perceived Impacts to faunal habitat, diversity and potentially occurring SCC in the study areas.

Project phase	Impact	Without mitigation											
		Nature	Duration	Extent	Intensity	Probability	Significance	Nature	Duration	Extent	Intensity	Probability	Significance
Construction	Loss of faunal habitat and diversity in the Dichrostachys Bushveld, Degraded Bushveld, Transformed and Donga Habitat Units.	Negative	Permanent	Limited	High	Certain / definite	Moderate - negative	Negative	On-going	Very limited	Moderate	Almost certain / Highly probable	Minor - negative
Construction	Loss of faunal habitat and diversity in the Mixed Bushveld Habitat unit.	Negative	Permanent	Limited	Very high	Certain / definite	Moderate - negative	Negative	On-going	Very limited	Moderate	Almost certain / Highly probable	Minor - negative
Construction	Loss of faunal SCC in the Dichrostachys Bushveld, Degraded Bushveld, Transformed and Donga Habitat Units.	Negative	Permanent	Limited	Low	Almost certain / Highly probable	Minor - negative	Negative	Long term	Very limited	Very low	Probable	Negligible - negative
Construction	Loss of faunal SCC in the Mixed Bushveld	Negative	Permanent	Limited	Moderate	Almost certain / Highly probable	Moderate - negative	Negative	Long term	Very limited	Very low	Probable	Negligible - negative
Operation	Loss of faunal habitat and diversity in the Mixed Bushveld, Dichrostachys Bushveld, Degraded Bushveld, Transformed and Donga Habitat units.	Negative	Permanent	Limited	Low	Almost certain / Highly probable	Minor - negative	Negative	On-going	Limited	Low	Likely	Minor - negative
Operation	Loss of faunal SCC in the Dichrostachys Bushveld, Degraded Bushveld, Transformed and Donga Habitat.	Negative	Permanent	Limited	Moderate	Likely	Minor - negative	Negative	On-going	Very limited	Very low	Unlikely	Negligible - negative

6.3 Impact Discussion

The perceived impact significance of the proposed infrastructure development (prior to mitigation) on faunal habitat, diversity and SCC in the study area ranges from moderate to minor, and following mitigation, is anticipated to range from minor to negligible. Disturbances to the environment, such as unmanaged AIP and erosion proliferation have potential to cause greater impacts to fauna than other potential triggers, due to being potentially long-term in duration, increased in scale and highly intense. However, mitigation does exist for these and all other associated triggers from development, such as increased personnel, widescale vegetation clearing and other activities that will impact fauna during the construction and operational phases. Should all mitigatory measures stipulated in section 6.4 be sufficiently implemented, significance of development risks and impacts can be considerably reduced.

6.3.1 Impact on Faunal Habitat and Diversity

Development must, as per the plans, be kept out of the Freshwater habitat (Seep wetland and Riverine habitat subunits) and edge effects suitably managed. Failure to ensure such may result in the loss of important habitat and surface water resources for fauna in the region. These habitats function as important migratory corridors and provide freshwater, that are resources which are not readily replaced in the surrounding landscape. Impeding movement corridors will inevitably lead to increased population fragmentation and pressure on fauna. Mitigatory measures are, however, available that will notably reduce impact significance, such as the minimization of development and associated risks within the Freshwater habitat unit as far as possible.

Focus area 2 and laydown area 3 both falls into a potential CBA in the eastern side of the study area. After the ground truthing on the 24th of May 2022 it was concluded that this area is not representative of a CBA and fall into the *Dichrostachys* Bushveld habitat unit.

Despite the decreased sensitivity of the remaining habitat units (Mixed Bushveld, *Dichrostachys* Bushveld, Degraded Bushveld, Transformed and Donga Habitat Units) in the study area, notable impacts to common fauna that currently rely on this study area, are anticipated, considering the characteristics and long operational lifespan of the proposed solar development. To make way for grid-patterned solar panels, faunal habitat will inevitably and permanently be removed from these focus areas, with little possibility of habitat regrowth and faunal re-colonization during the operational phase. Although faunal habitat in the study area will be lost as a result of the proposed activities, these resources are found elsewhere and are therefore replaceable in surrounding landscapes. Disturbed and cleared areas need to be

revegetated with indigenous grass species to help stabilize the soil surface underneath the solar panels. Where bare soils are left exposed because of construction activities, they should be immediately rehabilitated. It is important to consider, that despite the limited importance of most habitat units in the study area, there remains the opportunity to further reduced environmental impact risks by implementing the recommended mitigation measures listed in section 6.4. Through implementing mitigation measures not only will the overall impact significance decrease, the effort, time and financial input costs for rehabilitation and AIP control will be reduced.

Disturbances, associated with the construction and operational phases that could significantly impact fauna in on a local scale, are uncontrolled edge effects including AIP and erosion proliferation. If left unmanaged, these edge effects may potentially spread to areas outside of the study area, including the Watercourse habitat in the middle of the study area, and as a result may alter favourable faunal habitat on an increased spatial scale, jeopardizing conservation potential of landscapes surrounding the study area. However, mitigation for edge effects and disturbance of sensitive habitats does exist (refer to section 6.4) that will notably reduce significance of edge effect impacts to minor, due to decreased spatial scale and duration of impacts.

Other possible risks to fauna that are associated with the construction and operational phases, such as increased fire risk, persecution of wildlife and vehicle collisions were also considered in the impact assessment. Due to the considerable increase of personnel in the construction phase, there is increased risk of wildlife persecution and vehicle collisions during development. However, considering the moderate faunal diversity in the study area, and that most fauna on site is common, it can be mitigated against. To ensure that impacts to fauna from these triggers remain low, mitigatory measures, stipulated in section 6.4. should be adhered to.

