

FLORAL AND FAUNAL ECOLOGICAL ASSESSMENT AS PART OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS FOR THE PROPOSED ANGLO PLATINUM DER BROCHEN AMENDMENT PROJECT, LIMPOPO PROVINCE

Prepared for

SRK Consulting (Pty) Ltd

August 2019

Section C: Faunal Assessment

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Report Reference: STS 180051
Date: August 2019

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ACRONYMS

Ad mon	Additional Monitoring
BLSA	Bird Life South Africa
EIS	Ecological Importance and Sensitivity
EN	Endangered
End and N-end	Endemic and Near endemic
GDARD	Gauteng Department of Agriculture and Rural Development
GIS	Geographic Information System
GPS	Global Positioning System
IBA	Important Bird Area
IUCN	International Union for Conservation of Nature
LC	Least Concern
NT	Near Threatened
NYBA	Not yet been assessed
PES	Present Ecological State
POC	Probability of Occurrence
QDS	Quarter Degree Squares
SABAP	Southern African Bird Atlas
SCC	Species of Conservation Concern
STS	Scientific Terrestrial Services
VU	Vulnerable



1. INTRODUCTION

1.1 Background

Scientific Terrestrial Services (STS) was appointed to conduct a floral and faunal ecological assessment as part of the Environmental Impact Assessment (EIA) and authorisation process for the proposed Anglo Platinum Der Brochen Amendment Project, Limpopo Province. An area encompassing all the various expansion areas associated with the Der Brochen Amendment Project was used to gather all background information that might be relevant to the project and will henceforth be referred to as the “focus area”. The field assessment, however focussed only on the various infrastructure expansion areas and did not include the entire focus area, nor the Mining Right Area (MRA).

The Anglo Platinum Der Brochen Project is situated northeast of the R555 provincial road, and northwest of the R540, and approximately 24km south-west (40km by road) of the town of Steelpoort. Lydenburg is approximately 31km from the focus area in a southeast direction. The Anglo Platinum Der Brochen Mine is located in the Greater Tubatse Local Municipality which forms part of the Greater Sekhukhune District Municipality.

The purpose of this report is to define the terrestrial ecology of the focus area including both floral and faunal aspects as well as mapping and defining areas of increased Ecological Importance and Sensitivity (EIS) and to define the Present Ecological State (PES) of the focus area. It is the objective of this study to provide detailed information to guide the activities associated with the proposed mining activities associated with the focus area 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 Description¹

Subsequent to the submission and approval of the Der Brochen Amendment Project Scoping Report, the Der Brochen Team of Anglo American Platinum decided to integrate the previously approved North Opencast Pit (as approved in the 2015 Der Brochen Consolidated Environmental Management Programme (EMPr)) into the Der Brochen Amendment Project. With the integration of the previously approved North Open Pit into the Der Brochen Amendment Project, the need for proposed North Shaft and associated infrastructure (such as

¹ Terms of Reference developed and provided by SRK Consulting, 23 July 2019, Project number: 533247



three of the proposed six the ventilation shafts) have been removed. As a result of the above changes, the Der Brochen Amendment Project (Figure 1) will henceforth comprise of the following:

- The South Decline Shaft with associated infrastructure, i.e. water management infrastructure;
- The previously approved North Opencast Pit area with associated infrastructure as previously approved in 2015, i.e. water management infrastructure and waste rock stockpiles;
- Three up-cast ventilation shafts required for the underground workings associated with the South Decline Shaft;
- A Dense Medium Separation (DMS) Plant to be located within the existing footprint area of the Mototolo Concentrator area;
- A DMS Stockpile with associated water management infrastructure;
- The conversion of the existing Mototolo chrome plant from a final tailings' arrangement to an inter-stage arrangement;
- Additional Run of Mine stockpiles and associated silos;
- Change houses and office complex to be located at the proposed South Decline Shaft area;
- An explosive destruction bay area to be located near the proposed South decline shaft;
- Staff accommodation facilities to be located near the Der Brochen Dam; and
- Additional linear infrastructure, i.e.:
 - **Two conveyor systems:** *One conveyor belt will be constructed to connect the proposed South Decline Shaft with the proposed DMS Plant that will be located in the existing footprint area of the Mototolo Concentrator Plant, for the purpose of transporting ore from the South Decline Shaft to the plant area. Another conveyor belt system will be required to transport DMS material from the proposed DMS Plant to the proposed DMS Stockpile area. It is currently anticipated that the DMS conveyor system will run along the existing Mareesburg tailings pipeline system.*
 - **Access and haul roads.** *New access roads to the proposed ventilation shafts will be required for maintenance purposes. Certain existing roads will also be required to be upgraded to provide sufficient access roads to the project related infrastructure such as the North Opencast Pit area, the South Decline Shaft and offices. The mine is also considering including a haul road within the proposed corridor associated with the ore conveyor belt system to transport ore from the proposed South Decline Shaft to the Mototolo Concentrator Plant area as an interim measure, whilst the conveyor belt system is being constructed.*



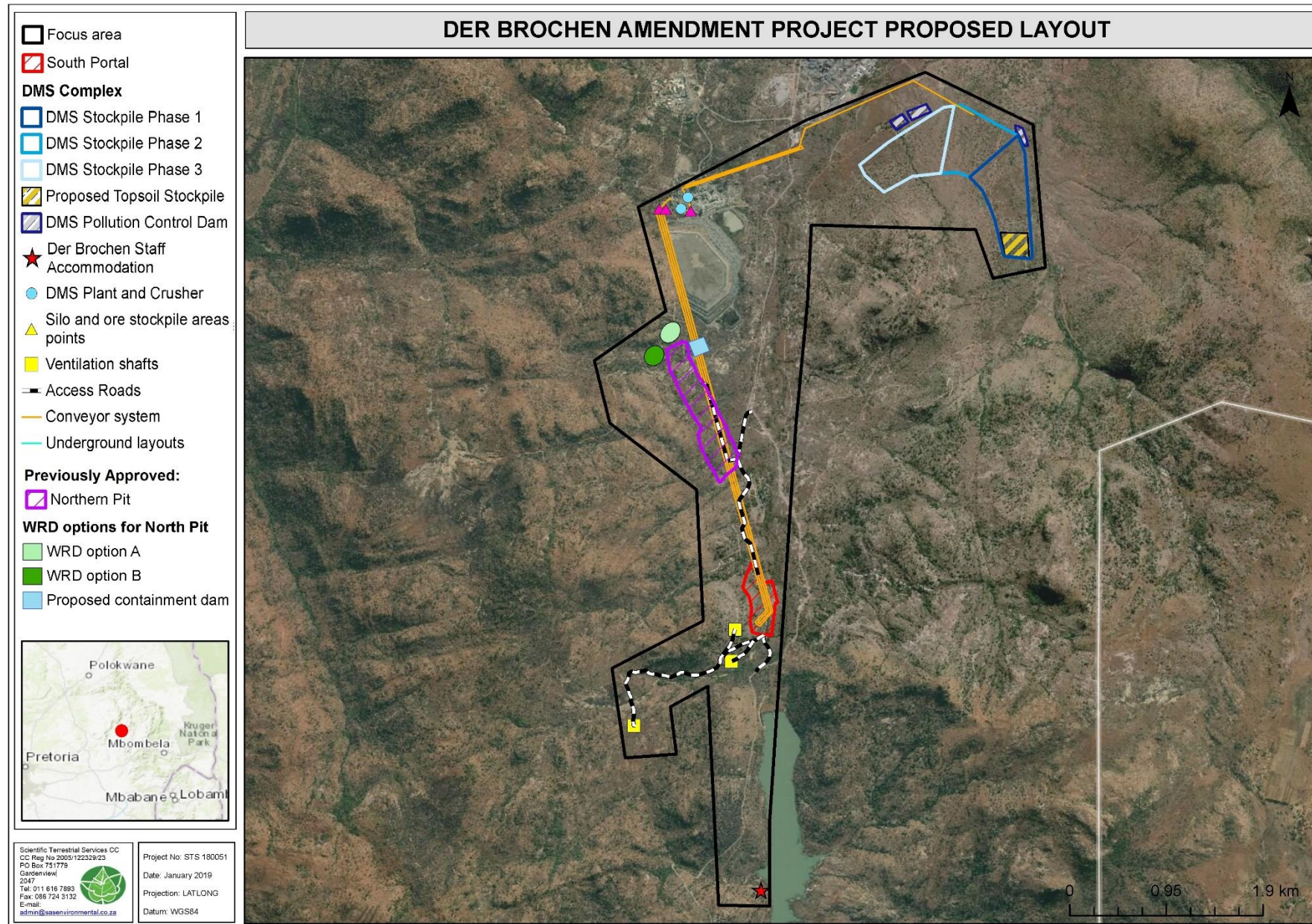


Figure 1: Proposed mine layout zoomed in onto the focus area.



2. ASSESSMENT APPROACH

A single field assessment was undertaken from the 21st to the 23rd of March 2018 (Summer Season), in order to determine the ecological status of the focus area. A reconnaissance 'walkabout' was initially undertaken to determine the general habitat types found throughout the focus area, following this, specific study sites that were selected were considered to be representative of the habitats found within the area, with special emphasis being placed on areas that may potentially support faunal Species of Conservation Concern (SCC). Sites were investigated on foot in order to identify the occurrence of fauna within the focus area. In order to increase the overall observation time within the focus area, as well as increasing the likelihood of observing shy and elusive species, motion sensitive camera traps were strategically placed within the focus area. Sherman traps were also used to increase the likelihood of capturing and observing small mammal species, notably small nocturnal mammals.

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, avifauna, reptiles, amphibians, general insects and arachnids.

2.1 Sensitivity Mapping

All the ecological features of the focus area were considered and sensitive areas were assessed. A Geographic Information System (GIS) was used to project these features onto aerial photographs and topographic maps. The sensitivity map should guide the design and layout of the proposed development.

3. FAUNAL ASSESSMENT RESULTS

3.1 Faunal Habitat

The focus area comprised four faunal habitat units, each capable of sustaining a wide variety of faunal species at varying abundances. 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 see Section B (Floral Report).



Sekhukhune Mountain Bushveld Habitat Unit

This was the predominant habitat unit throughout the focus area. The Sekhukhune Mountain Bushveld within the focus area is considered to be largely intact with minimal disturbances. This habitat unit supports a high diversity of faunal species and is considered important for continued conservation efforts in the region.

Open Bushveld Habitat Unit

This habitat unit is predominantly located within the north-eastern portion of the focus area. It is differentiated from the Sekhukhune Mountain Bushveld habitat as it is much more open with large grassland areas that are utilised by the herds of grazing mammals. This habitat unit is also suited to the larger predatory reptiles that actively hunt their prey items.

Freshwater Habitat Unit

This habitat unit includes the Groot Dwars River, its associated floodplain and the interlinking Ephemeral Drainage lines and wetland areas. This habitat unit provided habitat, food and water resources to a diversity of faunal species, and due to the location within the Dwars valley, the Groot Dwars River can be considered a focal point for observations and movements of species.

Transformed Habitat

This habitat unit incorporates all the current infrastructure areas, including the current offices and the concentrator plant in the north of the focus area. These areas provide limited food resources, however it is likely that small mammal, reptile, invertebrates and arachnid species still utilise and be found in these areas.



