# Appendix G.6

## ANIMAL SPECIES ASSESSMENT

# ANIMAL SPECIES SPECIALIST ASSESSMENT FOR THE PROPOSED GROOTHOEK WIND ENERGY FACILITY PROJECT

WSP Group Africa Pty (Ltd)

May 2025

Submitted to:
WSP Group Africa Pty (Ltd)
Building 1, Maxwell Office Park
Waterfall City, Midrand
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South Africa

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# Acronyms and Abbreviations

| Abbreviation | Explanation |
|---|---|
| AIS | Alien Invasive Species |
| AOO | Area of Occupancy |
| BI | Biodiversity Importance |
| CA | Conservation Areas |
| CBA | Critical Biodiversity Areas |
| CI | Conservation Importance |
| EA | Environmental Authorisation |
| EIA | Environmental Impact Assessment |
| EMP | Environmental Management Programme |
| EWT | Endangered Wildlife Trust |
| EOO | Extent of Occurrence |
| ESA | Ecological Support Areas |
| FI | Functional Integrity |
| FSBSP | Free State Biodiversity Sector Plan |
| Ha | Hectare |
| KBA | Key Biodiversity Areas |
| NEMA | National Environmental Management Act |
| NEMBA | National Environmental Management Biodiversity Act |
| NEMPA | National Environmental Management Protected Areas Act |
| QDS | Quarter Degree Square |
| RR | Receptor Resilience |
| SANBI | South African National Biodiversity Institute |
| SAPAD | South African Protected Areas Database |
| SCC | Species of Conservation Concern |
| SEI | Site Ecological Importance |
| ToPS | Threatened or Protected Species |
| WEF | Wind Energy Facility |

# Details of the Expertise of the Specialist

| Specialist Information | |
|---|---|
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| **Qualifications** | M.Sc. Resource Conservation Biology<br>B.Sc. Hons. Ecology and Conservation Biology<br>B.Sc. Zoology and Grassland Science |
| **Affiliations** | Member of the South African Council of Natural Scientific Professions<br>Member of the South African Wildlife Management Association<br>Member of the South African Association of Botanists |
| **Summary of Past Experience** | Andrew Zinn is a terrestrial ecologist with Hawkhead Consulting. In this role, he conducts varied specialist ecology studies, including flora and fauna surveys, for baseline ecological assessments and ecological impact assessments. He has over 15 years of experience working in the fields of ecology and conservation research and is registered as a Professional Natural Scientist (*Pr.Sci.Nat.*) – Ecological Science, with the South African Council of Natural Scientific Professions (SACNASP). Andrew has worked on projects in several African countries including Botswana, Democratic Republic of Congo, Ethiopia, Ghana, Mozambique, South Africa, Tanzania and Zambia. |
| Refer to Appendix A for a full Curriculum Vitae of Andrew Zinn. | |

# Declaration of Independence by Specialist

I, Andrew Zinn, declare that I –

- Act as the independent specialist for the undertaking of a specialist section for the proposed Groothoek Wind Energy Facility Project;
- Do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed;
- Do not have, nor will have, a vested interest in the proposed activity proceeding;
- Have no, and will not engage in, conflicting interests in the undertaking of the activity; and
- Undertake to disclose, to the competent authority, any information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document.

Andrew Zinn

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# 1. Introduction

Hawkhead Consulting was appointed by WSP Group Africa Pty (Ltd) to conduct the Animal Species Specialist Assessment for the proposed Groothoek Wind Energy Facility Project (hereafter referred to as the 'Project'), near Harrismith in the Free State Province, South Africa.

## 1.1. Scope and Purposes of this Report

This specialist study focused on terrestrial animals (fauna), specifically mammals (excl. bats), herpetofauna (reptiles and amphibians) and invertebrates of conservation concern. Avifauna have been assessed as part of a separate avifauna specialist study and are not discussed in this report.

The study has been conducted in line with the 'Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in Terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, When Applying for Environmental Authorisation', and specifically:

- Protocol for the Specialist Assessment and Minimum Content Requirements for Environmental Impacts on Animals.

The primary scope of work included:

- Collating and reviewing information and data on terrestrial fauna species that occur or potentially occur on-site and in the surrounding landscape;
- Conducting a field programme to assess the presence and potential presence of terrestrial fauna species present on-site, with specific focus on species of conservation concern and sensitive habitats;
- Assessing the suitability of the Proposed project and the potential negative impacts on terrestrial fauna that may result from proposed Project activities; and
- Recommending mitigation and management measures for inclusion in the proposed Project's Environmental Management Programme (EMP) and/or Biodiversity Management Plan (BMP).

In line with the above scope, the purpose of this report is to; 1) present a baseline description of terrestrial fauna species, highlighting the presence/potential presence of species of conservation concern and sensitive habitats; 2) present the findings of an impact assessment for the proposed Project; 3) recommend applicable biodiversity mitigation and management measures; and, 4) provide an impact statement on the appropriateness of the proposed Project with respects to terrestrial animal species conservation.

## 1.2. Project Description

### 1.2.1. Project Background

The proposed Project forms part of the larger Verkykerskop WEF Cluster development. This proposed development comprises three separate projects, each of which, is part of a separate environmental authorisation process:

- Groothoek WEF (up to 300MW) – focus of this specialist report;
- Kromhof WEF (up to 300MW); and

- Normandien WEF (up to 300MW).

The Verkykerskop WEF Cluster also includes separate project components that are related to supporting infrastructure and will be the focus of separate environmental authorisation processes. These include:

- Groothoek up to 132 kV Grid Connection;
- Normandien up to 132 kV Grid Connection; and
- Kromhof up to 132 kV Grid Connection.

### 1.2.2. Project Location

The proposed Verkykerskop WEF Cluster is located in the Thabo Mofutsanyane District Municipality and Phumelela Local Municipality, near the town of Harrismith, in the Free State Province of South Africa (**Error! Reference source not found.**).

### 1.2.3. Project Technical Details

The technical details of the proposed Project are detailed in Table 1.

*Table 1: Proposed Project Technical Details.*

| Details | Information |
|---|---|
| Applicant Name | Groothoek Wind Power (Pty) Ltd |
| Municipalities | Thabo Mofutsanyana District Municipality<br>Phumelela Local Municipality |
| Extent | 6 170 ha |
| Buildable area | 150 ha |
| Export Capacity | Up to 300MW |
| Power system technology | Wind |
| Number of Turbines | Up to 43 |
| Rotor Diameter | up to 200 m |
| Hub Height | up to 200 m |
| Hard Standing Dimensions | up to 0,8 ha per turbine |
| Turbine Foundations | Excavation up to 4.5 m deep, constructed of reinforced concrete to support the mounting ring.<br>Once tower established, footprint of foundation is covered with soil. |
| Substation | 1 x 33kV/132kV onsite collector substation (IPP Portion) being up to 2 ha. |
| Powerlines | 33kV cabling to connect the wind turbines to the onsite collector substations, to be laid underground where practical. |
| Construction camp and laydown area | Construction compounds including site office inclusive of<br>Concrete Batching plant of up to 1ha<br>Site office of 4 ha<br>Laydown area of combined extent of 8ha |
| Internal Roads | Up to 8m in width (operational road surface width excluding V drains and cabling). During construction the disturbed road footprint will be up to 14 m wide including v-drains and trenching for cabling). |
| O&M Building | O&M office of up to 1 ha. |
| BESS | • Battery Energy Storage System (BESS) ( 200MW/800MWh). |

| Details | Information |
|---|---|
| | • Pre-assembled solid state batteries<br>• Export Capacity of up to 800MWh<br>• Total storage capacity 200MW<br>• Storage capacity of up to 6-8 hours<br>• The BESS will be housed in containers covering a total approximate footprint of up to 7ha |

## 1.3. Study Spatial Scales

Two spatial scales were considered for this specialist study, namely:

- Local Study Area (LSA): The proposed development footprint for the Groothoek WEF Project, and all areas encompasses by the Project's site boundary - shown in **Error! Reference source not found.**. It is within this 6 170 ha area where direct and indirect impacts on terrestrial biodiversity, flora and fauna receptors are likely to occur; and
- Regional Study Area (RSA): Comprises the entire area of influence for the proposed Verkykerskop WEF Cluster development (approx. 19 506 ha). It encompasses all three separate project sites for the proposed Groothoek WEF, Kromhof WEF and Normandien WEF and is also shown in **Error! Reference source not found.**. The RSA formed the spatial focus for the desktop literature and data collation and review and the field programme.

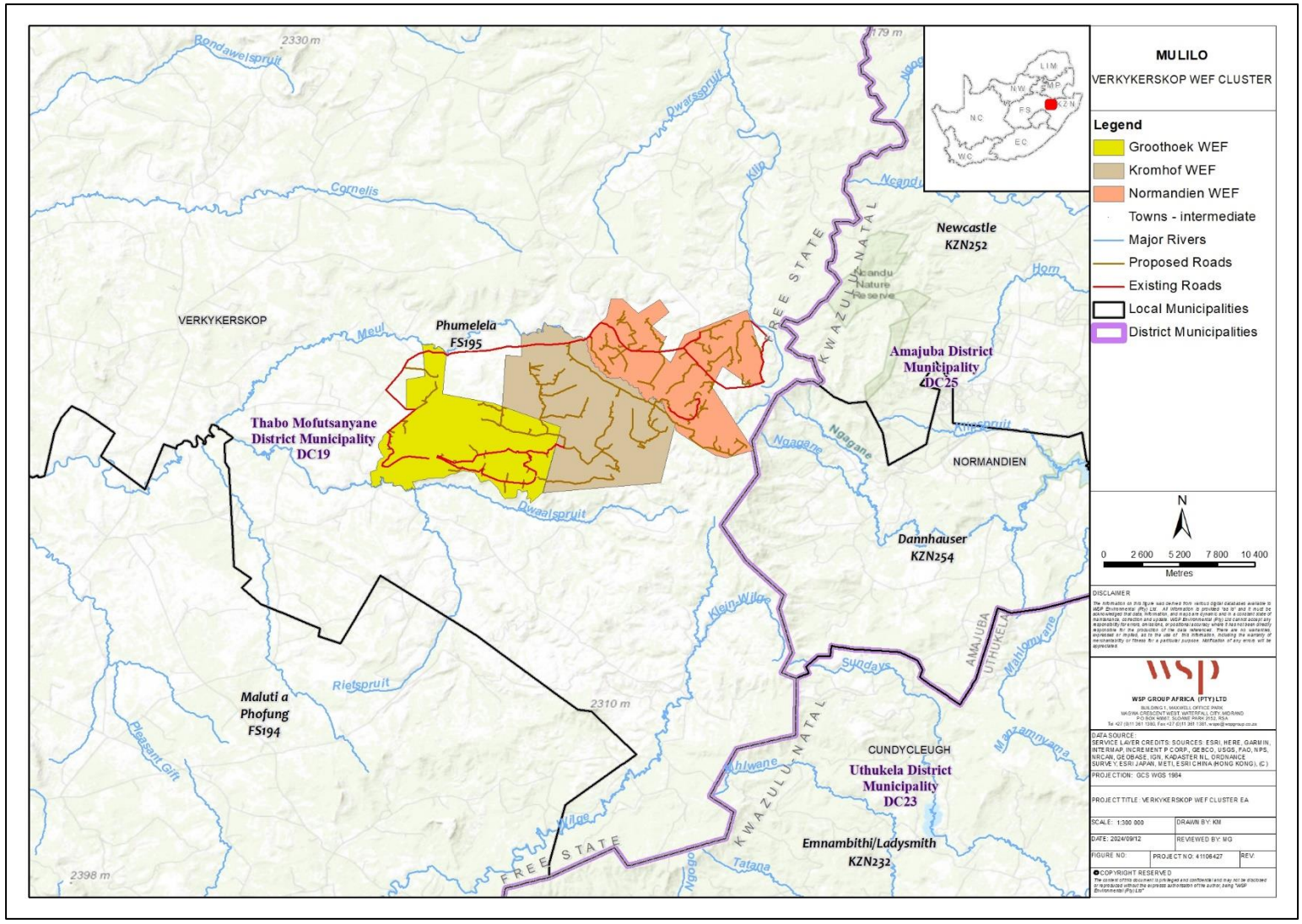
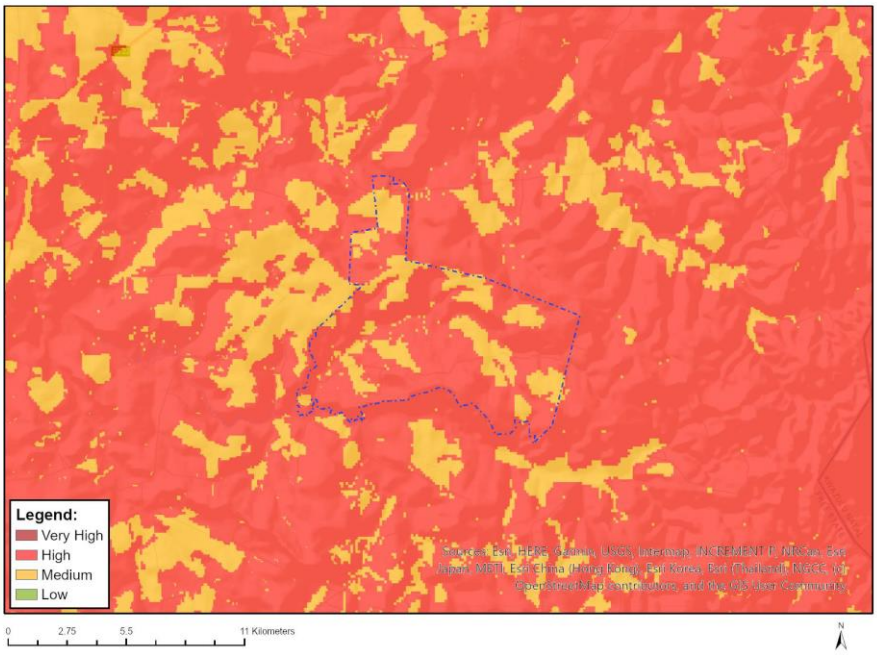



*Figure 1: Map showing the location of the proposed Groothoek Project site (i.e. the Local Study Area - yellow) and the broader Regional Study Area for the Verkykerskop WEF Cluster, which also encompasses the Kromhof WEF and Normandien WEF project sites.*

## 1.4. Results of the Environmental Screening Tool

According to the DFFE National Web Based Screening Tool, the Animal Species Theme was rated 'High' sensitivity on account of the potential presence of several threatened bird species. These are listed in the tables below and are the focus of a separate avifauna specialist study.

The screening tool also highlighted two threatened mammal species (*Hydrictis maculicollis* and O*urebia ourebi ourebi*), one threatened reptile species (Sensitive species 15) and one threatened invertebrate (*Clonia lalandei*) as being of 'Medium' sensitivity. These taxa are discussed in this report.




| Very High sensitivity | High sensitivity | Medium sensitivity | Low sensitivity |
|---|---|---|---|
| | X | | |

**Sensitivity Features:**

| Sensitivity | Feature(s) |
|---|---|
| High | Aves-Sagittarius serpentarius |
| High | Aves-Geronticus calvus |
| High | Aves-Neotis denhami |
| High | Aves-Anthus chloris |
| High | Aves-Circus ranivorus |
| High | Aves-Balearica regulorum |
| High | Aves-Falco biarmicus |
| High | Aves-Eupodotis senegalensis |
| Medium | Aves-Tyto capensis |
| Medium | Aves-Sagittarius serpentarius |
| Medium | Aves-Neotis denhami |
| Medium | Aves-Balearica regulorum |
| Medium | Aves-Heteromirafra ruddi |

| | |
|---|---|
| Medium | Aves-Eupodotis senegalensis |
| Medium | Aves-Anthus chloris |
| Medium | Aves-Circus ranivorus |
| Medium | Aves-Spizocorys fringillaris |
| Medium | Aves-Ciconia nigra |
| Medium | Aves-Hydroprogne caspia |
| Medium | Aves-Aquila verreauxii |
| Medium | Sensitive species 23 |
| Medium | Mammalia-Hydrictis maculicollis |
| Medium | Mammalia-Ourebia ourebi ourebi |
| Medium | Sensitive species 15 |
| Medium | Invertebrate-Clonia lalandei |

This specialist assessment focused on the above listed mammal and invertebrate SCC, along with other SCC that potentially occur in the study area. Bird SCC have been assessed as part of a separate avifauna specialist study.

# 2. Relevant Legislation and Guidelines

National and provincial legislation, as well as associated guidelines and policies that are relevant to the environment and biodiversity, and which were used to guide the Animal Species Specialist Assessment are listed in Table 2.