6.3.2 Impacts on Faunal SCC

Due to distribution overlap, food and habitat availability within or in the vicinity of the study area, there is a reasonable possibility that eleven SCC may utilise the site while aestivating, travelling or foraging. These possible SCC are: *Felis lybica* (African Wild cat), *Panthera pardus* (Leopard, VU), *Parahyaena brunnea* (Brown Hyena, NT), *Dasymys robertsii* (Robert's Shaggy Rat, NYBA), *Aonyx capensis* (Cape Clawless Otter, NT), *Python natalensis* (Southern African Python, VU), *Homoroselaps dorsalis* (Striped Harlequin Snake, R), *Pyxicephalus adspersus* (Giant African Bullfrog, NT), *Anthene minima minima* (Little Hairtail Butterfly, DD), *Opistophthalmus glabrifrons* (Rough Burrower, P) and the confirmed *Ceratogyrus darlingi* (Horned Baboon Spider, VU&P). Brown hyena may occur throughout the study area but is

unlikely to utilise any of the habitats for breeding, whilst *Felis lybica* (African Wild cat) and *Panthera pardus* (Leopard, VU) may use the study area as hunting ground or movement corridor. The shaggy rat and bullfrog have an increased POC in the Freshwater habitat, outside of the footprint but may move into the study area close to it. As such, these Wetland areas should be avoided by development. The arachnid SCC, *Ceratogyrus darlingi* (Horned Baboon Spider, VU&P) is confirmed to occur on site and it is certain that development will have a significant impact on the species due to its sedentary habits and poor dispersal ability. Due to decreased dispersal ability, herpetofauna and arachnid SCC face increased fatality risks during habitat clearing activities, if proper mitigation measures are not adhered to. It is strongly advised that rescue and relocation plan is designed and implemented prior to development for the Horned Baboon spider during development. Even with mitigatory measures implemented, it is inevitable that development and increased human presence in the study area will impact upon habitat for the abovementioned SCC, resulting in decline of Horned Baboon Spiders and other SCC in the study area. However, it is unlikely that impacts to most SCC that may occur in the study area will be significant, considering the reduced POC of seven out of eight SCC on site, and due to the ability of these SCC to occur elsewhere. SCC populations may however be unnecessarily placed under further pressure, if no mitigatory measures regarding SCC as listed in section 6.4 are undertaken.

6.3.3 Probable Residual Impacts

Even with extensive mitigation, residual impacts on the receiving faunal ecological environment are likely. The following points highlight the key residual impacts that have been identified. It should be noted, however, that these impacts are also a result of the already degraded state of the environment due to the high human activities and are therefore nor solely due to the proposed activities:

- Continued degradation of natural habitat adjacent to the proposed sites as a result of edge effects;
- Altered faunal species diversity;
- Potential continued loss of faunal SCC;
- Potential loss of faunal abundance in the local area;
- Edge effects such as further habitat fragmentation and AIP proliferation; and
- Disturbed areas are highly unlikely to be rehabilitated to baseline levels of ecological functioning and loss of faunal habitat and species diversity will most likely be long term (life of proposed solar development and due to increased human presence).

6.3.4 Cumulative Impacts

The local area has already been subjected to extensive impacts as a result of historic and current livestock farming and agriculture, informal housing and existing mining activities, with most of the proposed activities occurring along existing infrastructure and in already degraded habitat limited extent. The development will nonetheless lead to common faunal species being displaced from the proposed footprint areas into adjacent habitats. This may lead to increased competition for space and food resources, however, given the moderate abundance and replaceability of faunal diversity in the footprint areas, this impact is not expected to be significant. Edge effects and AIP proliferation are more concerning over the long-term. AIP proliferation will ultimately lead to loss of viable habitat, on a potentially increased scale, in the surrounding areas, displacing faunal species further as indigenous floral species (faunal habitat and food resources) are displaced and lost. An additional cumulative impact that could increase substantially over the life of the development, if not mitigated, is littering and dumping of other waste material in sensitive areas or outside designated areas, which will negatively impact faunal habitat on an increased scale over time.

6.4 Integrated Impact Mitigation

The table below highlights the additional general mitigation measures that are applicable to the project, in addition to those mentioned in the impact table, in order to suitably manage and mitigate the ecological impacts that are associated with the proposed infrastructure development within the study area.

Table 8: A summary of the mitigatory requirements for faunal resources.

Project phase	**PRE-CONSTRUCTION AND PLANNING PHASE**
Impact Summary	*Loss of faunal habitat and species diversity*
Management Measures	***Proposed mitigation and management measures:***

	Faunal Habitat and Diversity - At all times, ensure that sound environmental management is in place during the planning phase; - Minimise loss of indigenous vegetation where possible through refining the final development footprint, optimising the design within habitat of lowered ecological importance and sensitivity and avoiding the sensitive Freshwater habitat unit; and - Design of infrastructure should be environmentally sound and all construction equipment to be utilised must be a good working condition, and all possible precautions taken to prevent potential spills and /or leaks. **Faunal SCC** - Prior to vegetation clearing activities, the site should be inspected for the presence of SCC, including burrowing scorpion burrows, reptiles and baboon spiders. If located, these invertebrate species should be carefully rescued and relocated as per an approved rescue and relocation plan that must be developed; and - All relevant permits are to be obtained from LEDET and DFFE prior to the relocation of any faunal SCC, **Alien Vegetation** - Prior to the commencement of construction activities, an AIP Management/Control Plan should be compiled for implementation during the Construction and Operational Phases; and - Removal of alien invasive species should be planned to take place throughout the construction and operational phases. AIP clearing must be planned in a way that avoids the spread of propagules to areas outside of the study area. An AIP Management/Control Plan should be compiled by an experienced professional.
Project phase	**CONSTRUCTION PHASE**
Impact Summary	*Loss of faunal habitat and species diversity*
Management Measures	***Proposed mitigation and management measures:*** **Development footprint** - Alien vegetation within the study area must be removed and controlled, in line with the National Environmental Management: Biodiversity Act: 2004 (NEMBA) Alien and Invasive Species Regulations (2020); - The development footprint should be demarcated, and it should be ensured that no development related activities take place outside of the demarcated footprint; - The construction footprint must be kept as small as possible in order to minimise the impact on the surrounding environment; - Faunal habitat beyond the demarcated area should not be altered or disturbed; - Construction equipment should be restricted to travelling only on designated roadways to limit the ecological footprint of the development activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal; - No dumping of litter, rubble or cleared vegetation on site should be allowed. As such it is advised vegetation cuttings (especially AIP) to be carefully collected and disposed of at a separate waste facility; - Where spills or soil contamination occurs as a result of maintenance activities, the contaminated soil needs to be excavated and removed to an approved waste disposal site. New soil is then to be used to replace the removed soil and the area appropriately revegetated; - No fires are allowed by construction personnel as this will increase the risk of the surrounding veld catching fire and burning down not only the immediate faunal habitat but also that of the larger local areas; - Following heavy rains, access roads and areas adjacent to the development footprints are to be inspected for signs of erosion, which if found must be immediately rectified through appropriate erosion control measures; - During the site-pegging phase of surface infrastructure, should any faunal SCC be observed, the rescue and relocation plan must be effected; - Edge effect control needs to be implemented to ensure no further degradation and potential loss of faunal habitat outside of the proposed project footprint areas occurs; - Smaller species such as scorpions, spiders and reptiles are likely to be less mobile during the colder periods of the year, as such should any be observed in the footprint sites during clearing and operational activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Construction personnel are to be educated about these species and the need for their conservation. Smaller scorpion species and harmless reptiles should be carefully relocated by a suitably nominated construction person or staff member. For larger venomous