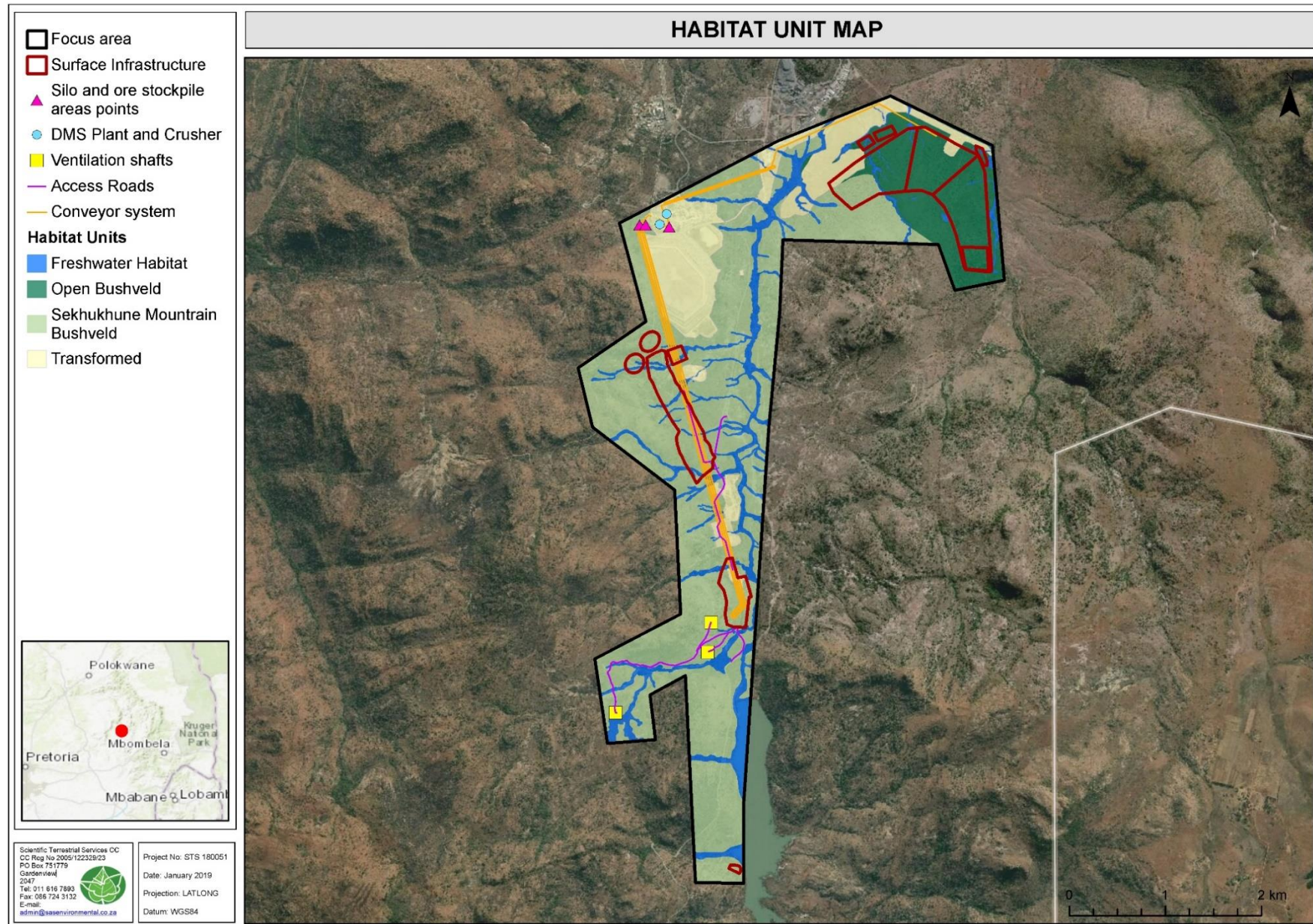

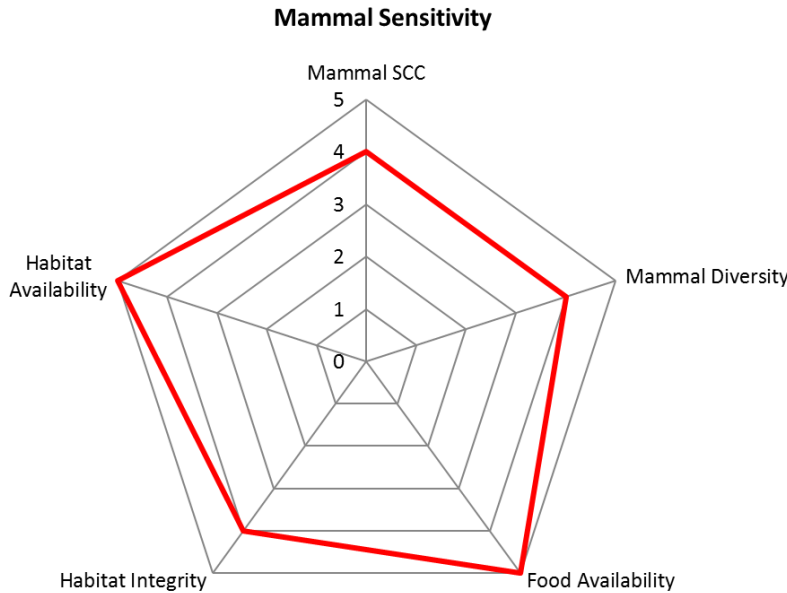


Figure 2: Habitat Unit map for the focus area with the proposed mining related infrastructure.



3.2 Mammals

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

Faunal Class: Mammals	Faunal Habitat Sensitivity	Moderately High	Photograph: 												
	Notes on Photograph: top left to bottom right: <i>Tragelaphus strepsiceros</i> (Kudu), <i>Hystrix africaeaustralis</i> (Cape Porcupine); <i>Aethomys namaquensis</i> (Namaqua Rock Mouse); <i>Equus quagga</i> (Plains Zebra); <i>Sylvicapra grimmia</i> (Grey Duiker); <i>Giraffa Camelopardalis</i> (Giraffe)														
Faunal Sensitivity Graph:															
<div><p>Mammal Sensitivity</p><table border="1"><thead><tr><th>Metric</th><th>Score</th></tr></thead><tbody><tr><td>Mammal SCC</td><td>4</td></tr><tr><td>Mammal Diversity</td><td>4.5</td></tr><tr><td>Food Availability</td><td>4.8</td></tr><tr><td>Habitat Integrity</td><td>4.5</td></tr><tr><td>Habitat Availability</td><td>4.2</td></tr></tbody></table></div>				Metric	Score	Mammal SCC	4	Mammal Diversity	4.5	Food Availability	4.8	Habitat Integrity	4.5	Habitat Availability	4.2
Metric	Score														
Mammal SCC	4														
Mammal Diversity	4.5														
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Habitat Integrity	4.5														
Habitat Availability	4.2														

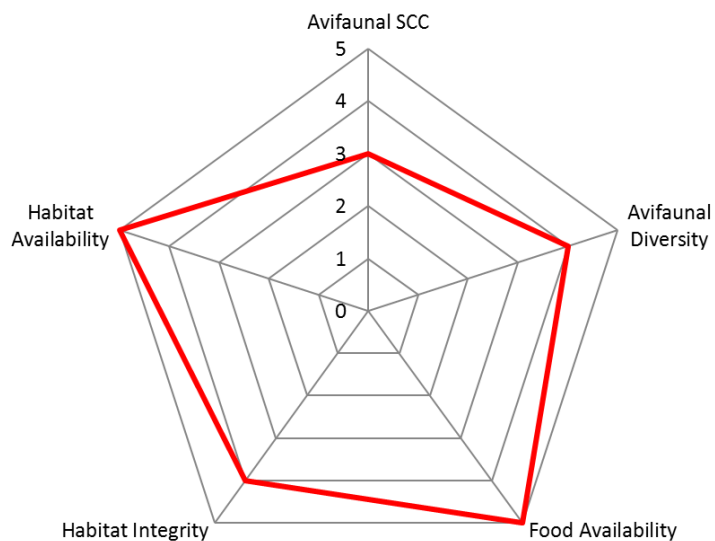



Faunal SCC/Endemics/TOPS/	The spoor of the mammal SCC namely <i>Hyaena brunnea</i> (Brown hyaena, NT) was observed during the field assessment. Additionally, <i>Panthera pardus</i> (Leopard, Vulnerable, TOPS 2015) has also been previously recorded within focus area. Other TOPS listed protected species occurring within the focus area include <i>Leptailurus serval</i> (Serval); <i>Connochaetes taurinus</i> (Blue Wildebeest), <i>Damaliscus pygargus phililpsi</i> (Blesbok), <i>Equus quagga</i> (Plains Zebra, NT), <i>Oreotragus</i> (Klipspringer) and <i>Alcelaphus buselaphus</i> (Red Hartebeest). It must be noted however that many of the large mammal species listed above have been artificially introduced to the focus area as part of Anglo's animal stocking plan. <i>Aonyx capensis</i> (Cape Clawless Otter) is also considered likely to occur within the Groot Dwars Valley, as well as <i>Chrysospalax villosus</i> (Rough-haired Golden Mole, VU).	General comments (dominant faunal species/noteworthy records etc.): The focus area is currently being utilised and managed as a natural (semi protected) area. Due to the exclusion of excessive cattle grazing, which is evident throughout the surrounding areas, the endemic Sekhukhune veld is considered largely undisturbed and capable of providing habitat and resources to the diversity of mammal species. Previous reports such as the Der Brochen EMP Report (SRK, 2002) further indicate and corroborate the findings of this study.	Business Case, Conclusion and Mitigation Requirements: The overall mammal habitat sensitivity is considered moderately high. The proposed mining activities and associated infrastructure will lead to the further loss of faunal habitat and food resources. Of particular concern are the proposed DMS stockpile areas, the topsoil stockpile, south portal and the conveyor lines. Due to the size and notably the location of these developments, large areas of habitat which are relied upon by mammal species will be permanently lost. The proposed conveyors, although small in footprint width, will result in a considerable amount of vegetation being cleared along their length. Of greater concern is that the conveyors will potentially be an impassable barrier for many of the large mammals. This will result in a significant loss of habitat connectivity and as such, decrease the available habitat and resources availability to species. The remaining infrastructure areas and ventilation shafts will result in habitat loss, however due to their smaller footprint sizes and in the case of the DMS plant the location, they are likely to pose less of a threat to mammal species.
Faunal Diversity	Mining and edge effects has had an impact on mammal species, notably the extent and availability of habitat. Regardless of these impacts, a moderately high diversity of the faunal species still remains within the focus area and mining property, although many of these species (large mammals) were re-introduced to the area when mining activities were initiated.		
Food Availability	As a result of restricted access and use of the mining property and active veld management, the overall food availability found within the focus area is considered high. Overgrazing as a result of local herdsman grazing their cattle on the veld has not occurred. This combined with species numbers and feeding class management has ensured the overall maintenance of food resources within the focus area.		
Habitat Integrity	Although the habitat integrity has been degraded as a result of mining activities, the proponent, through conservation initiatives, has endeavoured and to a large degree succeeded in ensuring that the remaining areas within the mining property are suitably managed. The result of these conservation management initiatives ensures that the habitat integrity in the remaining areas is not further degraded.		
Habitat Availability	As with the habitat integrity, veld and species management has ensured that habitat degradation, other than that directly related to mining activities, remains at a minimum. Although there has been habitat loss in some areas, the offsetting and management of the remaining areas has ensured that an abundance of habitat remains available to species.		



3.3 Avifauna

Table 2: Field assessment results pertaining to avifaunal species within the focus area

Faunal Class: Avifauna	Faunal Habitat Sensitivity	Moderately High	Photograph:												
	Notes on Photograph: Top: <i>Cisticola fulvicapillus</i> (Neddicky; <i>Lagonosticta rhodopareia</i> (Jameson's Firefinch). Bottom: <i>Vidua macroura</i> (Pin-tailed Whydah).														
Faunal Sensitivity Graph:															
<div><p>Avifaunal Sensitivity</p><table border="1"><caption>Avifaunal Sensitivity Graph Data</caption><thead><tr><th>Category</th><th>Score (0-5)</th></tr></thead><tbody><tr><td>Avifaunal SCC</td><td>3.2</td></tr><tr><td>Avifaunal Diversity</td><td>4.2</td></tr><tr><td>Food Availability</td><td>4.8</td></tr><tr><td>Habitat Integrity</td><td>3.8</td></tr><tr><td>Habitat Availability</td><td>4.5</td></tr></tbody></table></div>				Category	Score (0-5)	Avifaunal SCC	3.2	Avifaunal Diversity	4.2	Food Availability	4.8	Habitat Integrity	3.8	Habitat Availability	4.5
Category	Score (0-5)														
Avifaunal SCC	3.2														
Avifaunal Diversity	4.2														
Food Availability	4.8														
Habitat Integrity	3.8														
Habitat Availability	4.5														
															



Faunal SCC/Endemics/TOPS/	During the site assessment <i>Gyps africanus</i> (White Backed Vulture, Vulnerable) was observed circling over the focus area. Although it is unlikely that this species will utilise the focus area for nesting, the focus area does provide a large foraging area. <i>Falco biarmicus</i> (Lanner Falcon, VU), <i>Sagittarius serpentarius</i> (Secretary bird, VU), <i>Neotis denhami</i> (Denham's Bustard, NT) are also expected to occur within the focus area, utilising the varying habitats for foraging, roosting and possibly breeding.	General comments (dominant faunal species/noteworthy records etc.): A large diversity of avifaunal species is known to utilise the habitat within the focus area. Furthermore, the focus area is considered important for avifaunal SCC, both for breeding and for foraging. Due to the large-scale mining operations in the region, as well as the ongoing expansion of the local communities, avifaunal habitat in the region has been degraded, and as such, the focus area is considered to be of increased importance as it remains relatively unimpacted by such regional developments. Previous reports such as the Der Brochen EMP Report (SRK, 2002) further indicate and corroborate the findings of this study.	Business Case, Conclusion and Mitigation Requirements: The overall avifaunal habitat sensitivity is considered moderately high. The proposed mining activities and associated infrastructure will lead to the loss of habitat and food resources within the focus area. Of particular concern are the proposed DMS stockpile areas, topsoil stockpile and the south portal. Due to the size and notably the location of these developments, extensive areas of sensitive habitat which are relied upon by species will be permanently lost. The remaking infrastructure areas and vent shafts will result in habitat loss, however due to their smaller footprint sizes they are likely to pose less of a threat to avifaunal species. The proposed conveyors, although small in footprint width, will result in a considerable amount of vegetation being cleared along their length. The conveyors will result in the loss of sensitive habitat along the mountain sides and portions of sensitive drainage lines along the valley, compromising foraging and breeding areas for avifaunal species.
Faunal Diversity	Avifaunal diversity is considered to be high, as can be expected in the region. Habitat protection afforded by the mine and limited habitat disturbances further encourages a high diversity. The varying terrain and habitat units further serve to support diversity of species within the landscape.		
Food Availability	Food resources are readily available to avifaunal species. Many of the smaller avifaunal species are sustained through the seed and fruit production of the herbaceous layer and the woody plants. Insects, reptiles and small mammals supplement the food requirements of predatory avifaunal species.		
Habitat Integrity	Habitat integrity is considered high. The focus area exhibited increased levels of habitat connectivity and availability with minimal disturbances in the non-mining areas.		
Habitat Availability	The focus area provides a varied landscape of habitat for avifaunal species. The combination of riparian, bushveld areas, mountain slopes and wooded valleys all contribute to a high level of habitat availability. The focus area provides varied areas for roosting, foraging and for the breeding of avifaunal species.		