*Table 2: Relevant environmental and biodiversity legislation and guidelines.*

| Applicable Legislation and Guideline | Relevance to the Proposed Project |
|---|---|
| National Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA) | Section 24 of the NEMA, headed "Environmental Authorisations" sets out the provisions which are to give effect to the general objectives of Integrated Environmental Management, and laid down in Chapter 5 of the NEMA. In terms of section 24(1), the potential impact on the environment of listed activities must be considered, investigated, assessed and reported on to the competent authority charged by the NEMA with granting of the relevant environmental authorisation. In terms of section 24F (1) of the NEMA no person may commence an activity listed or specified in terms of section 24(2)(a) or (b) unless the competent authority has granted an environmental authorisation for the activity.<br><br>Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the NEMA (1998), when applying for environmental authorisation, the following is relevant to this study:<br><br>• Protocol for the specialist assessment and report content requirements for environmental impacts on terrestrial animal species. |
| National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) | The NEMBA is administered by the Department of Forestry, Fisheries and the Environment (DFFE) and provides the framework under the NEMA for the:<br><br>• Management and conservation of South Africa's biodiversity;<br>• The protection of species and ecosystems that warrant protection;<br>• The fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources; and<br>• The establishment and functions of a South African National Biodiversity Institute (SANBI).<br><br>Amongst other components, the NEMBA includes:<br>• Lists of Critically Endangered, Endangered, Vulnerable and Protected Species (February 2007), with associated amendments (December 2007 and 3 June 2020) (ToPS), published under Section 56(10) of NEMBA;<br>• Threatened or Protected Species Regulations (February 2007); and |

| Applicable Legislation and Guideline | Relevance to the Proposed Project |
|---|---|
| | • National list of threatened terrestrial ecosystems for South Africa (2021 revision), published under Section 51(1)(a) of NEMBA.<br>• National Biodiversity Offset Guideline (2023), which provides guidance on the need to develop biodiversity offsets.<br><br>The purpose of ToPS lists and regulations are to regulate the permit system concerning restricted activities involving specimens of listed threatened or protected species. The primary purpose of listing threatened ecosystems is to reduce the rate of ecosystem and species extinction by identifying 'witness' sites' of exceptionally high conservation value and enabling and facilitating proactive management of these ecosystems.<br><br>Chapter 5 of NEMBA also provides a list of regulations and guidance concerning alien invasive species, including:<br>• A guideline for Monitoring, Control and Eradication Plans (September 2015);<br>• 2020 Alien and Invasive Species Regulations (September 2020); and<br>• 2016 and 2020 Alien and Invasive Species Lists (March 2021). |
| National Environmental Management: Protected Areas Act (2003) (NEMPA) | • The NEMPA provides the framework under the NEMA for the protection and conservation of South Africa's biodiversity through the establishment of a system of protected areas that represent the country's diverse ecosystems, landscapes, and seascapes; and<br>• The NEMPA sets out mechanisms and processes for declaring and managing protected areas, including protected environments, with an emphasis on intergovernmental cooperation and public involvement. |
| Nature Conservation Ordinance 8 of 1969 for the Free State Province | The Nature Conservation Ordinance 8 of 1969 provides lists of specially protected and protected flora and fauna:<br>• Schedule 1: Protected Game; and<br>• Schedule 6: Protected Plants. |
| Other Relevant National and Provincial Policies, Plans and Guidelines | Other relevant policies, plans and guidelines that were considered during this study include:<br>• Species Environmental Assessment Guideline (SANBI, 2020);<br>• National Protected Area Expansion Strategy (2018); and<br>• Free State Biodiversity Sector Plan (2019). |

# 3. Study Methodology

The methodology used for this study included a literature review component and a field programme. The tasks associated with these are discussed below:

## 3.1. Desktop Data Collation and Literature Review

The aim of the desktop literature review component was to collate and review data and information pertaining to terrestrial animal species that may occur in the RSA, based on historic distribution ranges or recent records.

Literature and data that were reviewed were obtained from a variety of online and literature sources, as discussed below:

### 3.1.1. Mammals

- A list of mammal species that are known to occur in the region was compiled based on the historic distribution ranges presented in Stuart and Stuart (2007); and
- These data were cross-referenced with mammal species listed for the 2729CD, 2729DC, 2829BA and 2829AB Quarter Degree Square (QDS) on the MammalMAP database (Fitzpatrick Institute of African Ornithology, 2023).

### 3.1.2. Herpetofauna (Reptiles and Amphibians)

- A list of herpetofauna that potentially occur on-site was compiled based on the distribution maps presented in Bates *et al*., (2014) for reptiles, and Du Preez and Carruthers (2009) for amphibians; and
- Additional herpetofauna data were also sourced from ReptileMAP and FrogMAP for the 2729CD, 2729DC, 2829BA and 2829AB QDS (Fitzpatrick Institute of African Ornithology, 2023).

### 3.1.3. Invertebrates of Conservation Concern

Lists of invertebrate species potentially occurring on-site were obtained from LepiMAP, LacewingMAP, OdonataMAP, DungbeetleMAP, ScorpionMAP and SpiderMAP for the 2729CD, 2729DC, 2829BA and 2829AB QDS in which the RSA is located (Fitzpatrick Institute of African Ornithology, 2023). These were screened against available Red Lists to identify potential species of conservation concern.

## 3.2. Field Programme

The field programme comprised two field surveys: a dry season field survey focusing on fauna sampling was conducted by WSP Africa Pty (Ltd) from the 1st to 5th July 2024; and a wet season survey, comprising both flora and fauna sampling, was conducted by Hawkhead Consulting from the 3rd to 8th March 2025. Sampling was conducted across the entire RSA during both field surveys.

The sampling methodologies used during the field programme were based, in part, on those recommended in South African National Biodiversity Institute (SANBI) (2020), and included the following:

### 3.2.1. Mammals

Mammal sampling included both active and passive sampling methodologies:

- Active sampling of mammals included the use of baited motion-triggered camera traps placed at select sampling sites in the RSA:
    - Camera traps were placed at five fauna sampling sites. Sites were selected based on consideration of a combination of factors including: 1) habitat type, 2) proximity to water source/rivers, 3) presence of game trails/paths, and 4) general accessibility to field workers. The traps were operational continuously for the 24-hour cycle of each day of the survey. All devices were programmed to medium-sensitivity, with a one-minute delay between successive photographs to limit repeat triggers. Chicken pieces/tinned meat were used as bait; and
- Passive sampling aimed to record mammals of all sizes and included direct observations, indirect observations and anecdotal evidence:
    - Direct observations were made during opportunistic encounters of mammals made while walking and driving in the RSA;
    - Indirect observations included the identification of mammal tracks, faeces, burrows and mounds made while conducting the walked-transects; and
    - Local farmers were also consulted to obtain anecdotal evidence of mammal species present in the RSA.

#### 3.2.2. Herpetofauna (reptiles and amphibians)

- Sampling for reptiles and amphibians was based on active searches and opportunistic observations made while driving/working in the RSA were recorded; and
- Local farmers and other land users were also consulted to obtain anecdotal evidence of reptile/amphibian species present in the RSA.

### 3.3. Assessment of Species of Conservation Concern

#### 3.3.1. Threatened, Near Threatened and/or Protected Species Status

Species of Conservation Concern (SCC) were identified based on regional Red Lists of threatened species, including Vulnerable (VU), Endangered (EN), Critically Endangered (CR), and Near Threatened (NT) species. Additionally, species listed as Specially Protected, Protected, or threatened under national and provincial conservation legislation were also considered SCC, due to their specific conservation management requirements. Relevant Red Lists and legislation included:

- Red List of Mammals of South Africa, Lesotho and Swaziland (Child *et al*., 2016);
- SANBI's online Red List of South Africa Species (for reptiles, amphibians and invertebrates) (www.speciesstatus.sanbi.org);
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004) - Threatened or Protected Species List (Notice 389 of 2013) (NEMBA ToPS List, 2007); and
- Free State Nature Conservation Ordinance 8 of 1969, specifically Schedule 1.

#### 3.3.2. Habitat Suitability Assessments for Species of Conservation Concern

Habitat suitability assessments were conducted for SCC that have historically been recorded in the region to determine a 'probability of occurrence' in the RSA. The following parameters were used in the assessments:

- Habitat requirements: Most threatened species have very specific habitat requirements. The presence of these habitats in the RSA was evaluated;

- Habitat status: The status or ecological condition of available habitat was assessed. Often a high level of habitat degradation will negate the potential presence of sensitive species; and
- Habitat linkage: Dispersal and movement between natural areas for breeding and feeding are important population-level processes. Habitat connectivity within the RSA and to surrounding natural habitat and corridors was evaluated to determine the likely persistence of SCC.

Probability of occurrence is presented in the following categories:

- Recorded: Any SCC observed/documented in or close to the RSA;
- Probable: the species is likely to occur in the RSA and LSA due to suitable habitat and resources being present;
- Possible: The species may occur in the RSA and LSA, or move through the RSA (in the case of mobile species), due to potential habitat and/or resources; and
- Unlikely: the species will not likely occur in the RSA and LSA due to lack of suitable habitat and resources, or significant differences in its Area of Occupancy (AOO) compared to its Extent of Occurrence (EOO).

## 3.4. Assessment of Site Ecological Importance

The ecological importance of habitat units was determined using the protocol for evaluating site ecological importance (SEI) as published in SANBI's Species Assessment Guideline (SANBI, 2020). SEI is considered to be a function of the biodiversity importance (BI) of a receptor and its resilience to impacts (receptor resilience, RR), as per:

$$SEI = BI + RR.$$

Biodiversity importance is a function of conservation importance (CI) and the functional integrity (FI) of the receptor, as per:

$$BI = CI + FI$$

- **Conservation Importance** is defined as "the importance of a site for supporting biodiversity features of conservation concern present, e.g., populations of IUCN threatened and Near Threatened species (CR, EN, VU and NT), Rare species, range-restricted species, globally significant populations of congregatory species, and areas of threatened ecosystem types, through predominantly natural processes" (SANBI, 2020).
- **Functional Integrity** is defined as "A measure of the ecological condition of the impact receptor as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts" (SANBI, 2020).
- **Receptor Resilience** is defined as "the intrinsic capacity of the receptor to resist major damage from disturbance and/or to recover to its original state with limited or no human intervention" (SANBI, 2020).

For tables detailing the rating criteria for Conservation Importance, Functional Integrity and Receptor Resilience and the scoring matrices, refer to Appendix B. Table 3 presents a guideline for interpreting the SEI (SANBI, 2020).

*Table 3: Guidelines for interpreting SEI in the context of the proposed development activities*

| Site Ecological Importance | Interpretation in relation to proposed development activities |
|---|---|
| **Very High** | Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e., last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains. |
| **High** | Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit amount of habitat impacted; limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities. |
| **Medium** | Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities. |
| **Low** | Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities. |
| **Very Low** | Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required. |
| Source: SANBI (2020). | |

# 4. Assumptions, Uncertainties and Gaps in Knowledge

The following assumptions, uncertainties and gaps in knowledge are highlighted for this specialist study:

- Field work was conducted over a five-day period in July 2024 and a five-day period in March 2025. The timing of the field surveys therefore covered the mid-winter dry season and the mid-summer wet season periods, and accordingly, seasonality is not considered a limiting factor.
- Surveying sites were chosen to represent the range of on-site habitats. However, the RSA is extensive and topographically complex, and accordingly not all areas of natural habitat or proposed development footprints could be surveyed during the field programme;
- Considering the duration of field work, it is possible that certain rare, cryptic, migrating, or transient fauna species may not have been present and/or observed during the field surveys;
- The absence or non-recording of a specific fauna species, at a particular time, does not necessarily indicate that 1) the species does not occur there; 2) the species does not utilise resources in that area; or 3) the area does not play an ecological support role in the ecology of that species; and
- Given the difficulty of fully sampling and characterising the abundance and distribution of fauna species in the study area during the short period of time allocated to field work, the baseline descriptions were qualitative.

# 5. Characterisation of on-site Fauna Habitats

This section presents a brief description of the primary habitat types on-site during the field programme, as they relate to fauna resource use and life-cycle requirements.

Based on data collected during the field programme, six primary habitat units comprising three natural habitat units and three modified habitat units, were identified across the RSA, and are relevant to the LSA:

**Natural Habitats**

- Natural Dry Grassland;
- Rocky Shrubland;
- Moist Grassland (incl. rivers and streams);

**Modified Habitats**

- Secondary Grassland;
- Cultivated Fields and Grass Pastures; and
- Alien Tree Stands.

Habitat units are briefly described, with accompanying photographs, in the sections below**Error! Reference source not found.Error! Reference source not found.**. A habitat unit map for the LSA is shown in Figure 2. For full floristic descriptions of the identified habitat units, refer to the Plant Species Specialist Assessment Report.

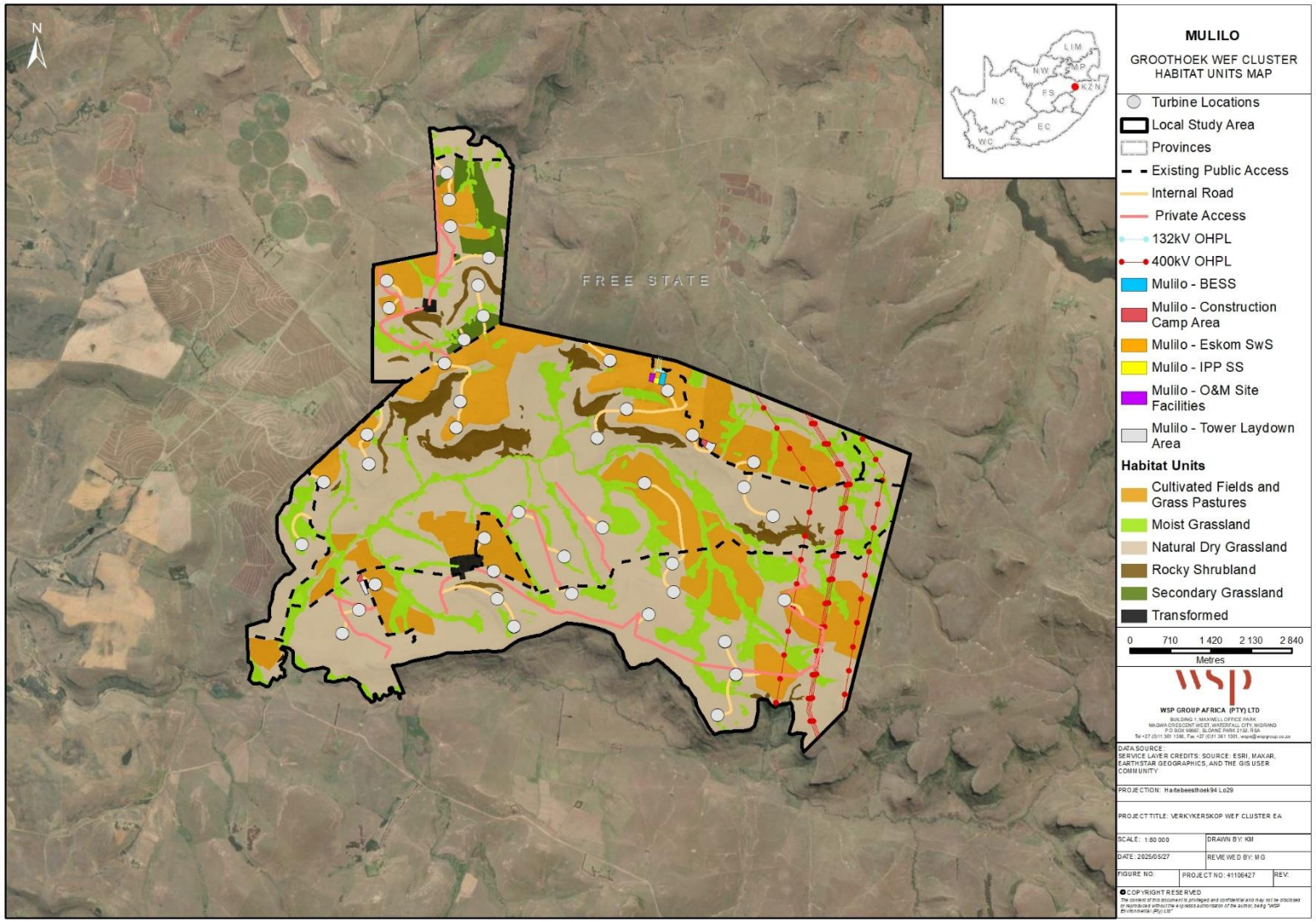



*Figure 2: Habitat unit map of the local study area, showing the proposed infrastructure layout. Also shown is the existing Eskom overhead powerline.*

### 5.1.1. Natural Dry Grassland

This is a large and variable habitat unit that covers the extensive rolling hills of the RSA. Structurally, vegetation is characterised by low closed grassland, as per Edwards (1983) structural classification.

Natural Dry Grasslands are characterised by a diverse flora assemblage, comprising a mixture of grasses and forb/herb species. Woody species generally occur at low abundances and as scattered individual small trees and shrubs, with denser woody aggregations present in transition areas between Natural Dry Grassland and areas of Rocky Shrubland.

Natural Dry Grasslands are crucial resource habitat for fauna. They also act as important ecological corridors, increasing local habitat connectivity and facilitating various ecological processes, such as *inter alia*, fauna movement and dispersal. Many of the diverse fauna assemblages that are likely to occur on-site, including many SCC, will depend on the continued integrity of this habitat unit.

*Figure 3: Typical Natural Dry Grassland.*

*Figure 4: Extensive tracts of intact Natural Dry Grassland are present on-site.*

### 5.1.2. Rocky Shrubland

Rocky Shrubland characterises many of the rocky hillsides, slopes and valleys in the RSA. Vegetation structure is variable and strongly dependent on aspect. As per Edwards (1983) structural classification, tall- to high closed shrubland characterises the cooler and moister south-facing hillsides and ridges, as well as the deeper valley areas. A more open vegetation structure, approximating tall open shrubland, typically occurs on the drier north-facing hillsides and ridges.

Compositionally, *Leucosidea sericea* is the dominant woody species in this unit and is particularly prevalent on moist south-facing hillsides and slopes, where it often forms dense, almost mono-specific stands. *Leucosidea sericea* is a common bush encroacher that typically increases in abundance in response to high levels of livestock grazing. This species is generally less abundant on north-facing slopes, with other woody taxa more evident.

The combination of indigenous woody vegetation and exposed rocks creates a distinctive rocky shrubland habitat that increase landscape-scale heterogeneity and provides important niche habitat for a variety of flora and fauna, including SCC that have an affinity for more wooded and/or rocky areas.

*Figure 5 South-facing hillside, dominated by Leucosidea sericea.*

*Figure 6: Rocky Shrubland below a rocky ridge/cliff face.*

### 5.1.3. Moist Grassland

This is a broad habitat unit that encompasses the range of drainage features across the RSA, including rivers and stream channels, as well as other wetland type habitats.

In typical moist grassland habitat, vegetation structure typically comprises low- to tall closed grassland. Along certain river/stream sections that are characterised by an increase in woody taxa, vegetation structure ranges from tall-open shrubland to short-closed woodland (*sensu*. Edwards, 1983).

Moist Grasslands are also functionally very important for fauna SCC. They provide essential resource habitat for feeding, sheltering and hunting, and serve as movement/dispersal corridors across the landscape. Moreover, rivers, streams and other aquatic features (farm dams) also provide key habitat for various aquatic and semi-aquatic fauna taxa.

*Figure 7: Typical moist grassland habitat.*

*Figure 8: Broad open water body.*

### 5.1.4. Secondary Grassland

Secondary Grassland habitat characterises former cultivated fields that have been abandoned and left fallow, and over several years have regenerated to form a secondary, but indigenous grassland vegetation community (commonly termed 'old lands').

Like undisturbed Natural Dry Grasslands, vegetation structure is low closed grassland (Edwards, 1983). Despite past disturbances and a secondary vegetation community, these habitats can retain some of the functional attributes of natural grasslands, and therefore these areas can constitute habitat for fauna species.

*Figure 9: Secondary Grassland habitat associated with a former cultivated field.*

### 5.1.5. Cultivated Fields and Grass Pastures

Cultivated Fields and Grass Pastures are typically present in low-lying bottomland areas that are characterised by deep, moist soils in RSA. Some however, were noted in flat, high-lying areas.

