

Appendix G.3

TERRESTRIAL BIODIVERSITY REPORT (INCLUDING THE ANIMAL AND PLANT SPECIES REPORTS)



TERRESTRIAL BIODIVERSITY SPECIALIST ASSESSMENT FOR THE PROPOSED PHEFUMULA EMOYENI ONE – UP TO 400 KV ELECTRICAL GRID INFRASTRUCTURE PROJECT

WSP Group Africa Pty (Ltd)

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Submitted to:
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Acronyms and Abbreviations

Abbreviation	Explanation
AIS	Alien Invasive Species
AOI	Area of Interest
AOO	Area of Occupancy
BI	Biodiversity Importance
CA	Conservation Areas
CBA	Critical Biodiversity Areas
CI	Conservation Importance
DFFE	Department of Forestry, Fisheries and the Environment
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
EOO	Extent of Occurrence
ESA	Ecological Support Area
FI	Functional Integrity
Ha	Hectare
IBA	Important Bird Areas
IUCN	International Union for the Conservation of Nature
KBA	Key Biodiversity Area
MPTA	Mpumalanga Parks and Tourism Agency
NEMA	National Environmental Management Act
NEMBA	National Environmental Management Biodiversity Act
NEMPA	National Environmental Management: Protected Areas Act
NFEPA	National Freshwater Ecosystem Priority Areas
OHL	Overhead Line
PA	Protected Areas
QDS	Quarter Degree Square
RR	Receptor Resilience
SANBI	South African National Biodiversity Institute
SAPAD	South African Protected Areas Database

SAS	Strategic Aquatic Services
SCC	Species of Conservation Concern
SEI	Site Ecological Importance
SWSA	Strategic Water Source Areas
ToPS	Threatened or Protected Species
WEF	Wind Energy Facility

Details of the Expertise of the Specialist

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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 Phefumula Emoyeni One - Up to 400 kV Electrical Grid Infrastructure 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.



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1. Introduction

Hawkhead Consulting was appointed by WSP Group Africa Pty (Ltd), on behalf of Phefumula Emoyeni One (Pty) Ltd, to conduct the Terrestrial Biodiversity Specialist Assessment for the proposed Phefumula Emoyeni One - Up to 400 kV Electrical Grid Infrastructure Project (hereafter referred to as the 'Project'), near Ermelo in Mpumalanga Province, South Africa.

1.1. Scope and Purposes of this Report

This specialist study focused on terrestrial biodiversity, and was 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 the:

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

The primary scope of work included:

- Reviewing and summarising pertinent biodiversity information presented in relevant ecological, conservation and biodiversity datasets and literature;
- Conducting a field survey of the Project site to collect field data to verify the ecosystem and biodiversity character and sensitivity of the site and surrounding landscape;
- Identifying and assessing potential negative impacts on terrestrial biodiversity and ecosystems associated with the proposed Project; and
- Recommending appropriate biodiversity mitigation, management and monitoring measures for inclusion in the proposed Project's Environmental Management Plan (EMP) and/or Biodiversity Management Plan (BMP).

Predicated on the above scope items, the purpose of this report is therefore to: 1) present a baseline description and sensitivity analysis of terrestrial biodiversity relevant to the site and its surrounding landscape, 2) assess the potential impacts of the proposed Project on on-site biodiversity; 3) detail appropriate management and monitoring measures to avoid/mitigate identified impacts and guide on-site biodiversity management; and 4) provide an impact statement on the appropriateness of the proposed Project with respects to terrestrial biodiversity conservation.

This report should be read in conjunction with the Plant Species Specialist Assessment and Animal Species Specialist Assessment reports, as well as any other biodiversity-related specialist reports.

1.2. Project Location

The proposed Project site is located approximately 18 km north of Ermelo in the Msukaligwa Local Municipality and Gert Sibande District Municipality, in Mpumalanga Province, South Africa (Figure 1).

1.3. Project Description

The proposed Project is intended to feed the electricity generated by the proposed Phefumula Emoyeni One Wind Energy Facility (WEF) (part of a separate application for Environmental Authorisation) to the national energy grid. A Project description is outlined in Table 1.

During the scoping phase, two proposed Project layouts (Alternative 1 and Alternative 2) were considered. Following the scoping phase, Alternative 2 was selected as the preferred layout from a Project proponent perspective, and was taken forward for further consideration during this impact assessment phase. The Alternative 2 layout is also preferred from a biodiversity perspective, as it has significantly less impact on patches of natural habitat (including CBAs) compared to Alternative 1. The Alternative 2 layout is the focus of this report.

Table 1: Phefumula Emoyeni One - Up to 400 kV Electrical Grid Infrastructure Project technical details

Detail	Information
Up to 400kV Transmission Line	<ul style="list-style-type: none"> • 400kV Loop-In-Loop-Out (LILO) Overhead Line (OHL). • Servitude width for 1 x up to 400kV transmission line is 60m for Loop-In-Loop-Out • Height of 1 x 400kV power line structure is on average 48 m, but may reach up to 50 m in exceptional circumstances depending on the complexity and slope of the terrain. • Minimum conductor clearance is between 8.1 and 12.6 m. • Span length between pylon structures is typically up to 100 – 250 m apart, depending on complexity and slope of terrain. • For up to 400kV structures footprint sizes may vary depending on design type up to 110 m² (10.5 m by 10.5 m), with concrete foundations of up to 80 m² and depths reaching up to 3.5 m typically depending on the number and design of the foundations (to be determined during the detailed design engineering phase). The actual number of structures required will vary according to the final route alignment determined. • Pylon structures will be either monopole or lattice structures depending on what is identified as appropriate during final design. <p>For safety reasons, transmission lines require certain minimum clearance distances. These are as follows:</p> <ul style="list-style-type: none"> • The minimum vertical clearance distance between the ground and the transmission line is 6.7 m. • The minimum vertical clearance to any fixed structure that does not form part of the transmission line is 9.4 m – 11 m. • The minimum distance between an up to 400kV transmission line and an existing road is 60 m – 120 m (depending on the type of road). • Any farming activity can be practiced under the conductors provided that safe working clearances and building restrictions are adhered to.
Up to 132kV Transmission Line	<ul style="list-style-type: none"> • The servitude width for 3 x up to 132kV transmission line is 31 m. A 300 m corridor must be assessed (150 m on either side of the centre line) to allow for micro-siting. In the case of the Loop-In-Loop-Out alternative this servitude will apply to each of the two connecting power lines. • The maximum height for an up to 132kV powerline structure is 40 m. • Pylon structures will be either monopole or lattice structures depending what is identified as appropriate during final design.

Detail	Information
	<ul style="list-style-type: none"> • Pylon structures may require anchors with guy-wires or be anchorless. • For up to 132kV structures, concrete foundation sizes may vary depending on design type up to 80 m² (10 m by 8 m), with depths reaching up to 3.5 m typically in a rectangular 'pad' shape. • A working area of approximately 100 m x 100 m is needed for each of the proposed structures to be constructed.
Main Transmission Substation (MTS) (Approx. 32 ha)	<ul style="list-style-type: none"> • A high voltage substation yard to allow for multiple 132kV and 400kV feeder bays and transformers, with infrastructure to allow for step-up to 400kV as required. • Standard substation electrical equipment, including but not limited to transformers, busbars, office area, operation and control room, workshop, and storage area, feeder bays, transformers, busbars, stringer strain beams, insulators, isolators, conductors, circuit breakers, lightning arrestors, relays, capacitor banks, batteries, wave trappers, switchyard, metering and indication instruments, equipment for carrier current, surge protection and outgoing feeders, as may be needed. • The control building, telecommunication infrastructure, oil dam(s) etc. • Workshop and office area within the collector substation footprint. • Fencing around the Substation. • All the access road infrastructure to and within the substation.
Three Distribution Substations	<ul style="list-style-type: none"> • Dx1-approx. 7.85Ha footprint • Dx2- approx. 20.45Ha footprint • Dx3- approx. 13.60Ha footprint
Temporary / Construction Phase Infrastructure	<ul style="list-style-type: none"> • Construction compound at the MTS (3 ha) (site offices including conservancy tank for ablutions, stores, material laydown area, generator, fuel storage, etc.) • 3 x construction compound / laydown areas, including site office of 3 ha each at each of the Dx locations (150 m x 200 m each) (including conservancy tank for ablutions) • Batch plant of 4-7 ha (unless a commercial source is used and concrete trucked to site, preferable to keep options open) • Portable ablation facilities will be used along the powerline routes

1.4. Study Spatial Scales

The 'area of interest' (AOI) for this assessment refers to the broader area in which flora and fauna field data were collected during the field survey. This area encompasses the entire Phefumula Emoyeni One WEF project site and is shown in Figure 1.

The 'Project site' refers to the proposed Alternative 2 OHL assessment corridor and MTS footprints, which are located in the centre of the AOI (also shown in Figure 1). It is within these footprints that most direct and indirect impacts on terrestrial biodiversity receptors (e.g., direct habitat loss) associated with this proposed Project could occur.

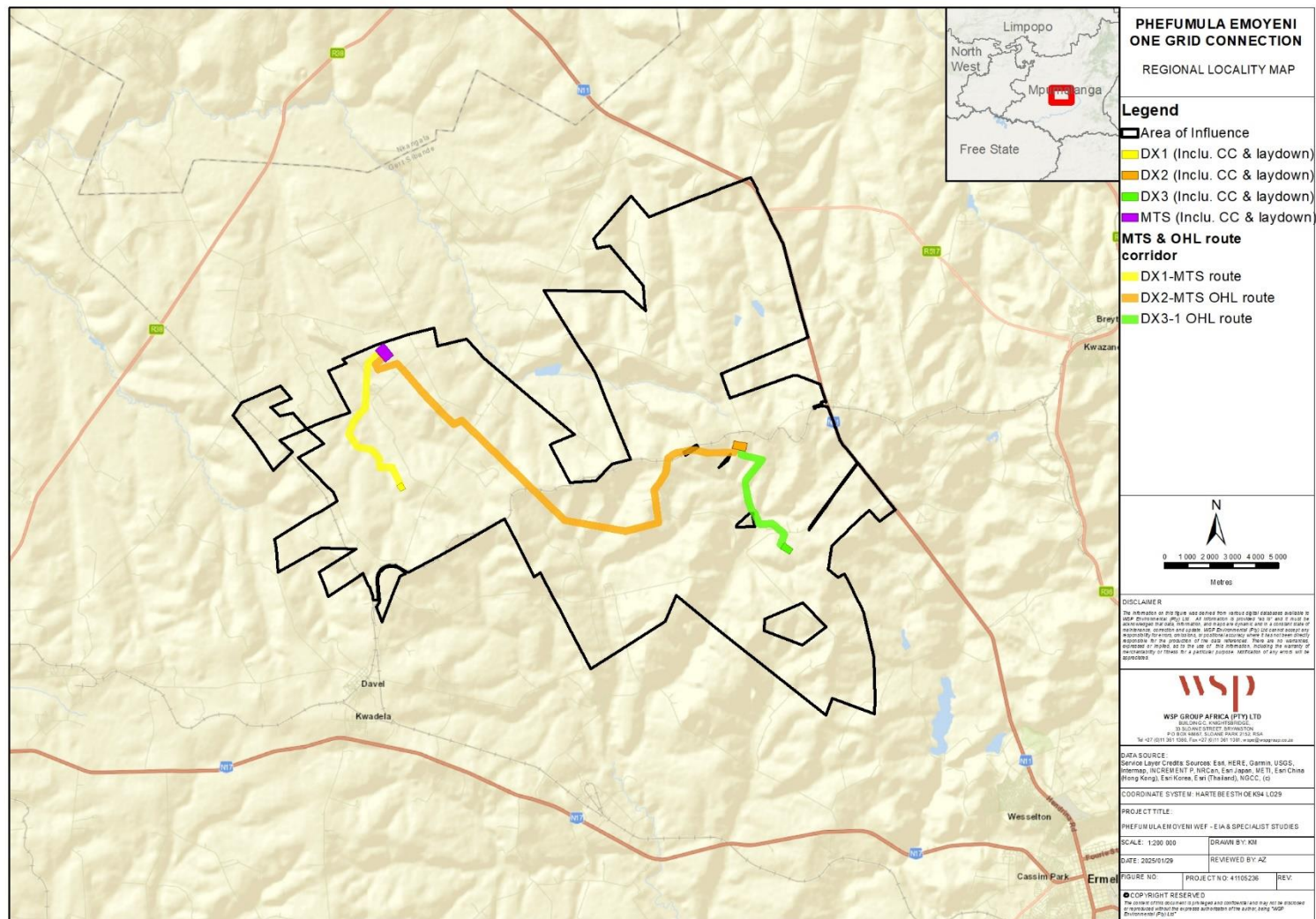


Figure 1 Map showing the regional location of the proposed Project site (i.e., the OHL assessment corridor and MTS footprints) and the broader Phefumula Emoyeni One AOI.

1.5. Environmental Screening Tool - Project Sensitivities

The proposed Project site was assessed at a desktop level using the Department of Forestry, Fisheries and the Environment's (DFFE) National Web-based Environmental Screening Tool. According to the sensitivity report output, the Terrestrial Biodiversity Theme is rated 'Very High' sensitivity due to the presence of the following features:

- Critical Biodiversity Area (CBA) 1;
- Critical Biodiversity Area 2;
- Freshwater Ecosystem Priority Area (FEPA) Sub-catchment;
- National Protected Area Expansion Strategy (NPAES);
- Endangered – Eastern Highveld Grassland; and
- Vulnerable – Soweto Highveld Grassland.

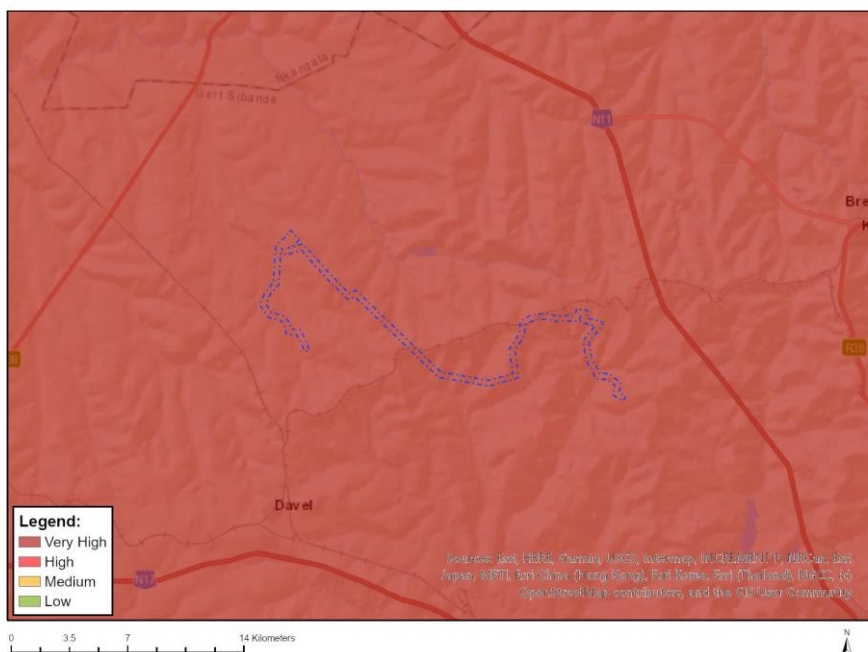


Figure 2: Terrestrial Biodiversity sensitivity for the Project site, as per the DFFE National Web-based Environmental Screening Tool.

2. Relevant Legislation and Guidelines

National and provincial legislation, associated guidelines and policies that are relevant to the environmental and biodiversity, and which were used to guide the Terrestrial Biodiversity 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)	<p>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.</p> <p>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:</p> <ul style="list-style-type: none"> • Protocol for the specialist assessment and report content requirements for environmental impacts on terrestrial biodiversity.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA)	<p>The NEMBA is administered by the Department of Forestry, Fisheries and the Environment (DFFE) and provides the framework under the NEMA for the:</p> <ul style="list-style-type: none"> • Management and conservation of South Africa’s biodiversity; • The protection of species and ecosystems that warrant protection; • The fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources; and • The establishment and functions of a South African National Biodiversity Institute (SANBI). <p>Amongst other components, the NEMBA includes:</p> <ul style="list-style-type: none"> • 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; • Threatened or Protected Species Regulations (February 2007); and

Applicable Legislation and Guideline	Relevance to the Proposed Project
	<ul style="list-style-type: none"> • National list of threatened terrestrial ecosystems for South Africa (2011, and 2021 revision), published under Section 51(1)(a) of NEMBA. • National Biodiversity Offset Guideline (2023), which provides guidance on the need to develop biodiversity offsets. <p>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.</p> <p>Chapter 5 of NEMBA also provides a list of regulations and guidance concerning alien invasive species, including:</p> <ul style="list-style-type: none"> • A guideline for Monitoring, Control and Eradication Plans (September 2015); • 2020 Alien and Invasive Species Regulations (September 2020); and • 2016 and 2020 Alien and Invasive Species Lists (March 2021).
National Environmental Management: Protected Areas Act (2003) (NEMPA)	<ul style="list-style-type: none"> • 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 • 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.
Mpumalanga Nature Conservation Act (Act No. 10 of 1998)	<p>Amongst other provisions, the Mpumalanga Nature Conservation Act (Act No. 10 of 1998) provides lists of specially protected and protected flora and fauna. Of particular relevance to this specialist study are species of game/wild animals and flora that are listed under:</p> <ul style="list-style-type: none"> • Schedule 1: Specially Protected Game; • Schedule 2: Protected Game; • Schedule 4: Protected Wild Animals; • Schedule 11 and 12: Protected and Specialist Protected Plants.
Other Relevant national and Provincial Policies, Plans and Guidelines	<p>Other relevant policies, plans and guidelines that were considered during this study include:</p> <ul style="list-style-type: none"> • Mpumalanga Biodiversity Sector Plan (2022); • Species Environmental Assessment Guideline (SANBI, 2020); • National Protected Area Expansion Strategy (2019); and • Mpumalanga Protected Area Expansion Strategy – 20-year Plan.

3. Study Methodology

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

3.1. Desktop Literature Review

The aim of the desktop literature review component was to collate and review data and information pertaining to the terrestrial biodiversity characteristics and conservation context of the AOI and surrounding landscape. Reviewed literature and datasets were obtained from a variety of online and literature sources, as discussed below:

- The South African National Biodiversity Institutes (SANBI) Final Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018) was consulted to identify the regional vegetation types relevant to the AOI;
- Mucina and Rutherford (2011) was reviewed to obtain full descriptions of the relevant regional vegetation type. SANBI (2013) was also reviewed for a biome-level description;
- The National List of Threatened Ecosystems (NEMBA Threatened Ecosystems, 2011 & 2021) was consulted to determine the conservation status of relevant vegetation types and ecosystems;
- The Mpumalanga Biodiversity Sector Plan (MBSP) (2022) spatial data was reviewed to determine the status and distribution of *inter alia*, protected areas, Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA);
- The Strategic Water Source Areas (SWSA) and Freshwater Ecosystem Priority Area (FEPA) databases were reviewed for information on the hydrological setting and management of the AOI and surrounding landscape;
- The South African Protected Areas Database (SAPAD, 2023) website was reviewed to identify protected areas (legally gazetted) and conservation areas in the broader region in which the AOI is located;
- The DWAF spatial data of Indigenous Forest Patches was consulted to identify any indigenous forests in, or in close proximity to, the AOI;
- The National Protected Area Expansion Strategy (NPAES) (2018) and the Mpumalanga Protected Area Expansion Strategy (20 Year Plan) were assessed to identify Priority Focus Areas for protected area expansion;
- Marnewick, *et al.*, (2015) was reviewed for descriptions of Important Bird Areas (IBA) in the region surrounding the AOI, while SANBI (2024) was reviewed for a discussion of Key Biodiversity Areas (KBA); and
- Satellite imagery available on Google Earth Pro and GeoTerra spatial data were also studied to develop an understanding of general landcover, likely habitat types, and historic- and current on-site disturbances in the AOI.

3.2. Field Programme

The field programme for the proposed Project comprised two wet-season field surveys. The first survey was conducted from the 22nd-26th January 2024 and focused on vegetation and flora occurring across the AOI. The second survey was conducted from the 14th-15th January 2025 and focused on sampling at select locations in the Project site. The January period coincides with the peak vegetation growing period (November to April) for grassland ecosystems in summer rainfall areas, and is

therefore an optimal time to assess vegetation and flora species. During this period, activity levels amongst many fauna species are also high, and therefore it is also an optimal time to survey for fauna.

The field survey focused on terrestrial biodiversity occurring across the AOI. Sampling methodologies were aligned with SANBI (2020) recommendations, and included both flora and fauna surveys, as summarised below (for detailed surveying methods, refer to the Animal Species Specialist Assessment and Plant Species Specialist Assessment reports):

- During the 2024 survey, vegetation was sampled using meander search transects at representative sites in each of the main natural habitat units in the AOI. Collected data included habitat character and condition, flora species composition, evidence of current and past disturbances, presence of flora species of conservation concern, and presence of declared alien invasive species. During the second survey, meander search transects were used to identify potential flora sensitivities at select sites of natural habitat in the Project site;
- Fauna surveys included:
 - Active sampling (e.g., baited motion-triggered camera traps and Sherman traps, and active searches);
 - Passive sampling methodologies, including direct observations/opportunistic encounters and indirect observations (i.e. identification of fauna tracks, scats, burrows etc.); and
 - Interviews with local farmers to obtain anecdotal evidence of fauna known to be present on-site; and
- While on-site, special emphasis was also placed on assessing *inter alia*: habitat connectivity within the AOI and across the surrounding landscape; the presence/potential presence of species of conservation concern based on habitat suitability; specific sites of potential sensitivity; and, the prominent ecological drivers of change in the AOI.

3.3. Delineation and Mapping of Habitat Units

Mapping of habitat units was conducted using a review and analysis of composite Google Earth aerial imagery, coupled with data and observations obtained during the field survey, and using the wetland delineations developed by Strategic Aquatic Services (SAS).

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 biodiversity assessment:

- The field surveys were conducted in January. The timing of the field surveys coincided with the peak vegetation growing period (November to April) for grassland ecosystems in summer rainfall areas. It was noted that sufficient rain had fallen prior to the field surveys and vegetation was actively growing and flowering. During this period, there is also increased activity levels amongst many fauna species. Conditions at this time were therefore

optimal to assess vegetation condition, general flora species composition and the character of the on-site fauna community. Seasonality was therefore not considered a study limitation;

- Notwithstanding the above, it is possible that certain herbaceous taxa (e.g., annuals and geophytes) that are most readily visible or distinguishable at other periods during the wet/growing season, may not have been detected during the field survey;
- It is also possible that certain rare, cryptic, migrating, aestivating or transient fauna species may not have been present and/or observed during the field survey;
- 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
- Mapping of habitat units was conducted manually at a desktop-level, using available aerial imagery, coupled with field observations and supplementary spatial datasets. It must be noted that agricultural landscapes are dynamic and subject to ongoing farming activities. It is thus possible that the character of individual habitat patches may change over time.

5. Regional Vegetation Characteristics

The AOI is located in the Grassland Biome, and according to SANBI's regional mapping of South Africa's vegetation types (2018), Eastern Highveld Grassland and Soweto Highveld Grassland are the dominant vegetation types across the AOI. Soweto Highveld Grassland dominates most of the Project site, with only a small patches of Eastern Highveld Grassland present in the west (shown in Figure 3).

The general characteristics of the Grassland Biome and these vegetation types are discussed in more detail below:

5.1. Grassland Biome

The AOI is located in the Grassland Biome, which covers approximately 28% of South Africa and is the dominant biome of the central plateau and inland areas of the eastern subcontinent (SANBI, 2013). Grasslands are typically situated in moist, summer rainfall regions that experience between 400 mm and 2000 mm of rainfall per year. Vegetation consists of a dominant field-layer comprising grasses and herbaceous perennials, with little-to-no woody plants present.

South Africa's grassland ecosystems are parsed into five groups, with the AOI located in the Mesic Highveld Grasslands group (SANBI 2013). Mesic Highveld Grasslands occur at mid-altitudes and experience warm, wet summers (MAP 700-1200 mm) and cold winters. They are typically highly productive sourveld grasslands that are dominated by long-lived perennial grasses (SANBI, 2013).

Fire is common in Mesic Highveld Grasslands and maintains these ecosystems in a relatively treeless form (SANBI, 2013). Apart from their importance as rich stores of biodiversity, grasslands are critically important water production landscapes, constituting about half of South Africa's Strategic Water Source Areas (SANBI, 2013).

5.2. Eastern Highveld Grassland

Eastern Highveld Grasslands extend from Johannesburg in the east through to Bethel, Ermelo and Piet Retief in the west. This vegetation type is found on slightly- to moderately undulating plains, low hills and wetland depressions. Grasses are typical Highveld species from the genera *Aristida*, *Digitaria*, *Eragrostis* and *Tristachya*. Indigenous woody species are mainly restricted to rocky areas and include *Celtis africana*, *Protea caffra*, *Protea welwitschii*, *Diospyros lycioides*, *Searsia magalismontana* and *Senegalia caffra* (Mucina & Rutherford, 2011).

Mucina & Rutherford (2011) note the following species, amongst several others, as important taxa in Eastern Highveld Grassland:

Shrubs: *Anthospermum rigidum* and *Seriphium plumosum*.

Graminoides: *Aristida aequiglumis*, *Aristida congesta*, *Aristida junciformis*, *Cynodon dactylon*, *Digitaria monodactyla*, *Eragrostis chloromelas*, *Eragrostis curvula*, *Eragrostis plana*, *Eragrostis racemosa*, *Heteropogon contortus*, *Loudetia simplex*, *Setaria sphacelata*, *Sporobolus africanus*, *Themeda triandra*, *Alloteropsis semialata* and *Monocymbium cerasiiforme*.

Herbs: *Berkheya setifera*, *Haplocarpha scaposa*, *Euryops gilfillanii*, *Euryops transvaalensis*, *Justicia anagalloides*, *Acalypha angusta*, *Chamaecrista mimosoides*, *Dicoma anomala*, *Kohautia amatymbica*, *Lactuca inermis*, *Gladiolus crassifolius*, *Haemanthus humilis* and *Selago densiflora*.

Endemic Taxa: The geophytic herbs *Agapanthus inapertus*, *Eucomis vandermerwei* and the succulent herb *Huernia insigniflora* are endemic to this region.