3.4 Amphibians

Table 3: Field assessment results pertaining to amphibian species within the focus area

Faunal Class: Amphibians	Faunal Habitat Sensitivity	Moderately High	Photograph:												
	Notes on Photograph: Top: Light colour variation of <i>Schismaderma carens</i> (Red toad). Bottom: Image depicting on of the ephemeral drainage lines found within the focus area.														
Faunal Sensitivity Graph:															
<div><p>Amphibian Sensitivity</p><table border="1"><thead><tr><th>Metric</th><th>Score (0-5)</th></tr></thead><tbody><tr><td>Amphibian SCC</td><td>2.2</td></tr><tr><td>Amphibian Diversity</td><td>2.5</td></tr><tr><td>Food Availability</td><td>2.8</td></tr><tr><td>Habitat Integrity</td><td>2.8</td></tr><tr><td>Habitat Availability</td><td>2.2</td></tr></tbody></table></div>				Metric	Score (0-5)	Amphibian SCC	2.2	Amphibian Diversity	2.5	Food Availability	2.8	Habitat Integrity	2.8	Habitat Availability	2.2
Metric	Score (0-5)														
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Amphibian Diversity	2.5														
Food Availability	2.8														
Habitat Integrity	2.8														
Habitat Availability	2.2														
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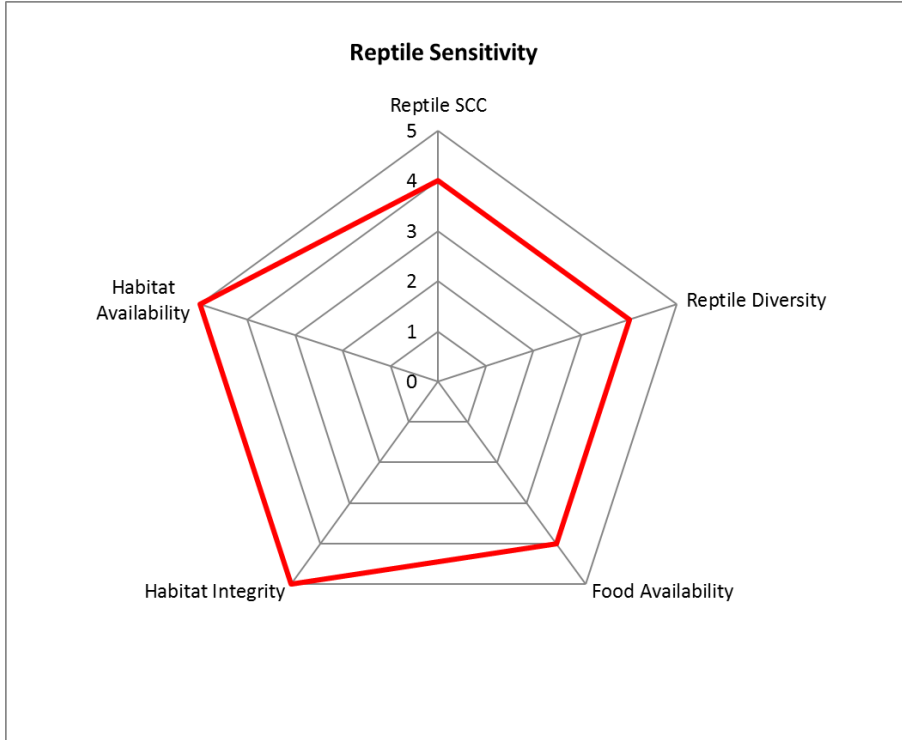


Faunal SCC/Endemics/TOPS/	No amphibian SCC were observed within the focus area. Furthermore, no amphibian species listed as protected or of conservation concern are expected to occur within the focus area.	General comments (dominant faunal species/noteworthy records etc.): Amphibian species will largely predominate around the water systems of the focus area, namely the drainage lines and the Groot Dwars river. However, there are a number of species that are more water independent and are not fully reliant on permanent water bodies, such as <i>Amietophrynus gutturalis</i> (Guttural Toad). Species such as the above can be found throughout the focus area. Previous reports such as the Der Brochen EMP Report (SRK, 2002) further indicate and corroborate the findings of this study.	Business Case, Conclusion and Mitigation Requirements: The overall amphibian habitat sensitivity is considered to be moderately high. Although the proposed infrastructure areas are located away from the Groot Dwars river, a number of drainage lines are located within the proposed footprint areas. These drainage lines play an important role as movement corridors whilst also supporting amphibian species. Furthermore, many of these drainage lines with pools of water are used as spawning grounds, with the densely vegetated drainage line pools providing increased protection and survival rates for the young. The loss of these drainage lines or impact on them due to sedimentation and/or impacts on water quality will negatively affect amphibian diversity and abundance. Construction and operational activities are likely to result in edge effects which may degrade the habitat and sensitivity of the Groot Dwars river, leading to further loss of amphibian diversity and habitat.
Faunal Diversity	Amphibian diversity within the focus area is considered to be moderately high. High levels of available habitat and food resources ensures that a diverse and abundant array of amphibians can be supported. Although only one amphibian species was observed at the time assessment, databases such as the South African Frog Atlas Project (SAFAP) and the Animal Demography Units virtual museum indicate a high species diversity within the area. Species previously observed within the focus area include <i>Amietia delalandii</i> (Delalande's River Frog), <i>Cacosternum boettgeri</i> (Common Caco), <i>Strongylopus grayii</i> (Clicking Stream Frog) and <i>Semnodactylus wealii</i> (Rattling Frog).		
Food Availability	Amphibians rely primarily on insects as a food source. The high abundance of invertebrates within the focus area ensures that amphibian species are not stressed for food resources, notably around the existing river and drainage systems.		
Habitat Integrity	The interconnected nature of the drainage lines and the Groot Dwars river ensure that habitat connectivity is maintained. This combined with the high levels of habitat availability and relatively localised areas of impacts insures that the overall habitat integrity of the focus area remains high.		
Habitat Availability	The wetlands provide primary habitat for amphibian species, whilst the degraded grassland areas are suitable for amphibian species that are less water dependant. Habitat availability is considered to be lower in the agricultural fields, due to a decreased level of food provision and harsher environment.		



3.5 Reptiles

Table 4: Field assessment results pertaining to reptile species within the focus area

Faunal Class: Reptiles	Faunal Habitat Sensitivity	Moderately High													
	Notes on Photograph: Top left to bottom right: <i>Panaspis maculicollis</i> (Spotted-neck Snake-eyed Skink); <i>Trachylepis striata</i> (Eastern Striped Skink); <i>Trachylepis margaritifer</i> (Rainbow Skink); <i>Platysaurus orientalis</i> (Sekukhune Flat Lizard) and <i>Stigmochelys pardalis</i> (Leopard Tortoise)														
Faunal Sensitivity Graph:															
<div><p>Reptile Sensitivity</p><table border="1"><caption>Reptile Sensitivity Data</caption><thead><tr><th>Category</th><th>Score</th></tr></thead><tbody><tr><td>Reptile SCC</td><td>4.5</td></tr><tr><td>Reptile Diversity</td><td>4.2</td></tr><tr><td>Food Availability</td><td>4.8</td></tr><tr><td>Habitat Integrity</td><td>4.5</td></tr><tr><td>Habitat Availability</td><td>4.5</td></tr></tbody></table></div>				Category	Score	Reptile SCC	4.5	Reptile Diversity	4.2	Food Availability	4.8	Habitat Integrity	4.5	Habitat Availability	4.5
Category	Score														
Reptile SCC	4.5														
Reptile Diversity	4.2														
Food Availability	4.8														
Habitat Integrity	4.5														
Habitat Availability	4.5														


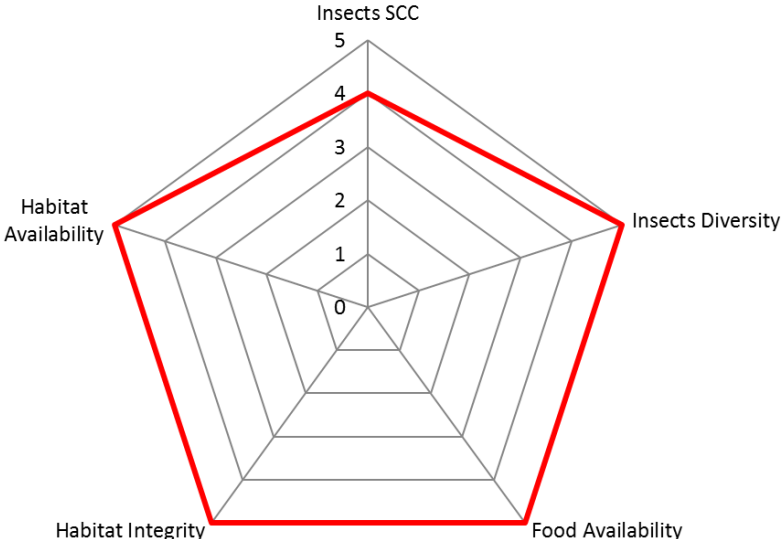


Faunal SCC/Endemics/TOPS/	Although no reptile SCC were observed during the site assessment, the species <i>Python natalensis</i> (African Python, VU) which is listed in the Limpopo SoER (2004) has been recorded within the focus area on a number of occasions. Furthermore, it is likely that species such as <i>Homoroselaps dorsalis</i> (Striped Harlequin Snake, NT) will utilise the north eastern portion of the focus area where the planned DMS and topsoil stockpiles are located. In addition to these species, it is likely that the mountainous areas with sheet rock will provide habitat to <i>Platysaurus orientalis fitzsimonsi</i> (Fitzsimon's Flat Lizard, NT) and the grassy slopes will be utilised by <i>Chamaesaura aenea</i> (Coppery Grass Lizard, NT).	General comments (dominant faunal species/noteworthy records etc.):	Business Case, Conclusion and Mitigation Requirements:
Faunal Diversity	The focus area is considered to have a moderately high reptile diversity. A number of species were observed during the assessment including <i>Gerrhosaurus flavigularis</i> (Yellow-throated Plated Lizard), <i>Naja mossambica</i> (Mozambique Spitting Cobra), <i>Stigmochelys pardalis</i> (Leopard Tortoise) and <i>Platysaurus orientalis</i> (Sekukhune Flat Lizard), whilst further communication with mine employees indicated that species such as <i>Python natalensis</i> (African Python) and <i>Dendroaspis polylepis</i> (Black Mamba) have been observed on a number of occasions.	Overall the focus area provides ample and well-suited habitat to a diverse and abundant array of reptile species. The overall abundance and diversity of the focus area is likely to be higher than what was observed, as reptile species by nature are reclusive and hard to observe, notably the smaller lizards, skinks and geckos. As such, the overall habitat integrity, habitat availability and food resources available were used to infer and inform the high abundance and diversity likelihood of the focus area. Previous reports such as the Der Brochen EMP Report (SRK, 2002) further indicate and corroborate the findings of this study.	The overall habitat sensitivity of the focus area in terms of reptile species is considered moderately high. Moderately high to high levels of habitat and food resources will serve to support the diversity and abundance of reptiles throughout the focus area. The proposed mining activities and associated infrastructure will lead to the loss of habitat for reptiles, as well as their food resources. The proposed DMS stockpiles, topsoil stockpile and south portal are likely to have the most significant impact on reptile species within the focus area. The south portal is located along the hill side, where a large number of small reptiles were observed inhabiting the rocky outcrops. The construction of the portal will result in localised habitat and possible species loss, with edge effects likely resulting in a larger impact footprint than that of the portals themselves. Footprint and edge effects minimisation will be key to limiting impacts to reptile species.
Food Availability	Many of the reptile species are predatory, however it has been observed that some of the skinks will eat soft vegetation material such as flowers and fruits when available in order to supplement their food requirements. The focus area, with variable plant material, small mammals, reptiles, amphibians and invertebrates is considered to have moderately high food resources/ availability for reptile species.		
Habitat Integrity	Currently, minimal disturbances to the habitat and habitat connectivity within the focus area has ensured that an overall high habitat integrity is still available. Species movement between the various habitats is largely unhindered, allowing for species to move between areas, following food resources or in search of breeding partners.		
Habitat Availability	Currently, only small and localised developmental activities are present within the focus area. As such, the majority of the available habitat for reptile species is undisturbed. The side slopes and valley bottom provide ideal habitat and foraging areas for a diverse array of reptile species, whilst the open bushveld area in the north east of the focus area is suitable for larger predatory snakes that actively hunt for their prey.		

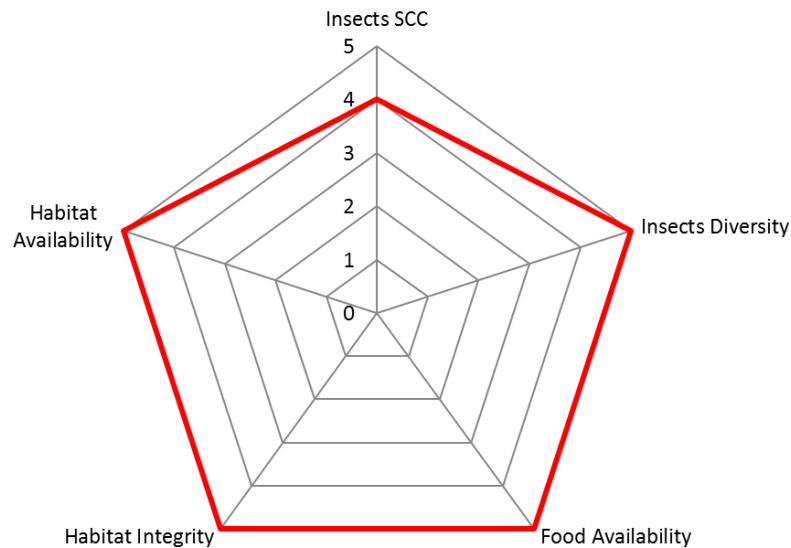


3.6 Insects

Table 5: Field assessment results pertaining to insect species within the focus area