Both Cultivated Fields and Grass Pastures are subject to regular anthropogenic disturbance. Cultivated agricultural fields are regularly ploughed, planted with crop plants (e.g. maize) and harvested. Grass pastures have been planted with palatable indigenous grasses species and are regularly mown and baled to provide forage for livestock.

Although certain fauna species may move through or periodically forage in Cultivated Fields, due to the high-level of ongoing disturbance and modification, they are not considered important fauna life-cycle habitats.

*Figure 10: Cultivated field under maize production.*

*Figure 11: Recently mown and baled grass pasture.*

### 5.1.6. Alien Tree Stands

Stands of alien trees are not abundant or extensive in the RSA. Structurally, this habitat unit comprises closed woodland, as per Edwards (1983). Common alien tree species noted include *Eucalyptus* species and *Populus x canescens*. Little indigenous vegetation is present in well-established alien tree stands.

Alien Tree Stands may be used as refuge habitats by fauna that are sensitive to hunting and other forms of anthropogenic disturbance. They may also be used as roosting/nesting habitats.

*Figure 12: Stand of Eucalyptus trees.*

*Figure 13: Populus x canescens trees.*

# 6. Fauna Assessment

## 6.1. Mammals

### 6.1.1. Mammal Species Richness and Habitat Availability

Twenty-one mammal species were recorded in the RSA during the field programme. These are listed in Table 4, with Figure 14 to Figure 19**Error! Reference source not found.** showing select photographs of mammals taken during the field programme.

Recorded mammals range from small species (e.g., Woodland Dormouse *Graphiurus murinus*), through to medium-sized species, such as Southern Reedbuck (*Redunca arundinum*) and Black-backed Jackal (*Canis mesomelas*). All recorded mammals are free-roaming[1] species, except the Blesbok (*Damaliscus pygargus phillipsi*), which is likely part of a managed/farmed population.

The LSA and broader RSA are characterised by extensive tracts of suitable, remote and heterogenous natural habitat. Despite the presence of numerous farm fences, habitat connectivity within LSA, as well as across the broader RSA, remains high. These factors, coupled with the low human population density, will promote a rich mammal assemblage, that is anticipated to approximate a contemporary reference community for the region.

The distribution range maps presented in Stuart & Stuart (2007) and Child *et al*., (2016) indicate that up to 73 mammal species are known from the region encompassing the RSA, and of these, MammalMAP records indicate that 24 mammal species have previously been documented in the relevant QDS. These are listed in Appendix C.

*Table 4: Mammal species recorded in the regional study area during the field programme.*

| Family | Scientific Name | Common Name | Field Programme |
|---|---|---|---|
| Bathyergidae | *Cryptomys* species | Mole-rat | Earth mound |
| Bovidae | *Redunca arundinum* | Southern Reedbuck | Visual observation |
| Bovidae | *Pelea capreolus* | Grey Rhebok | Visual observation |
| Bovidae | *Damaliscus pygargus phillipsi* | Blesbok | Visual observation |
| Bovidae | *Raphicerus campestris* | Steenbok | Visual observation |
| Bovidae | *Sylvicapra grimmia* | Common Duiker | Visual observation |
| Canidae | *Canis mesomelas* | Black-backed Jackal | Visual observation |
| Cercopithecidae | *Papio ursinus* | Chacma Baboon | Visual observation |
| Felidae | *Caracal caracal* | Caracal | Camera trap |
| Felidae | *Leptailurus serval* | Serval | Camera trap |
| Gliridae | *Graphiurus murinus* | Woodland Dormouse | Camera trap |
| Herpestidae | *Cynictis penicillata* | Yellow Mongoose | Visual observation |
| Herpestidae | *Atilax paludinosus* | Water Mongoose | Tracks |
| Herpestidae | *Suricata suricatta* | Suricate | Visual observation |
| Hystricidae | *Hystrix africaeaustralis* | Cape Porcupine | Scat |
| Hyaenidae | *Parahyaena brunnea* | Brown Hyaena | Anecdotal |

[1] Part of self-sustaining, natural populations that can move freely across the landscape. I.e., not part of managed/farmed populations.

| Family | Scientific Name | Common Name | Field Programme |
|---|---|---|---|
| Leporidae | *Pronolagus cf. rupestris* | Red Rock Rabbit | Scat |
| Mustelidae | *Aonyx capensis* | Cape Clawless Otter | Tracks & Scat |
| Oryceropodidae | *Orycteropus afer* | Aardvark | Burrows |
| Sciuridae | *Xerus inauris* | Ground Squirrel | Visual observation |
| Suidae | *Potamochoerus larvatus* | Bushpig | Anecdotal |
| *Anecdotal evidence is based on an interview with local farmer I. van de Merwe & K. Eloff | | | |

*Figure 14: Grey Rhebok (Pelea capreolus) – Near Threatened*


*Figure 15: Black-backed Jackal (Canis mesomelas)*


*Figure 16: Caracal (Caracal caracal)*


*Figure 17: Serval (Leptailurus serval) – Near Threatened*


*Figure 18: Woodland Dormouse (Graphiurus murinus)*

*Figure 19: Ground Squirrel (Xerus inauris)*

### 6.1.2. Mammal Species of Conservation Concern

Four mammal species recorded in the RSA during the field programme are listed on the regional mammal Red List as threatened or Near Threatened, namely Grey Rhebok (*Pelea capreolus*), Brown Hyaena (*Parahyaena brunnea*), Serval (*Leptailurus serval*) and Cape Clawless Otter (*Aonyx capensis*). These are discussed in more detail in Section 6.1.2.1**Error! Reference source not found.** to Section 6.1.2.4.

The DFFE web-based screening tool listed three mammal species as potentially sensitive features, namely the Maquassie Musk Shrew (*Crocidura maquassiensis*), Spotted-necked Otter (*Hydrictis maculicollis*) and Oribi (*Ourebia ourebi ourebi*). These are also discussed in more detail in Section 6.1.2.5 to Section 6.1.2.7.

Reviewed literature and datasets further indicates that an additional 12 mammal species that occur or potentially occur in the RSA, are listed as threatened (VU, EN or CR) or Near Threatened on the regional Red List, or as a SCC on the NEMBA ToPS List (2007) and/or provincial conservation legislation. These are listed in Table 5Table 5: Mammal species of conservation concern occurring or potentially occurring on-site., along with their conservation statuses, habitat preferences and a 'probability of occurrence' determined through field observations and/or habitat suitability assessments.

#### *6.1.2.1. Grey Rhebok*

Grey Rhebok (Near Threatened) are medium-sized, territorial browsing antelope. They are gregarious, living in herds comprising one adult male and 1 to 15 females and young (Taylor *et al.*, 2016a). They favour sourveld grassland and scrubland in hills and mountainous areas (Taylor *et al.*, 2016a). The regional population size of Grey Rhebok is thought to be about 10 000 individuals, with an estimated density in protected areas of 0.5 to 1.7 individuals per km$^2$ (Taylor *et al.*, 2016a). Small herds (< 6 individuals) of Grey Rhebok were observed at several locations in the RSA (including in the LSA) during the field programme. The local population is therefore considered stable. Important habitat for this species includes montane grassland and wetland areas.

#### *6.1.2.2. Brown Hyaena*

The Brown Hyaena (Near Threatened) is a large carnivore that has a widespread distribution across South Africa and favours a broad range of habitats (Yarnell, *et al*., 2016). Due to the secretive nature of this taxa, there a high degree of uncertainty with respects to its national population size, although it is estimated at between 800 to 2 200 individuals (Yarnell, *et al*., 2016). Brown Hyaena were considered extinct in the Free State at one time, but recent studies confirm low levels of occupancy through the province (Yarnell, *et al*., 2016). Brown Hyaena were not observed during the field programme, however a local farmer indicated that he had observed a single individual on his farm in the RSA in the recent past (pers. comm. I van der Merwe). It is possible that the observed Brown Hyaena was a transient individual (i.e. one moving temporarily through the area). Nonetheless, considering the extent of remote natural habitat and the secretive nature of this species, the presence of resident Brown Hyaena in the RSA and LSA is considered 'possible'.

#### *6.1.2.3. Serval*

The Serval (Near Threatened) is a small feline predator. They are solitary and territorial, and favour wetland, tall grassland and well-watered savanna habitats (Estes, 1991). Population densities range from 0.1 to 1.5 individuals per km$^2$, with a regional population estimated at 10 264 ±812 individuals

(Ramesh, *et al.*, 2016). This species is frequently found in farmland and mining/industrial land, provided sufficient suitable habitat is present and levels of persecution remain low (Ramesh, *et al.*, 2016). The highest known Serval densities (between 76.20 - 101.21 animals per 100 km$^2$). Serval were recorded on a camera trap during the field programme. Important habitat for this species also includes montane grassland and wetland areas. Considering the abundance of suitable habitat, the local population of Serval is anticipated to be both large and stable.

#### *6.1.2.4. Cape Clawless Otter*

Cape Clawless Otter is listed as Near Threatened on the regional Red List (Okes, *et al*., 2016). This species has a fairly widespread, but patchy distribution. Population estimates range from 21 500 to 30 276 animals, with mature individuals numbering between 16 552-19 377 (Okes, *et al*., 2016). The Cape-clawless Otter is an aquatic species that is rarely found far from permanent water (Okes, *et al*., 2016). It favours riverine habitats, characterised by large rocks, dense vegetation and large areas of long grass (Okes, *et al*., 2016). Cape-clawless Otter tracks and scat were observed along the Meul River in the RSA. Considering the availability of aquatic habitat (e.g., rivers, streams and dams) throughout the RSA and in the LSA, the local Cape-clawless Otter population is likely to be both large and stable.

#### *6.1.2.5. Spotted-necked Otter*

Spotted-necked Otter is listed as Vulnerable on the regional Red List. This species has a widespread distribution, but is restricted to areas of permanent, large open-water bodies (Ponsonby, *et al*., 2016). The estimated range of Spotted-necked Otter totals 31 407 km of river, resulting in an estimated population size (taking into account both undisturbed and disturbed river habitats), of 17 117 individuals (Ponsonby, *et al*., 2016). Spotted-necked Otter was not recorded during the field programme. However, considering the availability of aquatic habitat throughout the RSA and LSA, it is probable that this species is present on-site.

#### *6.1.2.6. Maquassie Musk Shrew*

Maquassie Musk Shrew (Vulnerable) is a rare shrew species. The EOO is estimated at 284 735 km$^2$; however, it is thought to be patchily distributed and, based on its preference for wetland habitats, its AOO is inferred at between 40 496 to 47 246 km$^2$ and 1 790-2 089 km$^2$ (based on a 500 and 32 m buffer around wetland habitat, respectively) (Taylor *et al*., 2016c). The population size of Maquassie Musk Shrew is estimated at 179 000 individuals. This species appears to favour moist grassland habitats in savanna and grassland ecosystems (Taylor *et al*., 2016c). Suitable habitat is present in the RSA and LSA. However, records indicate that Maquassie Musk Shrew has not been recorded in Free State Province (Taylor *et al*., 2016c). It is therefore unlikely that Maquassie Musk Shrew is present on-site.

#### *6.1.2.7. Oribi*

The Oribi (Endangered) is a medium-sized, territorial grazing antelope. They live in monogamous pairs, with a tendency to polygyny (Estes, 1991). They have a widespread, but patchy distribution across their range, and their regional population is facing increasing fragmentation. Oribi densities vary considerably depending on habitat suitability, but in areas where this species is uncommon, its density ranges from 0.1 to 0.4 animals per km$^2$ (Schrader *et al*., 2016). The AOO of Oribi is estimated at 158.61 km$^2$ (SANBI, 2020). Oribi favour short open grassland and floodplains, with patches of taller grass (Schrader *et al*., 2016). Suitable habitat is present for Oribi in the RSA and LSA. However,

none of the famers interviewed during the field programme indicated that they were aware of the presence of Oribi, which is a fairly conspicuous species, in the area. It is therefore unlikely that Oribi occurs on-site.

*Table 5: Mammal species of conservation concern occurring or potentially occurring on-site.*

| Family | **Scientific Name** | **Common Name** | **Regional Red List Status (2016)** | **NEMBA ToPS List (2007)** | **Free State Provincial Status** | **Habitat Preferences*** | **Probability of Occurrence** |
|---|---|---|---|---|---|---|---|
| Bovidae | *Connochaetes gnou* | Black Wildebeest | Least Concern | Protected | | Open grassland plains and arid shrubland. | Possible - Suitable habitat present, although typically a farmed species |
| Bovidae | *Ourebia ourebi ourebi* | Oribi | Endangered | Endangered | Protected | Short open grassland, with patches of taller grass. | Unlikely – Suitable habitat present, but no observations of species by farmers. |
| Bovidae | *Pelea capreolus* | Grey Rhebok | Near Threatened | - | - | Sourveld grassland and scrubland in hills and mountainous areas. | Recorded |
| Bovidae | *Redunca arundinum* | Southern Reedbuck | Least Concern | Protected | - | Savanna and grassland habitats in mountainous areas. | Recorded |
| Bovidae | *Redunca fulvorufula fulvorufula* | Mountain Reedbuck | Endangered | - | - | Rolling grassy hillsides and mountain slopes. | Probable - Suitable habitat present. |
| Canidae | *Vulpes chama* | Cape Fox | Least Concern | Protected | - | Range of habitats, including grassland and arid savanna. | Probable - Suitable habitat present. |
| Chrysochloridae | *Amblysomus septentrionalis* | Highveld Golden Mole | Near Threatened | - | - | Sandy soils in grassland areas. | Possible - Suitable habitat present. |
| Chrysochloridae | *Chrysospalax villosus* | Rough-haired Golden Mole | Vulnerable | Critically Endangered | - | Sandy soils in grassland areas. | Possible - Suitable habitat present. |
| Erinaceidae | *Atelerix frontalis* | South African Hedgehog | Near Threatened | Protected | - | Range of habitats, including grassland and savanna. | Probable - Suitable habitat present. |
| Felidae | *Felis nigripes* | Black-footed Cat | Vulnerable | Protected | - | Open short grass areas in savanna and grassland habitats. | Possible - Suitable habitat present. |
| Felidae | *Leptailurus serval* | Serval | Near Threatened | Protected | - | Wetland, tall grassland and well-watered savanna habitats. | Recorded |
| Hyaenidae | *Parahyaena brunnea* | Brown Hyaena | Near Threatened | Protected | - | Savanna and grassland habitats. | Recorded (anecdotal) |
| Hyaenidae | *Proteles cristata* | Aardwolf | Least Concern | - | Protected | Savanna and grassland habitats. | Probable - Suitable habitat present. |

| Family | **Scientific Name** | **Common Name** | **Regional Red List Status (2016)** | **NEMBA ToPS List (2007)** | **Free State Provincial Status** | **Habitat Preferences*** | **Probability of Occurrence** |
|---|---|---|---|---|---|---|---|
| Muridae | *Mystromys albicaudatus* | White-tailed Rat | Vulnerable | - | - | Grassland habitats. | Possible - Suitable habitat present. |
| Mustelidae | *Aonyx capensis* | Cape Clawless Otter | Near Threatened | Protected | - | Riparian habitats, with permanent water. | Recorded |
| Mustelidae | *Hydrictis maculicollis* | Spotted-necked Otter | Vulnerable | Protected | - | Riparian habitats, favouring large, open water bodies. | Probable - Suitable habitat present. |
| Mustelidae | *Poecilogale albinucha* | African Striped Weasel | Least Concern | - | - | Grassland habitats. | Probable - Suitable habitat present. |
| Soricidae | *Crocidura maquassiensis* | Maquassie Musk Shrew | Vulnerable | - | - | Little is known of habitat preferences. Thought to favour rocky or montane grasslands. | Unlikely - Suitable habitat present, but no records of this species in Free State Province. |
| Soricidae | *Crocidura mariquensis* | Swamp Musk Shrew | Near Threatened | - | - | Reedbeds, wetlands and thick moist grassland in riverine habitats. | Probable - Suitable habitat present. |
| *Habitat preferences as per Skinner and Smithers (1990), Stuart and Stuart (2007) and Child *et al.,* (2016). | | | | | | | |

## 6.2. Herpetofauna

### 6.2.1. Herpetofauna Richness and Habitat Availability

Two reptile and two amphibian species were documented in the RSA during the field programme - listed in Table 6. However, considering the availability and diversity of suitable herpetofauna habitat, ranging from rocky and well-wooded hillsides and valleys, large open watercourses, and areas of open grassland and wetlands, it is likely that the RSA, supports a diverse herpetofauna assemblage.

Indeed, ReptileMAP rand FrogMAP records indicate that 27 reptile and 20 amphibian species have previously been recorded in the QDS that encompass the RSA (Fitzpatrick Institute of African Ornithology, 2024). These data indicate the most frequently reported reptile taxa include the Common Crag Lizard (*Pseudocordylus melanotus melanotus*), Speckled Rock Skink (*Trachylepis punctatissima*) and the Burchell's Sand Lizard (*Pedioplanis burchelli*), while the most frequently reported amphibian species are the Common River Frog (*Amietia delalandii*) and the Cape River Frog (*Amietia fuscigula*).

The distribution maps presented in Bates *et al*., (2014) and Du Preez and Carruthers (2009), indicate that up to 56 reptile and 21 amphibian species are known from the region in which the RSA is located. These are listed in Appendix E.

*Table 6: Reptile and amphibian species recorded during the field programme*

| Family | Scientific Name | Common Name | Field Programme |
|---|---|---|---|
| **Reptile** | | | |
| Elapidae | *Hemachatus heamachatus* | Rinkhals | Anecdotal |
| Scincidae | *Trachylepis* species | Rock Skink | Visual observation |
| **Amphibians** | | | |
| Pipidae | *Xenopus laevis* | Common Platanna | Visual observation |
| Ranidae | *Amietia delalandii* | Common River Frog | Visual observation |
| *Anecdotal evidence is based on an interview with farmer K. Eloff | | | |

*Figure 20: Common River Frog (Amietia delalandii).*

*Figure 21: Common Platanna (Xenopus laevis).*

### 6.2.2. Herpetofauna Species of Conservation Concern

The DFFE web-based national environmental screening report highlighted Sensitive species 15 as a potential sensitive feature. This species is discussed in detail in Section 6.2.2.1. An additional four herpetofauna SCC, comprising three reptile and one amphibian species, potentially occur on-site. These are listed in Table 7, along with their conservation status, habitat preferences and a probability of occurrence.