5.3. Soweto Highveld Grassland

Soweto Highveld Grassland extends in a broad band between Johannesburg and Ermelo in the north, and Perdekop and the Vaal River in the south (Mucina & Rutherford, 2011). Vegetation is characterised by short to medium-high density tufted grassland, occurring on gently- to moderately undulating plains (Mucina & Rutherford, 2011). Grasslands are typically dominated by *Themeda triandra* along with several other co-dominant species. These grasslands are interrupted by small wetlands and rocky ridges and outcrops (Mucina & Rutherford, 2011).

The mean annual precipitation (MAP) of the region is 662 mm. Rainfall occurs in the summer, with winters being typically cold and dry (Mucina & Rutherford, 2011).

Mucina & Rutherford (2011) list the following flora species as being important or characteristic taxa in the Soweto Highveld Grassland vegetation type, amongst others:

Graminoids: *Themeda triandra*, *Andropogon appendiculatus*, *Brachiaria serrata*, *Cymbopogon pospischilii*, *Cynodon dactylon*, *Elionurus muticus*, *Eragrostis capensis*, *Eragrostis chloromelas*, *Eragrostis curvula*, *Eragrostis plana*, *Heteropogon contortus*, *Hyparrhenia hirta*, *Setaria sphacelata*, *Aristida junciformis*, *Aristida congesta*, *Aristida bipartita* and *Paspalum dilatatum*.

Herbs: *Hermannia depressa*, *Euryops gilfillanii*, *Geigeria aspera*, *Graderia subintegra*, *Haplocarpha scaposa*, *Helichrysum rugulosum*, *Helichrysum nudifolium*, *Lippia scaberrima*, *Senecio coronatus*, *Vernonia oligocephala* and *Wahlenbergia undulata*.

Shrubs: *Anthospermum hispidulum*, *Anthospermum rigidum*, *Berkheya annectens*, *Felicia muricata* and *Ziziphus zeyheriana*.

6. Regional Ecological Sensitivity and Conservation Setting

6.1. Nationally Threatened Ecosystems

Both Eastern Highveld Grassland and Soweto Highveld Grasslands are listed as threatened, as per the NEMBA Threatened Ecosystems (2021):

Eastern Highveld Grassland is listed as Endangered, and is subject to high rates of habitat loss as a result of cultivation, forestry, mines, urbanisation and the building of dams (Mucina & Rutherford, 2011). Estimates suggest that up to approximately 70% of the original extent of Eastern Highveld Grassland has been transformed. Only a very small fraction is conserved in statutory reserves (e.g., Nootgedacht Dam and Jericho Dam Nature Reserves) (Mucina & Rutherford, 2011). The mapped remaining extent of Eastern Highveld Grassland, as per SANBI (2021) spatial data, is shown in Figure 4 below.

Cultivation, urbanisation, road infrastructure and mining have similarly resulted in the transformation of more than half of the original extent of Soweto Highveld Grasslands (Mucina & Rutherford, 2011). Only a few patches are conserved in formal protected areas, such as Waldrift Nature Reserve, Krugersdorp Nature Reserve, Leeuwkuil Nature Reserve and Suikerbosrand Nature Reserve. This vegetation type is therefore listed as Vulnerable, according to the NEMBA Threatened Ecosystems (2021) (remaining extent also shown in Figure 4).

According to the SANBI (2018 & 2021) delineations, most of the proposed Project site is characterised by Soweto Highveld Grassland, with small areas in the west characterised by Eastern Highveld Grassland. Considering the conservation status of these vegetation types, potential loss of natural grassland associated with the proposed Project is a concern and needs to be carefully managed.

6.2. Terrestrial Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs)

The Mpumalanga Biodiversity Sector Plan (MBSP) technical report (Lötter, 2015) defines five categories of conservation focus; protected areas, critical biodiversity areas (CBA), ecological support areas (ESA), other natural areas, and modified habitats. Definitions for each are listed below:

- **Protected Areas:** protected areas recognised in terms of the National Environmental Management Protected Areas Act, No. 57 of 2003, that are currently considered to meet biodiversity targets in the MBSP.
- **Critical Biodiversity Area:** areas (outside of Protected Areas) that are required to meet biodiversity targets for biodiversity pattern (species and ecosystems) and ecological processes. They should remain in a natural state that is maintained in good ecological condition. The MBSP recognises two CBA ranks, viz, CBA Irreplaceable and CBA Optimal.
- **Ecological Support Area:** play an important role in supporting the ecological functioning of critical biodiversity areas or for generating or delivering important ecosystem services. They support landscape connectivity and resilience to climate change adaptation. They need to be maintained in at least an ecologically functional state.
- **Other Natural Areas:** often retain much of their natural character and may contribute significantly to maintenance of viable species populations and natural ecosystem

functioning, and may provide important ecological infrastructure and ecosystem services. They are not, however, prioritized for immediate conservation action in the MBSP.

- **Modified:** often referred to as transformed, these areas have lost a significant proportion (or all) of their natural biodiversity and in which ecological processes have broken down (in some cases irretrievably), as a result of biodiversity-incompatible land-use practices such as ploughing, hardening of surfaces, mining, cultivation and the construction of houses or other built infrastructure.

The spatial delineations of the Mpumalanga Biodiversity Sector Plan (2022) in relation to the Project site are shown in Figure 5. It is evident that several habitat patches in the Project site are delineated as CBA Irreplaceable (CBA 1) and CBA Optimal (CBA 2). Across the AOI, the statuses of the various CBA designated habitat patches are predicated on a combination of the following features, as per data received from the MPTA (M. Lötter):

- Eastern Highveld Grassland;
- Soweto Highveld Grassland;
- Mesic Highveld Grassland– Groups 1-3;
- Intact grassland patches;
- Several fauna species:
 - Giant bullfrog (*Pyxicephalus adspersus*);
 - Blue Korhaan (*Eupodotis caerulescens*);
 - Rudd’s Lark (*Hateromirafra ruddi*);
 - Botha’s Lark (*Spizocorys fringillaris*);
 - White-bellied Korhaan (*Eupodotis senegalensis*);
 - African Grass Owl (*Tyto capensis*);
 - Oribi (*Ourebia ourebi ourebi*);
- Climate change land facets;
- Macro-corridor;
- Critical linkages;
- Three flora species:
 - *Aspidoglossum xanthosphaerum*;
 - *Khadia carolinensis*;
 - *Brachycorythis conica* subsp. *transvaalensis*; and
- Core and supporting corridors.

The field survey indicated that CBAs comprise large areas of mostly intact natural dry- and moist grassland habitat. CBAs are important and functional natural habitat. The continued integrity and protection of these CBAs is crucial to meet conservation targets for biodiversity pattern (species and ecosystems) and ecological processes. The presence of CBA Irreplaceable and CBA Optimal land in the Project site is therefore a concern with respects to terrestrial biodiversity management. As per the MBSP, development in CBAs should be avoided as far as possible.

Land designated as ‘Other Natural Areas’ are not required to meet biodiversity targets, and development in these areas is permissible.



Figure 4: Project site in relation to delineations of the National Red List of Terrestrial Ecosystems (SANBI, 2021).

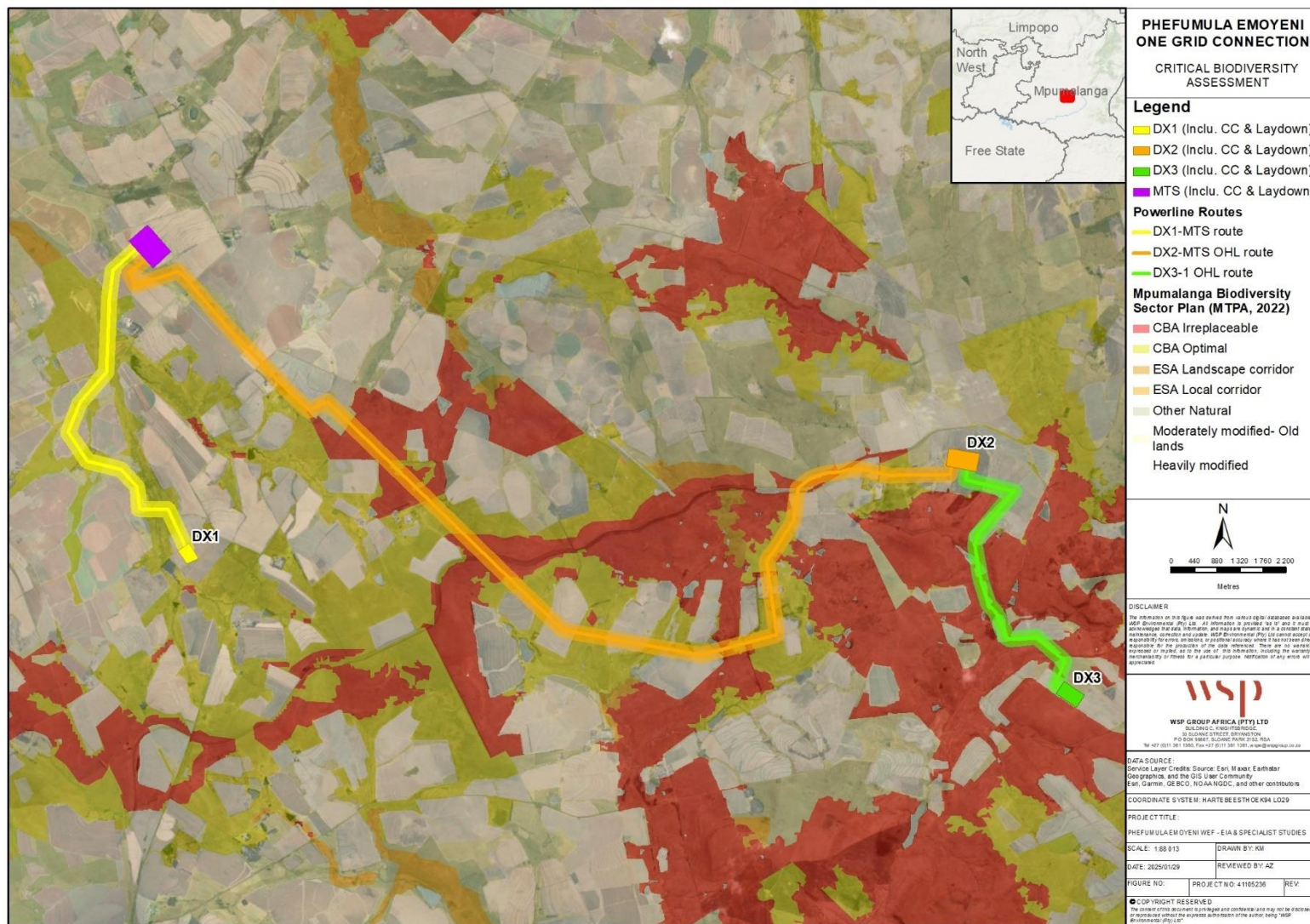


Figure 5: Project site and Critical Biodiversity Areas and Ecological Support Areas, as per the MBSP (2022).

6.3. Water Management

6.3.1. Strategic Water Source Areas

The Project site is not located within a mapped Strategic Water Source Area (SWSA). The nearest SWSA (*viz.* Upper Vaal SWSA) is located to the south-west of the Project site and is shown in Figure 6. SWSAs were not included as a receptor for the impact assessment for the proposed Project, or considered further in this report.

6.3.2. Freshwater Ecosystem Priority Area Sub-Catchment

Freshwater Ecosystem Priority Areas (FEPA) are rivers and wetlands required to meet biodiversity targets for freshwater ecosystems. Essentially, these areas were identified at a national level as priority areas for conserving freshwater ecosystems and supporting the sustainable use of water resources, as well as upstream catchment management areas (Driver, *et al.*, 2012).

Figure 7 shows the Project site in relation to mapped FEPAs. It is evident that the eastern extent of the Project site intersects a designated FEPA. According to Driver, *et al.*, (2012), FEPAs should be maintained in a natural/near natural condition, and anthropogenic activities in Upstream Management Areas should be carefully managed to prevent degradation of downstream FEPAs.

6.4. Indigenous Forests

No indigenous forests occur in the Project site or AOI. The AOI is dominated by cultivated fields and tracts of natural grassland and wetland habitat. Indigenous forests are therefore not included as receptor for the impact assessment, or considered further in this report.

6.5. Protected Areas and Conservation Areas

The Project site is not located in, or in close proximity to, a protected area. The nearest protected area is Rietvlei Private Nature Reserve, which is located to the south of the N17 national road, approximately 16 km south of the AOI (see Figure 8).

Chrissiesmeer Protected Environment is another important conservation area that was noted in the surrounding landscape (not shown in Figure 8). This protected environment was established in 2014 and covers a large, albeit fragmented area, approximately 23 km east of the Project site. It forms crucial habitat for several threatened bird species, and encompasses the Chrissie Pans Important Bird Area.

6.6. Priority Focus Areas for Protected Area Expansion

Priority Focus Areas for protected area expansion are large, intact and unfragmented areas of high biodiversity importance, that are suitable for the creation/expansion of protected areas (Driver, *et al.*, 2012). Land-use planning and decision making should avoid fragmenting Priority Focus Areas, to prevent such areas from being excluded from future protected area expansion. (Driver, *et al.*, 2012).

According to the National Protected Area Expansion Strategy (2018), virtually the entire Project site has been mapped as Priority Focus Areas for protected area expansion - shown in Figure 9. These delineations are mirrored by those presented in the Mpumalanga Protected Area Expansion – 20 Year Priorities, which parse natural habitat into either Priority 2 or Priority 3 areas for protected area expansion – as shown in Figure 10.

6.7. Important Bird Areas and Key Biodiversity Areas

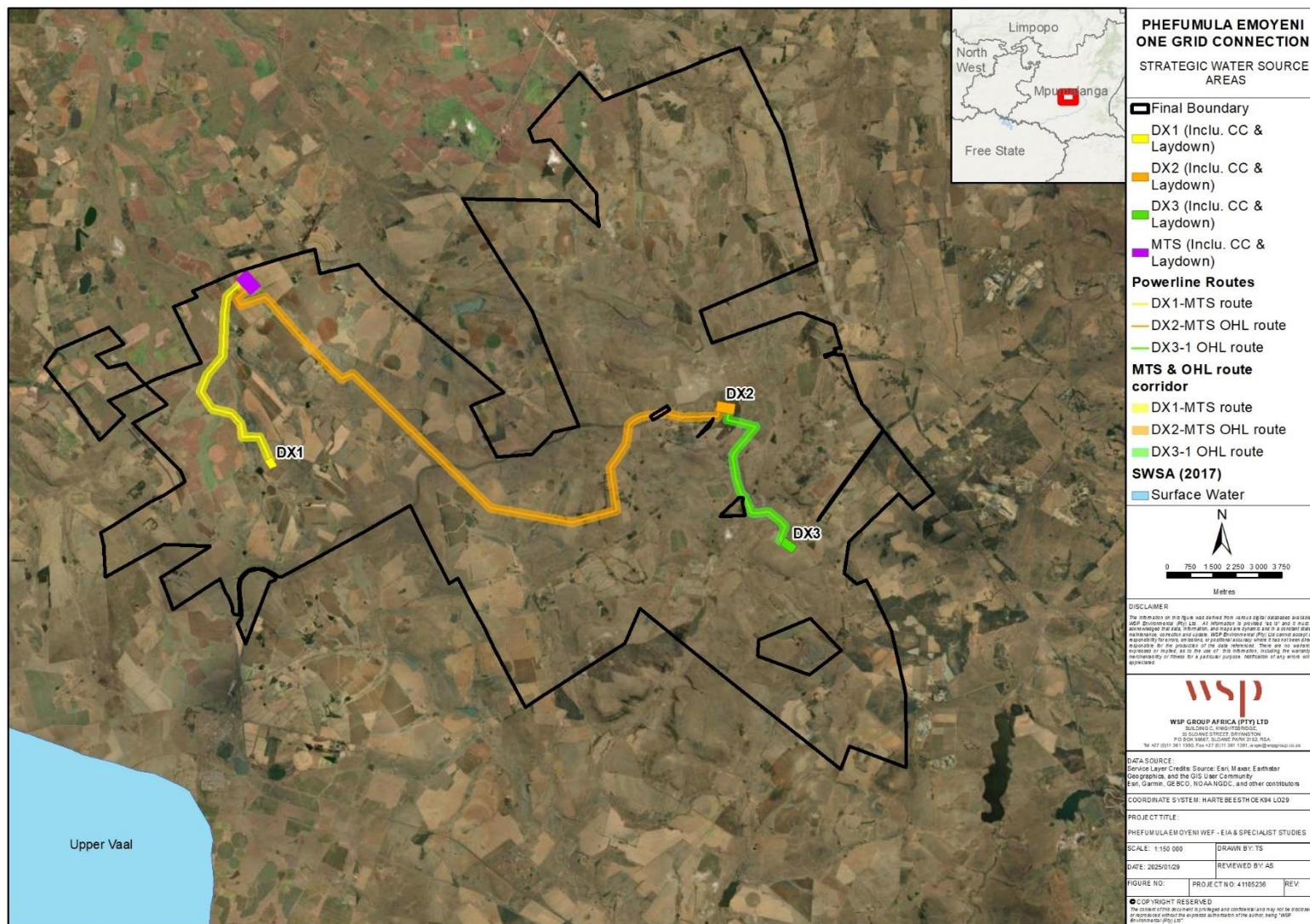
The Project site and the broader AOI are located within the Amersfoort-Bethal-Carolina District Important Bird Area (IBA) (SA014). This IBA is 343 320 ha in extent, and extends from Carolina in the north to Bethal in the east, and southward through Ermelo to Amersfoort (Marnewick, *et al.*, 2015) (Figure 11).

Several globally threatened trigger species occur in this IBA including, *inter alia*, Botha's Lark (*Spizocorys fringillaris*), Blue Crane (*Grus paradisea*), Southern Bald Ibis (*Geronticus calvus*), Black Harrier (*Circus maurus*), Black-winged Pratincole (*Vanellus melanopterus*), Secretary Bird (*Sagittarius serpentarius*) and Martial Eagle (*Polemaetus bellicosus*) (Marnewick, *et al.*, 2015).

The primary threat to the Amersfoort-Bethal-Carolina District IBA is the expansion of agricultural lands (mainly maize fields), resulting in a loss of natural habitat (Marnewick, *et al.*, 2015). Other purported threats include the expansion of nearby urban centres, transecting powerlines and local road networks. No part of the Amersfoort-Bethal-Carolina District IBA is formally protected (Marnewick, *et al.*, 2015).

South Africa's IBA network is currently being replaced by the concept of Key Biodiversity Areas (KBA). KBAs are sites of global importance for species and their habitats (SANBI, 2024). They are identified by applying the Global Standard for the Identification of Key Biodiversity Areas that was developed by the International Union for the Conservation of Nature (IUCN) (SANBI, 2024). Unlike IBAs, which only focus on bird conservation, KBAs are more holistic and consider a broader range of biodiversity, including mammals, herpetofauna (reptiles and amphibians), flora and many other taxa.

The Project site does not fall within a KBA. The closest KBA is the Chrissie Pans KBA which lies 1.5km east of the EGI Project site and 3.6km east of the nearest proposed OHL Route of the Phefumula Emoyeni One EGI (Figure 12).







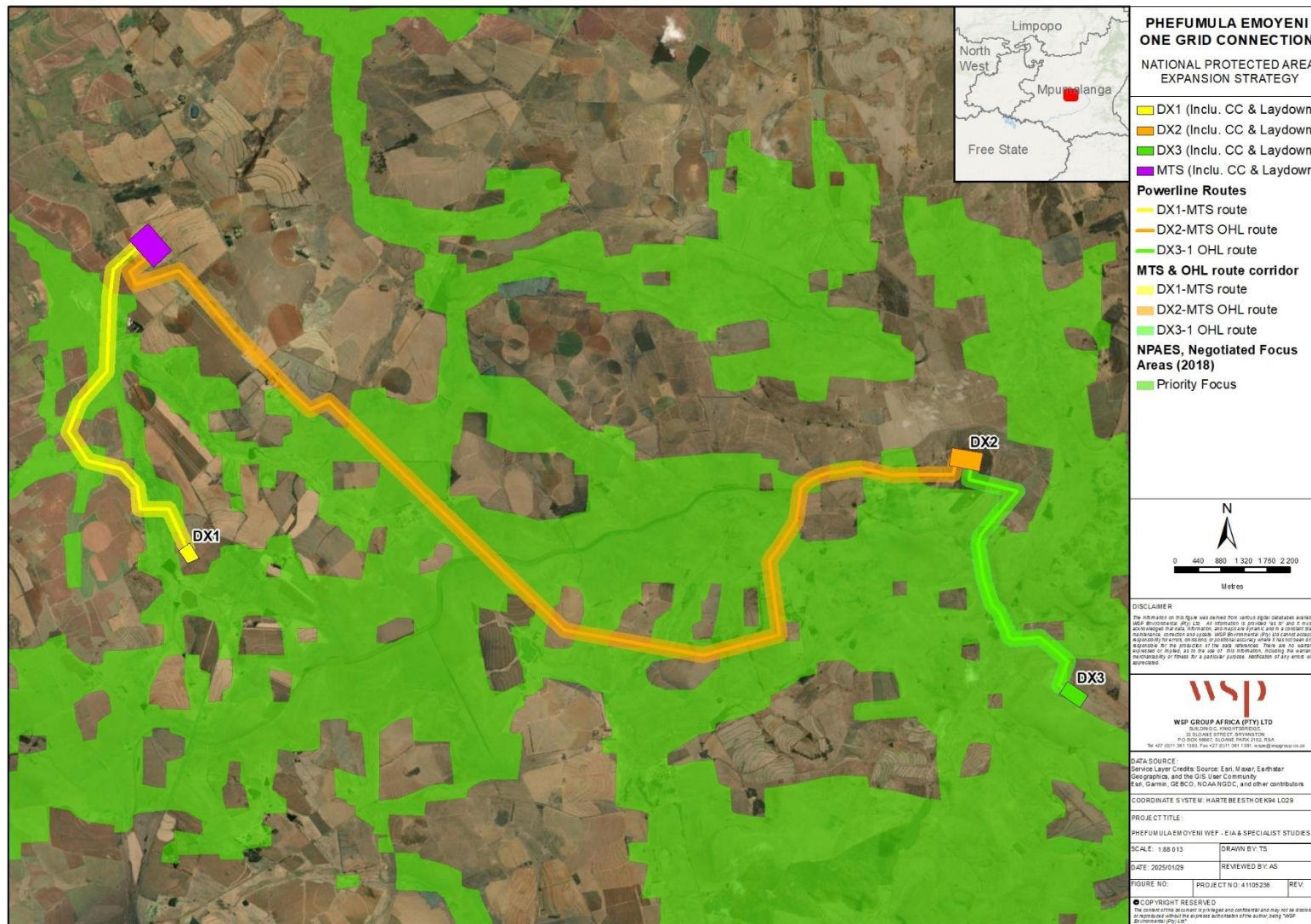


Figure 9: Project site in relation to Negotiated Focus Areas delineated under the National Protected Areas Expansion Strategy (2018).



PHEFUMULA EMOYENI ONE GRID CONNECTION

IMPORTANT BIRD AREAS

Important Bird Areas
(Birdlife South Africa 2013)

- DX1 (Inclu. CC & Laydown)
- DX2 (Inclu. CC & Laydown)
- DX3 (Inclu. CC & Laydown)
- MTS (Inclu. CC & Laydown)

Powerline Routes

- DX1-MTS route
- DX2-MTS OHL route
- DX3-1 OHL route

MTS & OHL route corridor

- DX1-MTS route
- DX2-MTS OHL route
- DX3-1 OHL route

Amersfoort-bethal-carolina District, Unprotected IBA

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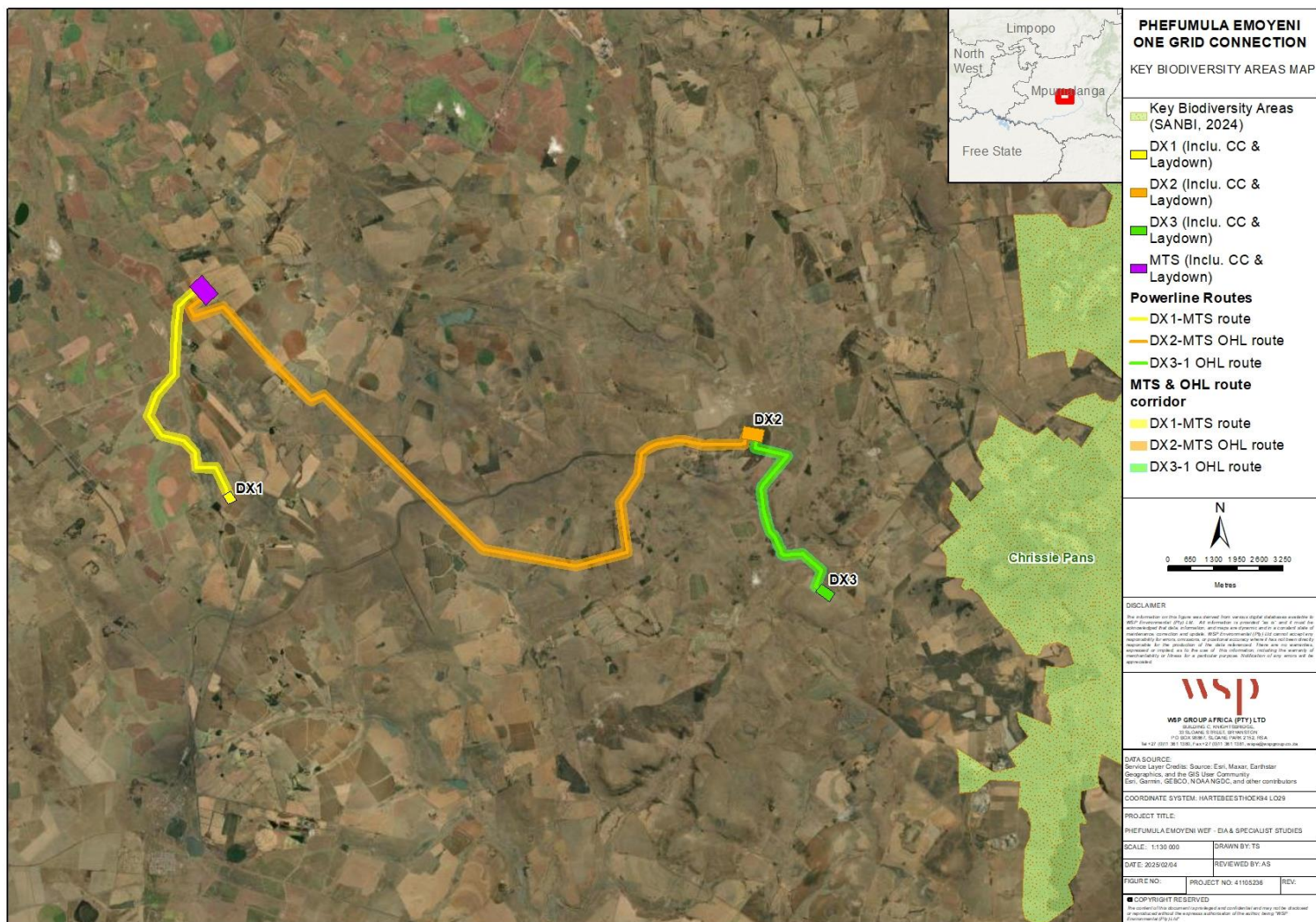
PROJECT TITLE:
PHEFUMULA EMOYENI WEF - FEA & SPECIALIST STUDIES

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7. Landscape Context and Existing Impacts on Terrestrial Biodiversity

The AOI is large and defined as a multi-functional rural-agricultural landscape, that is characterised by areas of both modified- and natural habitat. The following notes describe the general landscape context and major existing impacts (anthropogenic activities and infrastructure) that were observed in and around the AOI and Project site during the 2024 field survey:

- Farming is the dominant land use within the AOI, as well as across the surrounding landscape. Irrigated and dry-land cultivation, coupled with livestock production (mostly cattle, but also sheep) are the primary farming activities. These activities over the long term have caused varying degrees of spatial habitat modification and disturbance;
- Mining operations are present in the south-east and to the immediate north of the AOI. Mined areas were noted to be completely transformed, with typically little- to no natural habitat remaining. No mining is present in the Project site;
- Various forms of linear infrastructure are present in the Project site and across the broader AOI. These include major national tarred roads (N11 and N17), several gravel district roads, farms roads, informal vehicle tracks, a defunct railway line, and enumerable farm fences. These linear features have caused to varying degrees, and in conjunction with transformative land uses activities (e.g., mining and cultivation), habitat fragmentation across the AOI and surrounding landscape. Be that as it may, a large network of natural habitat patches and corridors is still present.;
- Alien invasive species (AIS) are not overly abundant in the AOI and Project site compared to other locations in Mpumalanga Province (Pers obs.). However, localised stands of alien trees are present, with aggressive invaders such as wattle (e.g., *Acacia dealbata* and *Acacia mearnsii*) and *Populus x canescens* noted. The edges of many cultivated field and other degraded locations are also encroached by various herbaceous AIS, such as *Verbena bonariensis*. Only a small area of the Project site comprises an alien tree stand; and
- Other anthropogenic activities and infrastructure in the AOI that have resulted in small-scale and localised habitat transformation include *inter alia*, farm residences, rural school buildings, and various agriculture structures (e.g., barns).