Faunal Class: Insects	Faunal Habitat Sensitivity	High	Photograph: 												
	<p>Notes on Photograph:</p> <p>Top: <i>Pycna silvia</i> (Cicada) observed on <i>Vitex obovata</i> subsp <i>wilmsii</i></p> <p>Middle left to bottom right: <i>Paternympha loxophthalma</i> (Big-eye Brown); <i>Crocothemis sanguinolenta</i> (Small Scarlet); <i>Anomalipus elephas</i> (Large Armoured Darkling Beetle); <i>Lepidochrysops plebeia</i> (Twin-spot Blue)</p>														
Faunal Sensitivity Graph:															
<div><p>Insect Sensitivity</p><table border="1"><caption>Insect Sensitivity Data</caption><thead><tr><th>Category</th><th>Sensitivity Level (0-5)</th></tr></thead><tbody><tr><td>Insects SCC</td><td>4</td></tr><tr><td>Insects Diversity</td><td>4</td></tr><tr><td>Food Availability</td><td>4</td></tr><tr><td>Habitat Integrity</td><td>4</td></tr><tr><td>Habitat Availability</td><td>4</td></tr></tbody></table></div>				Category	Sensitivity Level (0-5)	Insects SCC	4	Insects Diversity	4	Food Availability	4	Habitat Integrity	4	Habitat Availability	4
Category	Sensitivity Level (0-5)														
Insects SCC	4														
Insects Diversity	4														
Food Availability	4														
Habitat Integrity	4														
Habitat Availability	4														

Insect Sensitivity




Faunal SCC/Endemics/TOPS/	No listed SCC were observed within the study, nor are any expected to occur within the focus area. Although not listed as endangered or protected, the species <i>Pycna sylvia</i> is an endemic cicada species with limited distribution ranges within the Limpopo province. This species is known to occur within both the Groot and Klein Dwars valleys and adjacent areas of natural vegetation. During the November 2018 site assessment this species was observed and photographed within the Der Brochen property near the south portal.	General comments (dominant faunal species/noteworthy records etc.): Individuals of <i>Pycna sylvia</i> were observed and heard calling within the focus area during the November 2018 site assessment. These individuals were all located on or around stands of <i>Vitex obovata</i> subsp <i>wilmsii</i> , which are currently considered to be an important food resource for <i>Pycna sylvia</i> , however research and understanding in this regard is limited. Stands of <i>Vitex obovata</i> subsp <i>wilmsii</i> were observed throughout the valley, predominantly along the mountain sides and in close association with areas of increased water runoff. Additionally, previous reports such as the Der Brochen EMP Report (SRK, 2002) further indicate and corroborate the occurrence of this species within the focus area.	Business Case, Conclusion and Mitigation Requirements: The overall habitat sensitivity of the focus area in terms of insect species is considered to be high. The highest diversity of insect species was observed within the Sekhukhune Mountain Bushveld and the Ephemeral Drainage lines. The proposed conveyors and south portal will invariably impact upon these habitat types, resulting in the loss of habitat and food resources. <i>Vitex obovata</i> subsp <i>wilmsii</i> was observed within many of the proposed layout areas, and as such, it is highly likely that the resultant vegetation clearing, and construction will have a negative effect on the overall population numbers of <i>Pycna sylvia</i> . Of particular concern is that the individual <i>Pycna sylvia</i> observed in the above photograph was captured alongside a drainage line associated with the current south portal and the explosives destruction bay. Larvae existing subsurface in this area will be lost during earth moving activities, leading to further decline in population numbers.
Faunal Diversity	Insects can be either classified as generalists or specialists depending on their feeding preferences and habitat requirements. The focus area caters for both groups of insects, as was evident by the high diversity of insects observed. Species of the Coleoptera and Orthoptera families can often be used as examples of generalist species. However, species such as <i>Pycna sylvia</i> which appear to be largely limited to the food resource tree species <i>Vitex obovata</i> subsp <i>wilmsii</i> can be considered a specialist species. The focus area as expected was predominated by a high diversity of generalist insect species, however the known presence of <i>Pycna sylvia</i> has resulted in the increased sensitivity rating for insect diversity.		
Food Availability	Extensive vegetated areas of varying plant species across the landscape provide ample food resources to both generalist and specialist insect species. The presence of <i>Vitex obovata</i> subsp <i>wilmsii</i> in and around the numerous drainage lines indicates that there is still a high level of food resources available to <i>Pycna sylvia</i> .		
Habitat Integrity	Isolated disturbances within the focus area have not lead to a significant loss of habitat integrity. By and in large the habitat within the focus area remains largely undisturbed with a high level of habitat connectivity.		
Habitat Availability	Limited and isolated disturbances, high levels of vegetation cover and habitat connectivity all ensure that the overall habitat availability as observed within the focus area can be considered high.		

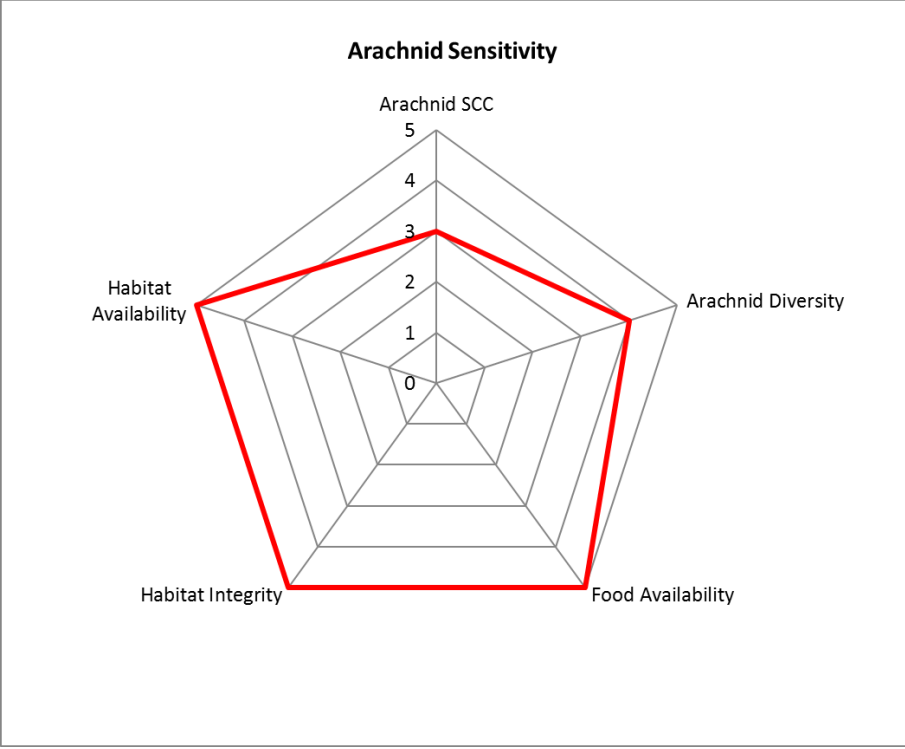


3.7 Arachnids

Table 6: Field assessment results pertaining to arachnid species within the focus area

Faunal Class: Arachnids	Faunal Habitat Sensitivity Moderately high	
	Notes on Photograph: Top left to bottom: Burrow of baboon spider, likely that of <i>Ceratogyrus darlingi</i> (Horned Baboon Spider), <i>Argiope trifasciata</i> (Banded Garden Orb-web Spider); <i>Hadogenes polytrichobothrius</i> , <i>Opisthophthalmus glabrifrons</i> and <i>Harpactirella overdijki</i> (Baboon Spider).	

Faunal Sensitivity Graph:



Arachnid Sensitivity

Arachnid SCC

5

4

3

2

1

0

Habitat Availability

Arachnid Diversity

Food Availability

Habitat Integrity



Faunal SCC/Endemics/TOPS/	The Limpopo SoER (2004) does not list any arachnid species, nor are any of the arachnid species as listed on the TOPS list expected to occur within the focus area. Although not formally protected, the scorpion species <i>Hadogenes polytrichobothrius</i> was observed. This species is endemic to the region and inhabits areas of sheet rock. It must be noted Prendini (2006), the author who described this species, states that "the threat of mining, quarrying, and other forms of habitat degradation, together with the restricted distributional range of this species, which otherwise falls entirely outside of existing protected areas, warrants its assignment to the Vulnerable IUCN Red List Category".	General comments (dominant faunal species/noteworthy records etc.): Arachnids can be notoriously hard to observe in the field due to their cryptic nature and behavioural patterns. The observation of the burrow belonging to one of the baboon spiders, possibly <i>Ceratogyrus darlingi</i> (Horned Baboon Spider) provides evidence to back-up the likelihood that these species will occur in the focus area. Baboon spiders across their range have been subjected to habitat loss and widespread collection as part of the illegal pet trade. This has resulted in a significant decreased in viable wild populations and available habitat. Baboon spiders, due to their burrow building habits, are particularly at risk from activities which involve earthworks. Furthermore, there are a number of scorpion species which also construct burrows, and as such are also at risk from such activities. Due to these species cryptic nature, they can easily go unseen during studies and during pre-construction activities. Previous reports such as the Der Brochen EMP Report (SRK, 2002) further indicate and corroborate the findings of this study.	Business Case, Conclusion and Mitigation Requirements: The overall habitat sensitivity of the focus area in terms of arachnid species is considered to be moderately high. An abundance of habitat and food resources serve to support the diversity and abundance of arachnid species throughout the focus area. The proposed mining expansion activities and associated infrastructure will lead to the loss of habitat for arachnids, as well as their food resources. The proposed DMS stockpiles, topsoil stockpiles and south portal are likely to have the most significant impact on arachnid species within the focus area due to their locations and size. The construction of the portals will result in localised habitat and species loss, with edge effects likely resulting in a larger impact footprint than that of the portals themselves. Footprint and edge effect minimisation will be key to limiting impacts to arachnid species.
Faunal Diversity	Arachnids by nature are laborious and time consuming to assess and quantify in terms of diversity. Many are secretive and predominantly nocturnal. As such, signs of arachnid activities were actively searched for (burrows, webs, discarded prey items etc). From observations and taking into account known regional arachnid occurrences, food availability and habitat levels, it is considered that the focus area will have a moderately high arachnid diversity. It is likely that additional species such as <i>Opisthophthalmus pugnax</i> and <i>Harpactira hamiltoni</i> will occur within the focus area. These species have been recorded on neighbouring properties to the south of the focus area, where similar habitat and food resources as that of the focus area were observed (SAS, 2012).		
Food Availability	The abundance of insects and small reptiles serves as a highly suitable food resource for many arachnid species of varying sizes.		
Habitat Integrity	Isolated disturbances within the focus area have not lead to a significant loss of habitat integrity. By and in large the habitat within the focus area remains largely undisturbed with a high level of habitat connectivity.		
Habitat Availability	The focus area is considered to have a high level of habitat availability for arachnid species. The mountain slopes provide rocky crevices for a number of arachnids to hide and burrow under, whilst the vegetated riparian areas are considered highly suitable to web building spiders. The low-lying areas of the valley provide habitat to both ground foraging arachnids as well as web building spiders. Arachnids are adaptable species and able to live in close proximity to humans, and as such will also be found inhabiting the existing buildings and infrastructure areas of the focus area.		



3.8 Faunal Species of Conservation Concern Assessment

During the field assessment, it is not always feasible to identify or observe all species within the focus area, largely due to the secretive nature of many faunal species, possible low population numbers or varying habits of species. As such, to specifically assess an area for faunal SCC, a Probability of Occurrence (POC) matrix is used, utilising a number of factors to determine the probability of faunal SCC occurrence within the focus area. Species listed in Appendix C whose known distribution ranges and habitat preferences include the focus area were taken into consideration. The species listed below are considered to have a significant probability of occurring within the focus area.

Table 7: Faunal SCC Probability of Occurrence Score (POC) for the focus area.

Scientific name	Common Name	POC %
<u>Mammals</u>		
<i>Panthera pardus</i>	Leopard	100%
<i>Aonyx capensis</i>	Cape clawless Otter	80%
<i>Hyaena brunnea</i>	Brown Hyaena	100%
<i>Leptailurus serval</i>	Serval	60%
<i>Connochaetes taurinus</i>	Blue Wildebeest	90%
<i>Equus quagga</i>	Plains Zebra	100%
<i>Oreotragus</i>	Klipspringer	100%
<i>Alcelaphus buselaphus</i>	Red Hartebeest	100%
<i>Damaliscus pygargus phililpsi</i>	Blesbok	100%
<i>Chrysospalax villosus</i>	Rough-haired Golden Mole	60%
<u>Avifauna</u>		
<i>Gyps africanus</i>	White Backed Vulture	100%
<i>Falco biarmicus</i>	Lanner Falcon	80%
<i>Sagittarius serpentarius</i>	Secretary bird	75%
<i>Neotis denhami</i>	Denham's Bustard	80%
<u>Arachnids</u>		
<i>Hadogenes polytrichobothrius</i>	Flat Rock Scorpion	100%
<u>Reptiles</u>		
<i>Python natalensis</i>	African Python	100%
<i>Platysaurus orientalis fitzsimonsi</i>	Fitzsimon's Flat Lizard	80%
<i>Chamaesaura aenea</i>	Coppery Grass Lizard	80%
<i>Homoroselaps dorsalis</i>	Striped Harlequin Snake	60%
<u>Insects</u>		
<i>Pycna silvia</i>	Cicada	100%

The focus area, as it has largely been managed and overseen as a natural area with limited development and mining activities, provides habitat to a number of SCC. It must be noted however that many of the larger mammal species have been re-introduced into the focus area. The proposed DMS stockpiles will have a negative impact on the TOPS listed large mammals, notably grazing species. The loss of habitat will result in the likely removal of larger mammal species in order to ensure that overutilisation of the remaining veld does not occur. This will result in a decreased food base for predatory species such as *Panthera pardus*. The proposed infrastructure sites within the Dwars River Valley, notably those along the slopes will impact upon the sensitive Sekhukhune Mountain Bushveld habitat, leading to habitat loss, decreased



food resources and increase inter and intraspecific species competition. The proposed south portal will necessitate the removal of stands of *Vitex obovata* subsp *wilmsii*, a known preferred food source of the Cicada species *Pycna silvia*. This may have a significant negative impact on the current population of this species in the Dwars River Valley, notably as the only individuals observed during the field assessment were located within the south portal.

4. SENSITIVITY MAPPING

The figures below conceptually illustrate the areas considered to be of increased faunal ecological sensitivity with the proposed infrastructure layout overlaid. 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. The table below presents the sensitivity of each area along with an associated conservation objective and implications for development.