	snakes, a suitably trained official or specialist should be contacted to affect the relocation of the species, should it not move off on its own; - All rescue and relocation plans for SCC should be overseen by a suitably qualified specialist; - Disturbed and cleared areas need to be revegetated with indigenous grass species to help stabilise the soil surface. Where bare soils are left exposed because of construction activities, they should be immediately rehabilitated; and - It is recommended that construction activities take place in a phased manner, so as to ensure that as far as possible faunal species can naturally disperse out of the area ahead of sequential construction activities; **Faunal SCC** - A rescue and relocation plan must be compiled prior to commencement of construction activities so all personnel are aware of the requirements should a SCC be encountered. This is of specific importance for *Ceratogyrus darlingi*) (Horned Baboon Spider) that is confirmed to be within *Dichrostachys* Bushveld habitat; - All relevant permits are to be obtained from LEDET and DFFE prior to the relocation of any faunal SCC and all rescue and relocation plans should be overseen by a suitably qualified specialist; and - It is recommended that construction activities take place in a phased manner, so as to ensure that as far as possible faunal species can naturally disperse out of the area ahead of sequential construction activities; **Alien Vegetation** - Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed, according to regulations specified in the floral report. - Ongoing alien and invasive plant monitoring and clearing/control should take place throughout the construction and operational phase of the development, and a 30m buffer surrounding the study area should be regularly checked for AIP proliferation and to prevent spread into surrounding natural areas. This is especially important for linear developments as they serve as corridors along which alien species can spread more rapidly; and - Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it; and - All cleared plant material to be disposed of at a licensed waste facility which complies with legal standards.
Project phase	**OPERATIONAL AND MAINTENANCE PHASE**
Impact Summary	*Loss of faunal habitat and species diversity*
Management Measures	**Development footprint** - All vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the development activities; - No litter or cleared plant material should be dumped or allowed to remain on-site. As such it is advised that alien vegetation cuttings be carefully collected and disposed of at a separate waste facility; - No hunting/trapping or collecting of any faunal species is allowed; - No fires are allowed by construction personnel as this will increase the risk of the surrounding veld catching fire and burning down not only the immediate faunal habitat but also that of the larger local areas. **Faunal SCC** - No collection or persecution of faunal SCC within the study area is allowed; and - Any faunal SCC that are observed should be logged (with a GPS position) and uploaded to the iNaturalist site. Such data can also be used as part of the projects long term monitoring programme. **Alien Vegetation** - Alien vegetation must be removed from the study area during both the construction and operational phases, in line with the NEMBA Alien and Invasive Species Regulations (2020).

7. CONCLUSION

Scientific Terrestrial Services (STS) was appointed by Zutari to conduct a Biodiversity Assessment as part of the Environmental Assessment and Authorisation process for the proposed solar development of a Solar Photovoltaic (PV) Plant outside the town of Mokopane at the Mogalakwena Mine, Limpopo Province.

Following the two field assessments (June 2021 and May 2022), three faunal habitats were noted in the study area, namely the Bushveld habitat, comprising three habitat subunits (Degraded Bushveld, Mixed Bushveld and *Dichrostachys* Bushveld); the Donga habitat and the Transformed habitat. Outside the footprint area but in close proximity with the study area is a Watercourse habitat which will support many faunal species including two potential SCC. These habitat units have all been subjected to varying degrees of impact and as a result support a limited diversity of faunal species. Due to existing and past disturbance, the Mixed Bushveld, contain limited ecological value from a faunal perspective, although there is potential for increased diversity of common, resilient and small bodied insectivorous and herbivorous fauna in the summer months and therefore has an intermediate sensitivity. The *Dichrostachys* Bushveld, Degraded Bushveld, Donga Habitat and Transformed Habitat have the lowest ecological value from a faunal perspective, as bush encroachment and informal settlements have significantly degraded faunal resources in these localities and have a moderately low faunal sensitivity.

One faunal SCC, *Ceratogyrus darlingi* (Horned Baboon Spider, VU&P) was recorded within the proposed study area and there is a reasonable possibility that ten other SCC may utilise the study area to forage, travel and aestivate. Faunal SCC with a medium POC on site, are: *Felis lybica* (African Wild cat), *Panthera pardus* (Leopard, VU), *Parahyaena brunnea* (Brown Hyena, NT), *Python natalensis* (Southern African Python, VU), *Dasymys robertsii* (Robert's Shaggy Rat, NYBA),), *Aonyx capensis* (Cape Clawless Otter, NT), *Homoroselaps dorsalis* (Striped Harlequin Snake, R), *Pyxicephalus adspersus* (Giant African Bullfrog, NT), *Anthene minima minima* (Little Hairtail Butterfly, DD) and *Opistophthalmus glabrifrons* (Rough Burrower, P). Herpetofaunal and arachnid SCC face an increased mortality risk during construction due to their habits and poor dispersal abilities. As such, a search and rescue plan in the event of encountering these SCC should be developed and implemented prior to development.