8. Habitat Units in the Project Site

Based on data collected during the field survey, six primary habitat units were identified in the AOI. These include three units regarded as natural habitat, and three units regarded as modified habitats:

Natural Habitats

- Mixed Dry Grassland;
- Rocky Shrubland;
- Moist Grassland;

Modified Habitats

- Old Lands;
- Cultivated Fields; and
- Alien Tree Plantations.

The proposed Project site (i.e., the proposed OHL assessment corridors and substation footprints), is dominated by natural habitat units, principally Mixed Dry Grassland, with small areas of Moist Grassland. Small patches characterised by the three modified habitat units are also present.

Habitat units are described, with accompanying photographs, in Section 8.1 through to Section 8.6. A habitat unit map for the Project site is shown in Figure 13.

8.1. Mixed Dry Grassland

Mixed Dry Grassland is a variable habitat unit that characterises the large intact grasslands of the AOI and most of the Project site. Based on contemporary and former farming activities, disturbance levels in areas of Mixed Dry Grassland vary.

As per Edwards (1983) structural classification system, the vegetation structure of this unit is defined as a low- closed grassland. Compositionally, areas of Mixed Dry Grassland are characterised by a diverse flora assemblage, that is typically grass dominated and forb rich, and with woody species generally occurring as scattered individual trees and shrubs.

Predicated on past livestock grazing levels and wildfire patterns, the grass species composition of these grasslands varies. Areas that have likely experienced high-levels of past selective grazing and/or too frequent wildfires tend to be dominated by early-seral grass species, such as *Eragrostis plana* and *Eragrostis chloromelas* (Figure 14), whereas in areas that have been less intensely grazed, other species are more common, such as the often-dominant *Themeda triandra*, as well as *Brachiaria serrata*, *Cymbopogon pospischilii*, *Eragrostis racemosa*, *Harpachloa falx*, *Setaria* species and *Tristachya leucothrix* (Figure 15).

Common herbs/forbs recorded in the Mixed Dry Grassland unit include *inter alia*; *Berkheya pinnatifida ingrata*, *Berkheya radula*, *Berkheya setifera*, *Berkheya speciosa*, *Haplocarpha scaposa*, *Hermannia transvaalensis*, *Hilliardiella aristata*, various *Helichrysum* and *Hypoxis* species and *Nidorella podocephala*.

Woody species occur at low abundances in areas of Dry Mixed Grassland and typically include scattered *Diospyros lycioides* and *Seriphium plumosum* shrubs. Higher abundances of *Seriphium plumosum* were noted at certain locations and are likely a result of historic localised overgrazing by livestock. In terms of declared alien invasive species, several species were observed including *inter alia*; *Cirsium vulgare*, *Solanum elaeagnifolium*, *Solanum sisymbriifolium*, *Verbena bonariensis* and *Verbena rigida*.

Sensitivity Aspects

This habitat unit characterises large portions of the AOI and most of the Project site. In conjunction with adjacent Moist Grassland habitat, areas of Mixed Dry Grassland are crucial resource and refuge habitat for flora and fauna. They also act as important ecological corridors, increasing local habitat connectivity and facilitating various ecological processes such as, *inter alia*, flora and fauna movement and dispersal.

In terms of flora SCC, Sensitive species 41, *Kniphofia ensifolia* subsp. *ensifolia* (NT, MP) and several protected flora species were recorded in this habitat unit across the broader AOI during the field survey. Habitat suitability assessments also indicate that several other flora SCC are likely to be present in areas of Mixed Dry Grassland. Patches of Mixed Dry Grassland also provide crucial fauna habitat, and will support many of the SCC known from the region. Refer to Section 12 for discussion of the Site Ecological Importance of this habitat unit.



Figure 14: *Eragrostis* dominated Mixed Dry Grassland.



Figure 15: *Themeda triandra* dominated Mixed Dry Grassland.

8.2. Rocky Shrubland

Rocky Shrubland is a relatively small habitat unit that occurs along rocky hillside slopes ridges in the AOI, but is not present within the proposed Project site and therefore will not be impacted by proposed Project activities. Unlike adjacent areas of open grassland, this habitat unit is characterised by a notably higher abundance of indigenous woody vegetation, coupled with the presence of numerous large protruding rocks.

In line with Edwards (1983) structural classification, this habitat unit is defined as low- to short sparse shrubland, with woody vegetation growing as small trees and shrubs (typically < 3m in height). These typically grow in either dense, but spatially discrete aggregations around exposed rocks, or as scattered individuals within the broader grassland matrix – see Figure 16 and Figure 17.

Compositionally, *Diospyros lycioides* is the most abundant woody species. Other common larger woody taxa recorded in this unit include *Asparagus laricinus*, *Euclea crispa*, *Gymnosporia buxifolia*, *Kiggelaria africana*, *Rabdosiella calycina*, *Searsia dentata*, *Searsia discolor* and *Searsia pyroides* var. *gracilis*.

The herbaceous layer shares many of the same species as adjacent areas of Mixed Dry Grassland, as well as several additional taxa. Commonly recorded grasses include *Cymbopogon pospischilii*, *Eragrostis chloromelas*, *Eragrostis plana*, *Eragrostis pseudosclerantha*, *Eragrostis racemosa*, *Hyparrhenia dregeana*, *Hyparrhenia hirta*, *Melinis nerviglumis*, *Themeda triandra* and *Tristachya leucothrix*.

Various forbs, geophytes and small shrublets are also common in the herbaceous layer including *inter alia*; *Berkheya radula*, *Haemanthus humilis*, *Hilliardiella aristata*, *Haplocarpha scaposa*, *Helichrysum rugulosum*, *Phyllica paniculata*, *Ledebouria ovatifolia* and *Leonotis dysophylla*. Ferns recorded in this unit include *Blechnum* cf. *australe*, *Cheilanthes hirta* var. *hirta*, *Pellaea calomelanos* var. *calomelanos* and *Selaginella dregei*.

Sensitivity Aspects

The combination of indigenous woody vegetation and exposed rocks creates a distinctive rocky shrubland habitat that is relatively uncommon within the AOI's typical open grassland dominated

land cover. Accordingly, areas of Rocky Shrubland increase landscape-scale heterogeneity, and provide important niche habitat for a variety of flora and fauna, including species of conservation concern that have an affinity for more wooded and/or rocky areas. The provincially protected *Haemanthus humilis* was recorded in this habitat unit, and habitat suitability assessments suggest that several other flora SCC are likely to be present. Refer to Section 12 for discussion of the Site Ecological Importance of this habitat unit.



Figure 16: Hillside characterised by exposed rocks and indigenous woody vegetation.



Figure 17: Pockets of woody trees and shrubs are typically dominated by *Diospyros lycioides*.

8.3. Moist Grassland

Moist Grassland habitat characterises wetland and riparian systems across the AOI and small portions of the Project site. Vegetation structure ranges from low- to tall-, closed grassland (*sensu* Edwards 1983), and although not widespread or abundant in most areas of Moist Grassland, alien woody vegetation is present and well-established at certain locations (Figure 18 and Figure 19).

Common flora species recorded include a range of grasses and sedges such as, *inter alia*; *Agrostis lachnantha*, *Andropogon appendiculatus*, *Arundinella nepalensis*, *Aristida junciformis*, *Cyperus congesta*, *Cyperus denudatus*, *Cyperus fastigiatus*, *Cyperus marginatus*, *Cynodon dactylon*, *Eleocharis limosa*, *Eragrostis gummiflua*, *Eragrostis heteromera*, *Eragrostis plana*, *Imperata cylindrica*, *Juncus dregeanus*, *Kyllinga erecta*, *Leersia hexandra* and *Paspalum dilatatum**. The tall reed *Phragmites australis*, the bulrush *Typha capensis* and *Schoenoplectus brachyceras* are also present in more permanently damp areas (*denotes alien taxa).

Common forbs recorded in this habitat unit include *inter alia*; *Berkheya pinnatifida ingrata*, *Berkheya radula*, *Berkheya setifera*, *Centella asiatica*, *Helichrysum aureonitens*, *Helichrysum nudifolium* var. *pilosellum*, *Lobelia flaccida*, *Monopsis decipiens*, *Nidorella podocephala*, *Pelargonium luridum*, *Pimpinella transvaalensis*, *Scabiosa columbaria* and *Trifolium repens*.

Several alien woody taxa recorded in this habitat unit include *Eucalyptus* sp., *Quercus ruber*, *Populus x canescens*, *Pyracantha angustifolia* and *Salix babylonica* (Figure 19).

Sensitivity Aspects

Moist Grasslands play a crucial in maintaining the hydrological functioning (e.g., filtration and flood attenuation), ecological processes and terrestrial biodiversity of the landscape. In conjunction with

adjacent Mixed Dry Grasslands, these habitats significantly increase landscape-scale habitat connectivity. Sensitive species 41 and several protected flora species, such as *Crinum bulbispermum* and various *Gladiolus* species, were recorded in Moist Grasslands, and habitat suitability assessments suggest that several other flora SCC are likely to be present.

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. Refer to Section 12 for discussion of the Site Ecological Importance of this habitat unit.



Figure 18: Typical area of open Moist Grassland.



Figure 19: Small stream encroached by large alien trees including *Salix babylonica* and *Populus x canescens*.

8.4. Old Lands

As the name suggests, this habitat unit characterises old, cultivated fields that have been left fallow, for several years, and as a result have subsequently regenerated to a secondary grassland community. As such, this is considered a modified habitat unit.

Vegetation structure is low closed grassland (*sensu*. Edwards, 1983). Compositionally, compared to natural grasslands, Old Lands are depleted of nutrients and thus floristically depauperate. Dominant grass species recorded in this unit during the field survey include the tall, robust thatching grasses *Hyparrhenia dregeana* and *Hyparrhenia hirta*, and relict-pioneer and early-seral taxa such as *Eragrostis chloromelas*, *Eragrostis curvula* and *Eragrostis plana* (see Figure 20).

Forbs recorded Old Lands include a mixture of indigenous and alien ruderal and weedy species, such as *Bidens pilosa*, *Conyza bonariensis*, *Pseudognaphalium luteo-album*, *Senecio consanguineus*, *Rumex acetosella*, *Selago densiflora*, *Tagetes minuta*, *Verbena rigida* and *Wahlenbergia undulata*. The only woody species recorded in this habitat unit was *Seriphium plumosum*.

Sensitivity Aspects

Despite past disturbances and a secondary vegetation community, Old Lands can retain some of the functional attributes of natural grasslands. They are also very stable and able to persist for extensive periods. This notwithstanding, no flora and fauna species of conservation were recorded in this habitat unit, and it is considered unlikely that Old Lands constitute important life-cycle habitat for any SCC. Refer to Section 12 for discussion of the Site Ecological Importance of this habitat unit.



Figure 20: Old Land dominated by *Hyparrhenia* grass species.

8.5. Cultivated Fields

Large portions of the AOI, but only a small area of the Project site, are characterised by cultivated agricultural fields, which is considered a modified habitat type. Cultivated Fields include both pivot-irrigated crop fields and dry-land crop fields. These are typically under maize production, and are regularly disturbed through ploughing and harvesting (Figure 21).

This habitat unit also includes open fields that are actively-managed as grass pastures. Unlike areas of natural grassland, grass pastures are often fertilised, and regularly mown and baled to provide reserve forage for livestock during the dry season (shown Figure 22).

Sensitivity Aspects

Active Cultivated Fields are denuded of indigenous vegetation, and are subject to regular anthropogenic disturbance. When not dominated by a monoculture of food crop species, these areas are typically colonised by a variety of alien invasive and weedy species.

No flora SCC were recorded in Cultivated Fields during the field survey, and no flora SCC are likely to be present in these areas. 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. Refer to Section 12 for discussion of the Site Ecological Importance of this habitat unit.



Figure 21: Dry-land cultivated field, under maize production



Figure 22: Recently mown and baled grass pasture. Note prevalence of the declared weed *Verbena bonariensis* in foreground.

8.6. Alien Tree Plantations

Alien Tree Plantations is a broad-term to describe the numerous and localised stands of alien woody vegetation in the AOI. These stands range from narrow wind-rows (typically associated with farms residences and farm roads) to defined plantation-type stands and informal thickets. Alien Tree Plantations are a modified habitat type (Figure 23 and Figure 24).

Vegetation structure is defined as short- to tall closed woodland (*sensu*. Edwards, 1983 Dominant alien tree species include alien *Eucalyptus* species, *Acacia dealbata* and *Acacia mearnsii* (wattles), and *Populus x canescens*. Little indigenous vegetation is present in dense, well-established Alien Tree Plantations, with herbaceous flora typically suppressed or in most cases, largely absent.

Sensitivity Aspects

Alien Tree Plantations are characterised by an almost complete dominance of one or two non-indigenous tree species. No flora SCC were observed in these areas during the field survey, and no flora SCC are likely to be present in these habitats.

From a fauna perspective, Alien Tree Plantations 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 habitat by *inter alia* raptors. Refer to Section 12 for discussion of the Site Ecological Importance of this habitat unit.



Figure 23: Small stand of *Acacia dealbata* trees

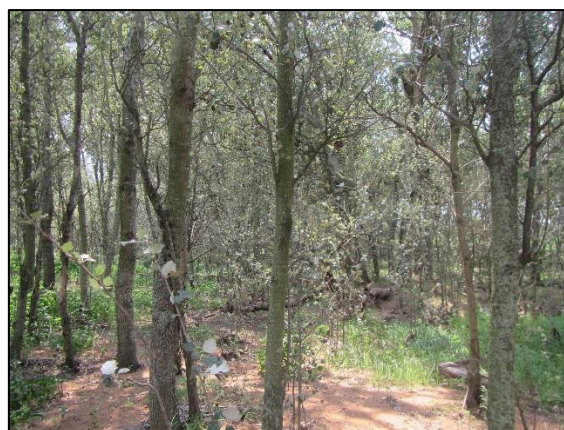


Figure 24: Stand of *Populus x canescens* trees growing in a hillside seep.

9. Flora Species of Conservation Concern

This section presents a summary discussion on flora SCC taken from the Plant Species Specialist Assessment Report.

One flora species listed as Vulnerable on the national Red List was recorded in the Project site, namely Sensitive species 41. *Kniphofia ensifolia* subsp. *ensifolia*, which is listed as Near Threatened on the Mpumalanga Red List, was recorded in the broader AOI, but not within the Project site. Based on reviewed literature and data sources, 10 additional flora species that occur, or potentially occur in the AOI are listed as threatened or Near Threatened on the national and/or provincial Red Lists. These are listed in Table 4.

Several flora species that are listed as Protected at a provincial level according to Mpumalanga Nature Conservation Act (Act No. 10 of 1998) were recorded in the AOI during the field survey, including *Aloe ecklonis*, *Boophone disticha*, *Crinum bulbispermum*, *Gladiolus crassifolius*, *Gladiolus longicollis* subsp. *platypetalus*, *Gladiolus sericeovillosus* subsp. *calvatus* and *Haemanthus humilis*.

Flora species that are listed as Protected (and Specially Protected) under the Mpumalanga Nature Conservation Act (Act No. 10 of 1998) require specific conservation management, i.e., that cannot be cleared or picked without a permit from the provincial authority. No flora species listed on the NEMBA ToPS (2007) List were recorded or potentially occur in the AOI.

For additional information on flora SCC occurring/potentially occurring in the AOI and Project site, including habitat preferences and a 'probability of occurrence' based on habitat suitability assessments, refer to the Plant Species Specialist Assessment Report for the proposed Project.

Table 4: Threatened flora species occurring or potentially occurring in the AOI.

Family	Scientific Name [#]	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status
Aizoaceae	<i>Khadia carolinensis</i>	Vulnerable	Vulnerable	-
Apocynaceae	<i>Aspidoglossum xanthosphaerum</i>	Vulnerable	Vulnerable	-
Apocynaceae	<i>Miraglossum davyi</i>	Vulnerable	Vulnerable	-

Family	Scientific Name [#]	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status
Apocynaceae	<i>Pachycarpus suaveolens</i>	Vulnerable	Vulnerable	-
Asphodelaceae	<i>Kniphofia ensifolia</i> subsp. <i>ensifolia</i>	Least Concern	Near Threatened	Protected
Hyacinthaceae	<i>Eucomis autumnalis</i>	Least Concern	Declining	Protected
Orchidaceae	<i>Eulophia cooperi</i>	Least Concern	Rare	Protected
-	Sensitive species 1252	Vulnerable	Vulnerable	Protected
-	Sensitive species 41	Vulnerable	Vulnerable	Protected
-	Sensitive species 691	Vulnerable	Near Threatened	-
-	Sensitive species 851	Vulnerable	-	-
-	Sensitive species 1200	Endangered	Endangered	-
[#] The names of specific taxa that are regarded as being susceptible to overexploitation have been redacted and are not presented in this report. These species are referred to by their assigned 'sensitive species number', as per the species assessment guidelines (SANBI, 2020).				

10. Fauna Attributes of the Area of Interest

This section presents a summary discussion on fauna SCC taken from the Animal Species Specialist Assessment Report. For additional information on fauna SCC occurring and potentially occurring in the AOI and Project site, refer to the Animal Species Specialist Assessment Report.

Large and intact patches of natural habitat provide important life-cycle habitat for a diverse fauna community, that includes numerous fauna SCC. During the field survey, several fauna SCC were documented in the AOI, including the following:

- Four mammal species of conservation concern:
 - Serval (*Leptailurus serval*) - Near Threatened;
 - Mountain Reedbuck (*Redunca fulvorufula fulvorufula*) - Endangered;
 - Cape Clawless Otter (*Aonyx capensis*) - Near Threatened;
 - Swamp Musk Shrew (*Crocidura mariquensis*) - Near Threatened; and
- Six bird species of conservation concern (refer to the Avifauna Specialist Study for additional detailed information on bird SCC):
 - Blue Crane (*Anthropoides paradiseus*) - Near Threatened;
 - Lesser Flamingo (*Phoeniconaias minor*) - Near Threatened;
 - Greater Flamingo (*Phoenicopus roseus*) - Near Threatened;
 - Southern Bald Ibis (*Geronticus calvus*) - Vulnerable;
 - Yellow-billed Stork (*Mycteria ibis*) - Endangered; and
 - Blue Korhaan (*Eupodotis caerulea*) - Vulnerable (NEMBA ToPS, 2007).

Habitat suitability assessments conducted for the Animal Species Specialist Assessment also indicate that several additional fauna SCC 'possibly' or 'probably' occur in the AOI, and it is likely that several of these may be impacted by proposed Project activities taking place within the OHL assessment corridors and substation footprints.

It is noted that the observed fauna SCC are associated with grassland and wetland-type habitats, and the integrity and connectivity of these habitat patches is important to maintaining local metapopulation dynamics and the continued persistence of on-site fauna SCC.

11. Key Ecological Attributes and Processes

11.1. Habitat Corridors, Resources and Refugia

The AOI is a multi-functional landscape that is characterised by large areas of cultivation (Cultivated Fields), but also large intact areas of natural dry grassland and moist grassland habitat. Various forms of linear infrastructure, such as formal roads, farm tracks, farm fences and an old railway line, and the presence of modified habitat patches, have caused habitat fragmentation. However, it is noted that the general level of habitat connectivity across the Project site and AOI, and to the broader landscape surrounding the AOI remains high.

On-site natural habitat patches provide a large network of dispersal and movement corridors for fauna, and the topographically linked ecological productivity gradients of dry upland sites and moist low-lying sites (i.e. wetland and watercourses) also provide important and functionally-adaptive foraging resources for fauna. This will sustain local metapopulation dynamics and a diverse fauna community that includes several species of conservation concern.

Within the grassland-dominated habitat matrix, the altitudinal variability, exposed rocks and abundance of indigenous woody flora that defines the Rocky Shrubland habitat unit, also creates diverse and unique micro-habitats that significantly increase broader-scale habitat heterogeneity. This will increase local flora and fauna diversity by providing niche habitats for, amongst others, obligate and facultative rupicolous¹ and shrubland-favouring species that are unlikely to be resident in adjacent open grassland.

Although Alien Tree Plantations are considered a modified habitat type, it is also noted that within the context of generally grassland-dominated habitat-matrix, these tall, densely wooded areas are likely to provide a form of refuge (or sheltering) habitat for several fauna species that are sensitive to disturbance and/or are persecuted. They are also likely to provide important roosting and nesting habitat for raptors, amongst other bird species.

The proposed Project may have an impact local habitat connectivity through habitat loss and fragmentation, and this may affect various ecological processes, such as the movement and dispersal of flora (propagules and pollinators) and fauna across the landscape.

11.2. 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 biodiversity and ecological processes.

11.2.1. Wildfire – Grassland Burning

Fire is a natural, albeit often human initiated, disturbance agent in grassland ecosystems. Mesic Highveld Grasslands are considered fire-prone and fire-dependent landscapes, and fire is essential to

¹ Flora and fauna species that are specifically adapted to rocky habitat.

the maintenance of biodiversity patterns and ecological processes (SANBI, 2013). Wildfire's have several key ecological effects with respects to fauna, including:

- Removal of moribund vegetation and increasing plant productivity and palatability, which improves grazing for wild herbivores;
- 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.

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

Fire is considered an important driver of change in the AOI. It is anticipated that the proposed Project may result in altered wildfire patterns across the AOI due to increased accidental fires from faulty/shorting Project infrastructure. Changes in local fire may impact vegetation productivity, which may affect the local fauna and flora diversity community, including SCC.

11.2.2. Herbivory - 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 can 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), which can negatively affect local fauna communities. Excessive cattle grazing and trampling can also cause soil erosion and gully formation, and modify and homogenise vegetation structure, which can potentially impact sensitive fauna species that have specific life-cycle habitat requirements.

Cattle grazing (Figure 25) and trampling are considered important drivers of change in the AOI. However, it is anticipated that the proposed Project is unlikely to alter livestock grazing patterns in the AOI.

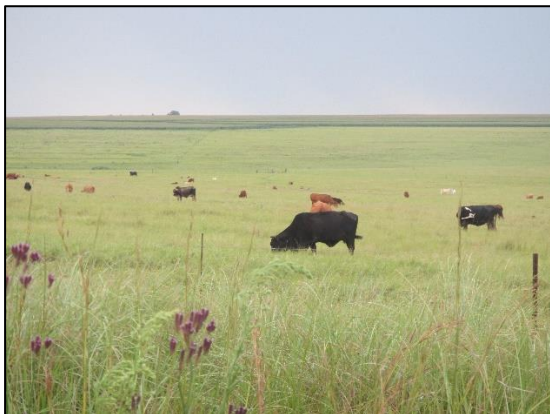


Figure 25: Cattle grazing is common in the AOI.

11.2.3. Alien Invasive Species Colonisation

Several formal alien tree plantations (e.g., *Eucalyptus* trees) and wattle infestations (*Acacia mearnsii* and *Acacia dealbata*) are present in the AOI, and many disturbed sites (e.g., cultivated fields) are encroached by herbaceous alien invasive species (e.g., *Verbena bonariensis*). If not actively controlled, species such as wattle may spread into adjacent natural habitats, where they will shade-out and 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 fauna communities;
- A reduction in grass productivity for grazing herbivores (e.g., Mountain Reedbuck), and
- Increased exposed soil surfaces and incidences of erosion.

The spread of alien invasive vegetation is therefore considered a significant driver of change in the AOI and surrounding landscape, and one capable of negatively impacting terrestrial biodiversity.

11.2.4. Subsistence Bushmeat Hunting

Small- and medium-sized antelope were recorded in the AOI, and these species, amongst others, are frequently the target of subsistence bushmeat hunting. Common subsistence hunting techniques include the use of snares (which is essentially indiscriminate) and hunting dogs (which is partly discriminate). Local subsistence hunters with hunting dogs were observed in the AOI during the field survey.