#### *6.2.2.1. Sensitive species 15*

Sensitive species 15 is listed as Vulnerable on both the regional and provincial Red Lists. It is further listed as Endangered on the NEMBA ToPS List (2007). This species is range-restricted and has a EOO estimated at 34 500 km$^2$ and an AOO of 1 149 km$^2$. It is restricted to northern Free State and south-western Mpumalanga. The population size is estimated at 677 000 mature individuals. Sensitive species 15 is a habitat specialist, occurring in Highveld grasslands where it favours gently sloping *Themeda triandra* dominated primary grasslands. Several factors shape the niche requirements of this species including soil type, prey species, temperature and humidity. It is an obligate burrower, living in self-excavated burrows. Sensitive species 15 was not observed in the RSA and LSA during the field programme, and none of the farmers interviewed during the field programme were aware of the presence of this species on their farms. This notwithstanding, considering the availability and remoteness of potentially suitable habitat, it is considered possible that Sensitive species 15 is present in the LSA.

*Table 7: Reptile and amphibian species of conservation concern potentially occurring on-site.*

| Family | **Scientific Name** | **Common Name** | **Regional Red List Status** | **NEMBA ToPS List (2007)** | **Free State Provincial Status** | **Habitat Preferences*** | **Probability of Occurrence** |
|---|---|---|---|---|---|---|---|
| **Reptiles** | | | | | | | |
| Chamaeleonidae | *Bradypodion dracomontanum* | Drakensberg Dwarf Chameleon | Near Threatened | - | Protected | Favours small forest patches but can occur in grassland. | Unlikely/Possible – Suitable habitat present. |
| Chamaeleonidae | *Chamaeleo dilepis* | Flap-neck Chameleon | Least Concern | - | Protected | Occurs in a range of habitats, but typically found in well-wooded areas. | Probable – Suitable habitat present |
| Pythonidae | *Python natalensis* | South African Python | Least Concern | Protected | Protected | Occurs in a range of habitats, but typically favours riverine and rocky habitats. | Probable – Suitable habitat present |
| - | Sensitive species 15 | - | Vulnerable | Endangered | Protected | Highveld grasslands, often dominated by *Themeda triandra.* | Possible – Suitable habitat present. |
| **Amphibians** | | | | | | | |
| Pyxicephalidae | *Pyxicephalus adspersus* | Giant Bullfrog | Least Concern | Protected | - | Shallow pans, wetlands and seasonally rained-filled depressions in savanna and grasslands. | Possible – Suitable habitat present |
| *Habitat preferences as per Branch (1998) and Bates *et al.,* (2014) for reptiles, and Du Preez and Carruthers (2007) for amphibians. | | | | | | | |

## 6.3. Invertebrates of Conservation Concern

Data retrieved from the Virtual Museum database lists 13 dragonfly, 63 butterfly, two lacewing, two scorpion and two spider species for the QDS that encompass the RSA. Of the listed taxa, one butterfly (*Orachrysops mijburghi*) and one spider (*Harpactira hamiltoni*) are SCC. The DFFE screening reports also identifies two other threatened invertebrate species as potentially sensitive features, namely *Chrysoritis phosphor borealis* and *Colonia lalandei.* These four species are discussed in more detail below:

### *6.3.1. Orachrysops mijburghi*

*Orachrysops mijburghi* (Endangered) is a butterfly species that is endemic to Gauteng and Free State Provinces. According to Dobson and Dobson (2018), this species is known from five locations, with an EOO of 4 465 km$^2$, and has a documented range that extends from Heilbron (in Free State Province) in the south to Suikerbosrand Nature Reserve (near Heidelberg in Gauteng Province) in the north (Dobson and Dobson, 2018). It is noted that the RSA is not included within this documented distribution range, which is far to the north-west of the RSA. It is therefore considered likely that the Virtual Museum record of *Orachrysops mijburghi* in the QDS that encompass the RSA, is probably an error. It is therefore considered unlikely that *Orachrysops mijburghi* is present on-site.

### *6.3.2. Harpactira hamiltoni*

*Harpactira hamiltoni* is a baboon spider species from the Family Theraphosidae. All baboon spiders are listed as protected at a national level according to the NEMBA ToPS (2007) List. This species is known to occur in grassland and savanna habitats, and suitable habitat is present in the RSA and LSA, and it is therefore probable that *Harpactira hamiltoni* is present.

### *6.3.3. Chrysoritis phosphor borealis*

*Chrysoritis phosphor borealis* is an Endangered butterfly species that is endemic to Mpumalanga and KwaZulu-Natal Provinces and has an EOO of 42 174 km$^2$ (Woodhall, 2018). It has an AOO of 20-200 km$^2$ and is known from only five confirmed locations, with an additional 5-10 locations suspected (Woodhall, 2018). *Chrysoritis phosphor borealis* occurs Afromontane forests surrounded by montane grassland, where they are commonly found near streams (Woodhall, 2018). Although well-wooded hillsides and valleys are present in the RSA and LSA, no Afromontane forests were noted. It is therefore considered unlikely that *Chrysoritis phosphor borealis* is present on-site.

### *6.3.4. Clonia lalandei*

*Clonia lalandei* is a Vulnerable grasshopper species. Its EOO is 15 000 km$^2$, and it is known from only four locations across KwaZulu-Natal, Mpumalanga and Free State Provinces (Bazelet and Naskrecki, 2014). It occurs in grassland and savanna habitats, but little is known of its specific habitat requirements (Bazelet and Naskrecki, 2014). Considering this dearth of habitat information and following the precautionary principle, it is considered possible that *Clonia lalandei* is present on-site.

# 7. Key Ecological Attributes and Processes

## 7.1. Habitat Corridors, Resources and Refugia

The LSA and broader RSA comprise extensive tracts of intact natural habitat, occurring on a highly varied topography that is characterised by low hills and mountains, are bisected by numerous drainage features. Areas of modified habitat (mostly Cultivated Fields) are present, but these are mostly confined to low-lying areas and some small upland sites.

Prominent linear infrastructure noted during the field programme included gravel district roads, farms roads and tracks, powerlines, as well as numerous farm fences. Although these linear features have caused some degree of habitat fragmentation, overall habitat connectivity remains very high across the landscape due to the extensive areas of undisturbed natural habitat.

The Rocky Shrubland habitat unit is characterized by acute altitudinal changes, exposed rocks, and indigenous woody vegetation, which in the general grassland-dominated habitat matrix, significantly increases habitat heterogeneity and provides diverse micro-habitats and refugia for flora and fauna.

Amongst other impacts, the proposed Project will impact local habitat connectivity through habitat loss and fragmentation, and this may affect various ecological processes, such as *inter alia*, wildfire patterns, fauna movement and foraging, and flora propagule dispersal.

## 7.2. Dynamic Ecological processes and Drivers of Change

The following notes summarise the key ecological processes and drivers of change that are present in the landscape and their possible influence on terrestrial fauna and in particular SCC.

### 7.2.1. Wildfire – Grassland Burning

Fire is a natural, albeit often human initiated, disturbance agent in both grasslands and savannas, which are considered fire-prone and fire-dependent landscapes. Fire is essential to the maintenance of biodiversity patterns and ecological processes (SANBI, 2013). Wildfires have several key ecological effects, including:

- Removal of moribund vegetation and increasing plant productivity and palatability, which improves grazing for wild herbivores, and stimulates germination / flowering of fire-adapted flora species (e.g., certain orchid species);
- Controls the encroachment of both alien and indigenous woody plant species and weeds; and
- Increases overall habitat heterogeneity by creating a structural mosaic of tall- and short grassland and closed- and open wooded areas.

Notwithstanding the positive ecological benefits of fire, wildfires that are too frequent, or too intense, can have negative consequences for terrestrial biodiversity. These include the killing of fauna species (typically slow-moving taxa, or taxa trapped by fences) and fire-sensitive flora species, and the homogenisation of on-site habitat, which can limit the availability of key adaptive resources and reduce biodiversity.

Fire is considered an important driver of change. It is anticipated that the proposed Project may result in altered wildfire patterns due to increased habitat fragmentation. It is also possible that the number of accidental fires initiated from shorting/faulty electrical infrastructure associated with the

proposed Project may increase. Changes in local fire may impact vegetation productivity, which may affect the local fauna and flora diversity community, including SCC.

### 7.2.2. Herbivory – Wildlife and Livestock Grazing and Trampling

High levels of grazing (overgrazing) and trampling by herbivores is a common cause of dryland degradation (Scholes, 2009). Overgrazing occurs when herbivores (both wildlife and domestic) are kept at excessive stocking rates and/or are able to concentrate their grazing to a limited foraging area, without suitable rest periods. A common degradation syndrome that is linked to overgrazing, at least in part, is a change in plant species composition. In grassland habitats, this typically manifests as a reduction in palatable grass species and a reduction in grassland productivity (Scholes, 2009). Excessive cattle grazing and trampling can also cause soil erosion and gulley formation and modify and homogenise vegetation structure.

Livestock grazing and trampling are considered important drivers of change. However, it is unlikely to that proposed Project activities will alter livestock grazing patterns.

### 7.2.3. Alien Invasive Species Colonisation

Several alien invasive plant species were recorded on-site during the field programme. These have the potential to spread into areas of natural habitat, where they may competitively exclude many indigenous species. This will have several deleterious impacts on the integrity and function of these habitats, such as *inter alia*:

- A loss of natural habitat and floristic diversity, with the resulting habitat patches unable to support diverse flora and fauna communities;
- A reduction in grass productivity for grazing herbivores, and
- Increased exposed soil surfaces and incidences of erosion.

The spread of alien invasive vegetation is therefore considered a significant driver of change, and one capable of negatively impacting terrestrial biodiversity. The proposed Project will create disturbed sites where alien invasive species could establish and this will need to be managed.

# 8. General Sensitivity and Analysis of Site Ecological Importance

The DFFE National Web Based Screening Tool rated the Animal Species Theme as 'High' sensitivity, based on the potential presence of several fauna SCC (listed in Section 1.4).

- During the field programme, four free-roaming Red List mammal species were recorded, namely Grey Rhebok (*Pelea capreolus*), Brown Hyaena (*Parahyaena brunnea*), Serval (*Leptailurus serval*) and Cape Clawless Otter (*Aonyx capensis*) – all listed as Near Threatened;
- Habitat suitability assessments also indicate that several other fauna SCC, including Spotted-necked Otter (Vulnerable), which was highlighted by the DFFE screening environmental tool, may be present.

The findings of this study therefore confirm the 'High' sensitivity rating.

The site-specific ecological importance (SEI) of identified habitat units in the LSA were assessed using the SANBI (2020) protocol (refer to Section 3.4 and Appendix B for the methodology). The results of the assessment are presented in Table 8, and shown in Figure 22.

*Table 8: Site Ecological Importance of habitat units.*

| Habitat Unit | Conservation Importance | Functional Integrity | Biodiversity Importance | Receptor Resilience | Site Ecological Importance |
|---|---|---|---|---|---|
| Natural Dry Grassland | MEDIUM: Confirmed or highly likely occurrence of CR, EN, VU species<br>>50% of receptor contains natural habitat to support SCC. | VERY HIGH: Very large (>100 ha) intact area for any conservation status of ecosystem type.<br>High habitat connectivity serving as a functional ecological corridor. Limited road network between intact habitat patches.<br>Only minor current negative ecological impacts (livestock grazing), with no signs of major disturbance. | HIGH | MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality | HIGH |
| Rocky Shrubland | MEDIUM: Confirmed or highly likely occurrence of CR, EN, VU species.<br>>50% of receptor contains natural habitat to support SCC. | VERY HIGH: Very large (>100 ha) intact area for any conservation status of ecosystem type.<br>High habitat connectivity serving as a functional ecological corridor.<br>Only minor current negative ecological impacts (livestock grazing), with no signs of major disturbance. | HIGH | MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality | HIGH |

| Habitat Unit | Conservation Importance | Functional Integrity | Biodiversity Importance | Receptor Resilience | Site Ecological Importance |
|---|---|---|---|---|---|
| Moist Grassland | MEDIUM: Confirmed or highly likely occurrence of CR, EN, VU species.<br>>50% of receptor contains natural habitat to support SCC. | VERY HIGH: Very large (>100 ha) intact area for any conservation status of ecosystem type.<br>High habitat connectivity serving as a functional ecological corridor.<br>Only minor current negative ecological impacts (livestock grazing). | HIGH | MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality | HIGH |
| Secondary Grassland | LOW: No confirmed populations of SCC.<br>< 50% of receptor contains natural habitat. | LOW: Good habitat connectivity, with potentially functional ecological corridors and a regularly used road network. BUT, Several major past impacts (=ploughing). | LOW | MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality | LOW |
| Cultivated Fields | VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining. | VERY LOW: Several major current negative ecological impacts. | VERY LOW | VERY HIGH: Habitat that can recover rapidly to restore >75% of the original species composition and functionality. | VERY LOW |
| Alien Tree Stands | VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining. | VERY LOW: Several major current negative ecological impacts. | VERY LOW | VERY HIGH: Habitat that can recover rapidly to restore >75% of the original species composition and functionality. | VERY LOW |

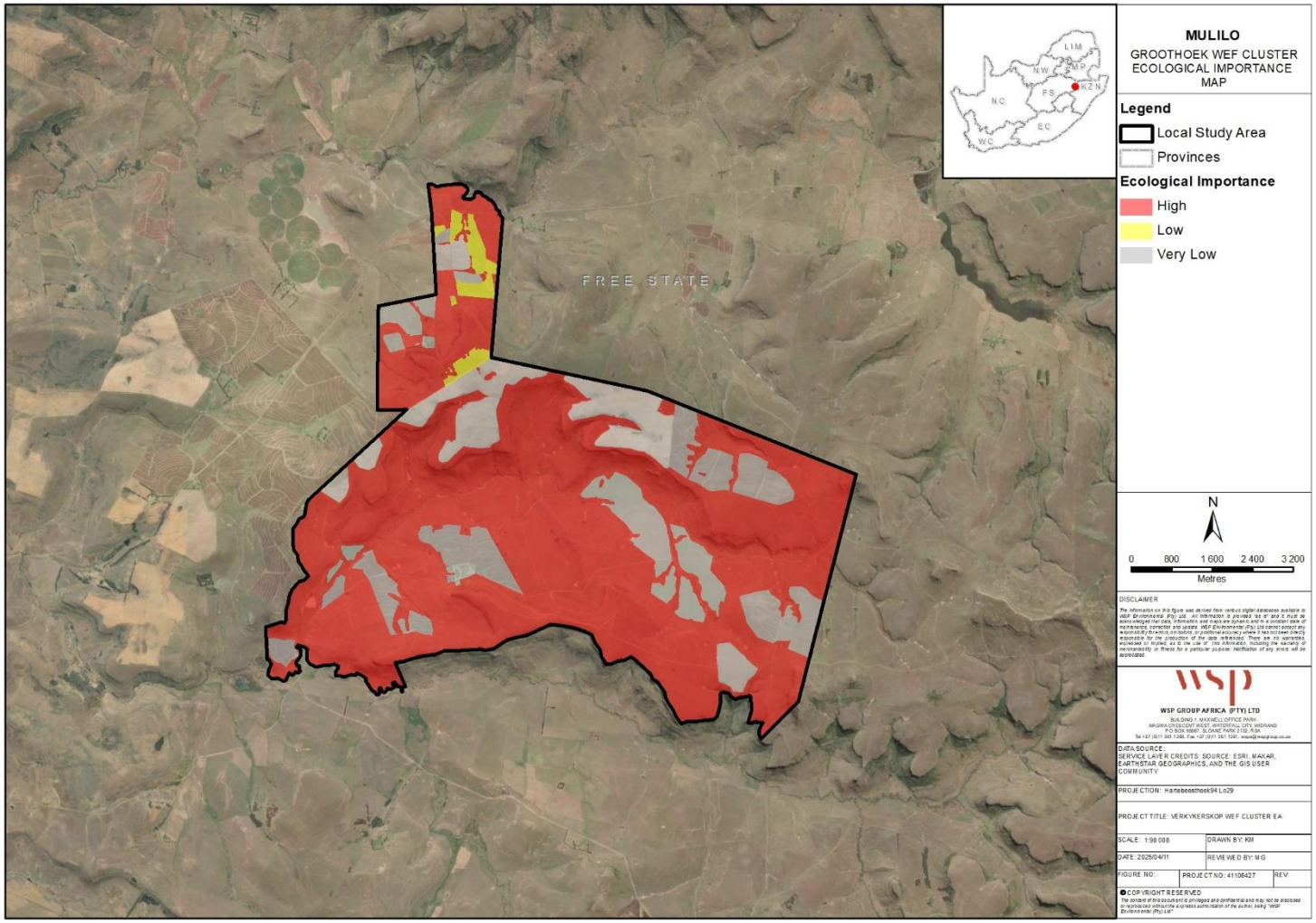



*Figure 22: Site Ecological Importance of the Local Study Area.*

# 9. Impact Assessment

## 9.1. Impact Assessment Methodology

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

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct[2], indirect[3], secondary[4] as well as cumulative[5] impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e., residual impact). The significance of environmental aspects is determined and ranked by considering the criteria[6] presented in Table 9.

*Table 9: Impact Assessment Criteria and Scoring System*

| CRITERIA | SCORE 1 | SCORE 2 | SCORE 3 | SCORE 4 | SCORE 5 |
|---|---|---|---|---|---|
| **Impact Magnitude (M)** The degree of alteration of the affected environmental receptor | Very low: No impact on processes | Low: Slight impact on processes | Medium: Processes continue but in a modified way | High: Processes temporarily cease | Very High: Permanent cessation of processes |
| **Impact Extent (E)** The geographical extent of the impact on a given environmental receptor | Site: Site only | Local: Inside activity area | Regional: Outside activity area | National: National scope or level | International: Across borders or boundaries |
| **Impact Reversibility (R)** The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change | Reversible: Recovery without rehabilitation | | Recoverable: Recovery with rehabilitation | | Irreversible: Not possible despite action |

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

| CRITERIA | SCORE 1 | SCORE 2 | SCORE 3 | SCORE 4 | SCORE 5 |
|---|---|---|---|---|---|
| **Impact Duration (D)** The length of permanence of the impact on the environmental receptor | Immediate: On impact | Short term: 0-5 years | Medium term: 5-15 years | Long term: Project life | Permanent: Indefinite |
| **Probability of Occurrence (P)** The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation | Improbable | Low Probability | Probable | Highly Probability | Definite |
| **Significance (S)** is determined by combining the above criteria in the following formula: | $[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$ | | | | |
| **IMPACT SIGNIFICANCE RATING** | | | | | |
| **Total Score** | **4 to 15** | **16 to 30** | **31 to 60** | **61 to 80** | **81 to 100** |
| **Environmental Significance Rating (Negative (-))** | **Very low** | **Low** | **Medium** | **High** | **Very High** |
| **Environmental Significance Rating (Positive (+))** | **Very low** | **Low** | **Medium** | **High** | **Very High** |

## 9.2. Impact Mitigation

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

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five (5) different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then

considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

The mitigation sequence/hierarchy is shown in Figure 23 below.