The perceived impact significance of the proposed infrastructure development (prior to mitigation) on faunal habitat, diversity and SCC ranges from moderate to minor, and following

mitigation, is anticipated to range from minor to negligible. Of most concern, are unmanaged AIP and erosion proliferation that have potential to cause greater impacts to fauna than other potential triggers, due to being potentially long-term in duration, increased in scale and highly intense. However, mitigation does exist for these and all other associated trigger activities from development, that will impact SCC and common fauna during the construction and operational phases. Should all mitigatory measures stipulated in section 6.4 be sufficiently implemented, significance of development risks and impacts can be considerably reduced.

Focus area 2 and laydown area 3 are part of the new layout and fall both into a potential CBA in the eastern side of the study area. After the ground truthing on the 24th of May 2022 it was concluded that this area is not representative of a CBA with no significant impact on faunal assemblages.

It is the professional opinion of the faunal specialist, that there is no sufficient reason that the proposed development should not be authorised. This judgement is based on the limited sensitivity of majority habitat units in the study area and the limited impact the proposed development is predicted to have on terrestrial biodiversity in the study area. The proponent should however practice efficient environmental management at all times and minimise impacts to biodiversity as much as possible, by strictly adhering to mitigatory measures in section 6.4.

The objective of this study was to provide sufficient information on the faunal ecology of the area, together with other studies on the physical and socio-cultural environment, in order for the Environmental Assessment Practitioner (EAP) and the relevant authorities to apply the principles of Integrated Environmental Management (IEM) and the concept of sustainable development. It is the opinion of the ecologist that this study provides the relevant information required in order to implement IEM and to ensure that the best long-term use of the ecological resources in the study area will be made in support of the principle of sustainable development.

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APPENDIX A: Faunal Method of Assessment

It is important to note that due to the nature and habits of fauna, varied stages of life cycles, seasonal and temporal fluctuations along with other external factors, it is unlikely that all faunal species will have been recorded during the site assessment. The presence of anthropogenic activities adjacent to the sites will have an impact on faunal behaviour and in turn the rate of observations.

Mammals

Mammal species were recorded during the field assessment with the use of visual identification, spoor, calls, dung and other notable field signs. Due to the short duration, limited size and disturbed nature of the environment, camera and Sherman traps were not employed. Specific attention was paid to mammal SCC as listed by the International Union for the Conservation of Nature (IUCN), the Limpopo province and NEMBA.

Avifauna

The Southern African Bird Atlas Project 2 database (http://sabap2.adu.org.za/) was compared with the recent field survey of avifaunal species identified in the study area. Field surveys were undertaken utilising direct observation and bird call identification techniques in order to accurately identify avifaunal species. Specific attention was given to avifaunal SCC listed on a regional and national level, as well as those identified by the IUCN.

Reptiles

Reptiles were identified during the field survey. Suitable applicable habitat areas (rocky outcrops and fallen dead trees) were inspected, and all reptiles encountered were identified. The data gathered during the assessment along with the habitat analysis provided an accurate indication of which reptile species are likely to occur on the study area. Specific attention was given to reptile SCC listed on a regional and national level, as well as those identified by the IUCN.

Amphibians

Identifying amphibian species is done by the use of direct visual identification along with call identification technique. Amphibian species flourish in and around wetland, riparian and moist grassland areas. It is unlikely that all amphibian species will have been recorded during the site assessment, due to their cryptic nature and habits, varied stages of life cycles and seasonal and temporal fluctuations within the environment. The data gathered during the assessment along with the habitat analysis provided an accurate indication of which amphibian species are likely to occur within the study area as well as the surrounding area. Specific attention was given to amphibian SCC listed on a regional and national level, as well as those identified by the IUCN.

Invertebrates

Whilst conducting transects through the study area, all insect species visually observed were identified, and where possible photographs taken. It must be noted, however that due to the cryptic nature and habits of insects, varied stages of life cycles and seasonal and temporal fluctuations within the environment, it is unlikely that all insect species will have been recorded during the site assessment period. Nevertheless, the data gathered during the assessment along with the habitat analysis provided an accurate indication of which species are likely to occur in the study area at the time of the survey. Specific attention was given to insect SCC listed on a regional and national level, as well as those identified by the IUCN.

Arachnids

Suitable applicable habitat areas (rocky outcrops, sandy areas and fallen dead trees) where spiders and scorpions are likely to reside were searched. Rocks were overturned and inspected for signs of these species. Specific attention was paid to searching for Mygalomorphae arachnids (Trapdoor and Baboon spiders) as well as potential SCC scorpions.

Faunal Species of Conservational Concern Assessment

The Probability of Occurrence (POC) for each faunal SCC is described:

- "**Confirmed'**: if observed during the survey;
- "**High**": if within the species' known distribution range and suitable habitat is available;
- "**Medium**": if either within the known distribution range of the species or if suitable habitat is present; or
- "**Low**": if the habitat is not suitable and falls outside the distribution range of the species.

The accuracy of the POC is based on the available knowledge about the species in question, with many of the species lacking in-depth habitat research.