An escalation of bush-meat hunting is likely to negatively affect local fauna communities, with species like the Mountain Reedbuck (Endangered) particularly at risk. Subsistence bushmeat hunting is therefore regarded as a potential driver of change in the AOI, which could impact certain mammals SCC.

An increase in on-site construction workers and contractors linked with the proposed Project may result in a temporary increase in levels of subsistence bushmeat hunting in the AOI, and this will need to be correctly managed during Project implementation.

12. General Sensitivity and Site Ecological Importance

The ecological importance (SEI) of identified habitat units in the Project site 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 5, and shown in Figure 26.

To assess the overall ecological sensitivity of the Project site and AOI, additional regional factors were also considered, as discussed below:

- **Biodiversity Significance:** Significant portions of the Project site and surrounding AOI are delineated under the MBSP (2022) as CBA Irreplaceable and CBA Optimal. Several ecological/biodiversity features are germane to these CBAs, including *inter alia*, the presence of large tracts of intact grassland, the presence/potential presence of both flora and fauna SCC, macro-corridor and habitat linkages. These areas are crucial to meeting provincial targets for biodiversity patterns and ecological processes;

- **Threatened Vegetation Types:** At a regional level, it is noted that both vegetation types that characterise the Project site, namely Eastern Highveld Grassland (EN) and Soweto Highveld Grassland (VU), are threatened and warrant careful management and protection. Natural grassland habitat should therefore, in general, be managed as sensitive and any potential negative impacts should be minimised; and
- **Wetland Importance:** Wetlands (referred to floristically as Moist Grasslands in this report) are functionally important from both a hydrological and biodiversity perspective, and delineated wetlands (refer to the wetland specialist study report) are subject to restrictions with respects to infrastructure development.

Based on these considerations, the findings of this specialist assessment confirm the 'Very High' sensitivity rating of the DFFE screening tool for the Project site.

Table 5: Site Ecological Importance of habitat units in the Project site.

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Mixed Dry Grassland	<u>HIGH</u> : Highly likely occurrence of CR, EN, VU species (=Mountain Reedbuck, EN & Sensitive species 41, VU). Small area of natural habitat of EN ecosystem (=Eastern Highveld Grassland, EN & Soweto Highveld Grassland, VU).	<u>HIGH</u> : Very large (>100 ha) intact area for any conservation status of ecosystem type. Good habitat connectivity with potentially functional ecological corridors. BUT Mostly minor current negative ecological impacts, with some major impacts and a few signs of past disturbance.	HIGH	<u>MEDIUM</u> : Habitat that can recover slowly to restore >75% of the original species composition and functionality	HIGH
Rocky Shrubland	<u>HIGH</u> : Highly likely occurrence of CR, EN, VU species (=Mountain Reedbuck, EN & Sensitive species 41, VU). Small area of natural habitat of EN ecosystem (=Eastern Highveld Grassland, EN & Soweto Highveld Grassland, VU).	<u>HIGH</u> : Large (> 5 ha but <100 ha) intact area for any conservation status. Good habitat connectivity with potentially functional ecological corridors. Only minor current negative ecological impacts with limited signs of major past disturbance and good rehabilitation potential.	HIGH	<u>MEDIUM</u> : Habitat that can recover slowly to restore >75% of the original species composition and functionality	HIGH
Moist Grassland	<u>HIGH</u> : <u>Highly</u> likely occurrence of CR, EN, VU species (=Yellow-billed Stork, EN & Southern Bald Ibis, VU). Small area of natural habitat of EN ecosystem (=Eastern	<u>HIGH</u> : Very large (>100 ha) intact area for any conservation status of ecosystem type.	HIGH	<u>MEDIUM</u> : 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
	Highveld Grassland, EN & Soweto Highveld Grassland, VU).	Good habitat connectivity with potentially functional ecological corridors. BUT Mostly minor current negative ecological impacts, with some major impacts and a few signs of past disturbance.			
Old Lands	LOW: No confirmed or highly likely populations of SCC or range-restricted species.	<u>MEDIUM/LOW</u> : Narrow corridors of good connectivity. Mostly minor current negative ecological impacts, BUT with major past impacts (i.e., former cultivation).	LOW	HIGH: Habitat that can recover relatively quickly to restore >75% of the original species composition and functionality	VERY LOW
Cultivated Fields	<u>VERY LOW</u> : No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	<u>VERY LOW</u> : Several major current negative ecological impacts.	VERY LOW	<u>VERY HIGH</u> : Habitat that can recover rapidly to restore >75% of the original species composition and functionality.	VERY LOW
Alien Tree Plantations	<u>VERY LOW</u> : No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	<u>VERY LOW</u> : Several major current negative ecological impacts.	VERY LOW	<u>VERY HIGH</u> : Habitat that can recover rapidly to restore >75% of the original species composition and functionality.	VERY LOW

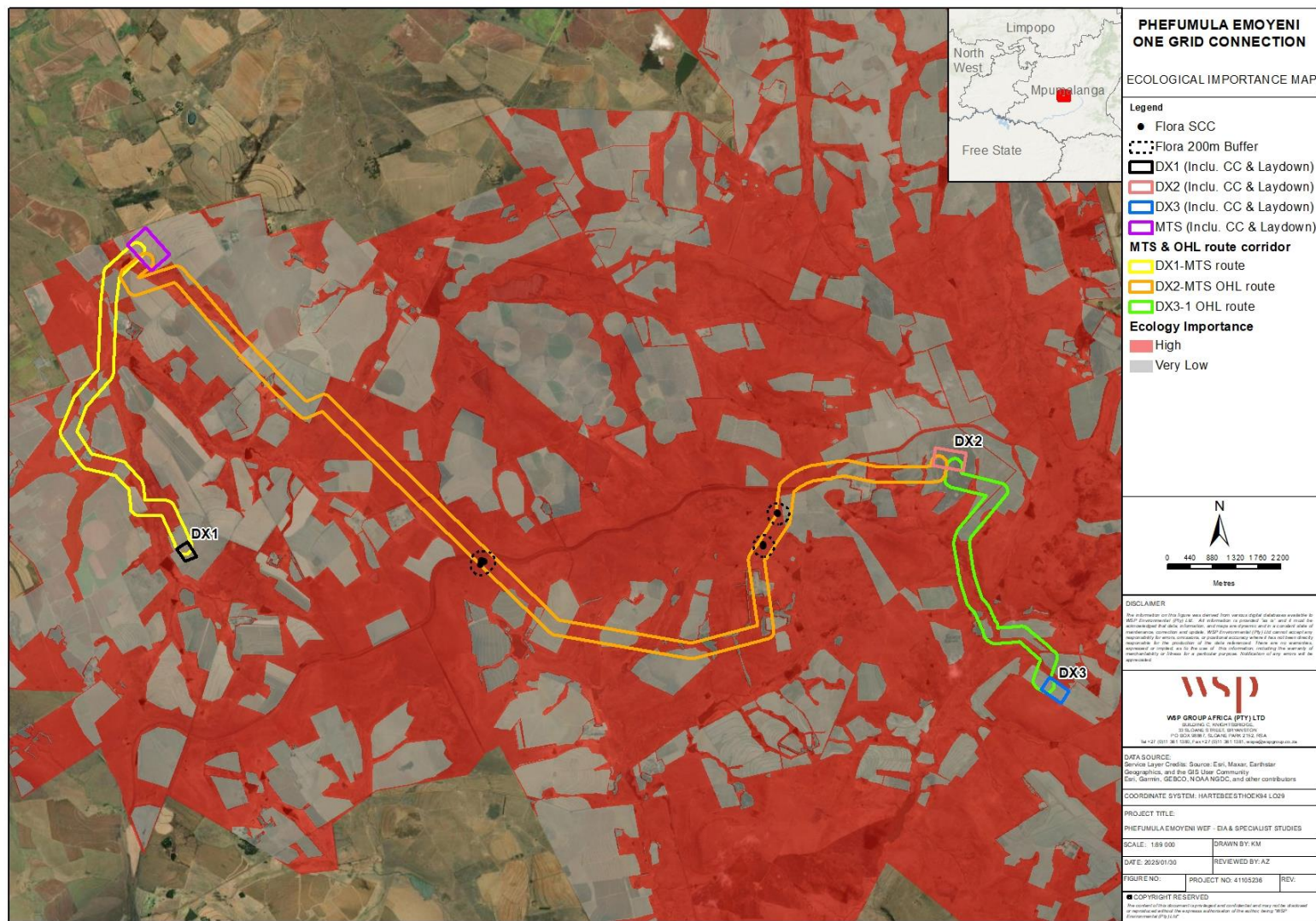


Figure 26: Site Ecological Importance of the Project site and surrounding AOI.

13. Terrestrial Biodiversity Impact Assessment

13.1. 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 direct², indirect³, secondary⁴ as well as cumulative⁵ 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 criteria⁶ presented in Table 6.

Table 6: 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	Moderate	High	Very High
Environmental Significance Rating (Positive (+))	Very low	Low	Moderate	High	Very High

13.2. 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 27 below.

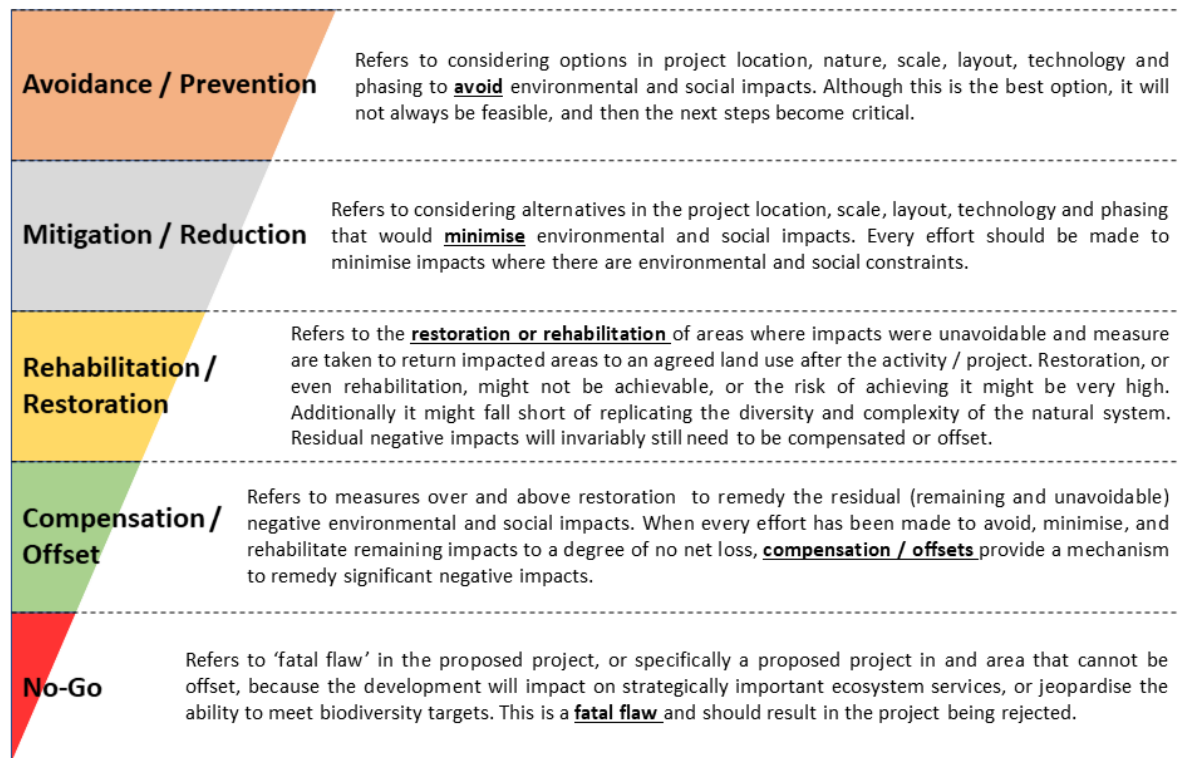


Figure 27: Mitigation Sequence/Hierarchy

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 13.3.4. A summary table presented in Table 9.

This impact assessment section should be read in conjunction with the impact assessment presented in the Animal Species Specialist Assessment and Plant Species Specialist Assessment reports.

13.3. Assessment of Impacts on Terrestrial Biodiversity

13.3.1. Construction Phase

13.3.1.1. 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 ecosystem functioning and integrity, and the viability of local fauna and flora populations.

Two project layouts (Alternative 1 & Alternative 2) were considered during the scoping phase. Alternative 2 was preferred as it minimizes disturbance to natural habitat, especially CBA Irreplaceable and CBA Optimal areas, by optimizing infrastructure placement within modified habitats, like cultivated fields.

Based on the currently proposed infrastructure layout (Alternative 2), only approximately 1.47 ha of natural habitat is likely to be lost due to Project infrastructure development, with Figure 28 showing an overlay of proposed infrastructure on the habitat unit map. Table 7 presents an indication of the approximate infrastructure footprints directly impacting each of the identified habitat units.

Anticipated habitat losses amount to approximately 0.62 ha of Soweto Highveld Grassland (VU) and 0.37 ha of Eastern Highveld Grassland (EN), as per the SANBI's (2021) delineations of remaining vegetation type extent. Note: Estimated development footprints for the proposed powerlines are predicated on an approximate inter-pylon distance of 175 m (which is the median between the 100-250 m range stated in the project description) and individual pylon structure footprints of 110 m².

The development of proposed Project infrastructure will have a small impact on designated CBAs and ESAs, with approximately 0.89 ha of CBAs impacted. Table 8 presents the approximate extent of CBA and ESA losses, per infrastructure footprint.

The impact prior to mitigation is considered to be of 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 high. This results in an impact of "medium" significance.

Several management/mitigation measures can be taken to further minimise impact significance. These include: 1) in-field micro-siting of tower/pylon footprints to already disturbed sites; 2) clearing only the minimum footprint areas required for construction activities; and 3) actively rehabilitating all disturbance footprints after construction.

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

Table 7: Indicative extent of possible impacts on the identified habitat units.

Impacted Habitat Units	Infrastructure Footprints (Ha)				Estimated Total Powerline Pylon Footprints (Ha)*			TOTAL (Ha)
	DX 1 (Incl. construction camp and laydown)	DX 2(Incl. construction camp and laydown)	DX 3(Incl. construction camp and laydown)	MTS (Incl. construction camp and laydown)	DX1-MTS route (9.58 km)	DX2-MTS OHL route (1.44 km)	DX3-1 OHL route (7.18 km)	
Mixed Dry Grassland	-	-	-	0.18	0.14	0.72	0.06	1.10
Cultivated Field	7.87	20.74	13.54	33.23	0.20	0.40	0.17	76.15
Moist Grassland	-	-	-	0.04	0.09	0.17	0.06	0.37
Old Lands	-	-	-	-	0.01	0.04	0.11	0.15
*Estimates based on inter-pylon distance of 175 m (i.e. median between 100 m - 250 m range) and an individual pylon footprint of 110 m ² .								

Table 8: Approximate extent of impacts on Critical Biodiversity Areas and Ecological Support Areas.

MBSP (2022) Category	Infrastructure Footprints (Ha)				Estimated Total Powerline Pylon Footprints (Ha)*			TOTAL (Ha)
	DX 1 (Incl. construction camp and laydown)	DX 2(Incl. construction camp and laydown)	DX 3(Incl. construction camp and laydown)	MTS (Incl. construction camp and laydown)	DX1-MTS route (9.58 km)	DX2-MTS OHL route (1.44 km)	DX3-1 OHL route (7.18 km)	
CBA Irreplaceable	-	-	-	-	0.00	0.24	0.04	0.28
CBA Optimal	-	-	-	-	0.19	0.42	0.00	0.61
ESA Landscape Corridor	-	-	-	-	-	-	-	-
*Estimates based on inter-pylon distance of 175 m (i.e. median between 100 m - 250 m range) and an individual pylon footprint of 110 m ² .								



Figure 28: Habitat units and the proposed Project infrastructure layout.

13.3.1.2. Fragmentation reducing natural habitat connectivity and integrity

Habitat fragmentation is caused when vegetation clearing and/or the development of infrastructure (e.g., roads and 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 (edge effects) and can affect various ecological processes (e.g. fire patterns) and metapopulation dynamics, such as fauna dispersal, movement and migration, and flora pollination and propagule dispersal. This can, in turn, affect flora and fauna species richness and population stability.

The proposed Project involves, in part, the construction of linear infrastructure (i.e. OHL). Linear infrastructure has the potential to cause habitat fragmentation. It is noted however, that the actual pylon footprints where permanent habitat loss is expected, are relatively small and estimated at 110 m² per pylon structure. As such, it is anticipated that potential fragmentation effects from the OHL will be limited.

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

With the application of mitigation measures, such as in-field micro-siting of pylon footprints to already disturbed sites, minimising the clearance footprint to the minimum area required for construction and operational purposes, and rehabilitating all disturbed footprints, impact magnitude can be reduced to low. 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.

13.3.1.3. Establishment and spread of alien invasive species

Habitat disturbances caused by vegetation clearing and earth works during construction can facilitate the establishment and spread of AIS. Alien plant infestations can spread exponentially, suppressing or replacing indigenous vegetation. This may impact ecological integrity and functioning and terrestrial biodiversity. Twenty NEMBA listed AIS have been recorded in the AOI. Construction activities will cause the physical disturbance of vegetation and soils in the Project site which will facilitate the spread of AIS.

Before mitigation, impact magnitude is high, while the duration is long term, and the impact has a high probability of occurrence. The spatial extent of AIS spread is local. Prior to mitigation, the establishment and spread of AIS is rated an impact of “moderate” significance.

This impact is relatively easy to mitigate through the implementation of an AIS control programme during the construction phase. This impact can be reduced to a low magnitude, with a short-term duration. Spatial extent will be reduced to the site only 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.

13.3.1.4. Increased soil erosion and sedimentation

Vegetation clearance and earth works is likely to increase potential incidences of soil erosion, which may lead to the mobilisation and transportation of sediment into drainage features in Project site

and across the broader AOI. High levels of sedimentation could have a smothering effect and impact the integrity and functioning of affected habitats, and reduce terrestrial biodiversity.

Before mitigation, impact magnitude is high, while duration is long term and it has a high probability. The spatial extent is local. Prior to mitigation, increased soil erosion and sedimentation is rated an impact of “moderate” significance.

This impact is relatively easy to mitigate with active interventions, such as *inter alia*, rehabilitation and the erection of silt traps. With the implementation of the required mitigation measures during the construction phase, this impact can be reduced to a low magnitude, with a short-term duration. Spatial extent will be reduced to the site only 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.

13.3.2. Operational Phase

13.3.2.1. *Establishment and spread of alien invasive species*

The potential establishment and spread of AIS in the Project site will continue to be an impact of concern during the operational phase.

Before mitigation, impact magnitude is high, while duration is long term and the impact has a medium probability of occurring as predicted. The spatial extent of alien invasive species spread is local. Prior to mitigation, the establishment and spread of alien invasive species is rated an impact of “moderate” significance.

With the continued implementation of an active alien species control programme during the operational phase this impact can be reduced to a low magnitude, with a short-term duration. Spatial extent will be reduced to the site only and probability at low. After mitigation, this impact is rated to be of “Low” significance.

13.3.2.2. *Increase in wildfires from faulty/shorting powerline infrastructure*

Wildfires are considered a natural and important disturbance agent in grassland ecosystems, and are essential to the maintenance of biodiversity patterns and ecological processes. They are also important in maintaining grassland productivity for local livestock farmers. An increase in unplanned or undesirable wildfire frequency from faulty/shorting electrical infrastructure may negatively impact ecological processes, which may affect terrestrial biodiversity and grassland productivity.

Before mitigation, this impact is of medium magnitude, with a long-term duration (i.e., Project life) affecting terrestrial biodiversity within and potentially adjacent to the development footprint (local). It is also considered to have a high probability, resulting in an impact of “Moderate” significance.

With the application of the recommended mitigation measures, impact magnitude can be reduced to low. Duration will remain the long-term, and probability will reduce to low, but spatial scale will remain local. This results in a residual impact of “Low” significance.

13.3.3. Decommissioning Phase

13.3.3.1. *Establishment and spread of alien invasive species*

As Project infrastructure is dismantled and removed from site during the decommissioning phase, the associated disturbances are likely to facilitate alien invasive species colonisation in, and immediately adjacent to, the Project site.

Before mitigation, impact magnitude is high, while duration is long term, and the impact has a high probability of occurring as predicted. The spatial extent of alien invasive species spread is local. Prior to mitigation, the establishment and spread of alien invasive species is rated an impact of “moderate” significance.

With the continued implementation of an active alien species control programme during decommissioning and for a defined period thereafter, this impact can be reduced to a low magnitude, with a short-term duration. Spatial extent will be reduced to the site only and the probability of the impact occurring would be low. After mitigation, this impact is rated to be of “Low” significance.

13.3.3.2. Increased soil erosion and sedimentation

Earth works during decommissioning may increase potential incidences of soil erosion, which may lead to the mobilisation and transportation of sediment into drainage features in the Project site and across the broader AOI.

Before mitigation, impact magnitude is high, while duration is long term and it has a high probability. The spatial extent is local. Prior to mitigation, increased soil erosion and sedimentation is rated an impact of “moderate” significance.

With the implementation of the required mitigation measures during the decommissioning phase, this impact can be reduced to a low magnitude, with a short-term duration. Spatial extent will be reduced to the site only 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.

Table 9: Impact assessment scoring for terrestrial biodiversity

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:	Terrestrial habitat	Direct loss and disturbance of natural habitat	Construction	Negative	Low	4	2	3	5	4	56	N2	2	1	3	4	2	20	N1
Significance						N2 - Medium							N1 - Low						
Impact 2:	Terrestrial habitat	Fragmentation reducing natural habitat connectivity and integrity	Construction	Negative	Low	3	2	3	5	4	52	N2	2	2	3	4	2	22	N1
Significance						N2 - Medium							N1 - Low						
Impact 3:	Terrestrial habitat	Establishment and spread of alien invasive species	Construction	Negative	High	4	2	3	4	4	52	N2	2	1	3	2	2	16	N1
Significance						N2 - Medium							N1 - Low						
Impact 4:	Terrestrial habitat	Increased soil erosion and sedimentation	Construction	Negative	High	4	2	3	4	4	52	N2	2	1	3	2	2	16	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:	Terrestrial habitat	Establishment and spread of alien invasive species	Operational	Negative	High	4	2	3	4	3	39	N2	2	1	3	2	2	16	N1
Significance						N2 - Medium							N1 - Low						
Impact 2:	Terrestrial habitat	Increase in wildfires from faulty/shorting powerline infrastructure	Construction	Negative	High	3	2	3	4	4	48	N2	2	2	1	4	2	18	N1
						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:	Terrestrial habitat	Establishment and spread of alien invasive species	Decommissioning	Negative	High	4	2	3	4	4	52	N2	2	1	3	2	2	16	N1
Significance						N2 - Medium							N1 - Low						
Impact 2:	Terrestrial habitat	Increased soil erosion and sedimentation	Decommissioning	Negative	High	4	2	3	4	4	52	N2	2	1	3	2	2	16	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:	Terrestrial habitat	Cumulative impact of loss, disturbance and fragmentation of natural habitat	Construction	Negative	Moderate	5	3	3	5	5	80	N3	3	3	3	4	2	26	N1
Significance						N3 - High							N1 - Low						

13.3.4. Cumulative Impacts

13.3.4.1. *Cumulative impact of natural habitat loss, disturbance and fragmentation.*

The landscape in which the AOI is located is already modified and fragmented because of historic and current agriculture, and other land use activities such as mining. The current degree of existing habitat modification and fragmentation in the landscape places significant pressure on the functioning and integrity of remaining natural and semi-natural habitat patches, and their ability to support terrestrial biodiversity.

At a local scale, the proposed Project is located within the broader planned development area for the Phefumula Emoyeni One WEF. At a regional scale, several renewable energy developments are, or may be, taking place in the broader region surrounding the AOI. Some of the main developments within a 55 km radius of the AOI include *inter alia*; Halfgewonnen solar photovoltaic (PV) facilities, Forzando North Coal Mine Solar PV Facility, Eskom Arnot PV Facility, Haverfontein WEF, Camden I WEF, Camden I Solar, Camden II WEF, Hendrina North WEF, Hendrina South WEF and Ummbila Emoyeni WEF.

Collectively, these projects will cause direct habitat loss, disturbance and fragmentation through vegetation clearing that is much greater in extent than that of a single constituent project, and this is a cumulative impact of concern with respects to terrestrial biodiversity and the proposed Project.

Prior to any form of mitigation, the cumulative impact on terrestrial biodiversity from vegetation clearing is rated 'high'. The proposed Project's contribution to cumulative impacts can be minimised by strictly implementing the required mitigation measures and addressing any significant residual impacts via additional conservation actions. The cumulative impacts on terrestrial biodiversity can therefore be reduced to 'Low' significance.

14. Assessment of the No Go Alternative

If the proposed Project does not proceed, it is anticipated that the current agricultural land use status quo will continue across most of the AOI and Project site into the future. The tracts of grassland and wetland habitat will continue to be used for livestock (cattle) production and game farming, and the croplands will continue to be actively cultivated to produce maize and other crop types.

Certain portions of the AOI are subject to heavy grazing and trampling by cattle, and it is possible that overtime, the condition of grassland and wetland habitat with respects to flora species diversity and ability to carry livestock (productivity) may deteriorate because of long-term overgrazing. This may compromise the agricultural profitability of on-site farming operations. With respects to biodiversity, overgrazing is likely to drive the homogenisation of habitats which will reduce on-site terrestrial biodiversity.

15. 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 10**Error! Reference source not found.** presents a summary of the proposed impact mitigation actions during the pre-construction, construction, operational, and decommissioning phases of the proposed Project.

Table 10: Summary of proposed impact mitigation actions.