Table 8: A summary of the sensitivity of each habitat unit and implications for development.

Habitat Unit	Sensitivity	Conservation Objective	Development Implications
Freshwater Habitat Unit	High	Conserve and enhance the biodiversity of the habitat unit, no-go alternative must be considered.	Any disturbance of sensitive faunal habitat and SCC must be actively avoided. In this regard, maintaining migratory corridors and connectivity in the wetland areas is deemed essential. Sensitive faunal habitat adjacent to the proposed development footprint areas must be designated as No-Go areas and no mining vehicles, personnel, or any other mining related activities are to encroach upon these areas.
Sekhukhune Mountain Bushveld Habitat Open Bushveld Habitat	Moderately High	Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance.	Development within these habitat units should be avoided as far as possible. Where development is unavoidable, the footprint areas are to remain as small as possible. Edge effects are to be actively managed and all mitigation measures actively employed.
Transformed Habitat	Intermediate	Conserve and enhance biodiversity of the habitat unit and surrounds while optimising development potential.	Any new development in this habitat unit should be limited, and the development footprint should be kept as small as possible. Care must be taken to limit edge effects on the surrounding natural areas.



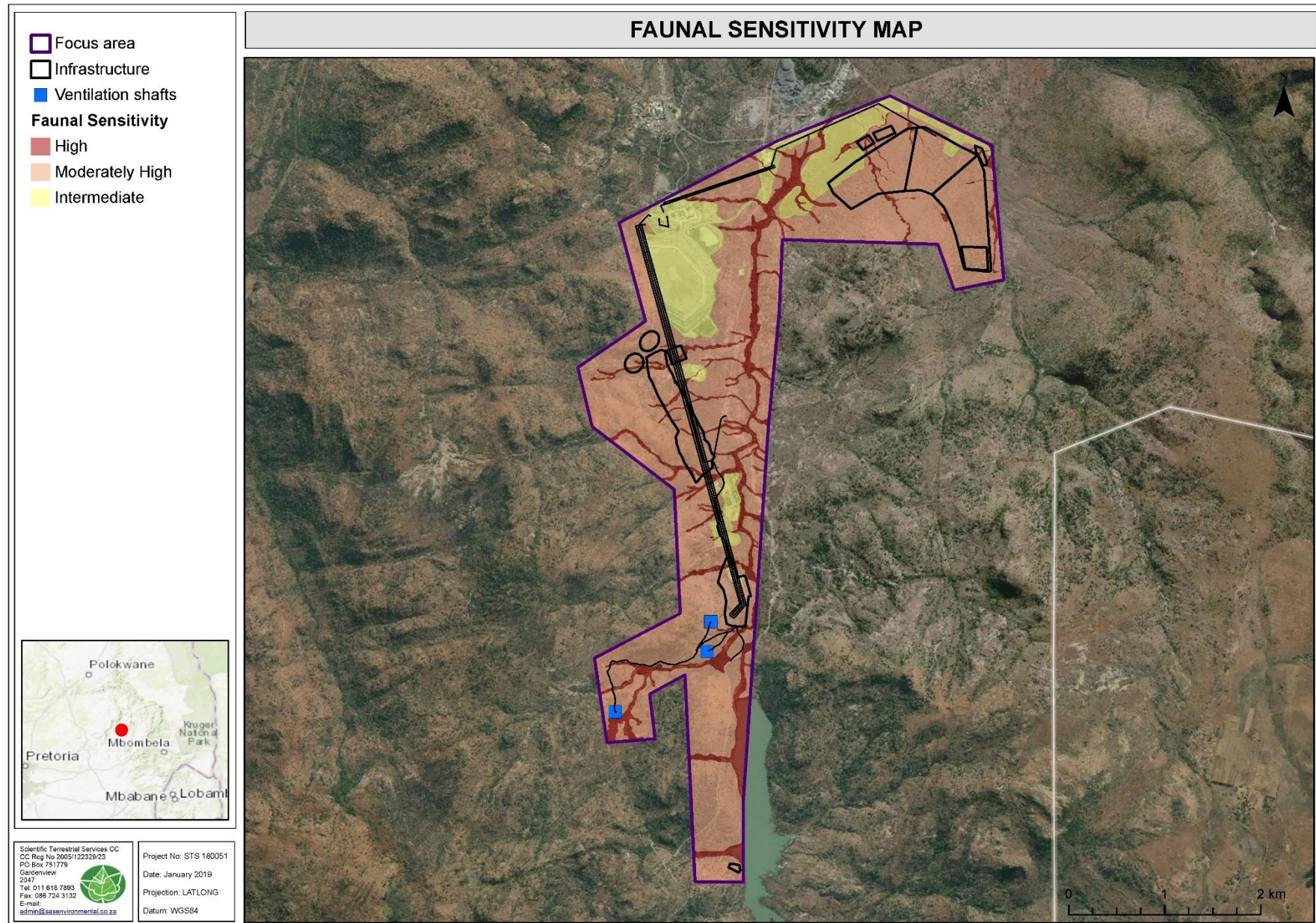


Figure 3: Sensitivity map for the focus area with the proposed mining related infrastructure.



5. IMPACT ASSESSMENT

The sections below serve to summarise the significance of perceived impacts on the faunal ecology of the focus area, with impacts identified presented in Section 6.2 of this report.

Table 9 in Section 6.2 below presents the impact assessment according to the method described in Appendix B of this report. All impacts are considered without mitigation taking place as well as with mitigation fully implemented. All the required mitigatory measures needed to minimise the impact is presented in Section 5.5.

5.1 Impact discussion

Placement of infrastructure and mining activities is likely to have a significant impact on faunal within the focus area (Loss of habitat, food resources and species abundance/diversity). Furthermore, the proposed mining layouts and activities are likely to impact a number of faunal SCC including *Panthera pardus* (Leopard), *Falco biarmicus* (Lanner Falcon), *Python natalensis* (African Python), *Homoroselaps dorsalis* (Striped Harlequin Snake) and *Pycna silvia* (Cicada). The region in which the focus area is located falls within the Sekhukhune centre of endemism and is considered to be a biodiversity rich area that has little to no conservation area. Continued mining and human population expansion has resulted in extensive areas of this habitat type being lost already. Currently there are very few areas remaining that can be considered representative of this vegetation type, of which the focus area is one of them and furthermore one of the most important.

Activities which are likely to negatively affect faunal species within focus area include, but are not limited to, the following:

- Placement of mining infrastructure within sensitive faunal habitat;
- Clearing of faunal habitat during construction and operational activities;
- Alien and invasive floral invasion and erosion in disturbed areas;
- Increased possibility of faunal species collision with vehicles and fence lines;
- Increased risk of poaching and trapping;
- Loss of niche habitat and food resources;

The following section provides an indication of the anticipated impact significance pre- and post-mitigation.



5.2 Results of the Impact Assessment

The impact significance of the proposed mining expansion plans associated with the loss of faunal species and habitat is considered to be moderate to high prior to the implementation of mitigation measures. Following the implementation of mitigation measures, it is likely that impacts can be decreased to a low to moderate significance levels.

The following table provides an indication of the anticipated impact significance pre- and post-mitigation.



Table 9: A summary of the Impact Assessment undertaken for the proposed 2018 Der Brochen Mining Expansion Plan.

Nature of the impact	Significance of potential impact BEFORE mitigation						Mitigation Measures	Significance of potential impact AFTER mitigation						degree of mitigation (%)			
	Probability	Duration	Extent	Magnitude	Loss of Resources (%)	Significance		Probability	Duration	Extent	Magnitude	Loss of Resources (%)	Significance				
Pre-Construction Phase																	
Potential poor planning may potentially result in: - Required mitigation measures not being implemented at commencement of construction; - Placement of infrastructure within sensitive habitat units and areas that will result in extensive impacts. To avoid failed rehabilitation attempts, it is recommended that mine infrastructure be placed in habitat that has a high probability to be successfully restored to pre-mining conditions. As such, rocky outcrops and intact grass slopes inhabited by species such as <i>Platysaurus orientalis fitzsimonsi</i> (Fitzsimon's Flat Lizard) and <i>Chamaesaura aenea</i> (Coppery Grass Lizard) should be excluded from mining activities as far possible as it is deemed highly unlikely that the micro and niche here-in can be recreated post-mining; -Placement of infrastructure within drainage lines will further result in greater linear impacts downstream due to increased sedimentation, habitat loss and the potential disruption of seasonal water flows and water retention leading to altered water resource provision to faunal species such as <i>Aonyx capensis</i> (Cape Clawless Otter) as well as the loss or disruption of breeding opportunities for amphibian species. Vegetation loss surrounding the drainage lines will also impact upon the cicada species <i>Pycna silvia</i> due to the potential clearing of the tree species <i>Vitex obovata</i> subsp. <i>wilmsii</i> which is often found in close association with drainage lines.	-	5	4	3	8	3	75	High	*Proposed Infrastructure areas must be optimised, ensuring that the layout footprint is as small as possible and does not encroach upon any sensitive habitat areas; *A rehabilitation plan for every phase of the mining project should be in development before any construction or mining activities commence with the detail on post construction rehabilitation being well defined while those of final closure can be limited to broader closure objectives and plans; *Regulated speed limits of 40km/h must be maintained on gravel roads to minimize dust generation.	2	4	1	6	2	22	Low	70,7



Construction Phase																	
<p>Clearing of faunal habitat and site preparation associated with the proposed surface infrastructure footprints, contractor laydown areas and construction of surface infrastructure. Here specific mention is made of:</p> <p>-Site clearing for the South portal (13,6 ha), along with construction of the south decline shaft;</p> <p>-Construction of DMS and Topsoil Stockpiles (total approximately 101 ha);</p> <p>-Construction of three up-cast ventilation shafts (each approximately 0,04 ha);</p> <p>-Construction of the DMS and Chrome Plants (<0,5 ha) close to the existing Mototolo Concentrator Plant;</p> <p>-Construction of DMS Pollution Control Dams PCD's, approximately 4 ha);</p> <p>-Construction of staff accommodation (0,6 ha).</p>	-	5	4	2	8	2	70	High	<p>*All footprint areas are to remain as small as possible and vegetation clearing must be limited to what is absolutely essential;</p> <p>*Mining surface infrastructure, including construction/ contractor's camps must be placed within transformed/impacted areas as far as possible. The footprint and daily operation of these structures must be strictly monitored to ensure that footprint creep and edge effects does not affect the surrounding sensitive faunal habitat;</p> <p>*Ensure that the ephemeral drainage lines, rocky outcrops and areas containing faunal SCC outside of the construction areas are demarcated as no-go zones for personnel and construction vehicles;</p> <p>*Implement an alien and invasive plant control plan;</p> <p>*Clearing of vegetation should take place in a phased manner so that faunal species are given the opportunity to naturally move off and relocate to the surrounding natural areas;</p> <p>*No indiscriminate driving through the veld is allowed. As far as possible vehicles are to utilise the existing roads. Where this is not feasible, new roads are to be located in areas of existing high disturbance, and not encroach upon sensitive habitats;</p> <p>*A species rescue and removal plan should be in place and acted upon should species and SCC be observed within construction footprints, notably if these species do not self-relocate naturally. Species such as the smaller less mobile and habitat specific species such as <i>Chrysospalax villosus</i>, <i>Hadogenes polytrichobothrius</i> and <i>Python natalensis</i>;</p> <p>*Edge effects of all construction activities which may affect faunal habitat within surrounding areas, are to be strictly managed;</p> <p>*Regulate speed limits to 40km/h along all gravel roads to limit dust generation;</p> <p>*Open fires are to be prohibited;</p> <p>*Fences and boundaries are to be patrolled regularly to locate and remove any snares and to note any signs of poacher incurrences;</p>	5	3	2	8	4	65	High	7,1
<p>These activities will lead to loss of sensitive faunal habitat and species, including faunal SCC such as <i>Platysaurus orientalis fitzsimonsi</i> (Fitzsimon's Flat Lizard), <i>Chamaesaura aenea</i> (Coppery Grass Lizard), <i>Aonyx capensis</i> (Cape Clawless Otter), <i>Pycna silvia</i>, <i>Panthera pardus</i> (Leopard), <i>Hyaena brunnea</i> (Brown Hyaena), <i>Leptailurus serval</i> (Serval), <i>Chrysospalax villosus</i> (Rough-haired Golden Mole), <i>Falco biarmicus</i> (Lanner Falcon), <i>Sagittarius serpentarius</i> (Secretary Bird), <i>Neotis denhami</i> (Denham's Bustard), <i>Hadogenes polytrichobothrius</i> (Flat Rock Scorpion), <i>Python natalensis</i> (African Python) and <i>Homoroselaps dorsalis</i> (Striped Harlequin Snake).</p>																	