Faunal Habitat Sensitivity

The sensitivity of the study area for each faunal class (i.e. mammals, birds, reptiles, amphibians and invertebrates) was determined by calculating the mean of five different parameters which influence each faunal class and provide an indication of the overall faunal ecological integrity, importance and sensitivity of the study area for each class. Each of the following parameters are subjectively rated on a scale of 1 to 5 (1 = lowest and 5 = highest):

- **Faunal SCC:** The confirmed presence or potential for faunal SCC or any other significant species, such as endemics, to occur within the habitat unit;
- **Habitat Availability:** The presence of suitable habitat for each class;
- **Food Availability:** The availability of food within the study area for each faunal class;
- **Faunal Diversity:** The recorded faunal diversity compared to a suitable reference condition such as surrounding natural areas or available faunal databases; and
- **Habitat Integrity:** The degree to which the habitat is transformed based on observed disturbances which may affect habitat integrity.

Each of these values contribute equally to the mean score, which determines the suitability and sensitivity of the study area for each faunal class. A conservation and land-use objective is also assigned to each sensitivity class which aims to guide the responsible and sustainable utilization of the study area in relation to each faunal class. The different classes and land-use objectives are presented in the table below:

Table A1: Faunal habitat sensitivity rankings and associated land-use objectives.

Score	Rating significance	Conservation objective
1.0 < 1.5	Low	Optimise development potential.
≥1.5 <2.5	Moderately low	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.
≥2.5 <3.5	Intermediate	Preserve and enhance biodiversity of the habitat unit ar surrounds while optimising development potential.
≥3.5<4.5	Moderately high	Preserve and enhance the biodiversity of the habitat un limit development and disturbance.
≥4.5 ≤ 5.0	High	Preserve and enhance the biodiversity of the habitat unit, no-go alternative must be considered.

APPENDIX B: Faunal SCC

Faunal Species of Conservation Concern

Table B1. Red Data Mammal species listed in the Limpopo SoER 2004 report including IUCN and TOPS 2007 status.

Scientific name	Common Name	Limpopo SoER 2004 Status	IUCN Red List Status	TOPS 2007 Red List Status	POC
Diceros bicornis	Black Rhinoceros	CR	CR	EN	Low
Neamblysomus julianae	Juliana's golden mole	CR	VU	VU	Low
Loxodonta africana	African elephant	VU	VU	-	Low
Lycaon pictus	African wild dog	EN	EN	EN	Low
Amblysomus gunningi	Gunning's golden mole	VU	EN	EN	Low
Hydrictis maculicollis	Spotted-necked otter	VU	LC	-	Low
Acinonyx jubatus	Cheetah	VU	VU	VU	Low
Felis lybica	African Wild Cat	VU	DD	Well Protected	Medium
Panthera leo	Lion	VU	VU	VU	Low
Ceratotherium simum	White rhinoceros	NT	NT	-	Low

LC = Least concerned, CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened. DD = Data Deficient.

Table B2. Red Data Amphibian species listed in the Limpopo SoER 2004 report including IUCN status.

Scientific name	Common Name	Limpopo SoER 2004 Status	IUCN Red List Status	POC
Breviceps sylvestris	Transvaal forest rain frog	VU	EN	Low
Ptychadena uzungwensis	Udzungwa ridged frog	P	LC	Low
Leptopelis bocagii	Bocage's tree frog	P	LC	Low
Hemisus guineensis	Guinea Snout-burrower	P	LC	Low

LC = Least concerned, CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, P = Peripheral. NYBA = Not yet been assessed by the IUCN.

Table B3. Red Data Reptile species listed in the Limpopo SoER 2004 report including IUCN and TOPS 2007 status.

Scientific name	Common Name	Limpopo SoER 2004 Status	IUCN Red List Status	TOPS 2007 Red List Status	POC
Homoroselaps dorsalis	Striped Harlequin snake	R	LC	-	Medium
Xenocalamus transvaalensis	Transvaal Quill-snout snake	R	DD	-	Low
Lamprophis swazicus	Swazi Rock Snake	R	NT	-	Low
Python natalensis	African Python	VU	NYBA	Protected	Medium
Lygodactylus methueni	Methuen's Dwarf Gecko	VU	DD	-	Low
Crocodylus niloticus	Nile Crocodile	VU	LC	Protected	Low
Lycophidion variegatum	Variegated Wolf snake	P	NYBA	-	Low
Psammophis jallae	Jalla's Sand snake	P	NYBA	-	Low

R = Rare, DD = Data Deficient, LC = Least concerned, CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, P = Peripheral. NYBA = Not yet been assessed by the IUCN.

Table B4. Red Data Invertebrates species listed in the Limpopo SoER 2004 report including IUCN and TOPS 2007 status.

Scientific name	Common Name	Limpopo SoER 2004 Status	IUCN Red List Status	TOPS 2007 Red List Status	POC
Taurhina splendens	Splendid fruit chafer	T	NYBA	-	Low
Charaxes marieps	Marieps Charaxes butterfly *	T	NYBA	-	Low
Trichostetha fasicularis	Protea beetle *	T	NYBA	-	Low
Ischnestoma ficqui	Fruit Chafer beetles	T	NYBA	Protected	Low

R = Rare, DD = Data Deficient, LC = Least concerned, CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened. NYBA = Not yet been assessed by the IUCN. T = listed as threatened but with no specific status for the Limpopo Province. * Very little detailed or general information exists on terrestrial invertebrates in the Limpopo Province, thus in general there is very little consolidated information regarding invertebrates (Limpopo SOER, 2004).