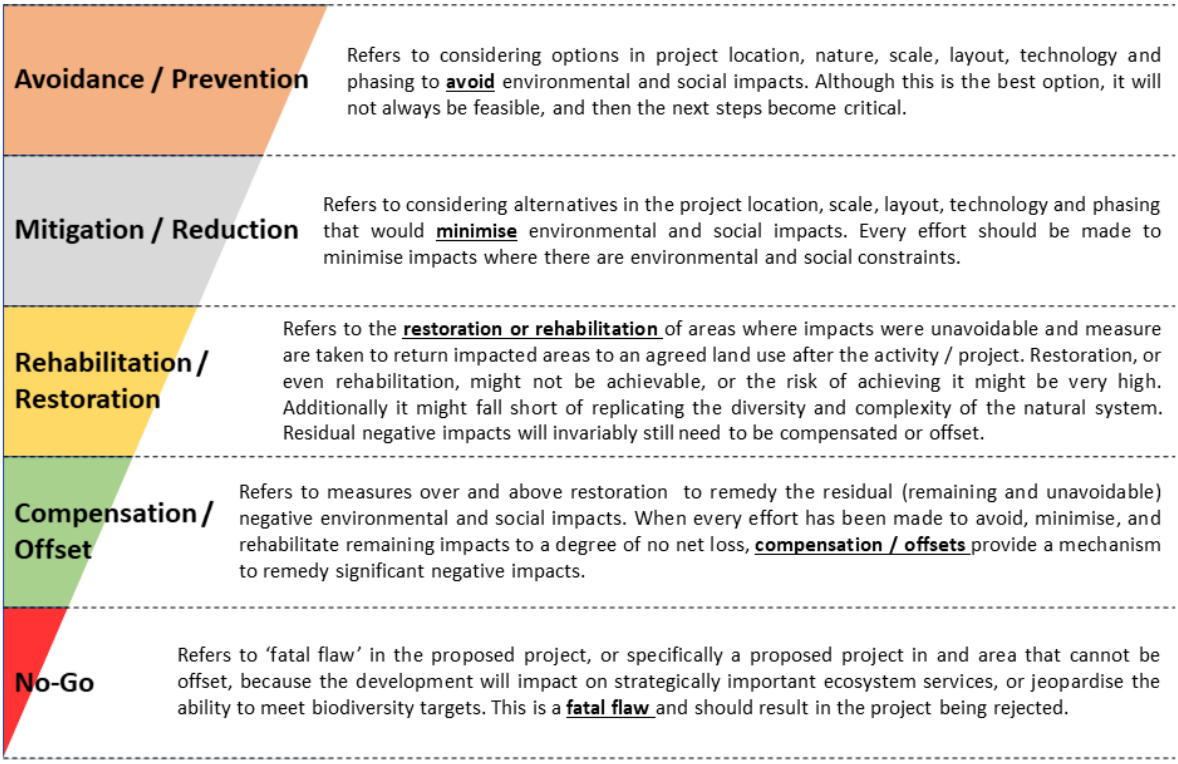



*Figure 23: Mitigation Sequence/Hierarchy*

A discussion on assessed impacts for each phase (i.e., Construction Operational and Decommissioning) of the proposed Project is provided in the sections below, along with an analysis of anticipated cumulative impacts in Section 9.3.4. A summary table presented in Table 11.

This impact assessment section should be read in conjunction with the impact assessments presented in the Plant Species Specialist Assessment and Terrestrial Biodiversity Specialist Assessment reports

## 9.3. Assessment of Impacts on Terrestrial Fauna

### 9.3.1. Construction Phase

#### *9.3.1.1. Direct loss and disturbance of natural habitat*

Habitat loss refers to the removal or complete degradation of natural habitat. In terrestrial ecosystems, this primarily occurs through vegetation clearing and bulk earth works during construction. Habitat disturbance refers to the modification of habitat to the extent that it loses important functionality. These impacts can negatively impact the viability of local fauna populations, including SCC. The proposed Project will result in the clearing of natural vegetation for infrastructure development.

Based on the placement of currently mapped proposed turbine, road and supporting infrastructure, it is anticipated that at least 99.61 ha of natural habitat is likely to be directly impacted by construction activities, with Table 10 presenting the approximate extent of habitat loss and disturbance for each habitat unit. The current proposed Project layout in relation to the identified habitat units is shown in Figure 24.

The impact prior to further mitigation is considered to be of very high magnitude. Duration of impact will be permanent, and habitat within and potentially adjacent to the development footprints (local) will be impacted. Probability is rated definite. This results in an impact of "high" significance.

Several management/mitigation measures can be taken to minimise impact significance, including: where possible repositioning turbines and internal roads to areas of modified habitat to avoid directly impacting natural habitat; in areas of natural habitat, in-field micro-siting of turbine and road footprints to already disturbed sites; minimising disturbance footprints to the absolute necessary for construction and operational purposes; and, rehabilitating all disturbed areas after construction.

With the application of these, and other recommended mitigation measures, impact magnitude can be reduced to medium, and it can be confined to the site scale. Duration can be reduced to the long-term, and probability to medium. This results in an after-mitigation impact of "Medium" significance.

*Table 10: Indicative extent of possible impacts on the identified habitat units, based on the current proposed Project layout.*

| Habitat Unit | Approx. Extent in Local Study Area (Ha) | Approx. Extent of Habitat Loss & Disturbance (Ha) |
|---|---|---|
| Natural Dry Grassland | 4489.38 | 88.62 |
| Rocky Shrubland | 306.70 | 0.65 |
| Moist Grassland | 1096.54 | 10.34 |
| Secondary Grassland | 135.8 | 2.72 |
| Cultivated Fields and Grass Pastures | 1905.45 | 53.30 |
| Alien Tree Stands | 0.0 | 0.0 |

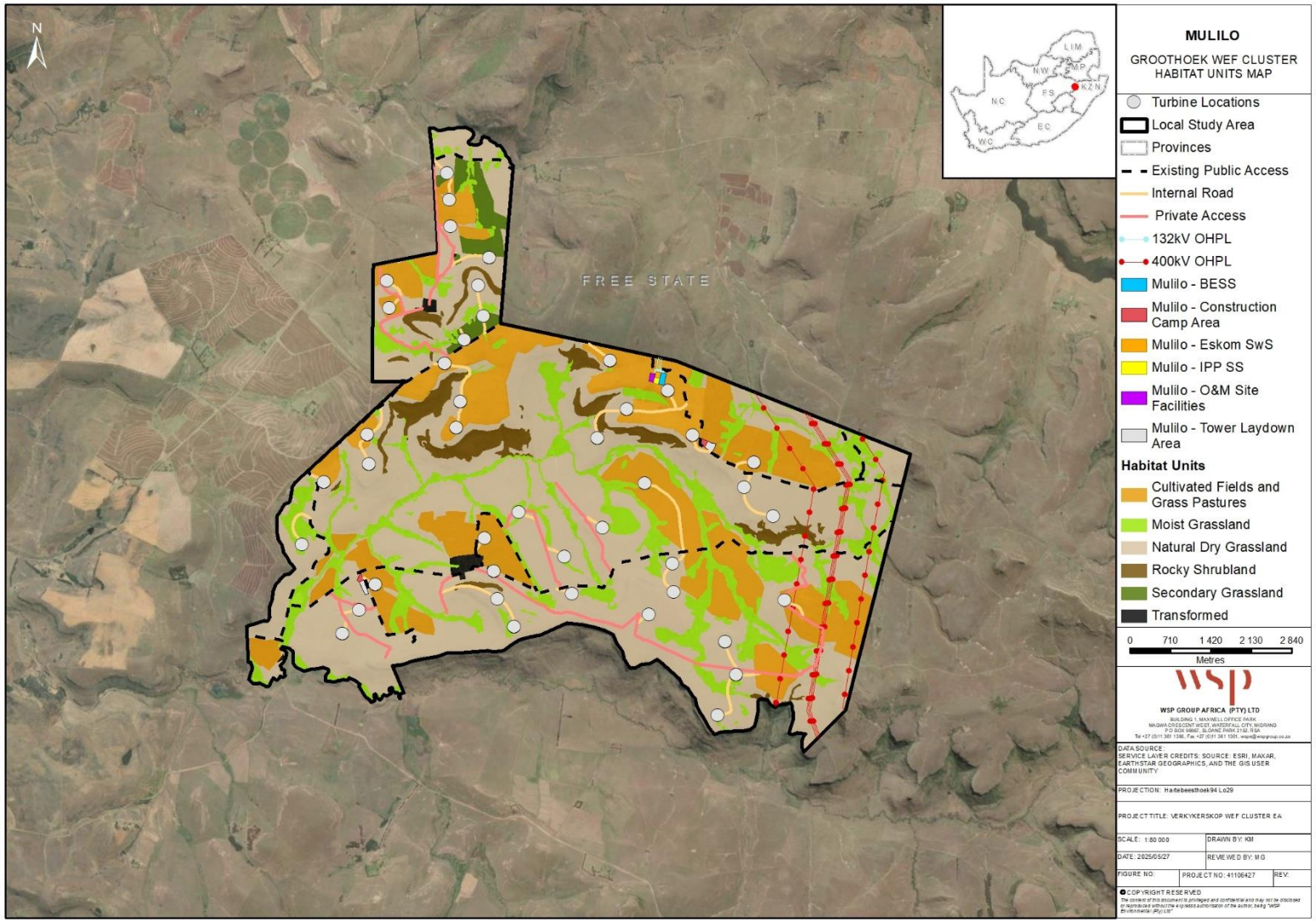



*Figure 24: Habitat units and the currently proposed infrastructure layout (also shown is the existing Eskom overhead powerline).*

#### *9.3.1.2. Fragmentation reducing natural habitat connectivity and integrity*

Habitat fragmentation is caused when vegetation clearing and/or the development of infrastructure (e.g., fences) result in the partitioning of habitat into smaller, discontinuous patches. This leads to altered habitat configuration that typically manifests as an increase in patch number and isolation, yet a decrease in overall patch size. These alterations change the ecological properties of remaining patches and can affect various ecological processes and metapopulation dynamics, such as fauna dispersal, movement and migration. This can, in turn, affect fauna species richness and population abundances.

The proposed access and internal road network is mostly aligned with existing farm roads. However, existing road upgrades coupled with the cutting of the proposed new access roads is likely to cause some fragmentation of natural habitat, and this will reduce habitat connectivity, which may have negative ecological impacts including *inter alia*, increased edge-effect disturbances and altered wildfire patterns.

Prior to mitigation, this impact has a high magnitude, permanently affecting natural habitat within and potentially adjacent to the development footprint (local). It is also considered to have a medium probability, resulting in an impact of "Medium" significance.

Various mitigation measures can be implemented to habitat fragmentation, including: aligning access roads with existing access roads and farm tracks; in-field micro-siting of new roads to already disturbed sites; minimising the clearance footprint to the minimum area required for construction and operational purposes; and, rehabilitating all disturbed footprints.

With these measures, impact magnitude can be reduced to medium. Duration can be reduced to the long-term, and probability to low, but spatial scale will remain local. This results in a residual impact of "Low" significance.

#### *9.3.1.3. Injury, mortality and disturbance of fauna*

Large and mobile fauna will move off to avoid disturbances caused by construction activities. However, smaller and less mobile species may be trapped, injured and killed during vegetation clearing and earth works. Susceptible fauna includes burrowing mammals (e.g., rodents), reptiles and amphibians. Other common potential causes of fauna death, injury and disturbance during the construction phase may include:

- Vehicle collisions along construction and access roads;
- Hunting and snaring by construction workers;
- Trapping of fauna in excavations and trenches; and
- Excessive dust and noise from construction machinery may cause sensory disturbances.

The impact prior to mitigation is considered to be of high magnitude and will affect fauna over the short term. The spatial scale is local. It is also considered to have a medium probability, resulting in an impact of "medium" significance.

With mitigation, which includes *inter alia*, enforcing a speed limit for construction and maintenance vehicles, strictly preventing hunting/snaring, and through the active management of all human-animal interactions, magnitude is reduced to low and probability of the impact can be reduced to low, and scale to the site only. This results in a residual impact of "Low" significance.

#### *9.3.1.4. Loss of fauna species of conservation concern*

Fauna SCC were documented during the field programme including the Grey Rhebok, Cape Clawless Otter, Serval and Brown Hyaena. Habitat suitability assessments also suggest that several other SCC may be present.

The recorded mammal SCC are all large and mobile species that are generally able to move off in response to direct construction activities and disturbances, such as earth works, vegetation clearing and excessive noise. Nonetheless, proposed Project activities may negatively impact fauna SCC populations through a reduction in general habitat integrity and functioning, caused by habitat loss, disturbance and fragmentation. Moreover, fauna SCC populations may also be impacted by mortality/injury associated with vehicle collisions, hunting and snaring.

The impact prior to mitigation is considered to be of very high magnitude and will have a short-term impact on affect fauna SCC. The spatial scale is local. It is also considered to have a medium probability, resulting in an impact of “medium” significance.

With mitigation, which includes a suite of measures to *inter alia*, limit habitat loss and disturbance and reduce direct mortality/disturbance, impact magnitude is reduced to high and probability of the impact can be reduced to low, and scale to the site only. This results in a residual impact of “Low” significance.

### 9.3.2. Operational Phase

Note: Impacts associated with fauna-wind turbine collisions will be assessed as part of separate avifauna and bat specialist studies.

#### *9.3.2.1.Injury, mortality and disturbance of fauna*

Potential causes of death, injury and disturbance to fauna during the operational phase include:

- Collision with maintenance vehicles along and access roads; and
- Hunting and snaring by maintenance workers.

The impact prior to mitigation is considered to be of high magnitude, and will have a medium-term effect since it could occur throughout the operational lifetime of the project. The spatial scale is local. It is also considered to have a medium probability, resulting in an impact of "medium" significance. With mitigation, magnitude is reduced to low and probability of the impact can be reduced to low, and scale to the site only. This results in a residual impact of "Low" significance.

#### *9.3.2.2. Vibration from operating wind turbines disturbing fauna*

Ground vibrations caused by operating wind turbines is purported to potentially cause disturbances to ground-dwelling fauna, such as moles and the mole-rats, and this may reduce the extent of suitable habitat for these species. It is noted however, that the overall impact of vibrations on fauna remain poorly understood and additional research, focusing on the South African context, is required to develop a better understanding of the type and significance of potential impacts, identify particularly sensitive species, and identify effective mitigation measures.

Pursuant to the above, an adaptive approach is recommended with respects to the proposed Project, with the proponent committing to keep abreast with research and developments in this field, and revise and implement additional mitigation measures as they become available.

Before mitigation, impact magnitude is high, while duration is permanent and it has a medium probability. The spatial extent is local. Prior to mitigation, this is rated an impact of "medium" significance. With the adoption of adaptive management approach, this impact can be reduced to a low magnitude, with a medium-term duration. Spatial extent will remain local and the probability of the impact occurring as predicted would be reduced to low. After mitigation, this impact is rated to be of "Low" significance.

### 9.3.3. Decommissioning Phase

#### *9.3.3.1. Injury, mortality and disturbance of fauna*

The dismantling and removal of Project infrastructure during decommissioning may result in incidences of fauna death and injury. Common causes may include, *inter alia*:

- Vehicle and machinery collisions along access roads and at infrastructure sites where decommissioning activities are occurring; and
- Increased hunting and snaring by workers involved in decommissioning activities are occurring.

The impact prior to mitigation is considered to be of high magnitude, and will have a short-term effect. The spatial scale is local. It is also considered to have a medium probability, resulting in an impact of "medium" significance.

With mitigation, magnitude is reduced to medium and probability of the impact can be reduced to low, and scale to the site only. This results in a residual impact of "Low" significance.