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	Terrestrial Habitat	Direct loss and disturbance of natural habitat.	<u>Avoidance</u> <ul style="list-style-type: none"> As far as possible, permanent Project infrastructure footprints should be located in areas of modified habitat (Cultivated Fields & Old Lands) to avoid/minimise impacts on natural habitats and specifically CBAs. Temporary Project infrastructure footprints (e.g., laydown areas) should only be located in areas of modified habitat; In areas of natural habitat, micro-site Project infrastructure to localised disturbed sites; A pre-construction walkdown of the transmission line corridor and the other development footprints should be conducted during the wet/growing season to identify sensitive biodiversity and inform additional micro-siting 	N/A	Avoidance, Minimisation, Rehabilitation & Offsetting	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
			<p>options, and any other relevant management measures.</p> <p><u>Minimisation</u></p> <ul style="list-style-type: none"> • All vegetation clearing for the Project should be restricted to the proposed Project footprints only, with no clearing permitted outside of these areas; • The footprints to be cleared of vegetation should be clearly demarcated prior to construction to prevent unnecessary clearing outside of these areas; • No heavy vehicles should travel beyond the marked works zone; • Removed topsoil should be stockpiled and used to rehabilitate all disturbed areas. <p><u>Rehabilitation</u></p> <p>A rehabilitation/ landscaping protocol should be developed and implemented to stabilise and revegetate all non-operational sites that</p>				

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			<p>have been disturbed by construction. The protocol should include:</p> <ul style="list-style-type: none"> • Stockpiling of topsoil that was cleared from development footprints during site preparation; • Post-construction, the land form should be correctly contoured to limit potential erosion and compacted soils should be ripped and loosened to facilitate vegetation establishment; • Topsoil removed during construction should be applied to all non-operational sites that were disturbed during construction and require revegetation; and • Grass species used during rehabilitation should be indigenous, locally-occurring perennial species. 				
1.2	Terrestrial Habitat	Fragmentation reducing natural habitat connectivity and integrity	<u>Avoidance and Minimisation</u>	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
			<p>See mitigation measures for <i>Direct loss and disturbance of natural habitat</i>, and</p> <p><u>Rehabilitation</u></p> <p>See rehabilitation measures for <i>Direct loss and disturbance of natural habitat</i></p>				
1.3	Terrestrial Habitat	Establish and spread of alien invasive species	<p>An AIS control and eradication plan must be developed for the Project that focuses on controlling and eradicating AIS occurring at sites disturbed by Project. The plan must include:</p> <ul style="list-style-type: none"> • Identification of AIS management units; • Prioritisation of sites and species requiring control; • Targets and indicators of success; • Scheduling of AIS control; • Species-specific control methods, using a combined approach of both chemical and mechanical control methods; and 	Guidelines for Monitoring, Control and Eradication of AIS (DEA, 2015)	Minimisation	During Construction Phase	Project Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			<ul style="list-style-type: none"> Provision for follow-up treatments, as informed by regular AIS monitoring. 				
1.4	Terrestrial Habitat	Increased soil erosion and sedimentation	<ul style="list-style-type: none"> All sites disturbed by construction activities should be stabilised and actively revegetated, as per the rehabilitation/ landscaping protocol; and Erosion prevention and control measures (e.g., brush-packing, gabions, silt-traps) should be implemented at any sites of erosion. 	N/A	Minimisation & Rehabilitation	During Construction Phase	Project Manager
2. Operational phase							
2.1	Terrestrial Habitat	Establish and spread of alien invasive species	<ul style="list-style-type: none"> Active alien invasive species control should continue throughout the operational phase, as per the approved AIS control and eradication programme. 	Guidelines for Monitoring, Control and Eradication of AIS (DEA, 2015)	Minimisation	During Operational Phase	Facility Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
2.2	Terrestrial Habitat	Increase in wildfires from faulty/shorting powerline infrastructure	<ul style="list-style-type: none"> Project infrastructure should be regularly inspected and maintained to ensure operational efficiency and prevent electrical failures and accidental fires; The Project proponent should approach all relevant farmers and the local fire protection association (FPA) to investigate developing a co-ordinated Grassland Burning Management Programme for the farms encompassing the Project site; As required, firebreaks should be maintained around infrastructure that are susceptible to faults/shorts that may cause accidental wildfires; and Construction- and maintenance workers should be trained on the dangers of wildfire and the need to actively prevent unplanned/accidental fires. 	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	Terrestrial Habitat	Establish and spread of alien invasive species	<ul style="list-style-type: none"> Active alien invasive species control should continue on an annual basis during the decommissioning phase and annual follow-up control should be carried out for a five- year period following decommissioning. 	Guidelines for Monitoring, Control and Eradication of AIS (DEA, 2015)	Minimisation	Annually during decommissioning and annually for a five-year period after decommissioning	Facility Manager
3.2	Terrestrial Habitat	Increased soil erosion and sedimentation	<ul style="list-style-type: none"> All sites disturbed by decommissioning activities should be stabilised and actively revegetated, as per the rehabilitation/ landscaping protocol; and Erosion prevention and control measures (e.g., brush-packing, gabions, silt-traps) should be implemented at any sites of erosion. 	N/A	Rehabilitation	During the Decommissioning Phase	Facility Manager

16. Monitoring Measures

The following section presents the proposed measures for monitoring and reporting on the implementation of the impact mitigation actions presented in the preceding section.

The content of this section is largely based on the monitoring requirements outlined in Appendix 4 of the EIA Regulations, 2014.

For each monitoring action, the following information is provided:

- Category: The category within which the potential impact and/or risk occurs
- Potential impact/risk: Identified potential impact/risk resulting from the pre-construction, construction, operation, and decommissioning of the proposed Project
- Method for monitoring: The method for monitoring the implementation of the recommended mitigation measures
- Time period: The time period over which the monitoring actions must be implemented
- Frequency of monitoring: The frequency of monitoring the implementation of the recommended mitigation measures
- Mechanism for monitoring compliance: The mechanism for monitoring compliance with the impact management actions
- Responsible persons: The persons who will be responsible for the implementation of the monitoring actions

As with the impact management actions, the proposed monitoring actions have been arranged according to the following project phases:

- Construction;
- Operational; and
- Decommissioning.

Table 11 presents a summary of the proposed monitoring actions during the construction, operational and decommissioning phases.

Table 11: Summary of monitoring measures

Ref. No.	Category	Method for monitoring	Time period	Frequency of monitoring	Mechanism for monitoring compliance	Responsible person
1. Construction and Operational phase						
1.1	Alien invasive species	<ul style="list-style-type: none"> Annual on-site alien invasive species monitoring should be conducted. Monitoring should focus on: <ul style="list-style-type: none"> All sites disturbed during the construction phase; Wetland areas adjacent to construction sites; and Monitoring should assess species type and density, and these data should inform the scope of ongoing alien invasive species control. 	Wet/growing season	Annual	Annual Monitoring Report	Project Manager
2. Decommissioning phase						
2.1	Alien invasive species	<ul style="list-style-type: none"> Alien invasive species monitoring should be conducted on an annual basis during decommissioning and annually for a five-year period following decommissioning. Monitoring should focus on: <ul style="list-style-type: none"> All sites disturbed during decommissioning; 	Wet/growing season	Annually during decommissioning for a five-year period after decommissioning	Annual Monitoring Report	Facility Manager

Ref. No.	Category	Method for monitoring	Time period	Frequency of monitoring	Mechanism for monitoring compliance	Responsible person
		<ul style="list-style-type: none"> ○ Wetland areas adjacent to former development sites; and ● Monitoring should assess species type and density, and these data should inform the scope of ongoing alien invasive species control. 				

17. Reasoned Opinion and Environmental Impact Statement

17.1. Summary of Main Findings

The Project site and surrounding AOI are characterised by Eastern Highveld Grassland and Soweto Highveld Grassland vegetation types, which, according to the NEMBA Threatened Ecosystems (2021), are listed as Endangered and Vulnerable, respectively. The Project site is not located within a delineated SWSA, but according to the mapping of FEPAs, the eastern portion of the Project site is located in a recognised FEPA.

From a biodiversity conservation planning perspective, several patches of natural habitat in the Project site are delineated as CBA Irreplaceable (CBA 1) and CBA Optimal (CBA 2). These areas are also mapped as Priority Focus Areas for protected area expansion, under both the National Protected Area Expansion Strategy (2018) and the Mpumalanga Protected Area Expansion – 20 Year Plan. The Project site is not located within a formal protected area, but it is located within the Amersfoort-Bethal-Carolina District IBA.

Natural dry- and moist grasslands in the Project site and across the broader AOI provide important habitat for flora and fauna, and contribute to habitat connectivity, which is an important component of maintaining various landscape-scale ecological processes, metapopulation dynamics and terrestrial biodiversity.

The DFFE National Web-based Environmental Screening Tool rates the Terrestrial Biodiversity Theme for the proposed Project as ‘Very High’ sensitivity on account of several biodiversity attributes and conservation planning features. The findings of this specialist assessment indicate that on-site natural habitat is of high biodiversity importance with respect to the listed sensitivity features, and therefore confirms the ‘Very High’ sensitivity rating of the screening tool.

The loss and disturbance of natural habitat from vegetation clearing during construction is the primary impact of concern, particularly where CBAs are impacted. Vegetation clearing, coupled with earth works, are also likely to be accompanied by other indirect impacts, such as habitat fragmentation, AIS colonisation, and erosion - all of which are likely to negatively affect on-site terrestrial biodiversity.

Following the scoping phase, the proposed Project’s Alternative 2 layout was selected as the preferred option for the impact assessment phase, as it will result in significantly less loss and disturbance of natural habitat compared to Alternative 1.

Several additional management measures can be implemented to further reduce the significance of natural habitat loss and disturbance from proposed Project activities, including: 1) micro-siting as much of the proposed Project infrastructure as possible to localised disturbed sites; 2) clearing only the minimum footprint areas required for construction activities; and 3) actively rehabilitating all disturbance footprints and controlling alien invasive species colonisation and erosion post-construction.

17.2. Conditions to be Included in the Environmental Authorisation

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

17.3. Specialist Opinion

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

18. References

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



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

Terrestrial Ecologist
Hawkhead Consulting

Appendix A: Curriculum Vitae – Andrew Zinn

Hawkhead Consulting

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

Details

Andrew David Zinn
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South Africa
Date of birth: 14 July 1982
Nationality: South African

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

- Zinn, A.D., D.E., Burkepile and D.I. Thompson (In prep). Impacts of fire and herbivores on tree seedling establishment in a South African savanna.
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- Zinn, A.D., D. Ward and K. Kirkman (2007). Inducible defences in *Acacia sieberiana* in response to giraffe browsing. *African Journal of Range and Forage Science*, 24, 123-129.
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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	<ul style="list-style-type: none"> • Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or Critically Rare species that have a global EOO of < 10km²; • 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 • Globally significant populations of congregatory species (>10% of global population).
High	<ul style="list-style-type: none"> • Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10km², 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; • Small area (>0.01% but <0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (>0.1%) of natural habitat of VU ecosystem type; • Presence of Rare species; • Globally significant populations of congregatory species (>1% but < 10% of global population).
Medium	<ul style="list-style-type: none"> • Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals; • Any area of natural habitat of threatened ecosystem type with status of VU; • Presence of range-restricted species; and • >50% of receptor contains natural habitat to support SCC.
Low	<ul style="list-style-type: none"> • No confirmed or highly likely populations of SCC; • No confirmed or highly likely populations of range-restricted species; and • <50% of receptor contains natural habitat with limited potential to support SCC.
Very Low	<ul style="list-style-type: none"> • No confirmed and highly unlikely populations of SCC; • No confirmed and highly unlikely populations of range-restricted species; and • No natural habitat remaining.

Table 2: Functional Integrity (FI) criteria.

Functional Integrity (FI)	Fulfilling Criteria
Very High	<ul style="list-style-type: none"> • Very large (>100 ha) intact area for any conservation status of ecosystem type or >5a ha for CR ecosystem type; • High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches; • No or minimal current negative ecological impacts with no signs of major disturbance (e.g., ploughing)
High	<ul style="list-style-type: none"> • Large (>5 ha but < 100 ha) intact area for any conservation status ecosystem types; • Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches; and • 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	<ul style="list-style-type: none"> • Medium (>5ha but < 20 ha) semi-intact area for any conservation status ecosystem type or >20 ha for VU ecosystem type; • Only narrow corridors of good connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches; • Mostly minor current negative ecological impacts with some major impacts (e.g., established population of alien invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential.
Low	<ul style="list-style-type: none"> • Small (> 1 ha but <5ha) area; • Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential; and • Several minor and major current negative ecological impacts.
Very Low	<ul style="list-style-type: none"> • Very small (<1 ha) area; • No habitat connectivity except for flying species or flora with wind-dispersed seeds; • Several major current negative ecological impacts.

$$BI = CI + FI$$

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

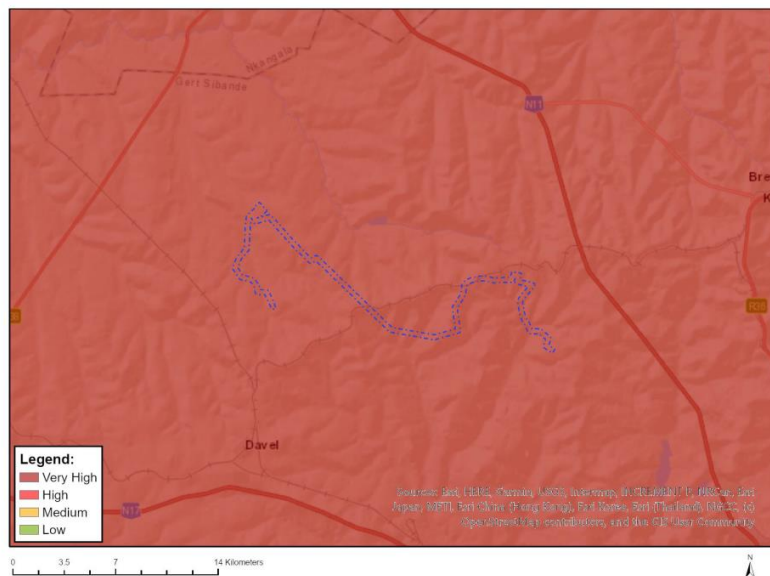
Table 4: Guidelines for interpreting SEI in the context of the proposed development activities.

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.

Appendix C: Summary and Comment on the Sensitivity Rating of the DFFE Screening Tool

Sensitivity Rating of the National Web Based Screening Tool

The National Web-based Environmental Screening Tool rates the Terrestrial Biodiversity Theme for the proposed Project as 'Very High' sensitivity on account of several conservation planning features. These are listed in the table below. Refer to the map showing the spatial sensitivity. It must be noted that the screening tool only allows for sensitivity ratings of 'Very High' or 'Low' for terrestrial biodiversity.



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	CBA 1
Very High	CBA 2
Very High	FEPA Subcatchment
Very High	National Protected Area Expansion Strategy (NPAES)
Very High	EN_Eastern Highveld Grassland
Very High	VU_Soweto Highveld Grassland

Appraisal of the Sensitivity Rating

Natural habitat in the Project site is of biodiversity importance with respect to the highlighted sensitivity features, i.e., CBAs, ESAs, FEPA subcatchment, National Priority Focus Areas for protected area expansion, and, Eastern Highveld Grassland (EN) and Soweto Highveld Grassland (VU), and therefore confirm the 'Very High' sensitivity rating of the screening tool for the Project site.

Appendix D: Compliance with Terrestrial Biodiversity Protocol.

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity	Relevant Section in Report
The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects:	
2.3.1. a description of the ecological drivers or processes of the system and how the proposed development will impact these	Section 11
2.3.2. ecological functioning and ecological processes (e.g., fire, migration, pollination, etc.) that operate within the preferred site;	Section 11
2.3.3. the ecological corridors that the proposed development would impede including migration and movement of flora and fauna;	Section 11 and Section 13.3
2.3.4. the description of any significant terrestrial landscape features (including rare or important flora- faunal associations, presence of strategic water source areas (SWSAs) or freshwater ecosystem priority area (FEPA) sub catchments;	Section 5, Section 6 & Section 8
2.3.5. a description of terrestrial biodiversity and ecosystems on the preferred site, including: a) main vegetation types; b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified; c) ecological connectivity, habitat fragmentation, ecological processes and fine scale habitats; and d) species, distribution, important habitats (e.g., feeding grounds, nesting sites, etc.) and movement patterns identified.	Section 5 to Section 11
2.3.6. the assessment must identify any alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification; and	Section 12 to Section 15
2.3.7. the assessment must be based on the results of a site inspection undertaken on the preferred site and must identify: 2.3.7.1. terrestrial critical biodiversity areas (CBAs), including: a) the reasons why an area has been identified as a CBA; b) an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation; c) the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s); d) the impact on ecosystem threat status; e) the impact on explicit subtypes in the vegetation; f) the impact on overall species and ecosystem diversity of the site; and g) the impact on any changes to threat status of populations of species of conservation concern in the CBA	Section 5, Section 6 & Section 13
2.3.7.2. terrestrial ecological support areas (ESAs), including: a) the impact on the ecological processes that operate within or across the site; b) the extent the proposed development will impact on the functionality of the ESA; and c) loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridors or	Section 6 & Section 13

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity	Relevant Section in Report
introducing barriers that impede migration and movement of flora and fauna	
2.3.7.3. protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including – a) an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan;	Section 6.5
2.3.7.4. priority areas for protected area expansion, including- a) the way in which the proposed development will compromise or contribute to the expansion of the protected area network;	Section 6.6
2.3.7.5. SWSAs including: a) the impact(s) on the terrestrial habitat of a SWSA; and b) the impacts of the proposed development on the SWSA water quality and quantity (e.g., describing potential increased runoff leading to increased sediment load in water courses);	Section 6.3.1
2.3.7.6. FEPA sub-catchments, including a) the impacts of the proposed development on habitat condition and species in the FEPA sub catchment;	Section 6.3.2
2.3.7.7. indigenous forests, including: a) impact on the ecological integrity of the forest; and b) percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.	Section 6.4
3.1. The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:	
3.1.1. contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	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 & Section 4
3.1.4. a description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant;	Section 3.1 & Section 3.2
3.1.5. a description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;	Section 4
3.1.6 a location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);	Section 6.2, Section 13
3.1.7. additional environmental impacts expected from the proposed development;	Section 13
3.1.8. any direct, indirect and cumulative impacts of the proposed development;	Section 13
3.1.9. the degree to which impacts and risks can be mitigated;	Section 15
3.1.10. the degree to which the impacts and risks can be reversed;	Section 15
3.1.11. the degree to which the impacts and risks can cause loss of irreplaceable resources;	Section 15

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity	Relevant Section in Report
3.1.12. proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	Section 15 & Section 16
3.1.13. a motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a "low" terrestrial biodiversity sensitivity and that were not considered appropriate;	N/A
3.1.14. a substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not; and	Section 17
3.1.15. any conditions to which this statement is subjected.	Section 17
3.2. The findings of the Terrestrial Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report including the mitigation and monitoring measures as identified, which must be incorporated into the EMPr, where relevant.	EAP to incorporate
3.2.1. A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	EAP to incorporate

PLANT SPECIES SPECIALIST ASSESSMENT FOR THE PROPOSED PHEFUMULA EMOYENI ONE – UP TO 400KV ELECTRICAL GRID INFRASTRUCTURE PROJECT

WSP Group Africa Pty (Ltd)

January 2025



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Acronyms and Abbreviations

Abbreviation	Explanation
AIS	Alien Invasive Species
AOI	Area of Interest
AOO	Area of Occupancy
BI	Biodiversity Importance
CA	Conservation Areas
CI	Conservation Importance
DFFE	Department of Forestry, Fisheries and the Environment
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
EOO	Extent of Occurrence
FI	Functional Integrity
Ha	Hectare
IUCN	International Union for the Conservation of Nature
MAP	Mean Annual Precipitation
MPTA	Mpumalanga Parks and Tourism Agency
NEMA	National Environmental Management Act
NEMBA	National Environmental Management Biodiversity Act
NEMPA	National Environmental Management: Protected Areas Act
OHL	Overhead Line
QDS	Quarter Degree Square
RR	Receptor Resilience
SANBI	South African National Biodiversity Institute
SAS	Strategic Aquatic Services
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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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 Phefumula Emoyeni One – Up to 400 kV Electrical Grid Infrastructure 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

1. Introduction

Hawkhead Consulting was appointed by WSP Group Africa Pty (Ltd), on behalf of Phefumula Emoyeni One (Pty) Ltd, to conduct the Plant Species Specialist Assessment for the proposed Phefumula Emoyeni One - Up to 400 kV Electrical Grid Infrastructure Project (hereafter referred to as the 'Project'), near Ermelo in Mpumalanga Province, South Africa.

1.1. Scope and Purposes of this Report

This specialist study focused on terrestrial plant species (flora), and was compiled 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 Terrestrial Plant Species.

The primary scope of work included:

- Collating and reviewing information and data on terrestrial vegetation and flora species that occur or potentially occur on-site and in the surrounding landscape;
- Conducting a field programme to collect data on vegetation communities and flora species present on-site, and identify any botanical sensitivities;
- Assessing the suitability of the Proposed project and the potential negative impacts on terrestrial vegetation and flora 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 flora species occurring on-site, highlighting the presence/potential presence of species of conservation concern;
- 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 plant species conservation.

This report should be read in conjunction with the Terrestrial Biodiversity Specialist Assessment and Animal Species Specialist Assessment reports, as well as any other biodiversity-related reports.

1.2. Project Location

The proposed Project is located approximately 18 km north of Ermelo in the Msukaligwa Local Municipality and Gert Sibande District Municipality, in Mpumalanga Province, South Africa (**Error! Reference source not found.**).

1.3. Project Description

The proposed Project is intended to feed the electricity generated by the proposed Phefumula Emoyeni One Wind Energy Facility (WEF) (part of a separate application for Environmental Authorisation) to the national energy grid. A Project description is outlined in Table 1.

During the scoping phase, two proposed Project layouts (Alternative 1 and Alternative 2) were considered. Following the scoping phase, Alternative 2 was selected as the preferred layout from a Project proponent perspective, and was taken forward for further consideration during this impact assessment phase. The Alternative 2 layout is also preferred from a biodiversity perspective, as it has significantly less impact on patches of natural habitat compared to Alternative 1. The Alternative 2 layout is the focus of this report.

Table 1: Phefumula Emoyeni One – Up to 400kV Electrical Grid Infrastructure Project technical details.

Detail	Information
Up to 400kV Transmission Line	<ul style="list-style-type: none"> • 400kV Loop-In-Loop-Out (LILO) Overhead Line (OHL). • Servitude width for 1 x up to 400kV transmission line is 60m for Loop-In-Loop-Out • Height of 1 x 400kV power line structure is on average 48 m, but may reach up to 50 m in exceptional circumstances depending on the complexity and slope of the terrain. • Minimum conductor clearance is between 8.1 and 12.6 m. • Span length between pylon structures is typically up to 100 – 250 m apart, depending on complexity and slope of terrain. • For up to 400kV structures footprint sizes may vary depending on design type up to 110 m² (10.5 m by 10.5 m), with concrete foundations of up to 80 m² and depths reaching up to 3.5 m typically depending on the number and design of the foundations (to be determined during the detailed design engineering phase). The actual number of structures required will vary according to the final route alignment determined. • Pylon structures will be either monopole or lattice structures depending on what is identified as appropriate during final design. <p>For safety reasons, transmission lines require certain minimum clearance distances. These are as follows:</p> <ul style="list-style-type: none"> • The minimum vertical clearance distance between the ground and the transmission line is 6.7 m. • The minimum vertical clearance to any fixed structure that does not form part of the transmission line is 9.4 m – 11 m. • The minimum distance between an up to 400kV transmission line and an existing road is 60 m – 120 m (depending on the type of road). • Any farming activity can be practiced under the conductors provided that safe working clearances and building restrictions are adhered to.
Up to 132kV Transmission Line	<ul style="list-style-type: none"> • The servitude width for 3 x up to 132kV transmission line is 31 m. A 300 m corridor must be assessed (150m on either side of the centre line) to allow for micro-siting. In the case of the Loop-In-Loop-Out alternative this servitude will apply to each of the two connecting power lines. • The maximum height for an up to 132kV powerline structure is 40 m. • Pylon structures will be either monopole or lattice structures depending what is identified as appropriate during final design.

Detail	Information
	<ul style="list-style-type: none"> • Pylon structures may require anchors with guy-wires or be anchorless. • For up to 132kV structures, concrete foundation sizes may vary depending on design type up to 80 m² (10 m by 8 m), with depths reaching up to 3.5 m typically in a rectangular 'pad' shape. • A working area of approximately 100 m x 100 m is needed for each of the proposed structures to be constructed.
Main Transmission Substation (MTS) (Approx. 17.5 ha)	<ul style="list-style-type: none"> • A high voltage substation yard to allow for multiple 132kV and 400kV feeder bays and transformers, with infrastructure to allow for step-up to 400kV as required. • Standard substation electrical equipment, including but not limited to transformers, busbars, office area, operation and control room, workshop, and storage area, feeder bays, transformers, busbars, stringer strain beams, insulators, isolators, conductors, circuit breakers, lightning arrestors, relays, capacitor banks, batteries, wave trappers, switchyard, metering and indication instruments, equipment for carrier current, surge protection and outgoing feeders, as may be needed. • The control building, telecommunication infrastructure, oil dam(s) etc. • Workshop and office area within the collector substation footprint. • Fencing around the Substation. • All the access road infrastructure to and within the substation.
Three Distribution Substations	<ul style="list-style-type: none"> • Dx1-approx. 7.85Ha footprint • Dx2- approx. 20.45Ha footprint • Dx3- approx. 13.60Ha footprint
Temporary / Construction Phase Infrastructure	<ul style="list-style-type: none"> • Construction compound at the MTS (3ha) (site offices including conservancy tank for ablutions, stores, material laydown area, generator, fuel storage, etc.) • 3 x construction compound / laydown areas, including site office of 3 ha each at each of the Dx locations (150 m x 200 m each) (including conservancy tank for ablutions) • Batch plant of 4-7 ha (unless a commercial source is used and concrete trucked to site, preferable to keep options open) • Portable ablation facilities will be used along the powerline routes

1.4. Study Spatial Scales

The 'area of interest' (AOI) for this assessment refers to the broader area in which flora and fauna field data were collected during the field survey. This area encompasses the entire Phefumula Emoyeni One WEF project site and is shown in Figure 1.

The 'Project site' refers to the proposed Alternative 2 OHL assessment corridor and MTS footprints, which are located in the centre of the AOI (also shown in Figure 1). It is within this footprint that direct and indirect impacts on terrestrial flora receptors (e.g., direct habitat loss, loss of flora species of conservation concern) associated with this proposed Project could occur.