Table B5. TOPS 2007 animal list for the Limpopo Province, not included in the Limpopo SoER 2004 report

Scientific name	Common Name	TOPS 2007 Red-List Status	IUCN Red List Status	POC
MAMMALS				
Chrysospalax villosus	Rough-haired Golden Mole	CR	VU	Low
Amblysomus robustus	Robust Golden Mole	EN	VU	Low
Damaliscus lunatus	Tsessebe/Topi	EN	LC	Low
Ourebia ourebi	Oribi	EN	LC	Low
Petrodromus tetradactylus	Four-toed Elephant Shrew	EN	LC	Low
Otomops martiensseni	Large-eared Free-tailed Bat	VU	NT	Low
Panthera pardus	Leopard	VU	VU	Medium
Smutsia (*Manis*) *temminckii*	Ground/Temminck's Pangolin	VU	VU	Low
Raphicerus sharpei	Sharpe's Grysbok	P	LC	Low
ParaParahyaena brunnea	Brown Parahyaena	P	NT	Medium
Felis nigripes	Black-footed cat	P	VU	Low
Mellivora capensis	Honey Badger	P	LC	Low
Vulpes chama	Cape Fox	P	LC	Low
Scientific name	**Common Name**	**TOPS 2007 Red-List Status**	**IUCN Red List Status**	**POC**
AMPHIBIANS				
Pyxicephalus adspersus	Giant African Bullfrog	Protected	LC	Medium
INVERTEBRATES				
Ichnestoma spp	Fruit Chafer Beetles	Protected	NYBA	Low
Manticora spp	Monster Tiger Beetles	Protected	NYBA	Low
Opistophthalmus spp	Burrowing Scorpions	Protected	NYBA	Medium
Ceratogyrus spp	Horned Baboon Spiders	Protected	NYBA	Confirmed

LC = Least concerned, CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, P = Peripheral. NYBA = Not yet been assessed by the IUCN.

Table B6. Faunal SCC that may occur in the study area, according to the DFFE screening tool

Scientific name	Common Name	RSA Status	IUCN Red List Status	POC
Anthene minima minima	Hairtail Butterfly	R	NYBA	Low
Dasymys robertsii	Robert's Shaggy Rat	DD	NYBA	Medium

R = Rare; NYBA = Not Yet Been Assessed by the IUCN

APPENDIX C: Faunal Species List

Table C1: Mammal species or signs thereof observed (*) or likely to occur on site, with reference to previous recordings in the vicinity of the study area. Previous recordings are sourced from: FitzPatrick Institute of African Ornithology (2021a) and Van Zyl (2019).

Scientific Name	Common Name	National Red List Status
MAMMALS RECORDED ON SITE OR IN CLOSE PROXIMITY TO THE STUDY AREA DURING THE FIELD ASSESSMENT		
Canis mesomelas	Black-backed Jackal	LC
Paraxerus cepapi	Tree Squirrel	LC
Sylvicapra grimmia	Bush Duiker	LC
Raphicerus campestris	Steenbok	LC
Tragelaphus strepsiceros	Greater Kudu	LC
Aonyx capensis	Cape Clawless Otter	NT
Hystrix africaeaustralis	Cape Porcupine	LC
Lepus saxatilis	Cape Scrub Hare	LC
Papio ursinus	Chacma Baboon	LC
Cryptomys hottentotus	African Mole rat	LC
Herpestes sanguineus	Slender Mongoose	LC
MAMMALS PREVIOUSLY RECORDED IN THE VICINITY OF STUDY AREA THAT MAY OCCUR ON SITE		
Scientific Name	**Common Name**	**National Red List Status**
Civettictis civetta	African Civet	LC
Genetta maculata	Common Large-spotted Genet	LC
Parahyaena brunnea	Brown Hyena	NT
Panthera pardus	Leopard	VU
Leptailurus serval	Serval	LC
Caracal caracal	Caracal	LC
Chlorocebus pygerythrus pygerythrus	Vervet Monkey	LC
Gerbilliscus leucogaster	Bushveld gerbil	LC
Genus Mastomys	Multimammate mouse	LC
Micaelamys namaquensis	Namaqua rock mouse	LC
Aethomys chrysophilus	Red veld rat	LC
Rattus rattus	Roof Rat	LC
Elephantulus brachyrhynchus	Short snouted elephant shrew	LC
Lemniscomys rosalia	Single-striped Grass mouse	LC
Acomys spinosissimus	Spiny mouse	LC
Otomys irroratus	Vlei Rat	LC
BATS PREVIOUSLY RECORDED IN THE AREA, THAT MAY FORAGE ON SITE		
Scientific Name	**Common Name**	**National Red List Status**
Nycteris thebaica	Cape Long Eared Bat	LC
Neoromicia capensis	Cape Serotine	LC
Chaerephon pumilus	Little Free-tailed Bat	LC
Tadarida aegyptiaca	Egyptian Free-tailed Bat	LC
Miniopterus natalensis	Natal Long-fingered Bat	LC
Taphozous mauritianus	Mauritian Tomb Bat	LC
Pipistrellus hesperidus	African (Dusty) Pipistrelle	LC
Pipistrellus rusticus	Rusty Pipistrelle	LC
Pipistrellus zuluensis	Zulu Serotine	LC
Scotophilus dinganii	Yellow-bellied House Bat	LC
Epomophorus crypturus	Peters's Epauletted Fruit Bat	LC

LC = Least Concern; NT = Near Threatened; VU = Vulnerable

Table C2: Reptile species that are likely to occur on site, based on previous recordings in the QDS on the ADU database. Source: FitzPatrick Institute of African Ornithology (2021b).

Scientific Name	Common Name	National Red List Status
Agama aculeata	Common Ground Agama	NE
Agama aculeata distanti	Distant's Ground Agama	LC
Philothamnus semivariegatus	Spotted Bush Snake	LC
Naja annulifera	Snouted Cobra	LC
Chondrodactylus turneri	Turner's Gecko	LC
Lycophidion capense capense	Cape Wolf Snake	LC
Python natalensis	Southern African Python	LC but VU in Limpopo
Trachylepis damarana	Damara Variable Skink	LC
Trachylepis margaritifera	Rainbow Skink	LC

NT = Near Threatened; NE = Not Evaluated; LC = Least Concern

Table C3: Amphibian that are likely to occur on site, or previously recorded by SAFAP in the QDS: 2329CC, 2428BB AND 2429AA). Source: FitzPatrick Institute of African Ornithology (2021c)

Scientific Name	Common Name	National Red List Status
Schismaderma carens	Red Toad	LC
Sclerophrys garmani	Olive Toad	LC
Sclerophrys gutturalis	Guttural Toad	LC
Ptychadena anchietae	Anchieta's Ridged Frog	LC
Amietia delalandii	Delalande's River Frog	LC
Amietia poyntoni	Poynton's River Frog	LC
Chiromantis xerampelina	Southern Foam Nest Frog	LC

LC = Least Concern

Table C4: Insect and species observed on site.