*Table 11: Impact assessment scoring for terrestrial fauna species*

| CONSTRUCTION | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Impact number** | **Receptor** | **Description** | **Stage** | **Character** | **Ease of Mitigation** | **Pre-Mitigation** | | | | | | | **Post-Mitigation** | | | | | | |
| | | | | | | **(M+** | **E+** | **R+** | **D)x** | **P=** | **S** | **Rating** | **(M+** | **E+** | **R+** | **D)x** | **P=** | **S** | **Rating** |
| **Impact 1:** | Fauna habitat | Direct loss and disturbance of natural habitat | Construction | Negative | Low | 4 | 2 | 3 | 5 | 5 | **70** | **N3** | 3 | 1 | 3 | 4 | 3 | **33** | **N2** |
| | | | | | **Significance** | **N3 - High** | | | | | | | **N2 - Medium** | | | | | | |
| **Impact 2:** | Fauna habitat | Fragmentation reducing natural habitat connectivity and integrity | Construction | Negative | Low | 4 | 2 | 3 | 5 | 3 | **42** | **N2** | 3 | 2 | 3 | 4 | 2 | **24** | **N1** |
| | | | | | **Significance** | **N2 - Medium** | | | | | | | **N1 - Low** | | | | | | |
| **Impact 3:** | Fauna SCC | Injury, mortality and disturbance of fauna | Construction | Negative | High | 4 | 2 | 3 | 2 | 3 | **33** | **N2** | 2 | 1 | 1 | 2 | 2 | **12** | **N1** |
| | | | | | **Significance** | **N2 - Medium** | | | | | | | **N1 - Low** | | | | | | |
| **Impact 4:** | Fauna SCC | Loss of fauna species of conservation concern | Construction | Negative | Low | 5 | 2 | 5 | 2 | 3 | **42** | **N2** | 4 | 1 | 5 | 2 | 2 | **24** | **N1** |
| | | | | | | **N2 - Medium** | | | | | | | **N1 - Low** | | | | | | |
| **OPERATIONAL** | | | | | | | | | | | | | | | | | | | |
| **Impact number** | **Receptor** | **Description** | **Stage** | **Character** | **Ease of Mitigation** | **Pre-Mitigation** | | | | | | | **Post-Mitigation** | | | | | | |
| | | | | | | **(M+** | **E+** | **R+** | **D)x** | **P=** | **S** | | **(M+** | **E+** | **R+** | **D)x** | **P=** | **S** | |
| **Impact 1:** | Fauna, incl. SCC | Injury and mortality of fauna, including SCC | Operational | Negative | High | 4 | 2 | 3 | 3 | 3 | **36** | **N2** | 2 | 1 | 1 | 2 | 2 | **12** | **N1** |
| | | | | | **Significance** | **N2 - Medium** | | | | | | | **N1 - Low** | | | | | | |
| **Impact 2:** | Fauna, incl. SCC | Vibrations from operating wind turbines | Operational | Negative | Low | 4 | 2 | 3 | 5 | 3 | **42** | **N2** | 2 | 2 | 3 | 3 | 2 | **20** | **N1** |
| | | | | | **Significance** | **N2 - Medium** | | | | | | | **N1 - Low** | | | | | | |
| **DECOMISSIONING** | | | | | | | | | | | | | | | | | | | |
| **Impact number** | **Receptor** | **Description** | **Stage** | **Character** | **Ease of Mitigation** | **Pre-Mitigation** | | | | | | | **Post-Mitigation** | | | | | | |
| | | | | | | **(M+** | **E+** | **R+** | **D)x** | **P=** | **S** | | **(M+** | **E+** | **R+** | **D)x** | **P=** | **S** | |
| **Impact 1:** | Fauna, incl. SCC | Injury and mortality of fauna, including SCC | Decommissioning | Negative | High | 4 | 2 | 3 | 2 | 3 | **33** | **N2** | 3 | 1 | 1 | 2 | 2 | **14** | **N1** |
| | | | | | **Significance** | **N2 - Medium** | | | | | | | **N1 - Low** | | | | | | |
| **CUMULATIVE** | | | | | | | | | | | | | | | | | | | |
| **Impact number** | **Receptor** | **Description** | **Stage** | **Character** | **Ease of Mitigation** | **Pre-Mitigation** | | | | | | | **Post-Mitigation** | | | | | | |
| | | | | | | **(M+** | **E+** | **R+** | **D)x** | **P=** | **S** | | **(M+** | **E+** | **R+** | **D)x** | **P=** | **S** | |
| **Impact 1:** | Fauna habitat & SCC | Cumulative impact on fauna SCC due to natural habitat loss, disturbance and fragmentation. | Construction | Negative | Moderate | 4 | 3 | 3 | 5 | 5 | **75** | **N3** | 2 | 3 | 3 | 4 | 2 | **24** | **N1** |
| | | | | | **Significance** | **N3 - High** | | | | | | | **N1 - Low** | | | | | | |
| **Impact 2:** | Fauna SCC | Cumulative impact of fauna SCC due to injury, mortality and disturbance | All | Negative | All | 4 | 3 | 5 | 3 | 4 | **52** | **N2** | 2 | 3 | 5 | 3 | 2 | **22** | **N1** |
| | | | | | **Significance** | **N2 - Medium** | | | | | | | **N1 - Low** | | | | | | |

### 9.3.4. Cumulative Impact Assessment

Cumulative impacts refer to the successive, incremental, and/or combined effects of a project, activity, or action when considered alongside other existing, planned, or reasonably foreseeable developments. The assessment and management of cumulative impacts focus on those impacts that are scientifically significant or of concern to affected receptors.

Cumulative impacts are evaluated within the project's area of influence, which includes:

- Areas directly impacted by the proposed Project;
- Surrounding regions influenced by other existing and planned projects; and
- Broader geographic and temporal scales where unplanned but predictable impacts may emerge.

The cumulative impact assessment provides a foundation for understanding the broader ecological context of the Verkykerskop WEF cluster in general and the Groothoek WEF in particular. It evaluates the additive effects of the proposed Project in conjunction with other renewable energy developments within the region with the goal of proposing actionable measures to mitigate cumulative impacts where feasible.

Cumulative impacts with existing and planned facilities may occur during construction and operation of the proposed WEF. While one project may not have a significant negative impact on sensitive resources or receptors, the collective impact of the projects may increase the severity of the potential impacts.

Several WEF in the surrounding area were considered for the cumulative impact assessment. Those within a 50 km radius of the Verkykerskop WEF cluster are listed in Table 12 and shown in Figure 25

*Table 12: WEF Projects within 50 km of the Verkykerskop WEF Cluster.*

| Project Name | Applicant | Status | Reference Number | Distance Away (km) |
|---|---|---|---|---|
| Newcastle Gas Engine Power Plant (NGEPP), Newcastle, KwaZulu-Natal Province. | Newcastle Energy (Pty) Ltd | Refused | 14/12/16/3/3/2/2074 | 36 |
| Proposed Upgrade of Karbochem boilers and electricity project in Newcastle | Distributed Energy Generation (Pty) Ltd | In process | 14/12/16/3/3/1/1164 | 37 |
| Proposed Upgrade of Karbochem boilers and electricity project in Newcastle - Amendment | Distributed Energy Generation (Pty) Ltd | Approved | 14/12/16/3/3/1/1164/AM1 | 37 |

| Project Name | Applicant | Status | Reference Number | Distance Away (km) |
|---|---|---|---|---|
| Proposed Newcastle solar energy facility near Newcastle, KwaZulu-Natal Province | Building Energy (Pty) Ltd | Refused | 14/12/16/3/3/1/1225 | 38 |
| Proposed Newcastle WEF 2 and associated grid infrastructure near Newcastle, KwaZulu-Natal Province | Mulilo Newcastle Wind Power 2 (Pty) Ltd | Refused | 14-12-16-3-3-2-2213 | 34 |
| Proposed Mulilo Newcastle WEF and associated grid infrastructure near Newcastle, KwaZulu-Natal Province | Mulilo Newcastle Wind Power (Pty) Ltd | Approved | 14-12-16-3-3-2-2457 | 40 |
| Proposed Mulilo Newcastle WEF 2 and associated grid infrastructure near Newcastle, KwaZulu-Natal Province | Mulilo Newcastle Wind Power 2 (Pty) Ltd | Approved | 14-12-16-3-3-2-2458 | 43 |

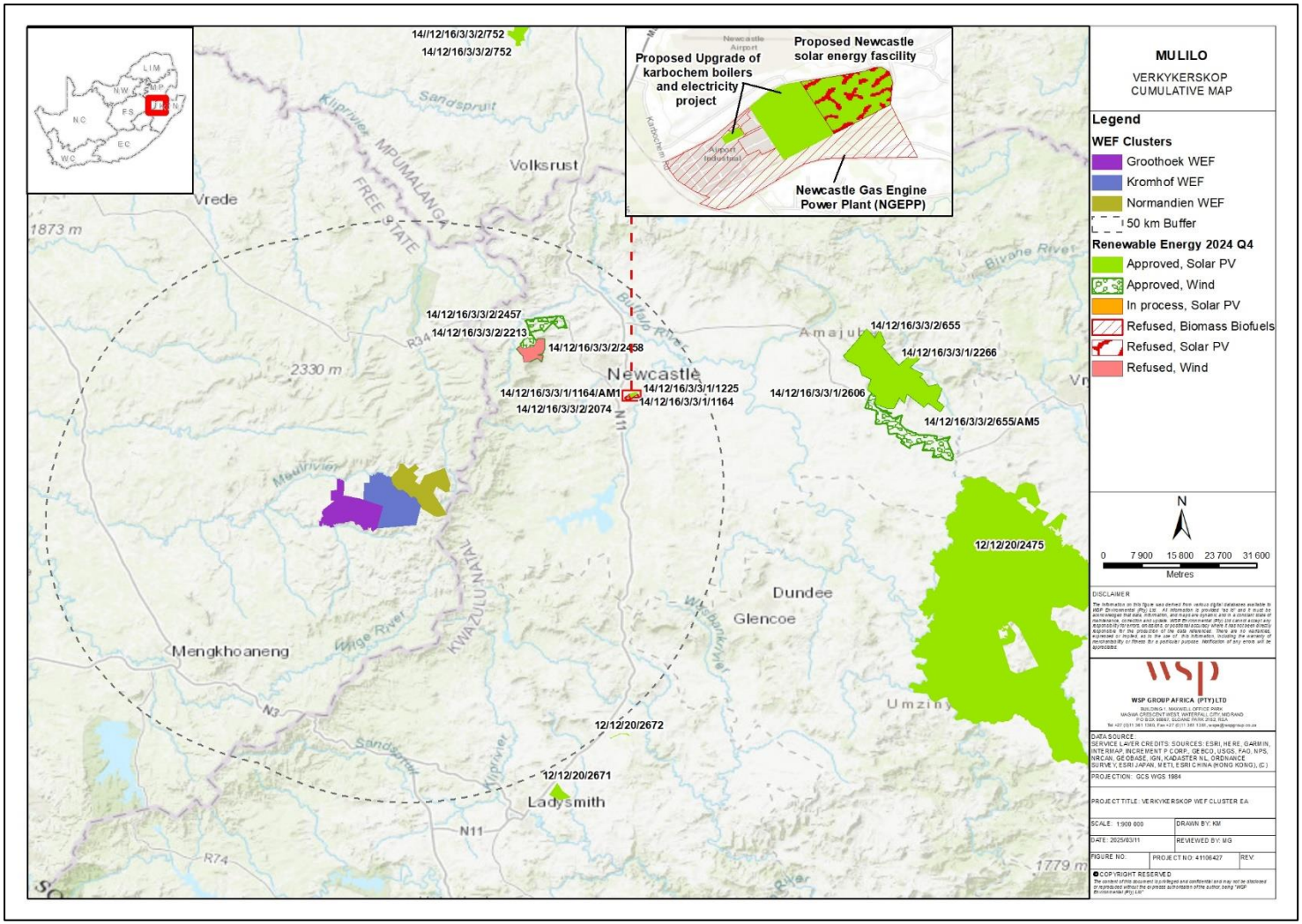



*Figure 25: Map showing WEF Projects within a 50 km radius of the Verkykerskop WEF Cluster.*

#### *9.3.4.1. Cumulative impact on fauna SCC due to natural habitat loss, disturbance and fragmentation.*

Collectively, the various projects associated with the Verkykerskop WEF cluster, as well as the additional projects within a 50 km radius (listed in Table 12), will cause direct habitat loss, disturbance and fragmentation through vegetation clearing that is greater in extent than that of a single project, and this is a cumulative impact of concern with respects to local fauna SCC metapopulations dynamics, and specifically their ability to move and disperse across the landscape to access key resources, in accordance with their life-cycle requirements.

Prior to any form of mitigation, the cumulative impact on fauna SCC resulting from habitat loss, disturbance and fragmentation is rated 'high'. The project contribution to cumulative impacts can be minimised by strictly implementing the required mitigation measures and addressing any significant residual impacts via additional conservation actions, which could include offsets. The cumulative impact on fauna SCC can be thus reduced to 'Low' significance.

#### *9.3.4.2. Cumulative impact on fauna SCC due to direct injury, mortality and disturbance*

The cumulative development of the various development projects will result in a higher number of construction locations, on-site workers, and higher levels of vehicle activity across the surrounding landscape, than compared to the current status quo, which is mostly characterised by rural farming activities. This is likely to increase the potential for, and number of, fauna SCC that may be killed, injured or disturbed. This may negatively impact the viability fauna SCC populations.

Prior to any form of mitigation, the cumulative impact on fauna SCC from injury, mortality or disturbance is rated 'medium'. With the implementation of the management and mitigation measures presented in this report, the Project contribution to cumulative impacts on terrestrial fauna SCC can be reduced to 'Low' significance.

# 10. Assessment of the No Go Alternative

Should the proposed Project not proceed, the existing agricultural practices (i.e., crop cultivation, cattle, and sheep farming) will persist across the LSA. Consequently, the condition and character of on-site natural habitat, along with current fauna populations, including SCC, will remain unchanged.

# 11. Mitigation Measures

The following section presents the proposed impact management actions to avoid, minimise and/or manage the potential impacts/risks which were assessed in the preceding section.

As with the assessment of potential impacts/risks, the impact management actions have been arranged according to the following main Project phases:

- Construction, incl. Pre-Construction;
- Operational; and
- Decommissioning.

For each impact management action, the following information is provided:

- Category: The category within which the potential impact/risk occurs;

- Potential impact/risk: Identified potential impact/risk resulting from the pre-construction, construction, operation, and decommissioning of the proposed Project;
- Description: Description of the possible impact management action;
- Prescribed standards or practices: Prescribed environmental standards or practices with which the impact management action must comply. Note that only key standards or practices have been listed;
- Mitigation type: The type of mitigation measure. This includes the following:
    - Avoidance;
    - Minimisation;
    - Rehabilitation or restoration;
    - Offsetting;
- Time period: The time period when the impact management actions must be implemented; and
- Responsible persons: The persons who will be responsible for the implementation of the impact management actions.

Table 13**Error! Reference source not found.** presents a summary of the proposed impact mitigation actions during the construction, operational, and decommissioning phases of the proposed Project.

*Table 13: Recommended mitigation and management measures for terrestrial fauna*

| Ref No. | Category | Potential impact/risk | Description | Prescribed standards or practices | Mitigation type | Time period | Responsible person |
|---|---|---|---|---|---|---|---|
| **1. Pre-Construction and Construction Phase** | | | | | | | |
| 1.1 | Fauna Habitats | Direct loss and disturbance of natural habitat | <u>Avoidance</u><br>• As far as possible proposed permanent Project infrastructure (e.g., wind turbines, access roads) should be located in areas of modified habitat (i.e., Cultivated Fields);<br>• All temporary construction footprints, (e.g., construction camps, laydown areas), should <u>only</u> be located in areas of modified habitat;<br>• A pre-construction walkdown of the approved development footprints should be conducted during the wet/growing season to identify sensitive biodiversity and inform the micro-siting of Project infrastructure to already disturbed sites and other relevant management measures.<br><br><u>Minimisation</u><br>• All vegetation clearing for the Project should be restricted to the proposed | N/A | Avoidance, Minimisation and Rehabilitation | During Pre-Construction and Construction Phase | Project Manager |

| Ref No. | Category | Potential impact/risk | Description | Prescribed standards or practices | Mitigation type | Time period | Responsible person |
|---|---|---|---|---|---|---|---|
| | | | Project footprints only, with no clearing permitted outside of these footprints;<br>• The footprints to be cleared of vegetation should be clearly demarcated, prior to construction, to prevent unnecessary clearing outside of these areas;<br>• No heavy vehicles should travel beyond the marked/demarked work zones;<br>• Removed topsoil should be stockpiled and used to rehabilitate all disturbed areas.<br><br><u>Rehabilitation</u><br><br>A rehabilitation/ landscaping protocol should be developed and implemented to stabilise and revegetate all non-operational sites that have been disturbed by construction activities. The protocol should include:<br><br>• The correct stockpiling of topsoil that was cleared from development footprints during site preparation;<br>• The correct contouring of the post-construction landform to limit potential erosion; | | | | |

| Ref No. | Category | Potential impact/risk | Description | Prescribed standards or practices | Mitigation type | Time period | Responsible person |
|---|---|---|---|---|---|---|---|
| | | | • Compacted soils should be ripped and loosened to facilitate vegetation establishment;<br>• Topsoil removed during construction should be applied to all non-operational sites that were disturbed during construction and require revegetation; and<br>• Active revegetation should be conducted using grass species that are indigenous, locally-occurring and perennial. | | | | |
| 1.2 | Fauna, incl. SCC | Fragmentation reducing natural habitat connectivity and integrity | <u>Minimisation</u><br><br>See mitigation measures for *Direct loss and disturbance of natural habitat*, and<br><br>• Proposed access roads should be aligned, as far as possible, with existing farm roads and tracks and new road should be micro-sited to already disturbed sites.<br><br><u>Rehabilitation</u><br><br>See mitigation measures for *Direct loss and disturbance of natural habitat* | N/A | Minimisation and Rehabilitation | During Pre-Construction and Construction Phase | Project Manager |

| Ref No. | Category | Potential impact/risk | Description | Prescribed standards or practices | Mitigation type | Time period | Responsible person |
|---|---|---|---|---|---|---|---|
| 1.3 | Fauna, incl. SCC | Injury, mortality and disturbance of fauna. | <u>Avoidance and Minimisation</u><br>• An Environmental Control Officer (ECO) should be on-site during vegetation clearing to monitor and manage any wildlife-human interactions;<br>• As appropriate, temporary barriers should be erected around construction trenches and excavations to prevent fauna becoming trapped;<br>• Any fauna species trapped in construction areas, should be safely and correctly relocated to an adjacent area of natural habitat;<br>• A low-speed limit (recommended 20-40 km/h) should be enforced on site to reduce wildlife collisions;<br>• No fauna may be intentionally killed or injured by on-site contractors and workers. Handling, poisoning, snaring and killing of on-site fauna by contractors and workers must be strictly prohibited;<br>• General noise abatement equipment should be fitted to construction machinery and vehicles; | N/A | Avoidance and Minimisation | During Construction Phase | Project Manager |

| Ref No. | Category | Potential impact/risk | Description | Prescribed standards or practices | Mitigation type | Time period | Responsible person |
|---|---|---|---|---|---|---|---|
| | | | • Dust suppression using water bowsers should be undertaken on all roads and other sites where dust entrainment occurs;<br>• The rules and regulations concerning fauna should be communicated to contractors through on-site signage and awareness training; and<br>• An incidence register should be maintained throughout all phases of the Project detailing any fauna mortalities/injuries caused by on-site activities. The register should be used to identify additional biodiversity management requirements. | | | | |
| 1.4 | Fauna SCC | Loss of fauna of conservation concern | <u>Avoidance and Minimisation</u><br><br>See mitigation measures for *Direct loss and disturbance of natural habitat*, *Fragmentation reducing natural habitat connectivity and integrity*, and *Injury, mortality and disturbance of Fauna* – And:<br><br>• During the pre-construction walkdown of the development footprints, additional | N/A | Avoidance and Minimisation | During Construction Phase | Project Manager |

| Ref No. | Category | Potential impact/risk | Description | Prescribed standards or practices | Mitigation type | Time period | Responsible person |
|---|---|---|---|---|---|---|---|
| | | | surveying should be conducted to identifying any Sensitive species 15 burrow sites;<br>• If Sensitive species 15 burrow sites are confirmed, then additional conservation actions should be identified, compiled in a species-specific management and monitoring plan for Sensitive species 15, and implemented; and<br>• Key measures that should be included in the plan include the delineation of an avoidance/exclusion buffer of 400 m around each burrow site, as prescribed by SANBI (2020). | | | | |
| **2. Operational phase** | | | | | | | |
| 2.1 | Fauna, incl. SCC | Injury, mortality disturbance of fauna, including SCC | <u>Avoidance and Minimisation</u><br>• No off-road driving is permitted for vehicles and mobile machinery used during operations and for maintenance purposes.<br>• A low-speed limit (recommended 20-40 km/h) should be enforced on site to reduce wildlife collisions; | N/A | Avoidance and Minimisation | During Operational Phase | Facility Manager |

| Ref No. | Category | Potential impact/risk | Description | Prescribed standards or practices | Mitigation type | Time period | Responsible person |
|---|---|---|---|---|---|---|---|
| | | | • No fauna may be intentionally killed or injured by on-site contractors and workers. Handling, poisoning, snaring and killing of on-site fauna by contractors and workers must be strictly prohibited;<br>• The rules and regulations concerning fauna should be communicated to maintenance personnel through on-site signage and awareness training. | | | | |
| 2.2 | Terrestrial Fauna, incl. SCC | Vibration from operating wind turbines disturbing fauna | <u>Minimisation</u><br>• The Project proponent must keep actively informed about new research in the field of vibration impacts on fauna and potential mitigation options; and<br>• Based on the findings of new research, the biodiversity management plan for the proposed Project should be updated to include additional mitigation measures and these should be implemented on-site. | N/A | Minimisation | During Operational Phase | Facility Manager |
| **3. Decommissioning phase** | | | | | | | |

| Ref No. | Category | Potential impact/risk | Description | Prescribed standards or practices | Mitigation type | Time period | Responsible person |
|---|---|---|---|---|---|---|---|
| 3.1 | Fauna incl. SCC | Injury, mortality disturbance of fauna, including SCC | <u>Avoidance and Minimisation</u><br>• No off-road driving is permitted for vehicles and mobile machinery used during decommissioning phases activities;<br>• A low-speed limit (recommended 20-40 km/h) should be enforced on site to reduce wildlife collisions;<br>• The handling, poisoning and killing of on-site fauna by on-site workers must be strictly prohibited; and<br>• The rules and regulations concerning fauna should be communicated to maintenance personnel through on-site signage and awareness training. | N/A | Avoidance and Minimisation | During Decommissioning Phase | Facility Manager |

# 12. Monitoring Measures

No additional monitoring measures are recommended for terrestrial animal species at this stage.