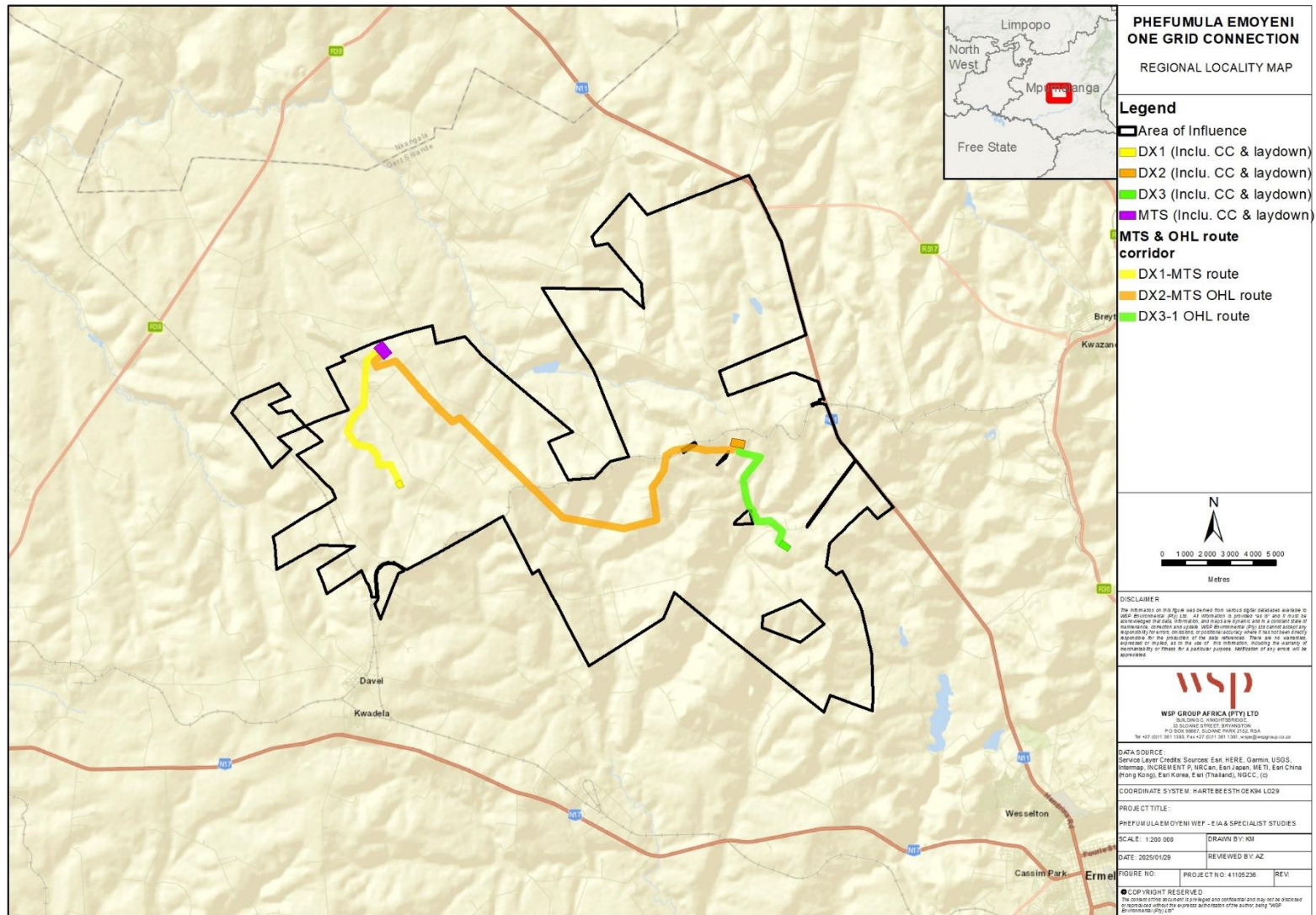


Figure 1: Map showing the regional location of the proposed Project site (i.e., the OHL assessment corridor and MTS footprints) and the broader Phefumula Emoyeni One AOI.

1.5. Results of the Environmental Screening Tool

The proposed Project site was assessed at a desktop level using the Department of Forestry, Fisheries and the Environment's (DFFE) National Web-based Environmental Screening Tool. According to the screening tool, the Plant Species Theme for the proposed Project was rated 'Medium' sensitivity on account of the potential presence of six threatened flora species. These species are listed below and discussed in more detail in Section 7.2.1 of this report:

- Sensitive species 1252;
- *Khadia carolinensis*;
- *Aspidoglossum xanthosphaerum*;
- *Miraglossum davyi*;
- Sensitive species 41;
- Sensitive species 691; and
- *Pachycarpus suaveolens*.

Note: The names of specific taxa that are regarded as being susceptible to overexploitation have been redacted and are not presented in this report. These species are referred to by their assigned 'sensitive species number', as per the species assessment guidelines (SANBI, 2020).

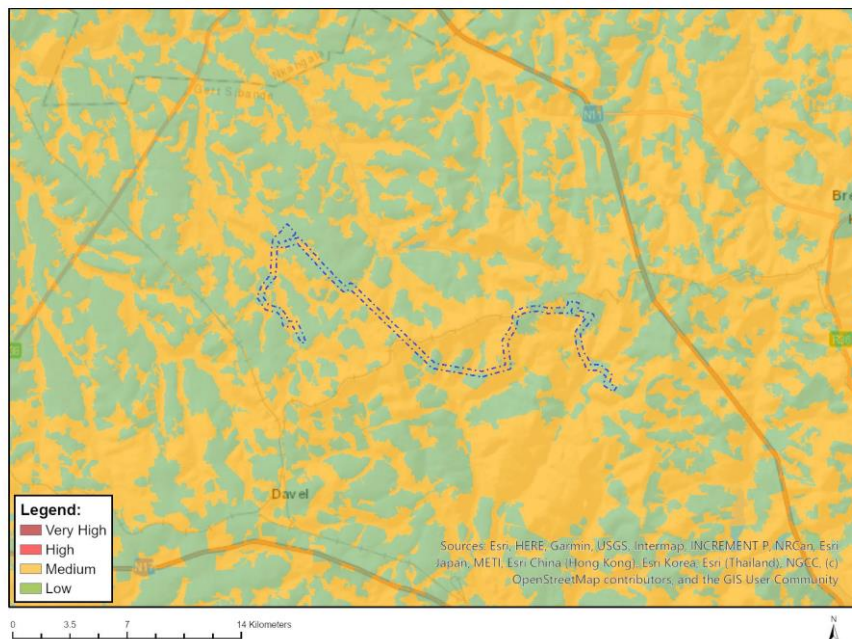


Figure 2: Plant Species sensitivity for the Project site, as per the DFFE National Web-based Environmental Screening Tool.

2. Relevant Legislation and Guidelines

National and provincial legislation, associated guidelines and policies that are relevant to the environment and biodiversity, and which were used to guide the Plant 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)	<p>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.</p> <p>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:</p> <ul style="list-style-type: none"> • Protocol for the specialist assessment and report content requirements for environmental impacts on terrestrial plants.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA)	<p>The NEMBA is administered by the Department of Forestry, Fisheries and the Environment (DFFE) and provides the framework under the NEMA for the:</p> <ul style="list-style-type: none"> • Management and conservation of South Africa’s biodiversity; • The protection of species and ecosystems that warrant protection; • The fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources; and • The establishment and functions of a South African National Biodiversity Institute (SANBI). <p>Amongst other components, the NEMBA includes:</p> <ul style="list-style-type: none"> • 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; • Threatened or Protected Species Regulations (February 2007); and

Applicable Legislation and Guideline	Relevance to the Proposed Project
	<ul style="list-style-type: none"> • National list of threatened terrestrial ecosystems for South Africa (2011, and 2021 revision), published under Section 51(1)(a) of NEMBA. • National Biodiversity Offset Guideline (2023), which provides guidance on the need to develop biodiversity offsets. <p>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.</p> <p>Chapter 5 of NEMBA also provides a list of regulations and guidance concerning alien invasive species, including:</p> <ul style="list-style-type: none"> • A guideline for Monitoring, Control and Eradication Plans (September 2015); • 2020 Alien and Invasive Species Regulations (September 2020); and • 2016 and 2020 Alien and Invasive Species Lists (March 2021).
National Environmental Management: Protected Areas Act (2003) (NEMPA)	<ul style="list-style-type: none"> • 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 • 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.
Mpumalanga Nature Conservation Act (Act No. 10 of 1998)	<p>Amongst other provisions, the Mpumalanga Nature Conservation Act (Act No. 10 of 1998) provides lists of specially protected and protected flora and fauna. Of particular relevance to this specialist study are species of game/wild animals and flora that are listed under:</p> <ul style="list-style-type: none"> • Schedule 11 and 12: Protected and Specialist Protected Plants.
Other Relevant national and Provincial Policies, Plans and Guidelines	<p>Other relevant policies, plans and guidelines that were considered during this study include:</p> <ul style="list-style-type: none"> • Mpumalanga Biodiversity Sector Plan (2022); • Species Environmental Assessment Guideline (SANBI, 2020); • National Protected Area Expansion Strategy (2019); and • Mpumalanga Protected Area Expansion Strategy – 20-year Plan.

3. Study Methodology

The methodology used for this study included a desktop literature review component and a field programme. The various tasks associated with these components 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 flora species that may occur in the Project site, AOI and surrounding landscape, based on historic distribution ranges or recent records. Literature and data that were reviewed were obtained from a variety of online and literature sources. These are discussed below:

3.1.1. Regional Ecosystems and Vegetation Types

General habitat descriptions relevant to the Project site and the surrounding AOI were obtained from SANBI (2018) and Mucina and Rutherford (2011).

3.1.2. Vegetation and Flora Species Richness

- A list of flora species that have previously been recorded in the broader region, and that potentially occur in the AOI and Project site, was obtained from the SANBI's online Botanical Database of Southern Africa (BODATSA); and
- Lists of flora species of conservation concern (SCC) were sourced from the Mpumalanga Parks and Tourism Agency (MPTA) for the 2629BD and 2629DC Quarter Degree Squares (QDS) and flora SCC highlighted by the online environmental sensitivity screening tool.

3.2. Field Programme

The field programme for the proposed Project comprised two wet-season field surveys. The first survey was conducted from the 22nd-26th January 2024 and focused on vegetation and flora occurring across the AOI. The second survey was conducted from the 14th-15th January 2025 and focused on sampling at select locations in the Project site. The January period coincides with the peak vegetation growing period (November to April) for grassland ecosystems in summer rainfall areas and is therefore an optimal time to assess flora. Sampling methodologies were based, in part, on those recommended in SANBI (2020), and included the following:

- During the 2024 survey, vegetation was sampled using meander search transects at representative sites in each of the main natural habitat units that were identified across the AOI at a desktop level using aerial imagery prior to the field survey. Twenty-nine transects were surveyed across the AOI;
- Data collected during flora survey included habitat character and condition, flora species composition, evidence of current and past disturbances, presence of flora species of conservation concern, and declared alien invasive species;
- During the 2025 survey, meander search transects were used to identify potential flora sensitivities at select sites of natural habitat in the Project site;
- Flora nomenclature is based on species names presented on SANBI's Red List of South African Plants website;
- Field data were used to compile a species list for the AOI, develop habitat unit descriptions, and provide the basis for habitat suitability assessments for flora species of conservation concern; and

- Vegetation structural classification was based on Edwards (1983).

3.3. Delineation and Mapping of Habitat Units

Mapping of habitat units was conducted using a review and analysis of composite Google Earth aerial imagery, coupled with data and observations obtained during the field survey, and using the wetland delineations developed by Strategic Aquatic Services (SAS).

3.4. Assessment of Species of Conservation Concern

3.4.1. Threatened, Near Threatened and/or Protected Species Status

Species of conservation concern (SCC) were based on the national and provincial Red Lists of threatened (Vulnerable, Endangered and Critically Endangered) and Near Threatened flora species. Also included in the discussion of flora SCC are species listed as threatened and/or Protected according to national and provincial legislation. Relevant Red Lists and legislation included:

- Red List of South African Plants (Version 2024), presented by SANBI (redlist.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);
- Mpumalanga Nature Conservation Act (Act No. 10 of 1998); and
- Mpumalanga Province Red List of Threatened Flora.

3.4.2. Habitat Suitability Assessments for Species of Conservation Concern

Based on the lists of SCC potentially present on-site, a 'probability of occurrence' of a species in the AOI/Project site was determined by conducting habitat suitability assessments. 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 AOI/Project site 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 are important population-level processes. Habitat connectivity within the AOI and Project site, 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 AOI/Project site;
- Probable: the species is likely to occur in the AOI/Project site due to suitable habitat and resources being present;
- Possible: the species may occur in the AOI/Project site due to potential habitat and/or resources; and
- Unlikely: the species will not likely occur in the AOI/Project site due to lack of suitable habitat and resources, or significant differences in its Area of Occupancy (AOO) compared to its Extent of Occurrence (EOO).

3.5. Alien Invasive Species

Owing to their potential to spread, outcompete and exclude indigenous vegetation, special emphasis was placed on declared alien invasive flora species occurring in the AOI. These were categorised according to the National Environmental Management: Biodiversity Act (NEMBA) (Act No. 10 of 2004) - 2020 listing of declared alien and invasive species.

3.6. Flora Species of Medicinal Value

Many common and widespread flora species have medical or cultural utility to humans, and as such have value to local communities. Flora of medicinal value recorded in the AOI were therefore identified and their purported uses described based on Van Wyk, *et al.*, (2009).

3.7. Assessment of Site Ecological Importance

The ecological importance (sensitivity) 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 International Union for Conservation of Nature (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)

Site Ecological Importance	Interpretation in relation to proposed development activities
	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 the Plant Species Specialist Assessment:

- The field surveys were conducted in January. The timing of the field surveys thus coincided with the peak vegetation growing period (November to April) for grassland ecosystems in summer rainfall areas. It was noted that sufficient rain had fallen prior to the field surveys, and vegetation was actively growing and flowering. Conditions at this time were therefore optimal to assess vegetation condition and flora species composition. Seasonality was therefore not considered a study limitation;
- Notwithstanding the above, it is possible that certain herbaceous taxa (e.g., annuals and geophytes) that are most readily visible or distinguishable at other periods during the wet/growing season, may not have been detected during the field survey; and
- Mapping of habitat units was conducted manually at a desktop-level, using available aerial imagery, coupled with field observations and supplementary spatial datasets. Agricultural landscapes are dynamic and subject to ongoing farming activities. It is thus possible that the character of individual habitat patches may change over time.

5. Regional Description of Baseline Vegetation

The AOI is located in the Grassland Biome, and according to SANBI's regional mapping of South Africa's vegetation types (2018), Eastern Highveld Grassland and Soweto Highveld Grassland are the dominant vegetation type across the AOI (Figure 3). Soweto Highveld Grassland dominates most of the Project site, with only a small area of Eastern Highveld Grassland present in the west.

The general characteristics of the Grassland Biome and these vegetation types, are discussed in more detail below:

5.1. Grassland Biome

The AOI is located in the Grassland Biome, which covers approximately 28% of South Africa and is the dominant biome of the central plateau and inland areas of the eastern subcontinent (SANBI, 2013). Grasslands are typically situated in moist, summer rainfall regions that experience between 400 mm and 2000 mm of rainfall per year. Vegetation consists of a dominant field-layer comprising grasses and herbaceous perennials, with little- to no woody plants present.

South Africa's grassland ecosystems are parsed into five groups, with the AOI located in the Mesic Highveld Grasslands group (SANBI 2013). Mesic Highveld Grasslands occur at mid-altitudes and experience warm, wet summers (MAP 700-1200 mm) and cold winters. They are typically highly productive sourveld grasslands that are dominated by long-lived perennial grasses (SANBI, 2013).

Fire is common in Mesic Highveld Grasslands and maintains these ecosystems in a relatively treeless form (SANBI, 2013). Apart from their importance as rich stores of biodiversity, grasslands are critically important water production landscapes, constituting about half of South Africa's Strategic Water Source Areas (SANBI, 2013).

5.2. Eastern Highveld Grassland

Eastern Highveld Grasslands extend from Johannesburg in the east through to Bethel, Ermelo and Piet Retief in the west. This vegetation type is found on slightly- to moderately undulating plains, low hills and wetland depressions. Grasses are typical Highveld species from the genera *Aristida*, *Digitaria*, *Eragrostis* and *Tristachya*. Indigenous woody species are mainly restricted to rocky areas and include *Celtis africana*, *Protea caffra*, *Protea welwitschii*, *Diospyros lycioides*, *Searsia magalismsontana* and *Senegalia caffra* (Mucina & Rutherford, 2011).

Mucina & Rutherford (2011) note the following species, amongst several others, as important taxa in Eastern Highveld Grassland:

Shrubs: *Anthospermum rigidum* and *Seriphium plumosum*.

Graminoides: *Aristida aequiglumis*, *Aristida congesta*, *Aristida junciformis*, *Cynodon dactylon*, *Digitaria monodactyla*, *Eragrostis chloromelas*, *Eragrostis curvula*, *Eragrostis plana*, *Eragrostis racemosa*, *Heteropogon contortus*, *Loudetia simplex*, *Setaria sphacelata*, *Sporobolus africanus*, *Themeda triandra*, *Alloteropsis semialata* and *Monocymbium cerasiiforme*.

Herbs: *Berkheya setifera*, *Haplocarpha scaposa*, *Euryops gilfillanii*, *Euryops transvaalensis*, *Justicia anagalloides*, *Acalypha angusta*, *Chamaecrista mimosoides*, *Dicoma anomala*, *Kohautia amatymbica*, *Lactuca inermis*, *Gladiolus crassifolius*, *Haemanthus humilis* and *Selago densiflora*.

Endemic Taxa: The geophytic herbs *Agapanthus inapertus*, *Eucomis vandermerwei* and the succulent herb *Huernia insigniflora* are endemic to this region.

5.3. Soweto Highveld Grassland

Soweto Highveld Grassland extends in a broad band between Johannesburg and Ermelo in the north, and Perdekop and the Vaal River in the south (Mucina & Rutherford, 2011). Vegetation is characterised by short to medium-high density tufted grassland occurring on gently to moderately undulating plains (Mucina & Rutherford, 2011). Grasslands are typically dominated by *Themeda triandra* along with

several other co-dominant species. These grasslands are interrupted by small wetlands and rocky ridges and outcrops (Mucina & Rutherford, 2011).

The mean annual precipitation (MAP) of the region is 662 mm. Rainfall occurs in the summer, with winters being typically cold and dry (Mucina & Rutherford, 2011).

Mucina & Rutherford (2011) list the following flora species as being important or characteristic taxa in the Soweto Highveld Grassland vegetation type, amongst others:

Graminoids: *Themeda triandra*, *Andropogon appendiculatus*, *Brachiaria serrata*, *Cymbopogon pospischilii*, *Cynodon dactylon*, *Elionurus muticus*, *Eragrostis capensis*, *Eragrostis chloromelas*, *Eragrostis curvula*, *Eragrostis plana*, *Heteropogon contortus*, *Hyparrhenia hirta*, *Setaria sphacelata*, *Aristida junciformis*, *Aristida congesta*, *Aristida bipartita* and *Paspalum dilatatum*.

Herbs: *Hermannia depressa*, *Euryops gilfillanii*, *Geigeria aspera*, *Graderia subintegra*, *Haplocarpha scaposa*, *Helichrysum rugulosum*, *Helichrysum nudifolium*, *Lippia scaberrima*, *Senecio coronatus*, *Vernonia oligocephala* and *Wahlenbergia undulata*.

Shrubs: *Anthospermum hispidulum*, *Anthospermum rigidum*, *Berkheya annectens*, *Felicia muricata* and *Ziziphus zeyheriana*.

5.4. Threat Status of Eastern Highveld Grassland and Soweto Highveld Grassland

Both Eastern Highveld Grassland and Soweto Highveld Grasslands are listed as threatened, as per NEMBA Threatened Ecosystems (2021).

Eastern Highveld Grassland is listed as Endangered and is subject to high rates of habitat loss as a result of cultivation, forestry, mines, urbanisation and the building of dams (Mucina & Rutherford, 2011). Estimates suggest that up to approximately 70% of the original extent of Eastern Highveld Grassland has been transformed. Only a very small fraction is conserved in statutory reserves (e.g., Nooitgedacht Dam and Jericho Dam Nature Reserves) (Mucina & Rutherford, 2011). The mapped remaining extent of Eastern Highveld Grassland, as per SANBI (2021) spatial data, is shown in Figure 4 below.

Cultivation, urbanisation, road infrastructure and mining have similarly resulted in the transformation of more than half of the original extent of Soweto Highveld Grasslands (Mucina & Rutherford, 2011). Only a few patches are conserved in formal protected areas, such as Waldrift Nature Reserve, Krugersdorp Nature Reserve, Leeuwkuil Nature Reserve and Suikerbosrand Nature Reserve. This vegetation type is therefore listed as Vulnerable, according to the NEMBA Threatened Ecosystems (2021) (remaining extent also shown in Figure 4).

According to the SANBI (2018 & 2021) delineations, most of the proposed Project site is characterised by Soweto Highveld Grassland, with small areas in the west characterised by Eastern Highveld Grassland. Considering the conservation status of these vegetation types, potential loss of natural grassland associated with the proposed Project is a concern and needs to be carefully managed.

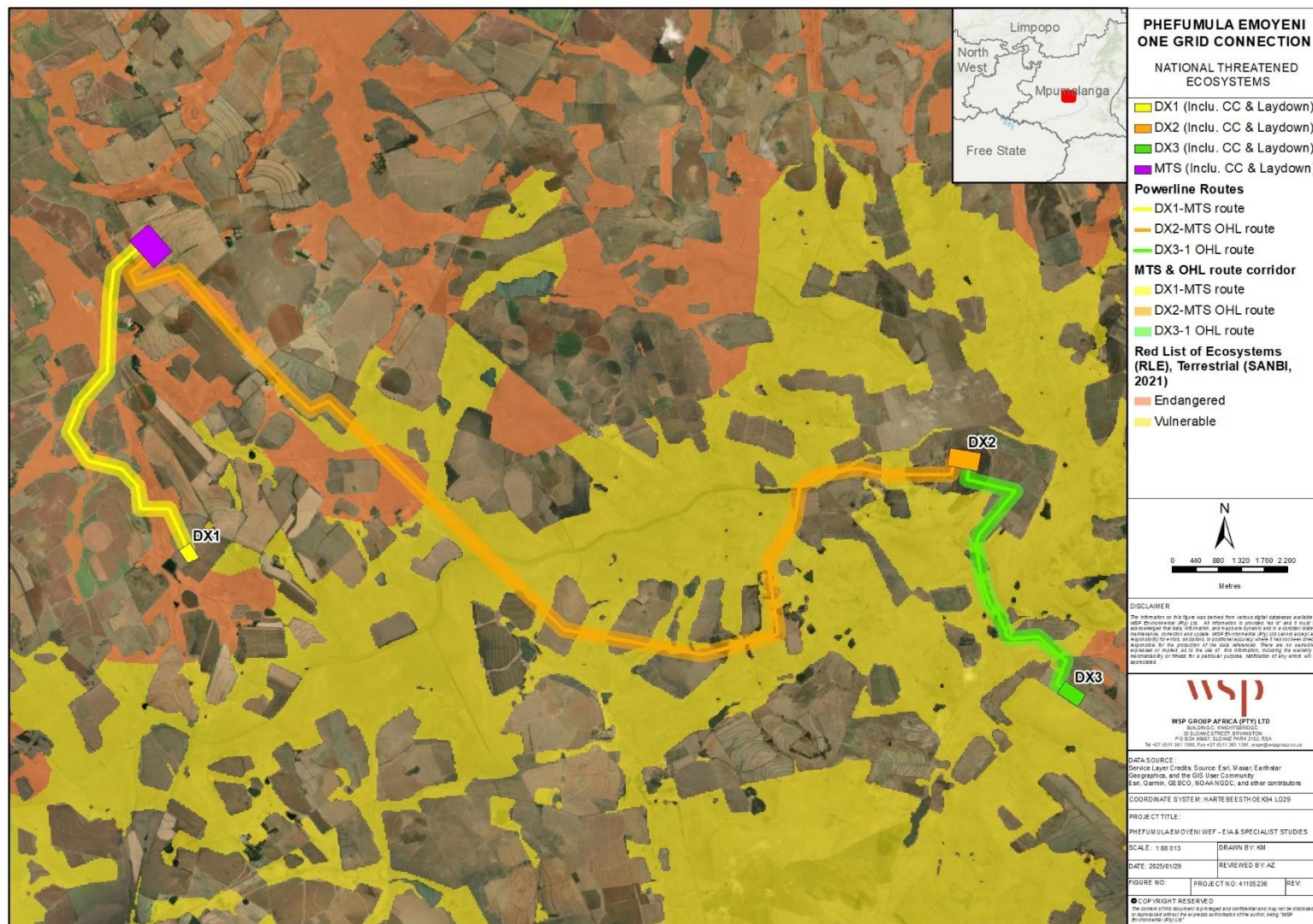


Figure 4: Project site in relation to delineations of the National Red List of Terrestrial Ecosystems (SANBI, 2021).

6. Landscape Context and Existing Impacts on Flora

The AOI is large and defined as a multi-functional rural-agricultural landscape, that is characterised by areas of both modified- and natural habitat. The following notes describe the general landscape context and major existing impacts (anthropogenic activities and infrastructure) that were observed in and around the AOI and Project site during the 2024 field survey:

- Farming is the dominant land use within the AOI, as well as across the surrounding landscape. Irrigated and dry-land cultivation, coupled with livestock production (mostly cattle, but also sheep) are the primary farming activities. These activities over the long term have caused varying degrees of spatial habitat modification and disturbance;
- Mining operations are present in the south-east of the AOI and to the immediate north of the AOI. Mined areas were noted to be completely transformed, with typically little- to no natural habitat remaining. No mining is present in the Project site;
- Various forms of linear infrastructure are present in the Project site, AOI and across the broader AOI. These include major national tarred roads (N11 and N17), several gravel district roads, farms roads, informal vehicle tracks, a defunct railway line, and enumerable farm fences. These linear features have caused to varying degrees, and in conjunction with transformative land uses activities (e.g., mining and cultivation), habitat fragmentation across the AOI and surrounding landscape. Be that as it may, a large network of natural habitat patches and corridors is still present;
- Alien invasive species (AIS) are not overly abundant in the AOI compared to other locations in Mpumalanga Province (Pers obs.). However, localised stands of alien trees are present, with aggressive invaders such as wattle (e.g., *Acacia dealbata* and *Acacia mearnsii*) and *Populus x canescens* noted. The edges of many cultivated field and other degraded locations are also encroached by various herbaceous AIS, such as *Verbena bonariensis*. Only a small area of the Project site comprises an alien tree stand; and
- Other anthropogenic activities and infrastructure in the AOI that have resulted in small-scale and localised habitat transformation include *inter alia*, farm residences, rural school buildings, and various agriculture structures (e.g., barns).