INSECTS		
Scientific Name	**Common Name**	**National Red Listing**
Subfamily *Asilidae*	Robber flies	NE
Macrotermes natalensis	Large Fungus-growing Termites	NE
Odontotermes badius	Common Fungus-growing Termites	NE
Family Coccidae	Soft Scale Insects	NE
Kheper nigroaeneus	Large Copper Dung Beetle	NE
Lagria vulnerata	Hairy Darkling Beetle	NE
Mylabris oculata	CMR Bean Beetle	NE
Cheilomenes lunata	Lunate Ladybeetle	NE
Phymateus viridipes	Green Stinkweed Locust	NE
Oceanthus spp	Tree Cricket	NE
Deropeltis erythrocephala	Redheaded Black Velvet Cockroach	NE
Belenois aurota	Brown-veined White Butterfly	LC
Hamanumida daedalus	Guineafowl Butterfly	LC
Colotis euippe	Smoky Orange Tip Butterfly	LC
Trithemis annulata	Violet Dropwing	LC
Crocothemis erythraea	Broad Scarlet	LC
Polistes fastidiotus	Umbrella Paper Wasps	NE
Sphodromantis gastrica	Common Green Mantid	NE
ARACHNIDS		

Trichonephila senegalensis	Banded-legged Orb-web spider	NE
Argiope australis	Garden Orb-web spider	NE
Stegodyphus dumicola	African Social spider	NE
Ceratogyrus darlingi	Rear Horned Baboon Spider*	P
Uroplectes spp	Lesser Thick-tailed scorpion	NE
Solifugae spp	Solifugid	NE

NE = Not Evaluated; LC = Least Concern; P = Protected according to NEMBA: TOPS 2007; * = not observed but likely to occur on site

APPENDIX D: Impact Assessment Results

This section presents the detailed impact assessment table per habitat unit and per impact relating to the impact summary table presented in Section 6.2 (Table 7). Impacts were assessed for the construction and the operational phase of the powerline. Impacts focussed on the loss of faunal habitat and species diversity as well as faunal SCC. The tables which follow detail the individual impacts, the mitigation measure and the cumulative impacts associated with the impact.

Table D1: Loss of faunal habitat and diversity in the *Dichrostachys* Bushveld, Degraded Bushveld, Transformed and Donga Habitat Units.

Ref:	1			
Project phase	**Construction**			
Impact	**Loss of faunal habitat and diversity in the *Dichrostachys* Bushveld, Degraded Bushveld, Transformed and Donga Habitat Units.**			
Description of impact	**Clearance of vegetation for the PV plant leading to habitat loss, decreased food resources and displacement of faunal species from these habitats.**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**-The development footprint should be demarcated, and it should be ensured that no development related activities take place outside of the demarcated footprint; -No dumping of litter, rubble or cleared vegetation on site should be allowed. As such it is advised vegetation cuttings (especially AIP) to be carefully collected and disposed of at a separate waste facility; -Edge effect control needs to be implemented to ensure no further degradation and potential loss of faunal habitat outside of the proposed project footprint areas occurs; -Disturbed and cleared areas need to be revegetated with indigenous grass species to help stabilise the soil surface. Where bare soils are left exposed because of construction activities, they should be immediately rehabilitated; and -It is recommended that construction activities take place in a phased manner, so as to ensure that as far as possible faunal species can naturally disperse out of the area ahead of sequential construction activities;**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	On-going	Impact will last between 15 and 20 years
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Certain / definite	There are sound scientific reasons to expect that the impact will definitely occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Moderate - negative**		**Minor - negative**	
Comment on significance	Provided all mitigation measures are implemented and construction activities take placed in an environmentally sound manner, impact significance is likely to be remain minor within the study area for the *Dichrostachys* Bushveld, Degraded Bushveld, Transformed and Donga Habitat Units.			
Cumulative impacts	The local area has already been subjected to extensive impacts as a result of historic and current livestock farming and agriculture, informal housing and existing mining activities in already degraded habitats. Edge effects and AIP proliferation are concerning over the long-term especially because this focus area is next to a Watercourse habitat. Further habitat loss will only add to the already high levels of habitat loss in the region.			

Table D2: Loss of faunal habitat and diversity in the Mixed Bushveld Habitat unit.

Ref:	2			
Project phase	**Construction**			
Impact	**Loss of faunal habitat and diversity in the Mixed Bushveld Habitat unit.**			
Description of impact	**Clearance of vegetation for the PV plant leading to habitat loss, decreased food resources and displacement of faunal species from these habitats.**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**-The development footprint should be demarcated, and it should be ensured that no development related activities take place outside of the demarcated footprint; -No dumping of litter, rubble or cleared vegetation on site should be allowed. As such it is advised vegetation cuttings (especially AIP) to be carefully collected and disposed of at a separate waste facility; -Edge effect control needs to be implemented to ensure no further degradation and potential loss of faunal habitat outside of the proposed project footprint areas occurs; -Disturbed and cleared areas need to be revegetated with indigenous grass species to help stabilise the soil surface. Where bare soils are left exposed because of construction activities, they should be immediately rehabilitated; and -It is recommended that construction activities take place in a phased manner, so as to ensure that as far as possible faunal species can naturally disperse out of the area ahead of sequential construction activities;**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	On-going	Impact will last between 15 and 20 years
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Very high	Natural and/ or social functions and/ or processes are majorly altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Certain / definite	There are sound scientific reasons to expect that the impact will definitely occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Moderate - negative**		**Minor - negative**	
Comment on significance	Provided all mitigation measures are implemented and construction activities take placed in an environmentally sound manner, impact significance is likely to be remain minor within this focus area for the Mixed Bushveld habitat unit.			
Cumulative impacts	The local area has already been subjected to extensive impacts as a result of historic and current livestock farming and agriculture, informal housing and existing mining activities in already degraded habitats. Edge effects and AIP proliferation are concerning over the long-term especially because this focus area is next to a Watercourse habitat. Further habitat loss will only add to the already high levels of habitat loss in the region.			