Clearing and removal of vegetation associated with the planned linear infrastructure: -Construction/widening of access roads and haul roads; -Construction of the conveyor systems; Clearing of vegetation along proposed linear developments will lead to a loss of species, including SCC. Potential proliferation of alien and invasive plant species due to disturbance along roads will further result in the degradation of faunal habitat.	-	4	2	1	8	2	44	Moderate	*All footprint areas are to remain as small as possible and vegetation clearing must be limited to what is absolutely essential; *Implement an alien and invasive plant control plan; *Clearing of vegetation should take place in a phased manner so that faunal species are given the opportunity to naturally move off and relocate to the surrounding natural areas; *No indiscriminate movement of any vehicles through the veld is allowed. As far as possible vehicles are to utilise the existing roads. Where this is not feasible, new roads are to be located in areas of existing high disturbance, and not encroach upon sensitive habitats; *Edge effects of all construction activities which may affect faunal habitat within surrounding areas are to be strictly managed.	3	2	1	4	3	21	Low	52,3
Disposal of construction related waste material in the surrounding habitat will lead to additional habitat destruction and the loss of suitable habitat and food resources for faunal species.	-	4	2	1	6	2	36	Moderate	*All construction related waste and material is to be disposed of at a registered waste facility; *No waste or construction rubble is to be dumped in the drainage lines or surrounding habitats.	2	2	1	4	1	14	Low	61,1
Increased personnel on site leading to possible poaching and increased risk of uncontrolled fires	-	5	2	2	8	3	60	High	*Ensure that access control is well monitored and that no unauthorised personnel are able to move through the property unregulated; *Ensure that perimeter fences notably around the game/natural open space areas are monitored and maintained; *In areas of high game usage game paths should be checked for snares and other methods of trapping animals by poachers; *No uncontrolled or unsanctioned fires are allowed, unless for specified veld management purposes. In this regard it is recommended that a fire management plan be developed; *No hunting or trapping of faunal species is allowed, unless hunting is part of a permitted process on the property.	3	2	2	4	1	24	Low	60,0
Increased movement of vehicles within the proposed infrastructure areas as well as along the access roads. This will increase the risk of faunal species collisions with vehicles	-	5	2	1	8	2	55	Moderate	*Vehicles are to utilise the existing roads only; *Speed restrictions to be placed on all vehicles within the focus area to limit faunal and vehicle collisions; *Drivers to be educated about the presence and importance of faunal species and instructed to actively avoid of collisions with faunal species;	3	2	2	2	1	18	Low	67,3



Loss of faunal species abundance and diversity due to habitat clearing, habitat degradation and increased illegal hunting/trapping/poaching by mine personnel	-	5	4	2	8	3	70	High	*Ecological footprint of the proposed infrastructure areas are to be kept as small as possible. *Ensure that the drainage lines and sensitive rocky outcrops are demarcated as no go zones for personnel and mine vehicles; *No uncontrolled or unsanctioned fires are allowed, unless otherwise specified and planned for as per a fire management plan; *No hunting or trapping of faunal species is allowed, unless hunting is part of a permitted process on the property.	5	3	2	8	3	65	High	7,1
Loss of faunal SCC due to habitat loss, decreased food resources, pollution of water resources and illegal hunting/trapping/poaching by mine personnel	-	5	4	2	8	3	70	High	*Ecological footprint of the proposed infrastructure areas are to be kept as small a possible; *Ensure that the drainage lines and rocky outcrops are demarcated as no go zones for personnel and mine vehicles; *No uncontrolled or unsanctioned fires are allowed, unless otherwise specified and planned for as per a fire management plan; *No hunting or trapping of faunal species is allowed, unless hunting is part of a permitted process on the property.	4	4	2	6	3	48	Moderate	31,4
Operational Phase																	
Continued loss of faunal habitat as a result of continued vegetation clearing related to the DMS Stockpiles, Topsoil Stockpiles, Pollution Control Dams, Conveyors and additional access roads. Loss of faunal diversity and endemic species due to long-term habitat loss associated with the above-mentioned mining activities.	-	5	4	2	8	4	70	High	*Stockpile and PCD positions, and their expansion as material is deposited, should be kept as small as possible whilst also monitoring for edge effects and possible spills/leaks; *The current proposed positions of the DMS stockpiles and PCD's within the north-eastern portion of the focus area will lead to the loss of a large area of faunal habitat, including sensitive rocky outcrops, that are relied upon by species for food resources and habitat. The DMS stockpiles also traverse freshwater resources, which will lead to a decrease in available surface water for species. Consideration should be given to shifting the DMS areas further north within the more disturbed habitat; *As far as possible, mining activities and infrastructure should avoid the rocky outcrop areas. Where this is unavoidable (South portal) the overall operational footprint must be kept as small as possible; *The new proposed positions of the conveyor belts are closer to existing roads and transformed areas which will decrease their impact on faunal SCC and faunal habitat, however they are still likely to result in habitat fragmentation. The conveyors should be maintained regularly and frequently inspected for increased	3	4	1	4	1	27	Low	61,4
The conveyor system extends across the majority of the focus area and will lead to fragmentation of habitat, thereby altering faunal population dynamics and reducing species diversity.	-	5	4	2	8	4	70	High		3	4	1	4	1	27	Low	61,4



									disturbance along its path e.g. material spills, soil erosion or soil instability due to conveyor movements and rainfall, or the proliferation of alien and invasive species resulting from disturbance to the surrounding habitat; *Design of the conveyors should be such that the habitat is, as far possible, not fragmented. In this regard where possible the conveyors should be raised in sections such that larger mammals can pass under, however this will not be feasible for species such as <i>Giraffa camelopardalis</i> (Giraffe); *Edge effects of all construction activities which may affect faunal habitat within surrounding areas, are to be strictly managed; *Regulate speed limits to 40km/h along all gravel roads to limit dust generation; *Open fires are to be prohibited; *Fences and boundaries are to be patrolled regularly to locate and remove any snares and to note any signs of poacher incursions;								
Movement of vehicles between infrastructure areas leading to increased risk of faunal species collisions with vehicles.	-	4	4	2	6	2	48	Moderate	*Vehicles are to utilise the existing roads only; *Speed restrictions to be placed on all vehicles within the focus area to limit faunal and vehicle collisions; *Drivers to be educated about the presence and importance of faunal species and instructed to actively avoid of collisions with faunal species;	3	4	1	4	1	27	Low	43,8
Increased personnel on site leading to possible poaching and increased risk of uncontrolled fires	-	4	4	2	8	2	56	Moderate	*No indiscriminate driving through the veld is allowed. As far as possible vehicles are to utilise the existing roads. Where this is not feasible, new roads are to be located in areas of existing high disturbance, and not encroach upon sensitive habitats; *Ensure that the ecological footprint of the proposed infrastructure area is kept as small as possible, monitoring all edge effects and for footprint creep; *Educate mine personnel about the destructive nature of runaway fires and to frequent fires with regard to loss of habitat and species; *Ensure that the ephemeral drainage lines are demarcated as no go zones for personnel and mine vehicles; *No uncontrolled or unsanctioned fires are allowed; *No hunting or trapping of faunal species is allowed, unless hunting is part of a permitted process on the property.	3	4	1	4	1	27	Low	51,8



Increased ambient lighting will result in the attraction of insects and insectivorous predators. This may result in the increased risk of injury or mortality rates to such species either from collision with operational machinery and vehicles, or as a result of direct human conflict.	-	5	4	2	8	2	70	High	*Lighting pollution and its effect on fauna (with special mention of invertebrates, bats and avifauna) must be effectively mitigated with the following guidelines in mind and with due cognizance taken of health and safety requirements: *Downward facing lights must be installed and limited to absolutely essential areas; *Covers/light diffusers must be installed to lessen the intensity of illumination where possible; *Outside lights are to utilise bulbs of varying wave lengths that do not attract insects; *As far as possible unnecessary lighting should be avoided/switched off at night, leaving only that which is essential for continued mining operation on.	3	4	1	6	2	33	Moderate	52,9
Loss of habitat connectivity as a result of the PCD's and Conveyors	-	5	4	2	8	2	70	High	*DMS stockpile positions and their expansion as material is deposited should not limit habitat connectivity and faunal species movement; *The conveyor belts will result in the loss of habitat connectivity and restrict the movement of larger faunal species. Consideration needs to be given incorporating new designs that will enable larger faunal species to cross either under or over the conveyor belts.	4	3	1	6	2	40	Moderate	42,9
Further loss of faunal SCC through niche habitat and food resource destruction	-	4	4	2	8	2	56	Moderate	*Ecological footprint of the proposed infrastructure areas are to be kept as small as possible. *Ensure that the drainage lines are demarcated as no go zones for personnel and mine vehicles; *No uncontrolled or unsanctioned fires are allowed. In this regard it is recommended that a fire management plan be developed for the Der Brochen property; *No hunting or trapping of faunal species is allowed, unless hunting is part of a permitted process on the property.	2	3	1	4	1	16	Low	71,4
Further loss of faunal habitat and species as a result of edge effects and operational footprint creep	-	4	4	2	8	2	56	Moderate	*Manage all edge effects stemming from mining operations and infrastructure areas; *Monitor all operations for footprint creep into the surrounding natural areas, this will lead to larger impact footprint as well as the spread of edge effects; *Implement erosion control measures where necessary to ensure that further habitat loss does not occur, and minimise downslope habitat and water resource siltation; *Any waste or toxic spills from vehicles or mining infrastructure must be dealt with immediately in accordance with the waste management plan.	2	3	1	4	1	16	Low	71,4
Alien plant proliferation within disturbed areas	-	5	5	2	8	2	75	High	*Implement an alien plant control plan throughout the operational phase of the mine.	3	4	1	6	2	33	Moderate	56,0



Closure/Rehabilitation Phase																	
<p>Decommissioning/ removal of surface infrastructure:</p> <p>-Failure to implement and manage rehabilitation plan leading continued faunal habitat loss and limited habitat and species diversity re-instatement post mining activities;</p> <p>-Compacted soils limiting the re-establishment of natural vegetation limiting the re-establishment of faunal habitat and species diversity;</p> <p>-Increased risk of erosion in disturbed areas leading to further habitat loss;</p> <p>-Proliferation of alien and invasive plant species leading to ongoing faunal habitat and species loss;</p> <p>-Improper rehabilitation of disturbed areas leading to permanent faunal habitat and species diversity loss;</p> <p>The above impacts and failures in terms of closure activities will lead to long term habitat loss, species diversity alteration and whilst limiting the likelihood of faunal species recolonising the disturbed areas post mining.</p>	-	5	5	2	8	2	75	High	<p>*Ensure sound implementation of alien and invasive plant control plan;</p> <p>*Where soils have been compacted that are to be ripped and where necessary reprofiled;</p> <p>*Indigenous grass species are to be used for revegetation of disturbed areas ;</p> <p>*Where necessary hessian sheets (or similar products) are to be used in order to stabilise the soil surface until revegetation has occurred;</p> <p>*Erosion mitigation measures are to be implemented to mitigate downslope sedimentation of freshwater resources and the hindrance of revegetation/ rehabilitation activities;</p> <p>*All surface infrastructure is to be removed and waste material disposed of at a registered dump site. Waste and remnant mine related material is not to be dumped or left within the focus area.</p>	3	3	1	4	1	24	Low	68,0
<p>Failure to adequately rehabilitate the DMS stockpiles leading to the permanent loss of the faunal habitat that existed in the footprint area pre-mining leading to the continued exclusion of faunal species from the footprint area. Worst case scenario would be the creation of a sterile environment on the DMS stockpiles.</p>	-	5	5	2	8	2	75	High	<p>*Ensure sound implementation of alien and invasive plant control plan;</p> <p>*Indigenous grass species are to be used for revegetation of disturbed areas ;</p> <p>*Where necessary hessian sheets (or similar products) are to be used in order to stabilise the soil surface until revegetation has occurred;</p> <p>*Erosion mitigation measures are to be implemented to mitigate downslope sedimentation of freshwater resources and the hindrance of revegetation/ rehabilitation activities;</p> <p>*Should removal of the DMS stockpiles not viable, they are to be sloped and revegetated in accordance with the surrounding topography and vegetation type;</p> <p>*Rehabilitation plans for the DMS stockpiles must focus on replacing and recreating the habitat originally lost pre-mining;</p> <p>*Re-vegetation must aim to provide habitat and viable food resources to faunal species within the focus area.</p>	5	5	2	4	2	55	Moderate	26,7



Post-Closure Phase																	
Post-rehabilitation: Potentially ineffective or poorly designed rehabilitation efforts will result in ongoing erosion, habitat loss, alien plant proliferation and the loss of faunal species diversity.	-	5	5	3	8	2	80	High	*Continue monitoring of rehabilitation activities for a minimum period of 5 years following the mine closure or until an acceptable level of habitat and biodiversity re-instatement has occurred, in such a way as to ensure that natural processes and veld succession will lead to the re-establishment of the natural wilderness conditions which are analogous to the pre-mining conditions of the area; *Implement all recommendations as per the mine closure plan; *Follow up with alien and invasive plant control measures for a period of 5 years post-closure.	3	3	1	4	1	24	Low	70,0
Removal of all mining related infrastructure and implementation of the rehabilitation plan in conjunction with the continued control of alien plant species leading to the re-instatement of faunal habitat to a suitable similar degree to that of pre-mining activities. Such rehabilitation will ensure the re-colonisation of the disturbed areas by faunal species, although it is unlikely that the faunal species composition will be identical to that of pre-mining activities.	+	1	5	2	2	5	9	Low	*Continue monitoring of rehabilitation activities for a minimum period of 5 years; *The soil fertility status should be determined by soil chemical analysis after levelling (before seeding/re-vegetation). Soil amelioration should be done according to the soil analyses as recommended by a soil specialist, in order to correct the pH and nutrition status before revegetation; *Undertake inspection of rehabilitated area to ascertain level of success of rehabilitation efforts and effectiveness; *Implement all mine closure and rehabilitation plans.	4	3	3	8	2	56	Moderate	-522.2



5.3 Faunal Impact Mitigation

Based on the findings of the faunal ecological impact assessment as above, impacts relating to the various phases of the mine will impact upon the faunal habitat and species diversity and abundance of the Der Brochen property, as well as the larger Dwarsrivier valley. With this in mind, mitigation measures have been recommended in order to minimise these impacts as far as possible, managing impacts and ensuring that the habitat integrity is not completely lost. In this regard, prior to the implementation of mitigation measures, the perceived impacts associated with the proposed mining activities are of a moderate to high significance. Following the implementation of mitigation measures, the perceived impacts can be reduced to low and moderate significance levels.

5.4 Probable Latent Impacts

Even with extensive mitigation, significant latent impacts on the receiving faunal ecological environment are deemed highly likely. The following points highlight the key latent impacts that have been identified for the focus area:

- Loss of ecologically intact, irreplaceable faunal habitat;
- Permanent loss of sensitive faunal habitat (notably the rocky outcrops);
- Loss of, or impairment of and altered faunal species diversity;
- Loss of, or impairment of faunal SCC and niche habitat; and
- Disturbed areas are highly unlikely to be rehabilitated to baseline levels of ecological functioning and significant loss of faunal habitat, species diversity and faunal SCC will most likely be permanent.