7. Vegetation and Flora Assessment

7.1. Habitat Units

Based on data collected during the field survey, six primary habitat units were identified in the AOI. These include three units regarded as natural habitat, and three units regarded as modified habitats:

Natural Habitats

- Mixed Dry Grassland;
- Rocky Shrubland;
- Moist Grassland;

Modified Habitats

- Old Lands;
- Cultivated Fields; and
- Alien Tree Plantations.

The proposed Project site (i.e., the proposed OHL assessment corridors and substation footprints), is dominated by natural habitat, principally Mixed Dry Grassland, with small areas of Moist Grassland. Small patches characterised by the three modified habitat units are also present.

Habitat units are described, with accompanying photographs, in Section 7.1.1 through to Section 7.1.6. **Error! Reference source not found.** A habitat unit map for the Project site is shown in Figure 5.



Figure 5: Habitat unit map of the proposed Project site and adjacent portions of the AOI.

7.1.1. *Mixed Dry Grassland*

Mixed Dry Grassland is a variable habitat unit that characterises the large intact grasslands of the AOI, and most of the Project site. Based on contemporary and former farming activities disturbance levels in areas of Mixed Dry Grassland vary.

As per Edwards (1983) structural classification system, the vegetation structure of this unit is defined a low- closed grassland. Compositionally, areas of Mixed Dry Grassland are characterised by a diverse flora assemblage, that is typically grass dominated and forb rich, and with woody species generally occurring as scattered individual trees and shrubs.

Predicated on past livestock grazing levels and wildfire patterns, the grass species composition of these grasslands varies. Areas that have likely experienced high-levels of past selective grazing and/or too frequent wildfires tend to be dominated by early-seral grass species, such as *Eragrostis plana* and *Eragrostis chloromelas* (Figure 6), whereas in areas that have been less intensely grazed, other species are more common, such as the often-dominant *Themeda triandra*, as well as *Brachiaria serrata*, *Cymbopogon pospischilii*, *Eragrostis racemosa*, *Harpochloa falx*, *Setaria* species and *Tristachya leucothrix* (Figure 7).

Common herbs/forbs recorded in the Mixed Dry Grassland unit include *inter alia*; *Berkheya pinnatifida ingrata*, *Berkheya radula*, *Berkheya setifera*, *Berkheya speciosa*, *Haplocarpha scaposa*, *Hermannia transvaalensis*, *Hilliardiella aristata*, various *Helichrysum* and *Hypoxis* species and *Nidorella podocephala*.

Woody species generally occur at low abundances in areas of Mixed Dry Grassland and typically include scattered *Diospyros lycioides* and *Seriphium plumosum* shrubs. Higher abundances of *Seriphium plumosum* were noted at certain locations and are likely a result of historic localised overgrazing by livestock. In terms of declared alien invasive species, several species were observed including *inter alia*; *Cirsium vulgare*, *Solanum elaeagnifolium*, *Solanum sisymbriifolium*, *Verbena bonariensis* and *Verbena rigida*. For a list of flora species recorded in this habitat unit during the field survey refer to Appendix C.

Sensitivity Aspects

This habitat unit characterises large portions of the AOI and most of the Project site. In conjunction with adjacent Moist Grassland habitat, areas of Mixed Dry Grassland are crucial resource and refuge habitat for flora and fauna. They also act as important ecological corridors, increasing local habitat connectivity and facilitating various ecological processes such as, *inter alia*, flora and fauna movement and dispersal.

In terms of flora SCC, Sensitive species 41 (VU), *Kniphofia ensifolia* subsp. *ensifolia* (NT, MP) and several protected flora species were recorded in this habitat unit across the broader AOI during the field survey. Habitat suitability assessments also indicate that several other flora SCC are likely to be present in areas of Mixed Dry Grassland (refer to Section 7.2.1 for further discussion on flora SCC). Refer to Section 9 for discussion of the Site Ecological Importance of this habitat unit.



Figure 6: *Eragrostis* dominated Mixed Dry Grassland.



Figure 7: *Themeda triandra* dominated Mixed Dry Grassland.

7.1.2. Rocky Shrubland

Rocky Shrubland is a relatively small habitat unit that occurs along rocky hillside and ridges in the AOI, but is not present within the proposed Project site and therefore will not be impacted by proposed Project activities. Unlike adjacent areas of open grassland, this habitat unit is characterised by a notably higher abundance of indigenous woody vegetation, coupled with the presence of numerous large protruding rocks.

In line with Edwards (1983) structural classification, this habitat unit is defined as low- to short sparse shrubland, with woody vegetation growing as small trees and shrubs (typically < 3m in height). These typically grow in either dense, but spatially discrete aggregations around exposed rocks, or as scattered individuals within the broader grassland matrix – see Figure 8 and Figure 9.

Compositionally, the *Diospyros lycioides* is the most abundant woody species. Other common larger woody taxa recorded in this unit include *Asparagus laricinus*, *Euclea crispa*, *Gymnosporia buxifolia*, *Kiggelaria africana*, *Rabdosiella calycina*, *Searsia dentata*, *Searsia discolor* and *Searsia pyroides* var. *gracilis*.

The herbaceous layer shares many of the same species as adjacent areas of Mixed Dry Grassland, as well as several additional taxa. Commonly recorded grasses include *Cymbopogon pospischilii*, *Eragrostis chloromelas*, *Eragrostis plana*, *Eragrostis pseudosclerantha*, *Eragrostis racemosa*, *Hyparrhenia dregeana*, *Hyparrhenia hirta*, *Melinis nerviglumis*, *Themeda triandra* and *Tristachya leucothrix*.

Various forbs, geophytes and small shrublets are also common in the herbaceous layer including *inter alia*; *Berkheya radula*, *Haemanthus humilis*, *Hilliardiella aristata*, *Haplocarpha scaposa*, *Helichrysum rugulosum*, *Phylica paniculata*, *Ledebouria ovatifolia* and *Leonotis dysophylla*. Ferns recorded in this unit include *Blechnum cf. australe*, *Cheilanthes hirta* var. *hirta*, *Pellaea calomelanos* var. *calomelanos* and *Selaginella dregei*. For a list of flora species recorded in this habitat unit during the field survey refer to Appendix C.

Sensitivity Aspects

The combination of indigenous woody vegetation and exposed rocks creates a distinctive rocky shrubland habitat that is relatively uncommon within the AOI's typical open grassland dominated land cover. Accordingly, areas of Rocky Shrubland increase landscape-scale heterogeneity, and provide important niche habitat for a variety of flora and fauna, including species of conservation concern that have an affinity for more wooded and/or rocky areas. The provincially protected *Haemanthus humilis* was recorded in this habitat unit, and habitat suitability assessments suggest that several other flora SCC are likely to be present. Refer to Section 9 for discussion of the Site Ecological Importance of this habitat unit.



Figure 8: Hillside characterised by exposed rocks and indigenous woody vegetation.



Figure 9: Pockets of woody trees and shrubs are typically dominated by *Diospyros lycioides*.

7.1.3. Moist Grassland

Moist Grassland habitat characterises wetland and riparian systems across the AOI and small portions of the Project site. Vegetation structure ranges from low- to tall closed grassland (*sensu*. Edwards 1983), and although not widespread or abundant in most areas of Moist Grassland, alien woody vegetation is present and well-established at certain locations (Figure 10 and Figure 11).

Common flora species recorded include a range of grasses and sedges such as, *inter alia*; *Agrostis lachnantha*, *Andropogon appendiculatus*, *Arundinella nepalensis*, *Aristida junciformis*, *Cyperus congesta*, *Cyperus denudatus*, *Cyperus fastigiatus*, *Cyperus marginatus*, *Cynodon dactylon*, *Eleocharis limosa*, *Eragrostis gummiflua*, *Eragrostis heteromera*, *Eragrostis plana*, *Imperata cylindrica*, *Juncus dregeanus*, *Kyllinga erecta*, *Leersia hexandra* and *Paspalum dilatatum**. The tall reed *Phragmites australis*, the bulrush *Typha capensis* and *Schoenoplectus brachyceras* are also present in more permanently damp areas (*denotes alien taxa).

Common forbs recorded in this habitat unit include *inter alia*; *Berkheya pinnatifida ingrata*, *Berkheya radula*, *Berkheya setifera*, *Centella asiatica*, *Helichrysum aureonitens*, *Helichrysum nudifolium* var. *pilosellum*, *Lobelia flaccida*, *Monopsis decipiens*, *Nidorella podocephala*, *Pelargonium luridum*, *Pimpinella transvaalensis*, *Scabiosa columbaria* and *Trifolium repens*.

Several alien woody taxa recorded in this habitat unit include *Eucalyptus* sp., *Quercus ruber*, *Populus x canescens*, *Pyracantha angustifolia* and *Salix babylonica* (Figure 11). For a list of flora species recorded in this habitat unit during the field survey refer to Appendix C.

Sensitivity Aspects

Moist Grasslands play a crucial in maintaining the hydrological functioning (e.g., filtration and flood attenuation), ecological processes, and terrestrial biodiversity of the landscape. In conjunction with adjacent Mixed Dry Grasslands, these habitats significantly increase landscape-scale habitat connectivity, and thus provide important ecological corridors. Sensitive species 41 (VU) and several protected flora species, such as *Crinum bulbispermum* and various *Gladiolus* species, were recorded in Moist Grasslands in the AOI, and habitat suitability assessments suggest that several other flora SCC are likely to be present. Refer to Section 9 for discussion of the Site Ecological Importance of this habitat unit.



Figure 10: Typical area of open Moist Grassland.



Figure 11: Small stream encroached by large alien trees including *Salix babylonica* and *Populus x canescens*.

7.1.4. Old Lands

As the name suggests, this habitat unit characterises old cultivated fields that have been left fallow for several years, and as a result have subsequently regenerated to a secondary grassland community. As such, this is considered a modified habitat unit.

Vegetation structure is low closed grassland (*sensu*. Edwards, 1983). Compositionally, compared to natural grasslands, Old Lands are depleted of nutrients and thus floristically depauperate. Dominant grass species recorded in this unit during the field survey include the tall, robust thatching grasses *Hyparrhenia dregeana* and *Hyparrhenia hirta*, and relict-pioneer and early-seral taxa such as *Eragrostis chloromelas*, *Eragrostis curvula* and *Eragrostis plana* (see Figure 12).

Forbs recorded Old Lands include a mixture of indigenous and alien ruderal and weedy species, such as *Bidens pilosa*, *Conyza bonariensis*, *Pseudognaphalium luteo-album*, *Senecio consanguineus*, *Rumex acetosella*, *Selago densiflora*, *Tagetes minuta*, *Verbena rigida* and *Wahlenbergia undulata*. The only woody species recorded in this habitat unit was *Seriphium plumosum*. For a list of flora species recorded during the field survey refer to Appendix C.

Sensitivity Aspects

Despite past disturbances and a secondary vegetation community, Old Lands can retain some of the functional attributes of natural grasslands. They are also very stable and able to persist for extensive periods. This notwithstanding, no flora and fauna species of conservation were recorded in this habitat unit, and it is considered unlikely that Old Lands constitute important life-cycle habitat for any SCC. Refer to Section 9 for discussion of the Site Ecological Importance of this habitat unit.



Figure 12: Old Land dominated by *Hyparrhenia* grass species.

7.1.5. Cultivated Fields

Large portions of the AOI, but only a small area of the Project site, are characterised by cultivated agricultural fields, which is considered a modified habitat type. Cultivated Fields include both pivot-irrigated crop fields and dry-land crop fields. These are typically under maize production, and are regularly disturbed through ploughing and harvesting (Figure 13).

This habitat unit also includes open fields that are actively-managed as grass pastures. Unlike areas of natural grassland, grass pastures are often fertilised, and regularly mown and baled to provide reserve forage for livestock during the dry season (shown Figure 14).

Sensitivity Aspects

Actively Cultivated Fields are denuded of indigenous vegetation, and are subject to regular anthropogenic disturbance. When not dominated by a monoculture of food crop species, these areas are typically colonised by a variety of alien invasive and weedy species.

No flora SCC were recorded in Cultivated Fields during the field survey, and no flora SCC are likely to be present in these areas. 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. Refer to Section 9 for discussion of the Site Ecological Importance of this habitat unit.



Figure 13: Dry-land Cultivated Field, under maize production.



Figure 14: Recently mown and baled grass pasture. Note prevalence of the declared weed *Verbena bonariensis* in foreground.

7.1.6. Alien Tree Plantations

Alien Tree Plantations is a broad-term to describe the numerous and localised stands of alien woody vegetation in the AOI. These stands range from narrow wind-rows (typically associated with farms residences and farm roads) to defined plantation-type stands and informal thickets (Figure 15 and Figure 16). Alien Tree Plantations are a modified habitat type.

Vegetation structure is defined as short- to tall closed woodland (*sensu*. Edwards, 1983). Dominant alien tree species include alien *Eucalyptus* species, *Acacia dealbata* and *Acacia mearnsii* (wattles), and *Populus x canescens*. Little indigenous vegetation is present in dense, well-established Alien Tree Plantations, with herbaceous flora typically suppressed or in most cases, largely absent.

Sensitivity Aspects

Alien Tree Plantations are characterised by an almost complete dominance of one or two non-indigenous tree species. No flora SCC were observed in these areas during the field survey, and no flora SCC are likely to be present in these habitats.

From a fauna perspective, Alien Tree Plantations 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 habitat by *inter alia* raptors. Refer to Section 9 for discussion of the Site Ecological Importance of this habitat unit.



Figure 15: Small stand of *Acacia dealbata* trees.



Figure 16: Stand of *Populus x canescens* trees growing in a hillside seep.

7.2. Floristics Analysis

7.2.1. Flora Species of Conservation Concern

In line with the internationally endorsed IUCN Red List Categories and Criteria, the Red List of South African Plants recognises three categories of threatened species, namely Critically Endangered (CR), Endangered (EN) and Vulnerable (VU), and five 'other categories of conservation concern' that are recognised as having high conservation importance, namely Near Threatened (NT), Critically Rare, Rare, Declining, and Data Deficient – Insufficient Information (DDD).

As they are subject to national and/or provincial environmental legislation and require specific conservation management, flora species listed on the NEMBA ToPS List (2007) and Mpumalanga Nature Conservation Act (Act No. 10 of 1998) are also included as flora species of conservation concern and discussed in this section.

One flora species listed as threatened on the national Red List in the Project site during the 2025 field survey, namely Sensitive species 41 (Vulnerable). This species occurs in moist grassland habitat, and typically flowers in October and November. Flowering during January is thus unusual and likely influenced by aseasonal burns or rains (pers. comm. J Manning). Several plants were recorded flowering at two locations in the Project site. The co-ordinates of individual plants are listed in Table 4 and the locations are shown in Figure 17. Sensitive species 41 has widespread distribution, with a EEO of <19 940 km² and a AOO of <2000 km², but is a rare species that is known from between six and ten locations and is experiencing population declines due to habitat loss and disturbance.

Kniphofia ensifolia subsp. *ensifolia* (Figure 18), which is listed as Near Threatened on the Mpumalanga Red List, was also recorded in the broader AOI (coordinates S26 19.732 E29 46.738), but not in the Project site.

Based on reviewed literature and data sources, 11 flora species that occur, or potentially occur in the AOI, are listed as threatened or Near Threatened on the national and/or provincial Red Lists. These are listed in Table 5, along with the conservation statuses, habitat preferences and a 'probability of occurrence', based on habitat suitability.

Several flora species that are listed as protected at a provincial level according to Mpumalanga Nature Conservation Act (Act No. 10 of 1998) were recorded in the AOI during the field survey and potentially occur in the Project site, including *Aloe ecklonis*, *Boophone disticha* (Figure 19), *Crinum bulbispermum* (Figure 20), *Gladiolus crassifolius*, *Gladiolus longicollis* subsp. *platypetalus*, *Gladiolus sericeovillosus* subsp. *calvatus* and *Haemanthus humilis* (Figure 21). No flora species listed on the NEMBA ToPS (2007) List were recorded or potentially occur in the AOI.

Table 4: Co-ordinates of Sensitive species 41 plants

Co-ordinates
S26 21.720 E29 47.918
S26 21.717 E29 47.907
S26 22.054 E29 47.747
S26 22.066 E29 47.747
S26 22.242 E29 44.435
S26 22.242 E29 44.450
S26 22.244 E29 44.475
S26 22.280 E29 44.429

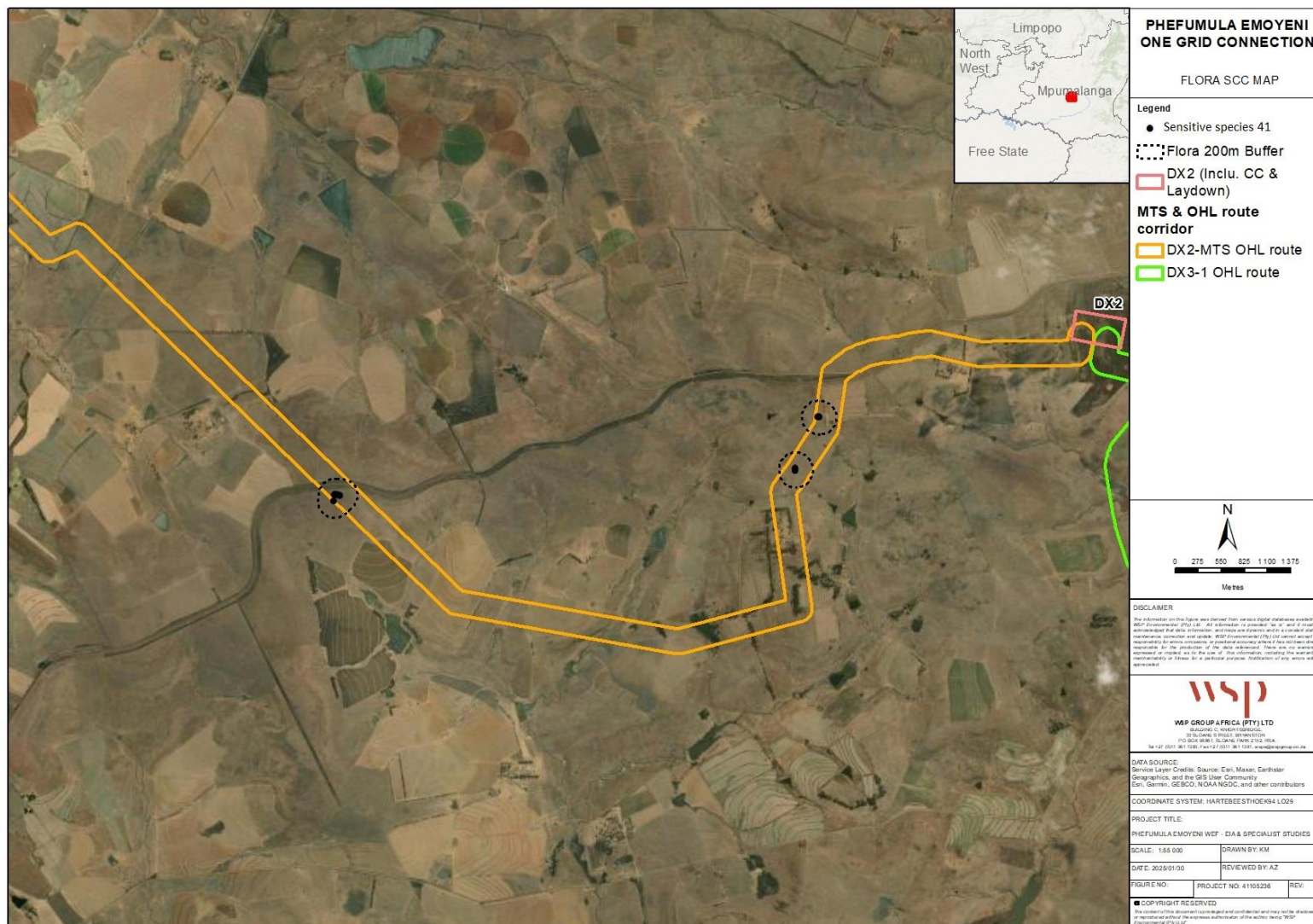


Figure 17: Locations of recorded Sensitive species 41 plants.



Figure 18: *Kniphofia ensifolia* subsp. *ensifolia*



Figure 19: *Boophone disticha*



Figure 20: *Crinum bulbispermum*



Figure 21: *Haemanthus humilis*

Table 5: Regionally or provincially threatened and Near Threatened flora species that occur or potentially occurring in the AOI.

Family	Scientific Name [#]	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
Aizoaceae	<i>Khadia carolinensis</i>	Vulnerable	Vulnerable	-	Range-restricted species, occurring in Highveld grasslands between 1700m. AOO is estimated at 28.34 km ² (SANBI, 2020). Favours on well-drained sandy loam soils amongst rock outcrops, or along the edges of sandstone sheets (Lötter <i>et al.</i> , 2007a)	Probable – suitable habitat present.
Apocynaceae	<i>Aspidoglossum xanthosphaerum</i>	Vulnerable	Vulnerable	-	Favours marshy habitats in montane grasslands around 1800 m. Only known from four locations, within an EOO of < 500 km ² (Nickolas & Victor, 2006), and an AOO estimated at 15.90 km ² (SANBI, 2020). Recorded at Breyten to the west of the town of Ermelo.	Possible – suitable habitat present.
Apocynaceae	<i>Miraglossum davyi</i>	Vulnerable	Vulnerable	-	Found on sloping grasslands in heavy black loam soils at high altitudes. Known from only five locations, with an EOO of <15 000km ² (Lötter <i>et al.</i> , 2005) and a AOO estimated at 10.78 km ² (SANBI, 2020).	Possible – suitable habitat present.
Apocynaceae	<i>Pachycarpus suaveolens</i>	Vulnerable	Vulnerable	-	Favours short, annually burnt grassland between 1400-2000 m. Known from eight locations with an EOO of 19 900 km ² (Lötter <i>et al.</i> , 2007b).	Probable – suitable habitat present.
Hyacinthaceae	<i>Eucomis autumnalis</i>	Least Concern	Declining	Protected	Favours damp open places (Williams, <i>et al.</i> , 2016b).	Probable – suitable habitat present.
Orchidaceae	<i>Eulophia cooperi</i>	Least Concern	Rare	Protected	Widespread species. Found on rocky quartzite ridges between 1000 and 1800 m.	Probable – suitable habitat present.
Asphodelaceae	<i>Kniphofia ensifolia</i> subsp. <i>ensifolia</i>	Least Concern	Near Threatened	Protected	Generally occurs on heavy clay soils, along streams in grassland habitats.	Recorded in AOI (S26)

Family	Scientific Name [#]	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
						19.732 E29 46.738)
-	Sensitive species 1252	Vulnerable	Vulnerable	Protected	Moist bushveld habitats, including wooded mountain kloofs. AOO estimated at 73.01 km ² (SANBI, 2020).	Unlikely/ Possible – limited suitable habitat present.
-	Sensitive species 41	Vulnerable	Vulnerable	Protected	Widespread but rare species, with a EEO of <19 940 km ² and a AOO of <2000 km ² . Known from between six and ten locations. Favours high altitude wetlands that remain damp throughout the year.	Recorded
-	Sensitive species 691	Vulnerable	Near Threatened	-	EOO is between 455 and 11 158 km ² , and thought to occur at less than 10 locations, with an AOO estimated at 3.06 km ² (SANBI, 2020). Prefers moist areas in undulating grassland.	Probable – suitable habitat present.
-	Sensitive species 851	Vulnerable	-	-	Uncertainty surrounding distribution due to taxonomic confusion. EEO is estimated at 6244 km ² , but it could be as large as 22 664 km ² . Known from only 10 locations. Occurs in shallow wetlands and marshes in high altitude montane grassland. Population known from the close-by Bethal area.	Probable – suitable habitat present.
-	Sensitive species 1200	Endangered	Endangered	-	The range of this species is between Breyton, Lothair, Middelburg and Stoffberg. Its EEO has reduced by more than 50% due to agriculture. Habitat preferences are poorly understood, but thought to favour edges of pans.	Unlikely – limited suitable habitat present.
[#] The names of specific taxa that are regarded as being susceptible to overexploitation have been redacted and are not presented in this report. These species are referred to by their assigned 'sensitive species number', as per the species assessment guidelines (SANBI, 2020).						
Source: List based on data from MPTA, BODATSA and Environmental Screening Report Output.						

7.2.2. Declared Alien Invasive Species

Based on the findings of the field survey, 20 NEMBA declared alien invasive plant species were recorded in the AOI. These are listed in Table 6, along with their growth form and NEMBA Category.

Table 6: Declared alien invasive species recorded in the AOI.

Scientific Name	Common Name	Growth Form	NEMBA Category
<i>Acacia mearnsii</i>	Black Wattle	Tree	2
<i>Acacia dealbata</i>	Silber Wattle	Tree	2
<i>Cirsium vulgare</i>	Spear Thistle	Herbaceous forb	1b
<i>Cortaderia selloana</i>	Pampas Grass	Graminoid	1b
<i>Datura stramonium</i>	Common Thorn Apple	Herbaceous forb	1b
<i>Eucalyptus</i> species	Gum	Tree	1b or 2
<i>Opuntia ficus-indica</i>	Sweet Prickly Pear	Succulent Tree	1b
<i>Pennisetum clandestinum</i>	Kikuyu	Graminoid	1b
<i>Pinus patula</i>	Patula pine	Tree	2
<i>Populus x canescens</i>	Grey Poplar	Tree	2
<i>Pyracantha angustifolia</i>	Yellow Fire-thorn	Tree	1b
<i>Robinia pseudoacacia</i>	Black Locust	Tree	1b
<i>Salix babylonica</i>	Weeping Willow	Tree	-
<i>Solanum elaeagnifolium</i>	Potato Creeper	Herbaceous forb	1b
<i>Solanum sisymbriifolium</i>	Wild Tomato	Herbaceous forb	1b
<i>Sorghum halepense</i>	Johnson Grass	Graminoid	2
<i>Verbena brasiliensis</i>	Wild Verbena	Herbaceous forb	1b
<i>Verbena bonariensis</i>	Wild Verbena	Herbaceous forb	1b
<i>Verbena rigida</i>	Veined Verbena	Herbaceous forb	1b
<i>Xanthium strumarium</i>	Large Cocklebur	Herbaceous forb	1b

7.2.3. Flora of Medicinal Value

Several flora species recorded in the AOI have recognised medicinal value. These are listed in Table 7, accompanied by a description of their purported use, as per Van Wyk *et al.*, (2009).