# 13. Reasoned Opinion and Environmental Impact Statement

## 13.1. Summary of Main Findings

The LSA, as well as the broader RSA, are characterised by extensive tracts of natural mountainous habitat, comprising Natural Dry Grasslands, Moist Grassland and Rocky Shrubland. Various forms of linear infrastructure, such as powerlines, district roads, farm roads and tracks, and numerous farm fences are present and have caused a degree of habitat fragmentation. However, overall habitat connectivity across the landscape remains very high.

Areas of natural habitat in the RSA and LSA therefore provide suitable habitat and a network of movement and dispersal corridors for local fauna species. The continued integrity and functioning of on-site natural habitat is therefore important in maintaining the metapopulation dynamics of local fauna, including SCC.

During the field programme, four mammal SCC were documented in the RSA, including Grey Rhebok (Near Threatened), Serval (Near Threatened), Cape Clawless Otter (Near Threatened) and Brown Hyaena (Near Threatened). Habitat suitability assessments indicate that several other SCC may also be present, including the Spotted-necked Otter, which was highlighted by the DFFE screening tool as potentially sensitive features.

The proposed Project will result in several ecological impacts, which may negatively impact local fauna SCC populations. Several mitigation measures have been recommended in this report to manage the anticipated ecological impacts, and it is recommended that these are incorporated into the proposed Project's environmental management plan report (EMPr).

## 13.2. Conditions to be Included in the Environmental Authorisation

No additional conditions are recommended for inclusion in the proposed Project's environmental authorisation.

## 13.3. Specialist Opinion

In accordance with the outcomes of the impact assessment, and taking cognisance of the baseline conditions presented herein, as well as the impact management measures, the proposed Project is not deemed to present significant negative ecological issues or impacts, and it should thus be authorised.

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This report has been compiled by Andrew Zinn (Hawkhead Consulting).

Andrew Zinn (*Pr.Sci.Nat*.)

# Appendix A: Curriculum Vitae – Andrew Zinn

# Hawkhead Consulting

# Curriculum Vitae of Andrew Zinn (Pr.Sci.Nat.)

## Details

Andrew David Zinn
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## Profile

I am an ecologist with an M.Sc. Degree in Resource Conservation Biology and 15 years of experience working in biodiversity consulting and ecological research. I am registered with the South African Council of Natural Scientific Professions as a Professional Natural Scientist. I currently work as an independent consulting ecologist, with Hawkhead Consulting. During my career I have worked on projects in remote areas in several African countries including South Africa, Botswana, Democratic Republic of the Congo, Ethiopia, Ghana, Mozambique, Tanzania and Zambia. I have also previously worked in the United Kingdom and the United Arab Emirates.

## Education and Qualifications

- University of the Witwatersrand, M.Sc. Resource Conservation Biology (2013).
- University of KwaZulu-Natal, BSc. Hons. Ecology and Conservation Biology (2005).
- University of KwaZulu-Natal, BSc. Zoology and Grassland Science (2004).
- Bryanston High School, Johannesburg. Matric Exemption. (2000).

## Affiliations

- Member of the South African Council of Natural Scientific Professions – Professional Natural Scientist (400687/15).
- Member of the South African Wildlife Management Association.
- Member of the South African Association of Botanists.

## Work Experience

1. **Independent Ecologist**

**Hawkhead Consulting, South Africa**
**September 2020 – Present**

Consulting ecologist focusing on terrestrial ecology. I specialise in conducting baseline flora and fauna surveys, ecological impact assessments, and developing mitigation and management programmes for projects and operations in various industry sectors. Core services and responsibilities include, amongst others:

- Biodiversity study design and implementation;
- Biodiversity baseline and impact assessment reporting;
- Mitigation measure design and application;
- Vegetation surveys and vegetation community mapping;
- Fauna surveys for mammals, birds, reptiles and amphibians;
- Development of biodiversity management plans;
- Development of rehabilitation and revegetation plans; and
- Alien invasive species control and eradication plans.

2. **Ecologist**

**Golder Associates Africa, South Africa**
**June 2011 – September 2020**

Ecologist responsible for the management and implementation of baseline biodiversity studies and ecological impact assessments for development projects in the mining, power generation, transport, land development and industrial development sectors throughout sub-Saharan Africa. Role responsibilities included project management, technical review, biodiversity study design and implementation, flora and fauna surveys, biodiversity baseline and impact assessment reporting, development of biodiversity management plans, rehabilitation plans and alien invasive species control and eradication plans. These studies were conducted to satisfy national environmental regulations and/or international financing requirements, including the International Finance Corporation's (IFC) Performance Standard 6 (PS6)

3. **Independent Ecologist**

**Subcontracted to KPMG, United Arab Emirates**
**March – April 2011**

Subcontracted to KPMG as a subject matter expert (ecology) on the internal audit of Sir Bani Yas Island's Conservation Department (United Arab Emirates). The audit focused on evaluating the efficacy of the island's various conservation practices, including game management, feed provisioning, carnivore breeding and monitoring, veterinary care and vegetation maintenance.

4. **Environmental Consultant**

**WSP Environment and Energy, South Africa**
**August 2008 – March 2011**

Environmental consultant, responsible for a range of environmental projects and services including managing environmental authorisation processes (BAs and EIAs), facilitating stakeholder engagement processes,
conducting compliance audits, developing environmental management programmes and conducting specialist ecological studies.

5. **Research Technician**

**Yale University, Kruger National Park, South Africa**
**October 2007 – May 2008**

Research technician on the Savanna Convergence Experiment (SCE). The SCE project was a long-term cross-continental study that investigated the role of mega-herbivores in fire-grazing interactions and their influence on vegetation dynamics. Responsible for collecting and analysing vegetation composition and productivity data, as well as herbivore distribution data.

## Publications

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# Appendix B: Methodology Supplement

**Rating criteria for Conservation Importance, Functional Integrity and Receptor Resilience and the scoring matrices, as per (SANBI, 2020).**

The ecological sensitivity of habitats in the study area was determined using the protocol for evaluating site ecological importance (SEI) as published in SANBI's Species Assessment Guideline (SANBI, 2020). SEI is considered to be a function of the biodiversity importance (BI) of a receptor and its resilience to impacts (receptor resilience, RR), as per:

$$SEI = BI + RR.$$

Biodiversity importance is a function of conservation importance (CI) and the functional integrity (FI) of the receptor, as per:

$$BI = CI + FI$$

- **Conservation Importance** is defined as "the importance of a site for supporting biodiversity features of conservation concern present, e.g., populations of IUCN threatened and Near Threatened species (CR, EN, VU and NT), Rare species, range-restricted species, globally significant populations of congregatory species, and areas of threatened ecosystems types, through predominantly natural processes" (SANBI, 2020).
- **Functional Integrity** is defined as "A measure of the ecological condition of the impact receptor as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts" (SANBI, 2020).
- **Receptor Resilience** is defined as "the intrinsic capacity of the receptor to resist major damage from disturbance and/or to recover to its original state with limited or no human intervention" (SANBI, 2020).

**Table 1: Conservation Importance (CI) criteria.**

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

**Table 2: Functional Integrity (FI) criteria.**

| Functional Integrity (FI) | Fulfilling Criteria |
|---|---|
| **Very High** | • Very large (>100 ha) intact area for any conservation status of ecosystem type or >5a ha for CR ecosystem type;<br>• High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches;<br>• No or minimal current negative ecological impacts with no signs of major disturbance (e.g., ploughing) |
| **High** | • Large (>5 ha but < 100 ha) intact area for any conservation status ecosystem types;<br>• Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches; and<br>• Only minor current negative ecological impacts (e.g., few livestock utilising area) with no signs of major past disturbance (e.g., ploughing) and good rehabilitation potential. |
| **Medium** | • Medium (>5ha but< 20 ha) semi-intact area for any conservation status ecosystem type or >20 ha for VU ecosystem type;<br>• Only narrow corridors of good connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches;<br>• Mostly minor current negative ecological impacts with some major impacts (e.g., established population of alien invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential. |
| **Low** | • Small (> 1 ha but <5ha) area;<br>• Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential; and<br>• Several minor and major current negative ecological impacts. |
| **Very Low** | • Very small (<1 ha) area;<br>• No habitat connectivity except for flying species or flora with wind-dispersed seeds;<br>• Several major current negative ecological impacts. |

**BI = CI + FI**

**Biodiversity Importance (BI) Rating Matrix**

| Biodiversity Importance (BI) | | Conservation Importance | | | | |
|---|---|---|---|---|---|---|
| | | **Very High** | **High** | **Medium** | **Low** | **Very Low** |
| **Functional Integrity** | **Very High** | Very High | Very High | High | Medium | Low |
| | **High** | Very High | High | Medium | Medium | Low |
| | **Medium** | High | Medium | Medium | Low | Very Low |
| | **Low** | Medium | Medium | Low | Low | Very Low |
| | **Very Low** | Medium | Low | Very Low | Very Low | Very Low |

**Table 3: Receptor Resilience criteria (RR)**

| Resilience | Fulfilling Criteria |
|---|---|
| **Very High** | Habitat that can recover rapidly (˜less than 5 years) to restore >75% of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of remaining at a site even when a disturbance or impacts occurring, or species that have a very high likelihood of returning to a site once the disturbance or impact has been removed. |
| **High** | Habitat that can recover relatively quickly (˜ 5-10 years) to restore >75% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impacts occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed. |
| **Medium** | Habitat that can recover slowly (˜ more than 10 years) to restore >75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impacts occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed. |
| **Low** | Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ˜less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of remaining at a site even when a disturbance or impacts occurring, or species that have a low likelihood of returning to a site once the disturbance or impact has been removed. |
| **Very Low** | Habitat that is unable to recover from major impacts, or species that are unlikely to remain at a site even when a disturbance or impact is occurring, or species that are unlikely to return to a site once the disturbance or impact has been removed. |

**SEI = BI + RR**

**Site Ecological Importance (SEI) Rating Matrix**

| Site Ecological Importance | | Biodiversity Importance | | | | |
|---|---|---|---|---|---|---|
| | | **Very High** | **High** | **Medium** | **Low** | **Very Low** |
| **Receptor Resilience** | **Very Low** | Very High | Very High | High | Medium | Low |
| | **Low** | Very High | Very High | High | Medium | Very Low |
| | **Medium** | Very High | High | Medium | Low | Very Low |
| | **High** | High | Medium | Low | Very Low | Very Low |
| | **Very High** | Medium | Low | Very Low | Very Low | Very Low |

# Appendix C: List of Mammal Species Recorded or Potentially Occurring in the RSA and LSA

Species highlighted in **bold** text have been recorded in the 2729CD, 2729DC, 2829BA and 2829AB QDS as per MammalMap.

| Family | Scientific Name | Common Name | Regional Red List Status (2016) | NEMBA ToPS List (2007) | Free State Provincial Status |
|---|---|---|---|---|---|
| Bathyergidae | *Cryptomys hottentotus* | Common Mole-rat | Least Concern | - | - |
| Bovidae | *Connochaetes gnou* | Black Wildebeest | Least Concern | Protected | - |
| Bovidae | *Damaliscus pygargus phillipsi* | Blesbok | Least Concern | - | - |
| Bovidae | *Oreotragus oreotragus* | Klipspringer | Least Concern | - | - |
| Bovidae | *Ourebia ourebi ourebi* | Oribi | Endangered | Endangered | Protected |
| **Bovidae** | ***Pelea capreolus*** | **Grey Rhebok** | **Near Threatened** | - | - |
| **Bovidae** | ***Raphicerus campestris*** | **Steenbok** | **Least Concern** | - | - |
| Bovidae | *Redunca arundinum* | Southern Reedbuck | Least Concern | Protected | - |
| **Bovidae** | ***Redunca fulvorufula fulvorufula*** | **Mountain Reedbuck** | **Endangered** | - | - |
| **Bovidae** | ***Sylvicapra grimmia*** | **Common Duiker** | **Least Concern** | - | - |
| **Bovidae** | ***Tragelaphus strepsiceros*** | **Greater Kudu** | **Least Concern** | - | - |
| Bovidae | *Tragelaphus sylvaticus* | Southern Bushbuck | Least Concern | - | - |
| Canidae | *Canis mesomelas* | Black-backed Jackal | Least Concern | - | - |
| Canidae | *Vulpes chama* | Cape Fox | Least Concern | Protected | - |
| Cercopithecidae | *Chlorocebus pygerythrus* | Vervet Monkey | Least Concern | - | - |
| **Cercopithecidae** | ***Papio ursinus*** | **Chacma Baboon** | **Least Concern** | - | - |
| Chrysochloridae | *Amblysomus hottentotus* | Hottentot's Golden Mole | Least Concern | - | - |
| Chrysochloridae | *Amblysomus septentrionalis* | Highveld Golden Mole | Near Threatened | - | - |
| Chrysochloridae | *Chlorotalpa sclateri* | Sclater's Golden Mole | Least Concern | - | - |
| Chrysochloridae | *Chrysospalax villosus* | Rough-haired Golden Mole | Vulnerable | Critically Endangered | - |
| Erinaceidae | *Atelerix frontalis* | South African Hedgehog | Near Threatened | Protected | - |
| **Felidae** | ***Caracal caracal*** | **Caracal** | **Least Concern** | | - |

| Family | Scientific Name | Common Name | Regional Red List Status (2016) | NEMBA ToPS List (2007) | Free State Provincial Status |
|---|---|---|---|---|---|
| **Felidae** | ***Felis nigripes*** | **Black-footed Cat** | **Vulnerable** | **Protected** | - |
| Felidae | *Felis silvestris* | African Wildcat | Least Concern | - | - |
| **Felidae** | ***Leptailurus serval*** | **Serval** | **Near Threatened** | **Protected** | - |
| **Gliridae** | ***Graphiurus murinus*** | **Woodland Dormouse** | **Least Concern** | - | - |
| Herpestidae | *Atilax paludinosus* | Water Mongoose | Least Concern | - | - |
| **Herpestidae** | ***Cynictis penicillata*** | **Yellow Mongoose** | **Least Concern** | - | - |
| Herpestidae | *Herpestes pulverulentus* | Cape Grey Mongoose | Least Concern | - | - |
| Herpestidae | *Herpestes sanguineus* | Slender Mongoose | Least Concern | - | - |
| Herpestidae | *Ichneumia albicauda* | White-tailed Mongoose | Least Concern | - | - |
| **Herpestidae** | ***Suricata suricatta*** | **Suricate** | **Least Concern** | - | - |
| Hyaenidae | *Proteles cristata* | Aardwolf | Least Concern | - | Protected |
| **Hystricidae** | ***Hystrix africaeaustralis*** | **Cape Porcupine** | **Least Concern** | - | **Protected** |
| **Leporidae** | ***Lepus saxatilis*** | **Scrub Hare** | **Least Concern** | - | - |
| Leporidae | *Pronolagus crassicaudatus* | Natal Red Rock Rabbit | Least Concern | - | - |
| Leporidae | *Pronolagus rupestris* | Smith's Red Rock Rabbit | Least Concern | - | - |
| Macroscelididae | *Elephantulus myurus* | Eastern Rock Sengi | Least Concern | - | - |
| Muridae | *Aethomys chrysophilus* | Red Veld Rat | Least Concern | - | - |
| **Muridae** | ***Gerbilliscus brantsii*** | **Highveld Gerbil** | **Least Concern** | - | - |
| Muridae | *Gerbilliscus paeba* | Hairy-footed Gerbil | Least Concern | - | - |
| Muridae | *Mastomys natalensis* | Natal Multimammate Mouse | Least Concern | - | - |
| Muridae | *Micaelamys namaquensis* | Namaqua Rock Mouse | Least Concern | - | - |
| **Muridae** | ***Mus minutoides*** | **Pygmy Mouse** | **Least Concern** | - | - |
| Muridae | *Otomys angoniensis* | Angoni Vlei Rat | Least Concern | - | - |
| **Muridae** | ***Otomys auratus*** | **Southern African Vlei Rat** | **Least Concern** | - | - |
| Muridae | *Otomys sloggetti* | Sloggett's Rat | Least Concern | - | - |
| **Muridae** | ***Rhabdomys pumilio*** | **Xeric Four-striped Mouse** | **Least Concern** | - | - |