5.5 Cumulative Impacts

The Anglo Platinum Der Brochen project is located within an area which is under increasing pressure from mining activities. The focus area is predominantly located within the Sekhukhune Mountain Bushveld Habitat and located within the Sekhukhune centre of endemism. Significant habitat loss has already occurred within this centre of endemism, largely attributable to the expansion of local communities and mines and associated mining exploration. Currently the focus area, due to the increased level of protection afforded to it as a result of Anglo Platinum managing the land, is considered to be largely intact with representative vegetation types associated with the Sekhukhune centre of endemism. As such, the overall species diversity and abundance of the focus area is a stark contrast to that of the surrounding area. Mining activities within the focus area will add to the cumulative loss of habitat, species abundance and species diversity currently being experienced. The south shaft footprint, conveyor servitude, DMS stockpiles and associated



PCD's will result in the long term loss of habitat and species in the region, which, when combined with the losses associated with the current proposed opencast mining and waste rock dumps will lead to a significant cumulative loss of habitat, species diversity and species abundance in the focus area as well as the surrounding landscapes. The loss of breeding areas and breeding individuals will further impact upon regional population numbers. This is of significant importance with respect to the endemic cicada species *Pycna sylvia*, currently only known to occur in the Dwars River Valley system.

5.6 Faunal Monitoring

A faunal monitoring plan must be designed and implemented throughout all phases of mining construction and operation provided that the mining plans are to be approved. The following points aim to guide the design of the monitoring plan. It must be noted that the monitoring plan must be continually updated and refined for site-specific requirements:

- Permanent monitoring points must be established in areas surrounding the surface infrastructure. These points must be designed to accurately monitor the following parameters:
 - Species diversity (mammal, invertebrate, amphibian, reptile and avifaunal);
 - Species abundance; and
 - Faunal community structure including species composition and diversity, which should be compared to pre-development conditions;
- The following methods aim to guide the monitoring plan, although more detailed, site specific methods must be employed during the development and implementation of the monitoring plan:
 - Monitoring activities must take place on an annual basis as a minimum, but on a bi-annual basis ideally, one winter and one summer monitoring session;
 - Annual walk down of all water sources within a radius of 1km of infrastructure areas should be done, as the water course will be used as migratory corridors by faunal species. All spoor, scat and signs of faunal species occurrence must be identified and recorded; and
 - Sherman traps must be installed to monitor small mammal diversity;
 - Camera trap surveys should be conducted on a bi-annual basis, a winter and a summer trapping survey, for medium to large mammals, as well as cryptic and nocturnal species;
- The following criteria must be used with regards to the avifaunal monitoring:



- Fixed and random points for bird counts to determine species composition and diversity trends. At these points, the observer must record all avifaunal species and total of species observed at the point. A Bird Laser app that can be downloaded onto a smartphone can assist with record keeping, all necessary information can be captured; and
 - Proposed avifaunal fixed-point monitoring must be monitored bi-annually (July and February) in order to record summer as well as winter avifaunal species utilising the focus area.
- The results of the monitoring activities must be considered during all phases of the proposed mining development and action must be taken to mitigate impacts as soon as the negative effects from mining related activities become apparent; and
- The method of monitoring must be designed to be subjective and repeatable in order to ensure consistent results.



6. CONCLUSION

Scientific Terrestrial Services (STS) was appointed to conduct a floral and faunal ecological assessment as part of the Environmental Impact Assessment (EIA) and authorisation process for the proposed Anglo Platinum Der Brochen Expansion Project, Limpopo Province. An area encompassing all the various expansion areas associated with the Anglo Platinum Der Brochen Mine was used to gather all background information that might be relevant to the project, and will hence forth be referred to as the “focus area”. Faunal habitat within the focus area has been divided into four habitat units namely, Sekhukhune Mountain Bushveld, Open Bushveld, Freshwater Habitat and Transformed Habitat. Although the focus area has been subjected to varying degrees of isolated anthropogenic activities, it remains intact, providing an abundance and diversity of habitat to faunal species. The focus is considered to have a moderately-high to high species diversity and abundance largely due to the varying and extensive habitat found within the valley. Furthermore, the focus area is considered important for the continued survival and conservation of several faunal SCC, with a number of these species being endemic and restricted to the region/ habitat types.

The perceived impact significance of the proposed mining activities prior to mitigation affecting faunal habitat, diversity and SCC are moderate to high significance impacts. If effective mitigation takes place, all impacts may be reduced to a low or moderate significance rating. It is thus deemed essential that a cogently developed, documented and managed biodiversity management plan be implemented and maintained throughout the life of the proposed mine

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. The needs for conservation as well as the risks to other spheres of the physical and socio-cultural environment need to compare and considered along with the need to ensure economic development of the country.

It is the opinion of the ecologists 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 focus 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 human habitation nearby the focus area and the associated anthropogenic activities may have an impact on faunal behaviour and in turn the rate of observations. In order to increase overall observation time within the focus area, as well as increasing the likelihood of observing shy and hesitant species, camera traps were strategically placed within the focus area. Sherman traps were also used to increase the likelihood of capturing and observing small mammal species, notably small nocturnal mammals.

Mammals

Small mammals are unlikely to be directly observed in the field because of their nocturnal/crepuscular and cryptic nature. A simple and effective solution to this problem is to use Sherman traps. A Sherman trap is a small aluminium box with a spring-loaded door (Figure B1). Once the animal is inside the trap, it steps on a small plate that causes the door to snap shut, thereby capturing the individual. In the event of capturing a small mammal during the night, the animal would be photographed and then set free unharmed early the following morning. Traps were baited with a universal mixture of oats, peanut butter, and fish paste.



Figure A1: Sherman trap and bait used to capture and identify small mammal species.

Motion sensitive infrared camera traps were used to capture medium to large mammal species (Figure B). These cameras were placed along trails and near suitable habitat areas and left for the full duration of the field site visit.



Figure A2: Field cameras used to document medium to large mammal species.

Medium to large mammal species were recorded during the field assessment with the use of visual identification, spoor, call and dung. Specific attention was given to mammal SCC listed on a regional and national level, as well as those identified by the International Union for the Conservation of Nature (IUCN).

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 on the focus area. Field surveys were undertaken utilising a pair of Bushnell 10x50 binoculars and bird call identification techniques were utilised during the assessment 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 International Union for the Conservation of Nature (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 focus area. Specific attention was given to reptile SCC listed on a regional and national level, as well as those identified by the International Union for the Conservation of Nature (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 focus 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 International Union for the Conservation of Nature (IUCN).

Invertebrates

Whilst conducting transects through the focus area, all insect species visually observed were identified, and where possible photographs taken. Furthermore, at suitable and open sites within the focus area sweep netting was conducted, and all the insects captured identified. Due to the terrain, and shallow/rocky soil structure pitfall traps were not utilised during the site assessment.

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 focus area at the time of survey. Specific attention was given to insect SCC listed on a regional and national level, as well as those identified by the International Union for the Conservation of Nature (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 within the focus area



Faunal Species of Conservation Concern Assessment

The Probability of Occurrence (POC) for each faunal SCC was determined using the following four parameters:

- Species distribution;
- Habitat availability;
- Food availability; and
- Habitat disturbance.

The accuracy of the calculation is based on the available knowledge about the species in question. Therefore, it is important that the literature available is also considered during the calculation.

Each factor contributes an equal value to the calculation.

Scoring Guideline				
Habitat availability				
No Habitat	Very low	Low	Moderate	High
1	2	3	4	5
Food availability				
No food available	Very low	Low	Moderate	High
1	2	3	4	5
Habitat disturbance				
Very High	High	Moderate	Low	Very Low
1	2	3	4	5
Distribution/Range				
Not Recorded		Historically Recorded		Recently Recorded
1		3		5

$[\text{Habitat availability} + \text{Food availability} + \text{Habitat disturbance} + \text{Distribution/Range}] / 20 \times 100 = \text{POC}\%$

Faunal Habitat Sensitivity

The sensitivity of the focus 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 focus 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 focus 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 focus 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 focus 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> and <2	Low	Optimise development potential.
2> and <3	Moderately low	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.
3> and <4	Intermediate	Preserve and enhance biodiversity of the habitat unit and surrounds while optimising development potential.
4> and <5	Moderately high	Preserve and enhance the biodiversity of the habitat unit limit development and disturbance.
5	High	Preserve and enhance the biodiversity of the habitat unit, no-go alternative must be considered.



APPENDIX B: Impact Assessment Methodology

In order for the EAP to allow for sufficient consideration of all environmental impacts, impacts were assessed using a common, defensible method of assessing significance that will enable comparisons to be made between risks/impacts and will enable authorities, stakeholders and the client to understand the process and rationale upon which risks/impacts have been assessed. The method to be used for assessing risks/impacts is outlined in the sections below.

Impact Assessment Methodology

The anticipated impacts associated with the proposed project have been assessed according to SRK's standardised impact assessment methodology which is presented below. This methodology has been formalised to comply with Regulation 31(2) (I) of the National Environmental Management Act (Act 107 of 1998) (NEMA), which states the following:

"An environmental impact assessment report must contain all information that is necessary for the competent authority to consider the application and to reach a decision, and must include;

- I. An assessment of each identified potentially significant impact, including:
 - a. Cumulative impacts;
 - b. The nature of the impact;
 - c. The extent and duration of the impact;
 - d. The probability of the impact occurring;
 - e. The degree to which the impact can be reversed;
 - f. The degree to which the impact may cause irreplaceable loss of resources; and
 - g. The degree to which the impact can be mitigated."

Based on the above, the EIA Methodology will require that each potential impact identified is clearly described (providing the nature of the impact) and be assessed in terms of the following factors:

- **Extent** (spatial scale) - will the impact affect the national, regional or local environment, or only that of the site;
- **Duration** (temporal scale) - how long will the impact last;
- **Magnitude** (severity) - will the impact be of high, moderate or low severity; and
- **Probability** (likelihood of occurring) - how likely is it that the impact may occur.



To enable a scientific approach for the determination of the environmental significance (importance) of each identified potential impact, a numerical value has been linked to each factor.

The following ranking scales are applicable:

Occurrence	Duration:	Probability:
	5 – Permanent	5 – Definite/don't know
	4 – Long-term (ceases with the operational life)	4 – Highly probable
	3 – Medium-term (5-15 years)	3 – Medium probability
	2 – Short-term (0-5 years)	2 – Low probability
	1 – Immediate	1 – Improbable
Severity		0 – None
	Extent/scale:	Magnitude:
	5 – International	10 – Very high/uncertain
	4 – National	8 – High
	3 – Regional	6 – Moderate
	2 – Local	4 – Low
	1 – Site only	2 – Minor
	0 – None	

Once the above factors had been ranked for each identified potential impact, the environmental significance of each impact can be calculated using the following formula:

$$\text{Significance} = (\text{duration} + \text{extent} + \text{magnitude}) \times \text{probability}$$

The maximum value that can be calculated for the environmental significance of any impact is 100.

The environmental significance of any identified potential impact is then rated as either: high, moderate or low on the following basis:

- More than 60 significance value indicates a high (H) environmental significance impact;
- Between 30 and 60 significance value indicates a moderate (M) environmental significance impact; and
- Less than 30 significance value indicates a low (L) environmental significance impact.

In order to assess the degree to which the potential impact can be reversed, and be mitigated, each identified potential impact will need to be assessed twice;

- Firstly, the potential impact will be assessed and rated prior to implementing any mitigation and management measures; and



- Secondly, the potential impact will be assessed and rated after the proposed mitigation and management measures have been implemented.

The purpose of this dual rating of the impact before and after mitigation is to indicate that the significance rating of the initial impact is and should be higher in relation to the significance of the impact after mitigation measures have been implemented.

In order to assess the degree to which the potential impact can cause irreplaceable loss of resources, the following classes (%) will be used and will need to be selected based on your informed decision and discretion:

- 5 100% - Permanent loss
- 4 75% - 99% - significant loss
- 3 50% - 74% - moderate loss
- 2 25% - 49% - minor loss
- 1 0% - 24% - limited loss

Please note that the Loss of Resources aspect will not affect the overall significance rating of the impact.

In terms of assessing the cumulative impacts, it must be addressed in a sentence/paragraph fashion as the spatial extent of the cumulative impacts will vary from project to project.

Cumulative impact, in relation to an activity, means the impact of an activity that in itself may not be significant, but may become significant when added to the existing or potential impacts eventuating from similar or diverse activities or undertakings in the area.



APPENDIX C: Faunal SCC

Faunal Species of Conservation Concern

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

Scientific name	Common Name	Limpopo SoER 2004 Status	IUCN Red List Status 2015
<i>Diceros bicornis</i>	Black Rhinoceros	CR	CR
<i>Neamblysomus julianae</i>	Juliana's golden mole	CR	VU
<i>Loxodonta africana</i>	African elephant	VU	VU
<i>Lycaon pictus</i>	African wild dog	EN	EN
<i>Amblysomus gunningi</i>	Gunning's golden mole	VU	EN
<i>Lutra maculicollis</i>	Spotted-necked otter	VU	LC
<i>Acinonyx jubatus</i>	Cheetah	VU	VU
<i>Felis lybica</i>	African Wild Cat	VU	NYBA
<i>Panthera leo</i>	Lion	VU	VU
<i>Ceratotherium simum</i>	White rhinoceros	NT	NT

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

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

Scientific name	Common Name	Limpopo SoER 2004 Status	IUCN Red List Status 2015
<i>Gyps coprotheres</i>	Cape Vulture	T	VU
<i>Ciconia nigra</i>	Black Stork	T	LC
<i>Falco naumanni</i>	Lesser Kestrel	T	LC
<i>Certhilauda chuana</i>	Short-clawed Lark	T	LC
<i>Pterocles gutturalis</i>	Yellow throated Sandgrouse	T	LC
<i>Anthropoides paradiseus</i>	Blue Crane	T	VU
<i>Gyps africanus</i>	White backed Vultures	T	EN
<i>Ardeotis kori</i>	Kori Bustard	T	LC
<i>Scotopelia peli</i>	Pel's Fishing Owl	T	LC
<i>Bucorvus leadbeateri</i>	Southern Ground Hornbill	T	VU
<i>Buphagus erythrorhynchus</i>	Red-billed Oxpecker	T	LC
<i>Terathopius ecaudatus</i>	Bateleur	T	NT
<i>Polemaetus bellicosus</i>	Martial Eagle	T	NT
<i>Aquila rapax</i>	Tawny Eagle	T	LC
<i>Torgos tracheliotos</i>	Lappet faced Vulture	T	VU
<i>Trigonoceps occipitalis</i>	White headed Vulture	T	VU
<i>Buphagus africanus</i>	Yellow billed Oxpecker	T	LC
<i>Stephanoaetus coronatus</i>	Crowned hawk Eagle	T	NT

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.