Table D3: Loss of faunal SCC in the *Dichrostachys* Bushveld, Degraded Bushveld, Transformed and Donga Habitat Units.

Ref:	3			
Project phase	**Construction**			
Impact	**Loss of faunal SCC in the *Dichrostachys* Bushveld, Degraded Bushveld, Transformed and Donga Habitat Units.**			
Description of impact	**Faunal SCC populations may experience further decline and increased pressure, should an action plan not be compiled or authorised in the event that a SCC be encountered during construction.**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**A rescue and relocation plan must be compiled prior to commencement of construction activities so all personnel are aware of the requirements should a SCC be encountered. This is of specific importance for *Ceratogyrus darlingi* (Horned Baboon Spider) that is confirmed to be within *Dichrostachys* Bushveld habitat. It is recommended that construction activities take place in a phased so as to ensure that as far as possible faunal species can naturally disperse out of the area ahead of sequential construction activities;**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	Long term	Impact will last between 10 and 15 years
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	It is unlikely that impacts to SCC in the focus area, will be significant, considering the reduced POC of SCC on site, and due to the ability of these SCC to occur elsewhere, although their populations may be placed under further pressure, if no mitigatory measures regarding SCC are undertaken. If mitigatory measures are adhere to the impacts to SCC can be negligible.			
Cumulative impacts	Habitat loss in already degraded habitats can cause further decline of potentially occurring SCC in the area, should a rescue plan not be implemented. Further habitat loss will only add to the already high levels of habitat loss in the region.			

Table D4: Loss of faunal SCC in the Mixed Bushveld

Ref:	4			
Project phase	**Construction**			
Impact	**Loss of faunal SCC in the Mixed Bushveld**			
Description of impact	**Faunal SCC populations may experience further decline and increased pressure, should an action plan not be compiled or authorised in the event that a SCC be encountered during construction.**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**A rescue and relocation plan must be compiled prior to commencement of construction activities so all personnel are aware of the requirements should a SCC be encountered. This is of specific importance for *Ceratogyrus darlingi* (Horned Baboon Spider) that is confirmed to be within *Dichrostachys* Bushveld habitat. It is recommended that construction activities take place in a phased so as to ensure that as far as possible faunal species can naturally disperse out of the area ahead of sequential construction activities;**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	Long term	Impact will last between 10 and 15 years
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Moderate - negative**		**Negligible - negative**	
Comment on significance	It is unlikely that impacts to SCC in the focus area, will be significant, considering the reduced POC of SCC on site, and due to the ability of these SCC to occur elsewhere, although their populations may be placed under further pressure, if no mitigatory measures regarding SCC are undertaken. If mitigatory measures are adhere to the impacts to SCC can be negligible.			
Cumulative impacts	Habitat loss in already degraded habitats can cause further decline of potentially occurring SCC in the area, should a rescue plan not be implemented.			

Table D5: Loss of faunal habitat and diversity in the Mixed Bushveld, *Dichrostachys* Bushveld, Degraded Bushveld, Transformed and Donga Habitat units.

Ref:	5			
Project phase	**Operation**			
Impact	**Loss of faunal habitat and diversity in the Mixed Bushveld, Dichrostachys Bushveld, Degraded Bushveld, Transformed and Donga Habitat units.**			
Description of impact	**Maintenance activities and edge effects leading to habitat degradation and decreases faunal species diversity and abundance.**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**- All vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the development activities;** **- No litter or cleared plant material should be dumped or allowed to remain on-site. As such it is advised that alien vegetation cuttings be carefully collected and disposed of at a separate waste facility;** **- No hunting/trapping or collecting of any faunal species is allowed;** **- No fires are allowed by construction personnel as this will increase the risk of the surrounding veld catching fire and burning down not only the immediate faunal habitat but also that of the larger local areas**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	On-going	Impact will last between 15 and 20 years
Extent	Limited	Limited to the site and its immediate surroundings	Limited	Limited to the site and its immediate surroundings
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Likely	The impact may occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Minor - negative**		**Minor - negative**	
Comment on significance	If left unmanaged, AIP and erosion proliferation from operations may have a notable impact on faunal diversity, as these changes have potential to impact a larger area than that of the focus area, creating long-term and unnecessary loss of faunal habitat outside the development footprint.			
Cumulative impacts	On-going disturbance arising from the proposed solar development, of faunal habitat situated outside the study area, is possible during the operational phase and should be mitigated against.			

Table D6: Loss of faunal SCC in the Mixed Bushveld, *Dichrostachys* Bushveld, Degraded Bushveld, Transformed and Donga Habitat units.

Ref:	6			
Project phase	**Operation**			
Impact	**Loss of faunal SCC in the *Dichrostachys* Bushveld, Degraded Bushveld, Transformed and Donga Habitat units.**			
Description of impact	**Potential loss of faunal SCC from the affected areas due to habitat degradation and/or loss as well as risk of direct mortalities resulting from collisions with vehicles.**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**- No collection or persecution of faunal SCC within the study area is allowed; and** **- Any faunal SCC that are observed should be logged (with a GPS position) and uploaded to the iNaturalist site. Such data can also be used as part of the projects long term monitoring programme.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	On-going	Impact will last between 15 and 20 years
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Likely	The impact may occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	Due to the relatively low number (50) staff members expected to work in the operational and maintenance phase, the impact from possible vehicle collisions and soil compaction Is considered minor to negligible, considering the already disturbed condition of the focus area.			
Cumulative impacts	Degradation from on-going disturbance by vehicles, may limit the potential for fauna to recolonise the focus area. Albeit impacts from this are not deemed significant as the habitat lost to the proposed development is replaced in the surrounding landscape.			