| Family | Scientific Name | Common Name | Regional Red List Status (2016) | NEMBA ToPS List (2007) | Free State Provincial Status |
|---|---|---|---|---|---|
| Muridae | *Dendromus melanotis* | Grey Climbing Mouse | Least Concern | - | - |
| Muridae | *Dendromus mesomelas* | Brant's Climbing Mouse | Least Concern | - | - |
| Muridae | *Dendromus mystacalis* | Chestnut Climbing Mouse | Least Concern | - | - |
| Muridae | *Mystromys albicaudatus* | White-tailed Rat | Vulnerable | - | - |
| Muridae | *Steatomys pratensis* | Fat Mouse | Least Concern | - | - |
| Mustelidae | *Aonyx capensis* | Cape Clawless Otter | Near Threatened | Protected | - |
| Mustelidae | *Hydrictis maculicollis* | Spotted-necked Otter | Vulnerable | Protected | - |
| Mustelidae | *Ictonyx striatus* | Striped Polecat | Least Concern | - | - |
| Mustelidae | *Mellivora capensis* | Honey Badger | Least Concern | Protected | - |
| Mustelidae | *Poecilogale albinucha* | African Striped Weasel | Near Threatened | - | - |
| Orycteropodidae | *Orycteropus afer* | Aardvark | Least Concern | - | - |
| **Pedetidae** | ***Pedetes capensis*** | **Springhare** | **Least Concern** | - | - |
| **Procaviidae** | ***Procavia capensis*** | **Rock Hyrax** | **Least Concern** | - | - |
| **Sciuridae** | ***Xerus inauris*** | **Cape Ground Squirrel** | **Least Concern** | - | - |
| Soricidae | *Crocidura cyanea* | Reddish-grey Musk Shrew | Least Concern | - | - |
| Soricidae | *Crocidura flavescens* | Greater Red Musk Shrew | Least Concern | - | - |
| Soricidae | *Crocidura fuscomurina* | Tiny Musk Shrew | Least Concern | - | - |
| Soricidae | *Crocidura hirta* | Lesser Red Musk Shrew | Least Concern | - | - |
| Soricidae | *Crocidura maquassiensis* | Maquassie Musk Shrew | Vulnerable | - | - |
| Soricidae | *Crocidura mariquensis* | Swamp Musk Shrew | Near Threatened | - | - |
| Soricidae | *Myosorex varius* | Forest Shrew | Least Concern | - | - |
| Soricidae | *Suncus varilla* | Lesser Dwarf Shrew | Least Concern | - | - |
| Thryonomyidae | *Thryonomys swinderianus* | Greater Cane Rat | Least Concern | - | - |
| Viverridae | *Genetta genetta* | Small-spotted Genet | Least Concern | - | - |
| Viverridae | *Genetta tigrina* | Cape Genet | Least Concern | - | - |
| Source: Master list based on distribution maps in Stuart and Stuart (2007) | | | | | |

# Appendix D: List of Herpetofauna Species Recorded or Potentially Occurring in the RSA and LSA

Reptiles

(Species highlighted in **bold** text have been recorded in the 2729CD, 2729DC, 2829BA and 2829AB QDS, as per ReptileMap)

| Family | Scientific Name | Common Name | Regional Red List Status | NEMBA ToPS List (2007) | Free State Provincial Status |
|---|---|---|---|---|---|
| Agamidae | *Acanthocercus atricollis atricollis* | Southern Tree Agama | Least Concern | - | - |
| **Agamidae** | ***Agama aculeata distanti*** | **Eastern Ground Agama** | **Least Concern** | - | - |
| Agamidae | *Agama atra* | Southern Rock Agama | Least Concern | - | - |
| **Chamaeleonidae** | **Bradypodion dracomontanum** | **Drakensberg Dwarf Chameleon** | **Near Threatened** | - | - |
| **Chamaeleonidae** | ***Chamaeleo dilepis*** | **Flap-neck Chameleon** | **Least Concern** | - | **Protected** |
| **Colubridae** | ***Crotaphopeltis hotamboeia*** | **Red-lipped Snake** | **Least Concern** | - | - |
| **Colubridae** | ***Dasypeltis inornata*** | **Southern Brown Egg-eater** | **Least Concern** | - | - |
| **Colubridae** | ***Dasypeltis scabra*** | **Rhombic Egg-eater** | **Least Concern** | - | - |
| Colubridae | *Philothamnus hoplogaster* | Green Water Snake | Least Concern | - | - |
| **Colubridae** | ***Philothamnus natalensis occidentalis*** | **Western Natal Green Snake** | **Least Concern** | - | - |
| Colubridae | *Philothamnus semivariegatus* | Spotted Bush Snake | Least Concern | - | - |
| Cordylidae | *Chamaesaura aenea* | Coppery Grass Lizard | Least Concern | - | - |
| Cordylidae | *Chamaesaura anguina anguina* | Cape Grass Lizard | Least Concern | - | - |
| **Cordylidae** | ***Cordylus vittifer*** | **Common Girdled Lizard** | **Least Concern** | - | - |
| **Cordylidae** | ***Pseudocordylus melanotus melanotus*** | **Common Crag Lizard** | **Least Concern** | - | - |
| Cordylidae | *Pseudocordylus melanotus subviridis* | Drakensberg Crag Lizard | Least Concern | - | - |
| Cordylidae | *Pseudocordylus spinosus* | Spiny Crag Lizard | Least Concern | - | - |
| **Cordylidae** | ***Smaug giganteus*** | **Giant Dragon Lizard** | **Vulnerable** | **Endangered** | **Protected** |
| Elapidae | *Elapsoidea sundevallii* | Sundevall's Garter Snake | Least Concern | - | - |
| **Elapidae** | ***Hemachatus heamachatus*** | **Rinkhals** | **Least Concern** | - | - |
| Elapidae | *Naja mossambica* | Mozambique Spitting Cobra | Least Concern | - | - |
| Gekkonidae | *Afroedura nivaria* | Drakensberg Flat Gecko | Least Concern | - | - |

| Family | Scientific Name | Common Name | Regional Red List Status | NEMBA ToPS List (2007) | Free State Provincial Status |
|---|---|---|---|---|---|
| **Gekkonidae** | ***Pachydactylus capensis*** | **Cape Gecko** | **Least Concern** | - | - |
| **Gekkonidae** | ***Pachydactylus vansoni*** | **Van Son's Gecko** | **Least Concern** | - | - |
| Gerrhosauridae | *Gerrhosaurus flavigularis* | Yellow-throated Plated Lizard | Least Concern | - | - |
| **Gerrhosauridae** | ***Tetradactylus breyeri*** | **Breyer's Long-tailed Seps** | **Least Concern** | - | - |
| **Lacertidae** | ***Nucras lalandii*** | **Delalande's Sandveld Lizard** | **Least Concern** | - | - |
| Lacertidae | *Nucras ornata* | Ornate Sandveld Lizard | Least Concern | - | - |
| **Lacertidae** | ***Pedioplanis burchelli*** | **Burchell's Sand Lizard** | **Least Concern** | - | - |
| Lamprophiidae | *Amplorhinus multimaculatus* | Many-spotted Snake | Least Concern | - | - |
| **Lamprophiidae** | ***Aparallactus capensis*** | **Cape centipede-eater** | **Least Concern** | - | - |
| Lamprophiidae | *Atractaspis bibronii* | Bibron's Stiletto Snake | Least Concern | - | - |
| Lamprophiidae | *Boaedon capensis* | Common House Snake | Least Concern | - | - |
| Lamprophiidae | *Duberria lutrix lutrix* | South African Slug Eater | Least Concern | - | - |
| Lamprophiidae | *Homoroselaps dorsalis* | Striped Harlequin Snake | Least Concern | - | - |
| **Lamprophiidae** | ***Homoroselaps lacteus*** | **Spotted Harlequin Snake** | **Least Concern** | - | - |
| **Lamprophiidae** | ***Lamprophis aurora*** | **Aurora Snake** | **Least Concern** | - | - |
| Lamprophiidae | *Lamprophis guttatus* | Spotted Rock Snake | Least Concern | - | |
| Lamprophiidae | *Lycodonomorphus inornatus* | Live Ground Snake | Least Concern | - | - |
| Lamprophiidae | *Lycodonomorphus laevissimus* | Dusky-bellied Water Snake | Least Concern | - | - |
| Lamprophiidae | *Lycodonomorphus rufulus* | Brown Water Snake | Least Concern | - | - |
| Lamprophiidae | *Lycophidion capense* | Cape Wolf Snake | Least Concern | - | - |
| Lamprophiidae | *Psammophis brevirostris* | Short-snouted Grass Snake | Least Concern | - | - |
| **Lamprophiidae** | ***Psammophis crucifer*** | **Montane Grass Snake** | **Least Concern** | - | - |
| **Lamprophiidae** | ***Psammophylax rhombeatus rhombeatus*** | **Spotted Grass Snake** | **Least Concern** | - | - |
| **Lamprophiidae** | ***Pseudaspis cana*** | **Mole Snake** | **Least Concern** | - | - |
| **Leptotyphlopidae** | ***Leptotyphlops scutifrons*** | **Peter's Thread Snake** | **Least Concern** | - | - |

| Family | Scientific Name | Common Name | Regional Red List Status | NEMBA ToPS List (2007) | Free State Provincial Status |
|---|---|---|---|---|---|
| Pelomedusidae | *Pelomedusa subrufa* | Marsh Terrapin | Least Concern | - | - |
| Pythonidae | *Python natalensis* | South African Python | Least Concern | Protected | Protected |
| Scincidae | *Acontias plumbeus* | Giant Legless Skink | Least Concern | - | - |
| Scincidae | *Afroablepharus wahlbergii* | Wahlberg's Snake-eyed Skink | Least Concern | - | - |
| Scincidae | *Scelotes mossambicus* | Mozambique Dwarf Burrowing Skink | Least Concern | - | - |
| **Scincidae** | ***Trachylepis capensis capensis*** | **Cape Skink** | **Least Concern** | - | - |
| **Scincidae** | ***Trachylepis punctatissima*** | **Montane Rock Skink** | **Least Concern** | - | - |
| Scincidae | *Trachylepis punctulata* | Speckled Sand Skink | Least Concern | - | - |
| **Scincidae** | ***Trachylepis varia*** | **Variable Skink** | **Least Concern** | - | - |
| Typhlopidae | *Afrotyphlops bibronii* | Bibron's Blind Snake | Least Concern | - | - |
| Varanidae | *Varanus albigularis albigularis* | Rock Monitor | Least Concern | - | - |
| Varanidae | *Varanus niloticus* | Water Monitor | Least Concern | - | - |
| Viperidae | *Bitis arietans arietans* | Puff Adder | Least Concern | - | - |
| Viperidae | *Bitis atropos* | Berg Adder | Least Concern | - | - |
| Viperidae | *Causus rhombeatus* | Rhombic Night Adder | Least Concern | - | - |
| Source: Master list based on the distribution maps in Bates *et al*., (2014). | | | | | |

**Amphibians**

(Species highlighted in **bold** text have been recorded in the 2729CD, 2729DC, 2829BA and 2829AB QDS, as per FrogMap)

| Family | Scientific Name | Comon Name | Regional Red List Status | NEMBA ToPS List (2007) |
|---|---|---|---|---|
| Breviceptidae | *Breviceps adspersus* | Bushveld Rain Frog | - | - |
| **Breviceptidae** | ***Breviceps mossambicus*** | **Mozambique Rain Frog** | - | - |
| **Breviceptidae** | ***Breviceps verrucosus*** | **Plain Rain Frog** | - | - |
| **Bufonidae** | ***Sclerophrys gutturalis*** | **Guttural Toad** | - | - |
| **Bufonidae** | ***Sclerophrys rangeri*** | **Raucous Toad** | - | - |
| **Bufonidae** | ***Vandijkophrynus gariepensis*** | **Karoo Toad** | - | - |
| **Bufonidae** | ***Schismaderma carens*** | **Red Toad** | - | - |
| **Heleophrynidae** | ***Hadromophryne natalensis*** | **Natal Cascade Frog** | - | - |
| **Hyperoliidae** | ***Kassina senegalensis*** | **Bubbling Kassina** | - | - |
| **Hyperoliidae** | ***Semnodactylus wealii*** | **Rattling Frog** | - | - |
| **Phrynobatrachidae** | ***Phrynobatrachus natalensis*** | **Snoring Puddle Frog** | - | - |
| **Pipidae** | ***Xenopus laevis*** | **Common Platanna** | - | - |
| Ptychadenidae | *Ptychadena anchietae* | Plan Grass Frog | - | - |
| Ptychadenidae | *Ptychadena oxyrhynchus* | Sharp-nosed Grass frog | - | - |
| **Ptychadenidae** | ***Ptychadena porosissima*** | **Striped Grass Frog** | - | - |
| **Pyxicephalidae** | ***Amietia delalandii*** | **Common River Frog** | - | - |
| **Pyxicephalidae** | ***Amietia fuscigula*** | **Cape River Frog** | - | - |
| **Pyxicephalidae** | ***Cacosternum boettgeri*** | **Common Caco** | - | - |
| **Pyxicephalidae** | ***Cacosternum nanum*** | **Bronze Caco** | - | - |
| Pyxicephalidae | *Pyxicephalus adspersus* | Giant Bullfrog | - | Protected |
| Pyxicephalidae | *Strongylopus fasciatus* | Striped Stream Frog | - | - |
| **Pyxicephalidae** | ***Strongylopus grayii*** | **Clicking Stream Frog** | - | - |
| **Pyxicephalidae** | ***Tomopterna cryptotis*** | **Tremolo Sand Frog** | - | - |
| Pyxicephalidae | *Tomopterna krugerensis* | Knocking Sand Frog | - | - |

| Family | Scientific Name | Comon Name | Regional Red List Status | NEMBA ToPS List (2007) |
|---|---|---|---|---|
| **Pyxicephalidae** | ***Tomopterna natalensis*** | **Natal Sand Frog** | - | - |
| Pyxicephalidae | *Tomopterna tandyi* | Tandy's Sand Frog | - | - |
| Source: Master list based on the distribution maps in Du Preez and Carruthers (2007) | | | | |

# Appendix E: Compliance with Animal Species Protocol.

| Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity | Relevant Section in Report |
|---|---|
| **The assessment must be undertaken in accordance with the Species Environmental Assessment Guideline7; and must;** | |
| 2.2.1 identify the SCC which were found, observed or are likely to occur within the study area; | Section 6.1.2, Section 6.2.2, & Section 6.3 |
| 2.2.2 provide evidence (photographs or sound recordings) of each SCC found or observed within the study area, which must be disseminated by the specialist to a recognized online database facility, immediately after the site inspection has been performed (prior to preparing the report contemplated in paragraph 3); | Section 6.1.2, Section 6.2.2, & Section 6.3 |
| 2.2.3 identify the distribution, location, viability and provide a detailed description of population size of the SCC, identified within the study area; | Section 6.1.2, Section 6.2.2, & Section 6.3 |
| 2.2.4 identify the nature and the extent of the potential impact of the proposed development on the population of the SCC located within the study area; | Section 9.3 |
| 2.2.5 determine the importance of the conservation of the population of the SCC identified within the study area, based on information available in national and international databases, including the IUCN Red List of Threatened Species, South African Red List of Species, and/or other relevant databases; | Section 6.1.2, Section 6.2.2, & Section 6.3 |
| 2.2.6 determine the potential impact of the proposed development on the habitat of the SCC located within the study area; | Section 9.3 |
| 2.2.7 include a review of relevant literature on the population size of the SCC, the conservation interventions as well as any national or provincial species management plans for the SCC. This review must provide information on the need to conserve the SCC and indicate whether the development is compliant with the applicable species management plans and if not, include a motivation for the deviation; | Section 6.1.2, Section 6.2.2, & Section 6.3 |
| 2.2.8 identify any dynamic ecological processes occurring within the broader landscape that might be disrupted by the development and result in negative impact on the identified SCC, for example, fires in fire-prone systems; | Section 7 |
| 2.2.9 identify any potential impact of ecological connectivity in relation to the broader landscape, resulting in impacts on the identified SCC and its long-term viability; | Section 7 & Section 9.3 |
| 2.2.10 determine buffer distances as per the Species Environmental Assessment Guidelines used for the population of each SCC; | N/A |
| 2.2.11 discuss the presence or likelihood of additional SCC including threatened species not identified by the screening tool, Data Deficient or Near Threatened Species, as well as any undescribed species10; or roosting and breeding or foraging areas used by migratory species where these species show significant congregations, occurring in the vicinity | Section 6.1.2, Section 6.2.2, & Section 6.3 |
| 2.2.12 identify any alternative development footprints within the preferred site which would be of “low” or “medium” sensitivity as identified by the screening tool and verified through the site sensitivity verification | Section 8 |
| 3.1 This report must include as a minimum the following information: | |

| Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity | Relevant Section in Report |
|---|---|
| 3.1.1 contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the assessment including a curriculum vitae; | Page 3 & Appendix A |
| 3.1.2 a signed statement of independence by the specialist; | Page 3 |
| 3.1.3 a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment; | Section 3.2 & Section 4 |
| 3.1.4 a description of the methodology used to undertake the site sensitivity verification, impact assessment and site inspection, including equipment and modelling used where relevant; | Section 3 & Section 9.1 |
| 3.1.5 a description of the mean density of observations/number of sample sites per unit area and the site inspection observations; | Section 3.2 |
| 3.1.6 a description of the assumptions made and any uncertainties or gaps in knowledge or data; | Section 4 |
| 3.1.7 details of all SCC found or suspected to occur on site, ensuring sensitive species are appropriately reported; | Section 6.1.2, Section 6.2.2, & Section 6.3 |
| 3.1.8 the online database name, hyperlink and record accession numbers for disseminated evidence of SCC found within the study area; | iNaturalist – Andrew Zinn profile |
| 3.1.9 the location of areas not suitable for development and to be avoided during construction where relevant; | N/A |
| 3.1.10 a discussion on the cumulative impacts; | Section 9.3.4 |
| 3.1.11 impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr); | Section 11 & Section 12 |
| 3.1.12 a reasoned opinion, based on the findings of the specialist assessment, regarding the acceptability or not of the development and if the development should receive approval or not, related to the specific theme being considered, and any conditions to which the opinion is subjected if relevant; | Section 13 |
| 3.1.13 a motivation must be provided if there were any development footprints identified as per paragraph 2.2.12 above that were identified as having “low” or “medium” terrestrial animal species sensitivity and were not considered appropriate; | N/A |
| 3.2 A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report. | EAP to incorporate |