Table B3: 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 2015
<i>Breviceps sylvestris</i>	Transvaal forest rain frog	VU	EN
<i>Ptychadena uzungwensis</i>		P	LC
<i>Leptopelis bocagii</i>		P	LC
<i>Hemiscus guineensis</i>	Guinea Snout-burrower	P	LC

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 Reptile species listed in the Limpopo SoER 2004 report including IUCN status.

Scientific name	Common Name	Limpopo SoER 2004 Status	IUCN Red List Status 2015
<i>Homoroselaps dorsalis</i>	Striped Harlequin snake	R	NT
<i>Xenocalamus transvaalensis</i>	Transvaal Quill-snout snake	R	DD
<i>Lamprophis swazicus</i>	Swazi Rock Snake	R	NT
<i>Python natalensis</i>	African Python	VU	NYBA
<i>Lygodactylus methueni</i>	Methuen's Dwarf Gecko	VU	VU
<i>Crocodylus niloticus</i>	Nile Crocodile	VU	LC
<i>Lycophidion variegatum</i>	Variegated Wolf snake	P	NYBA
<i>Psammophis jallae</i>	Jalla's Sand snake	P	NYBA

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 B5: Red Data Invertebrates species mentioned in the Limpopo SoER 2004 report including IUCN status.

Scientific name	Common Name	Limpopo SoER 2004 Status	IUCN Red List Status 2015
<i>Taurhina splendens</i>	Splendid fruit chafer *	T	NYBA
<i>Charaxes marieps</i>	Marieps Charaxes butterfly *	T	NYBA
<i>Trichostetha fascicularis</i>	Protea beetle *	T	NYBA
<i>Ischnestoma ficqui</i>	Fruit eating beetles *	T	NYBA

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).

South African Bird Atlas Project 2 list

Avifaunal Species for the pentad 2500_3005 within the QDS 2530AA

http://sabap2.adu.org.za/pentad_info.php?pentad=2500_3005#menu_top



APPENDIX D: Observed Faunal Species

Table D1: Mammal species recorded during the field assessment.

Scientific Name	Common Name	IUCN Status
<i>Tragelaphus strepsiceros</i>	Kudu	LC
<i>Hystrix africaeaustralis</i>	Cape Porcupine	LC
<i>Hyaena brunnea</i>	Brown hyaena	NT
<i>Herpestes sanguinea</i>	Slender Mongoose	NYBA
<i>Equus quagga</i>	Plains Zebra	LC
<i>Sylvicapra grimmia</i>	Grey Duiker	LC
<i>Atilax paludinosus</i>	Water Mongoose	LC
<i>Raphicerus campestris</i>	Steenbok	LC
<i>Kobus ellipsiprymnus</i>	Waterbuck	LC
<i>Papio hamadryas ursinus</i>	Chacma Baboon	LC
<i>Alcelaphus buselaphus</i>	Red Hartebeest	LC
<i>Aethomys namaquensis</i>	Namaqua Rock Mouse	LC
<i>Phacochoerus africanus</i>	Warthog	LC
<i>Aepyceros melampus</i>	Impala	LC
<i>Tragelaphus oryx</i>	Eland	LC
<i>Connochaetes taurinus</i>	Blue Wildebeest	LC
<i>Lepus saxatilis</i>	Scrub Hare	LC
<i>Giraffa camelopardalis</i>	Giraffe	LC

LC – Least Concern, NYBA – Not Yet Been Assessed

Table D2: Avifaunal species recorded during the survey, with SCC indicated in bold.

Scientific name	English name	IUCN Status
<i>Apalis thoracica</i>	Bar-throated Apalis	LC
<i>Upupa africana</i>	African Hoopoe	LC
<i>Motacilla alba</i>	African Pied Wagtail	LC
<i>Ortygospiza fuscocrissa</i>	African Quail-finch	LC
<i>Pycnonotus nigricans</i>	African Red-eyed Bulbul	LC
<i>Threskiornis aethiopicus</i>	African Sacred Ibis	LC
<i>Saxicola torquatus</i>	African Stonechat	LC
<i>Myrmecocichla formicivora</i>	Ant-eating Chat	LC
<i>Ardea melanocephala</i>	Black-headed Heron	LC
<i>Elanus caeruleus</i>	Black-shouldered Kite	LC
<i>Vanellus armatus</i>	Blacksmith Lapwing	LC
<i>Batis molitor</i>	Chin-spot Batis	LC
<i>Passer melanurus</i>	Cape Sparrow	LC
<i>Merops pusillus</i>	Little Bee-eater	LC
<i>Streptopelia capicola</i>	Cape Turtle Dove	LC
<i>Motacilla capensis</i>	Cape Wagtail	LC
<i>Pycnonotus tricolor</i>	Dark-capped Bulbul	LC
<i>Lanius collaris</i>	Common Fiscal	LC
<i>Emberiza tahapisi</i>	Cinnamon-breasted Bunting	LC
<i>Estrilda astrild</i>	Common Waxbill	LC



Scientific name	English name	IUCN Status
<i>Emberiza flaviventris</i>	Golden-breasted Bunting	LC
<i>Malaconotus blanchoti</i>	Grey-headed Bush-shrike	LC
<i>Crithagra mozambicus</i>	Yellow-fronted Canary	LC
<i>Scopus umbretta</i>	Hamerkop	LC
<i>Numida meleagris</i>	Helmeted Guineafowl	LC
<i>Cercomela familiaris</i>	Familiar Chat	LC
<i>Passer domesticus</i>	House Sparrow	LC
<i>Streptopelia senegalensis</i>	Laughing Dove	LC
<i>Cisticola tinniens</i>	Levaillant's Cisticola	LC
<i>Apus affinis</i>	Little Swift	LC
<i>Corvus albus</i>	Pied Crow	LC
<i>Dicrurus adsimilis</i>	Fork-tailed Drongo	LC
<i>Cisticola fulvicapilla</i>	Neddicky	LC
<i>Corvus albus</i>	Pied Crow	LC
<i>Streptopelia semitorquata</i>	Red-eyed Dove	LC
<i>Lanius collaris</i>	Common Fiscal	LC
<i>Corythaixoides concolor</i>	Grey Go-away Bird	LC
<i>Phalacrocorax africanus</i>	Reed Cormorant	LC
<i>Oriolus larvatus</i>	Black-headed Oriole	LC
<i>Ploceus velatus</i>	Southern Masked Weaver	LC
<i>Ploceus cucullatus</i>	Village Weaver	LC
<i>Euplectes orix</i>	Southern Red Bishop	LC
<i>Colius striatus</i>	Speckled Mousebird	LC
<i>Burhinus capensis</i>	Spotted Thick-knee	LC
<i>Prinia subflava</i>	Tawny-flanked Prinia,	LC
<i>Chrysococcyx caprius</i>	Diederik Cuckoo	LC
<i>Pternistis swainsonii</i>	Swainson's Spurfowl	LC
<i>Prinia subflava</i>	Tawny-flanked Prinia	LC
<i>Bubulcus ibis</i>	Western Cattle Egret	LC
<i>Lamprolornis nitens</i>	Cape Glossy Starling	LC
<i>Cinnyris talatala</i>	White-bellied Sunbird	LC
<i>Indicator</i>	Greater Honeyguide	LC
<i>Crithagra gularis</i>	Streaky-headed Seedeater	LC
<i>Psophocichla litsipsirupa</i>	Groundscraper Thrush	LC
<i>Buteo vulpinus</i>	Steppe Buzzard	LC
<i>Cossypha humeralis</i>	White-throated Robin-chat	LC
<i>Gallirex porphyreolophus</i>	Purple-crested Turaco	LC
<i>Anas undulata</i>	Yellow-billed Duck	LC

End = Endemic, N-End Near-endemic, br = Breeding, CR = Critically Endangered, EN = Endangered, LC = Least Concern, NT = Near Threatened, VU = Vulnerable



Table D3: Reptile species recorded during the field assessment.

Scientific name	Common Name	IUCN Status
<i>Panaspis maculicollis</i>	Spotted-neck Snake-eyed Skink	LC
<i>Trachylepis striata</i>	Eastern Striped Skink	LC
<i>Trachylepis margaritifer</i>	Rainbow Skink	LC
<i>Stigmochelys pardalis</i>	Leopard Tortoise	LC
<i>Trachylepis punctatissima</i>	Speckled Rock Skink	LC
<i>Platysaurus orientalis orientalis</i>	Sekukhune Flat Lizard	LC
<i>Naja mossambica</i>	Mozambique Spitting Cobra	LC

LC = Least Concern, NYBA = Not Yet Been Assessed

Table D4: Results from invertebrate collecting during the assessment of the focus area.

Scientific Name	Common Name	IUCN Status
<i>Eurema brigitta</i>	Broad-bordered Grass Yellow	NYBA
<i>Pycna silvia</i>	Cicada	Region Endemic
<i>Belenois aurota</i>	Brown-veined White	NYBA
<i>Junonia hierta</i>	Yellow Pansy	LC
<i>Cyligramma latona</i>	Cream-striped Owl	LC
<i>Crocothemis sanguinolenta</i>	Small Scarlet	LC
<i>Musca domestica</i>	House Fly	NYBA
<i>Kheper nigroaeneus</i>	Large Copper Dung Beetle	NYBA
<i>Catantops humeralis</i>	N/A	NYBA
<i>Odaleus</i> sp.	N/A	NYBA
<i>Rhachitopsis</i> sp.	N/A	NYBA
<i>Anoplolepis custodiens</i>	Pugnacious Ant	NYBA
<i>Gryllus bimaculatus</i>	Common Garden Cricket	NYBA
<i>Lampetis amaurotica</i>	Eyed Jewel Beetle	NYBA
<i>Anomalipus elephas</i>	Large Armoured Darkling Beetle	NYBA
<i>Mylabris oculata</i>	CMR Bean Beetle	NYBA
<i>Junonia hierta</i>	Yellow Pansy	LC
<i>Heteracris</i> sp	N/A	NYBA
<i>Gegenes pumilio gambica</i>	Dark Hottentot Skipper	NYBA
<i>Trithemis stictica</i>	Jaunting Dropwing	LC
<i>Trithemis kirbyi</i>	Kirby's Dropwing	LC
<i>Lepidochrysops plebeia plebeia</i>	Twin-spot Blue	LC
<i>Garreta</i> sp	Dung Beetle	NYBA
<i>Linepithema humile</i>	Argentine Ant	NYBA
<i>Danaus chrysippus</i>	African Monarch	LC
<i>Pselaphelia flavivitta</i>	Leaf Emperor	LC
<i>Deudorix antalus</i>	Brown Playboy	LC
<i>Phalanta phalantha</i>	Common Leopard	LC
Asopinae (Subfamily)	Predatory Stink Bugs	NYBA
<i>Papilio nireus</i>	Green-banded Swallowtail	LC
<i>Colotis euippe</i>	Smokey Orange Tip	LC
<i>Acrida acuminata</i>	Common Stick Grasshopper	NYBA
<i>Junonia Octavia</i>	Gaudy Commodore	LC
<i>Byblia ilythia</i>	Spotted Joker	LC



Scientific Name	Common Name	IUCN Status
<i>Papilio demodocus</i>	Citrus Swallowtail	LC
<i>Hamanumida Daedalus</i>	Guinea Fowl	LC
<i>Gastrimargus</i> sp	N/A	NYBA
<i>Lycus trabeatus</i>	Tailed Net-winged Beetle	NYBA
<i>Catopsilia florella</i>	African Migrant	LC
<i>Rachitopis</i> sp	N/A	NYBA
<i>Chlorocala</i> sp	Fruit Chafer	NYBA
<i>Pontia helice</i>	Meadow White	LC
<i>Paternympha loxophthalma</i>	Big-eye Brown	LC

LC = Least Concern, NYBA = Not yet been assessed by the IUCN

Table D5: Arachnid species recorded during the site assessment.

Common Name	Scientific Name	IUCN Status
* <i>Ceratogyrus darlingi</i>	Horned Baboon Spider	NYBA
<i>Argiope trifasciata</i>	Banded Garden Orb-web Spider	NYBA
<i>Harpactirella overdijki</i>	Baboon Spider	NYBA
<i>Hadogenes polytrichobothrius</i>	Flat Rock Scorpion	Region Endemic
<i>Opisthophthalmus glabrifrons</i>	Burrowing Scorpion	NYBA
<i>Olurunia ocellata</i>	Grass Funnel-web Spider	NYBA

LC = Least Concern, NYBA = Not Yet Been Assessed, *Unconfirmed

Table D6: Amphibian species recorded during the site assessment.

Common Name	Scientific Name	IUCN Status
<i>Schismaderma carens</i>	Red toad	NYBA

LC = Least Concern, NYBA = Not Yet Been Assessed