Table 7: Flora species recorded in the AOI that have recognised medicinal value.

Scientific Name	Medicinal Use*
<i>Asparagus laricinus</i>	Used in the treatment of tuberculosis, kidney ailments and rheumatism.
<i>Berula erecta</i>	Used to treat toothache.
<i>Boophone disticha</i>	Bulbs scales are used to treat boils and septic wounds, as well as alleviate pains.
<i>Centella asiatica</i>	Used to treat a variety of infirmities including leprosy, wounds, cancer, fever and syphilis.
<i>Datura stramonium</i>	Relieves asthma and acts to reduce pain. Weak infusions are used as an aphrodisiac.
<i>Gomphocarpus fruticosus</i>	Ground leaves are used as snuff, and to treat headaches, tuberculosis and as an emetic.
<i>Helichrysum</i> species	Treats a variety of afflictions, including coughs, colds, fever, headaches and infections.

Scientific Name	Medicinal Use*
<i>Hilliardiella aristata</i>	Infusions taken to treat stomach ailments, rheumatism, dysentery and diabetes.
<i>Hypoxis</i> species	Infusions of the corm are used to treat dizziness, bladder disorders and insanity.
<i>Mentha longifolia</i>	Treats various respiratory ailments including coughs, colds and asthma.
<i>Pelargonium luridum</i>	Taken orally to treat diarrhoea and dysentery.
<i>Pellaea calomelanos</i> var. <i>calomelanos</i>	Used to treat boils and abscesses and for internal parasites
<i>Pentanisia prunelloides</i>	Decoctions are used to treat burns, swellings, sore joints and rheumatism.
<i>Rumex crispus</i>	Used as a remedy for internal parasites, as well as vascular diseases and internal bleeding.
<i>Scabiosa columbaria</i>	Used to treat colic and heartburn.
<i>Typha capensis</i>	Decoctions used to treat venereal disease, as well as diarrhoea, dysentery and enhance male libido.
<i>Xysmalobium undulatum</i>	Remedy for diarrhoea and colic.
*Medicinal use, as per Van Wyk, <i>et al.</i> (2009).	

8. Key Ecological Attributes and Processes

8.1. Habitat Corridors, Resources and Refugia

The AOI is a multi-functional landscape that is characterised by large areas of cultivation (Cultivated Fields), but also large intact areas of natural dry grassland and moist grassland habitat. Various forms of linear infrastructure, such as formal roads, farm tracks, farm fences and an old railway line, and the presence of modified habitat patches, have caused habitat fragmentation. However, it is noted that the general level of habitat connectivity across the Project site and AOI, and to the broader landscape surrounding the AOI remains high. On-site natural habitat patches provide a large network of dispersal and movement corridors for flora pollinators and propagules.

Within the grassland-dominated habitat matrix, the altitudinal variability, exposed rocks and abundance of indigenous woody flora that defines the Rocky Shrubland habitat unit, also creates diverse and unique micro-habitats that significantly increase broader-scale habitat heterogeneity. This will increase local flora and fauna diversity by providing niche habitats for, amongst others, obligate and facultative rupicolous¹ and shrubland-favouring species that are unlikely to be resident in adjacent open grassland.

The proposed Project may have an impact local habitat connectivity through habitat loss and fragmentation, and this may affect various ecological processes, such as the movement and dispersal of flora propagules and pollinators.

¹ Flora and fauna species that are specifically adapted to rocky habitat.

8.2. 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 the character of terrestrial vegetation and flora in the AOI.

8.2.1. Wildfire – Grassland Burning

Fire is a natural, albeit often human initiated, disturbance agent in grassland ecosystems. Mesic Highveld Grasslands are considered fire-prone and fire-dependent landscapes, and fire is essential to the maintenance of biodiversity patterns and ecological processes (SANBI, 2013). Wildfire's have several key ecological effects with respects to fauna, including:

- Removal of moribund vegetation and increasing plant productivity and palatability, which improves grazing for wild herbivores;
- 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.

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

Fire is considered an important driver of change in the AOI. It is anticipated that the proposed Project may result in altered wildfire patterns across the AOI due to increased accidental fires from faulty/shorting Project infrastructure. Changes in local fire may impact vegetation productivity, which may affect the local fauna and flora diversity community, including SCC.

8.2.2. Herbivory - 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.

Cattle grazing (Figure 22) and trampling are considered important drivers of change in the AOI. However, it is anticipated that the proposed Project is unlikely to alter livestock grazing patterns in the AOI.



Figure 22: Cattle grazing is common in the AOI.

8.2.3. Alien Invasive Species Colonisation

Several alien tree plantations (e.g., *Eucalyptus* trees) and wattle infestations (*Acacia mearnsii* and *Acacia dealbata*) are present in the AOI, and many disturbed sites (e.g., cultivated fields) are encroached by herbaceous alien invasive species (e.g., *Verbena bonariensis*). If not actively controlled, species such as wattle may spread into adjacent natural habitats, where they will shade-out and 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 fauna communities;
- A reduction in grass productivity for grazing herbivores (e.g., Mountain Reedbuck), and
- Increased exposed soil surfaces and incidences of erosion.

The spread of alien invasive vegetation is therefore considered a significant driver of change in the AOI and surrounding landscape, and one capable of negatively impacting terrestrial biodiversity.

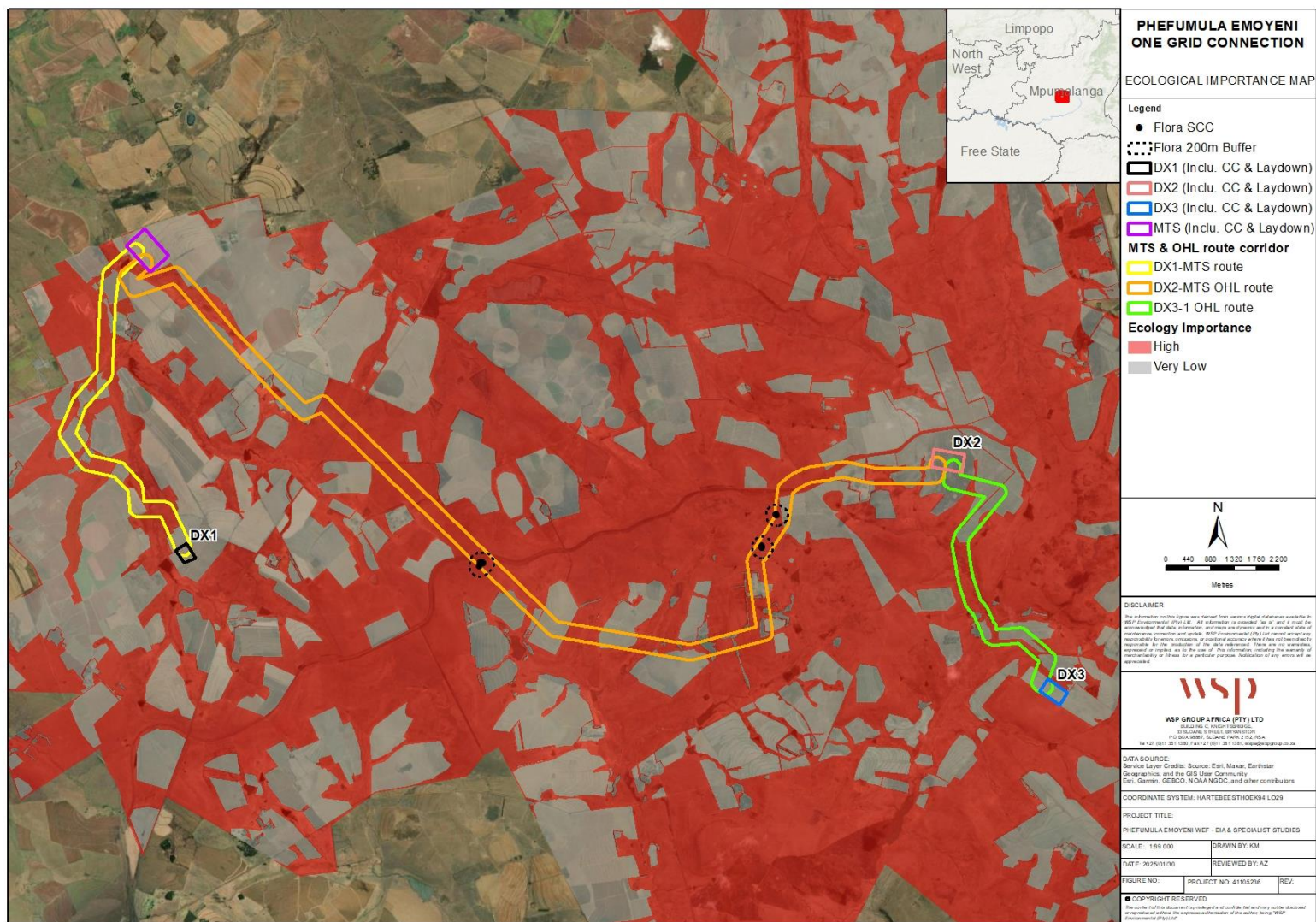
9. Analysis of Site Ecological Importance

The ecological importance (SEI) of identified habitat units in the Project site were assessed using the SANBI (2020) protocol (refer to Section 3.7 and Appendix B for the methodology). The results of the assessment are presented in Table 8 and shown in Figure 23.

Table 8: Site Ecological Importance of habitat units in the Project site

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Mixed Dry Grassland	<u>HIGH</u> : Confirmed or highly likely occurrence of CR, EN, VU species (=Sensitive species 41). Small area of natural habitat of EN ecosystem (=Eastern Highveld Grassland, EN & Soweto Highveld Grassland, VU).	<u>HIGH</u> : Very large (>100 ha) intact area for any conservation status of ecosystem type. Good habitat connectivity with potentially functional ecological corridors. BUT Mostly minor current negative ecological impacts, with some major impacts and a few signs of past disturbance.	HIGH	<u>MEDIUM</u> : Habitat that can recover slowly to restore >75% of the original species composition and functionality	HIGH
Rocky Shrubland	<u>HIGH</u> : Highly likely occurrence of CR, EN, VU species. Small area of natural habitat of EN ecosystem (=Eastern Highveld Grassland, EN & Soweto Highveld Grassland, VU).	<u>HIGH</u> : Large (> 5 ha but <100 ha) intact area for any conservation status. Good habitat connectivity with potentially functional ecological corridors. Only minor current negative ecological impacts with limited signs of major past disturbance and good rehabilitation potential.	HIGH	<u>MEDIUM</u> : Habitat that can recover slowly to restore >75% of the original species composition and functionality	HIGH
Moist Grassland	<u>HIGH</u> : Confirmed or highly likely occurrence of CR, EN, VU species (=Sensitive species 41). Small area of natural habitat of EN ecosystem (=Eastern Highveld Grassland, EN & Soweto Highveld Grassland, VU).	<u>HIGH</u> : Very large (>100 ha) intact area for any conservation status of ecosystem type. Good habitat connectivity with potentially functional ecological corridors. BUT	HIGH	<u>MEDIUM</u> : 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
		Mostly minor current negative ecological impacts, with some major impacts and a few signs of past disturbance.			
Old Lands	LOW: No confirmed or highly likely populations of SCC or range-restricted species.	<u>MEDIUM/LOW</u> : Narrow corridors of good connectivity. Mostly minor current negative ecological impacts, BUT with major past impacts (i.e., former cultivation).	LOW	HIGH: Habitat that can recover relatively quickly to restore >75% of the original species composition and functionality.	VERY LOW
Cultivated Fields	<u>VERY LOW</u> : No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	<u>VERY LOW</u> : Several major current negative ecological impacts.	VERY LOW	<u>VERY HIGH</u> : Habitat that can recover rapidly to restore >75% of the original species composition and functionality.	VERY LOW
Alien Tree Plantations	<u>VERY LOW</u> : No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	<u>VERY LOW</u> : Several major current negative ecological impacts.	VERY LOW	<u>VERY HIGH</u> : Habitat that can recover rapidly to restore >75% of the original species composition and functionality.	VERY LOW



10. Impact Assessment

10.1. 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 direct², indirect³, secondary⁴ as well as cumulative⁵ 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 criteria⁶ 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	Moderate	High	Very High
Environmental Significance Rating (Positive (+))	Very low	Low	Moderate	High	Very High

10.2. 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 24 below.

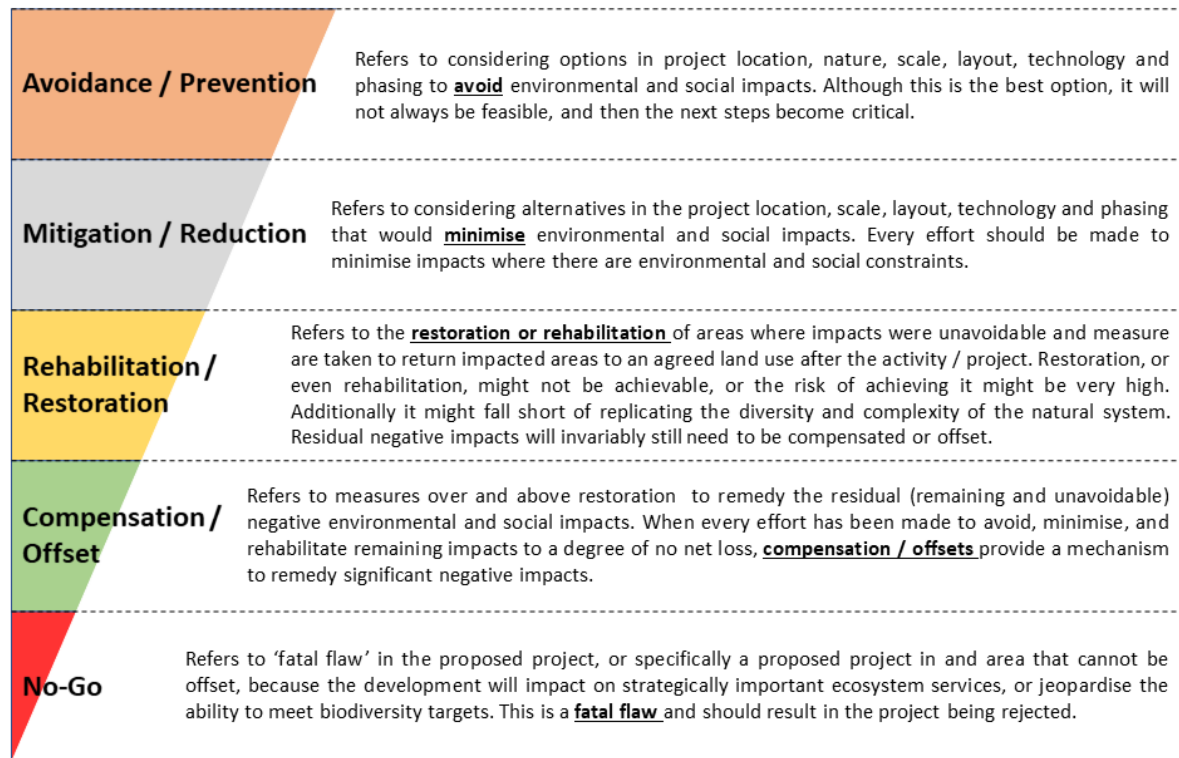


Figure 24: Mitigation Sequence/Hierarchy

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 impact in Section 10.3.4. A summary table presented in Table 11.

10.3. Assessment of Impacts on Terrestrial Flora

10.3.1. Construction Phase

10.3.1.1. 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 flora occurring in the AOI, including SCC.

Two project layouts (Alternative 1 & Alternative 2) were considered during the scoping phase. Alternative 2 was preferred as it minimizes disturbance to natural habitat, especially CBA Irreplaceable and CBA Optimal areas, by optimizing infrastructure placement within modified habitats, like cultivated fields.

Based on the currently proposed infrastructure layout (Alternative 2), only approximately 1.47 ha of natural habitat is likely to be lost due to Project infrastructure development, with Figure 25 showing an overlay of proposed infrastructure on the habitat unit map. Table 10 presents an indication of the approximate infrastructure footprints directly impacting each of the identified habitat units. Note: Estimated development footprints for the proposed powerlines are predicated on an approximate inter-pylon distance of 175 m (which is the median between the 100-250 m range stated in the project description) and individual pylon structure footprints of 110 m².

The impact prior to mitigation is considered to be of 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 high. This results in an impact of “medium” significance.

Several management/mitigation measures can be taken to further minimise impact significance. These include: 1) in-field micro-siting of tower/pylon footprints to already disturbed sites; 2) clearing only the minimum footprint areas required for construction activities; and 3) actively rehabilitating all disturbance footprints after construction.

With the application of these, and other recommended mitigation measures, impact magnitude can be reduced to low, and it can be confined to the site scale. Duration can be reduced to the long-term, and probability to low. This results in an after-mitigation (residual) impact of “Low” significance.

Table 10: Indicative extent of possible impacts on the identified habitat units.

Impacted Habitat Units	Infrastructure Footprints (Ha)				Estimated Total Powerline Pylon Footprints (Ha)*			TOTAL (Ha)
	DX 1 (Incl. construction camp and laydown)	DX 2(Incl. construction camp and laydown)	DX 3(Incl. construction camp and laydown)	MTS (Incl. construction camp and laydown)	DX1-MTS route (9.58 km)	DX2-MTS OHL route (1.44 km)	DX3-1 OHL route (7.18 km)	
Mixed Dry Grassland	-	-	-	0.18	0.14	0.72	0.06	1.10
Cultivated Field	7.87	20.74	13.54	33.23	0.20	0.40	0.17	76.15
Moist Grassland	-	-	-	0.04	0.09	0.17	0.06	0.37
Old Lands	-	-	-	-	0.01	0.04	0.11	0.15
*Estimates based on inter-pylon distance of 175 m (i.e. median between 100 m - 250 m range) and an individual pylon footprint of 110 m ² .								



Figure 25: Habitat units and the proposed infrastructure layout.

10.3.1.2. Fragmentation reducing natural habitat connectivity and integrity

Habitat fragmentation is caused when vegetation clearing and/or the development of infrastructure (e.g., roads and 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 (edge effects) and can affect various ecological processes (e.g. fire patterns) and metapopulation dynamics, such as flora pollination and propagule dispersal. This can, in turn, affect flora species richness and population stability.

The proposed Project involves, in part, the construction of linear infrastructure (i.e. OHL). Linear infrastructure has the potential to cause habitat fragmentation. It is noted however, that the actual pylon footprints where permanent habitat loss is expected, are relatively small and estimated at 110 m² per pylon structure. As such, it is anticipated that potential fragmentation effects from the OHL will be limited.

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

With the application of mitigation measures, such as in-field micro-siting of pylon footprints to already disturbed sites, minimising the clearance footprint to the minimum area required for construction and operational purposes, and rehabilitating all disturbed footprints, impact magnitude can be reduced to low. 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.

10.3.1.3. Loss of flora species of conservation concern

Sensitive species 41 (Vulnerable) plants were recorded at two locations in the Project site, while several protected flora species were recorded in the Project site and broader AOI. Habitat suitability assessments also indicate that other Red List flora species may be present on-site. Consequently, construction activities, including vegetation clearing and earthworks, pose a risk of loss or damage to SCC, which may affect local population suitability.

Before mitigation, the loss of flora SCC is rated an impact with a very high magnitude. Duration is immediate and it has a high probability of occurrence. The spatial extent of the impact is at the local scale. Prior to mitigation, this impact is rated of “moderate” significance.

It is recommended that proposed pylons/tower footprints be located outside a 200 m buffer around the Sensitive species 41 locations, as recommended by SANBI (2020). Recognizing that the extent of permanent habitat loss associated with individual powerline pylons/tower footprints is relatively small – at about 110 m², deviation to a slightly reduced buffer may be considered if absolutely required, but only if the pylons/tower footprints are carefully micro-sited to already disturbed habitat patches, that are thoroughly searched for Sensitive species 41 plants. And, that all construction disturbances are strictly limited to the 110 m² pylon/tower development footprint only, thereby minimizing any potential impacts on Sensitive species 41.

With the application of the above measures, coupled with the further mitigation measures presented in Section 12, this impact can be reduced to a medium magnitude, while duration will remain of

immediate. Spatial extent will be reduced to the site only, but probability will be reduced to low. After mitigation, this impact is rated to be of “Low” significance.

10.3.1.4. Establishment and spread of alien invasive species

Habitat disturbances caused by vegetation clearing and earth works during construction can facilitate the establishment and spread of AIS. Alien plant infestations can spread exponentially, suppressing or replacing indigenous vegetation. This may impact ecological integrity and functioning and terrestrial biodiversity. Twenty NEMBA listed AIS have been recorded in the AOI. Construction activities will cause the physical disturbance of vegetation and soils which will facilitate the spread of AIS.

Before mitigation, impact magnitude is high, while the duration is long term, and the impact has a high probability of occurrence. The spatial extent of AIS spread is local. Prior to mitigation, the establishment and spread of AIS is rated an impact of “moderate” significance.

This impact is relatively easy to mitigate though the implementation of an AIS control programme during the construction phase. This impact can be reduced to a low magnitude, with a short-term duration. Spatial extent will be reduced to the site only 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.

10.3.2. Operational Phase

10.3.2.1. Establishment and spread of alien invasive species

The potential establishment and spread of AIS in the Project site will continue to be an impact of concern during the operational phase.

Before mitigation, impact magnitude is high, while duration is long term and the impact has a medium probability of occurring as predicted. The spatial extent of alien invasive species spread is local. Prior to mitigation, the establishment and spread of alien invasive species is rated an impact of “moderate” significance.

With the continued implementation of an active alien species control programme during the operational phase this impact can be reduced to a low magnitude, with a short-term duration. Spatial extent will be reduced to the site only and probability at low. After mitigation, this impact is rated to be of “Low” significance.

10.3.2.2. Increase in wildfires from faulty/shorting powerline infrastructure

Wildfires are considered a natural and important disturbance agent in grassland ecosystems, and are essential to the maintenance of biodiversity patterns and ecological processes. They are also important in maintaining grassland productivity for local livestock farmers. An increase in unplanned or undesirable wildfire frequency from faulty/shorting electrical infrastructure may negatively impact ecological processes, which may affect grassland productivity and diversity.

Before mitigation, this impact is of medium magnitude, with a long-term duration (i.e., Project life) affecting terrestrial biodiversity within and potentially adjacent to the development footprint (local). It is also considered to have a high probability, resulting in an impact of “Moderate” significance.

With the application of the recommended mitigation measures, impact magnitude can be reduced to low. Duration will remain the long-term, and probability will reduce to low, but spatial scale will remain local. This results in a residual impact of “Low” significance

10.3.3. Decommissioning Phase

10.3.3.1. Establishment and spread of alien invasive species

As Project infrastructure is dismantled and removed from site during the decommissioning phase, the associated disturbances are likely to facilitate alien invasive species colonisation in, and immediately adjacent to, the Project site.

Before mitigation, impact magnitude is high, while duration is long term and the impact has a high probability of occurring as predicted. The spatial extent of alien invasive species spread is local. Prior to mitigation, the establishment and spread of alien invasive species is rated an impact of “moderate” significance.

With the continued implementation of an active alien species control programme during decommissioning and for a defined period thereafter, this impact can be reduced to a low magnitude, with a short-term duration. Spatial extent will be reduced to the site only and the probability of the impact occurring would be low. After mitigation, this impact is rated to be of “Low” significance.

Table 11: Impact assessment scoring for terrestrial flora 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:	Flora habitat	Direct loss and disturbance of natural habitat	Construction	Negative	Low	4	2	3	5	4	56	N2	2	1	3	4	2	20	N1
Significance						N2 - Medium							N1 - Low						
Impact 2:	Flora habitat	Fragmentation reducing natural habitat connectivity and integrity	Construction	Negative	Low	3	2	3	5	4	52	N2	2	2	3	4	2	22	N1
Significance						N2 - Medium							N1 - Low						
Impact 3:	Flora SCC	Loss of flora of conservation concern	Construction	Negative	High	5	2	5	1	4	52	N2	3	1	3	1	2	16	N1
Significance						N2 - Medium							N1 - Low						
Impact 4:	Flora habitat	Establishment and spread of alien invasive species	Construction	Negative	High	4	2	3	4	4	52	N2	2	1	3	2	2	16	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:	Flora habitat	Establishment and spread of alien invasive species	Operational	Negative	High	4	2	3	4	3	39	N2	2	1	3	2	2	16	N1
						N2 - Medium							N1 - Low						
Impact 2:	Flora habitat	Increase in wildfires from faulty/shorting powerline infrastructure	Operational	Negative	High	3	2	3	4	4	48	N2	2	2	1	4	2	18	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:	Flora habitat	Establishment and spread of alien invasive species	Decommissioning	Negative	High	4	2	3	4	4	52	N2	2	1	3	2	2	16	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:	Flora habitat & SCC	Cumulative loss of flora SCC due to natural habitat loss, disturbance and fragmentation	Construction	Negative	Moderate	5	3	3	5	5	80	N3	2	3	3	4	2	24	N1
Significance						N3 - High							N1 - Low						

10.3.4. Cumulative Impacts

10.3.4.1. Cumulative loss of flora SCC due to natural habitat loss, disturbance and fragmentation.

The landscape in which the AOI is located is already modified and fragmented as a consequence of historic and current agriculture, and other land use activities such as mining. The current degree of existing habitat modification and fragmentation in the landscape places significant pressure on the functioning and integrity of remaining natural and semi-natural habitat patches, and their ability to support viable populations of SCC.

At a local scale, the proposed Project is located within the broader planned development area for the Phefumula Emoyeni One WEF. At a regional scale, several renewable energy developments are, or may be, taking place in the broader region surrounding the AOI. Some of the main developments within a 55 km radius of the AOI include *inter alia*; Halfgewonnen solar photovoltaic (PV) facilities, Forzando North Coal Mine Solar PV Facility, Eskom Arnot PV Facility, Haverfontein WEF, Camden I WEF, Camden I Solar, Camden II WEF, Hendrina North WEF, Hendrina South WEF and Ummbila Emoyeni WEF.

Collectively, these projects will cause direct habitat loss, disturbance and fragmentation through vegetation clearing that is much greater in extent than that of a single constituent project, and this is a cumulative impact of concern with respects to flora SCC and the proposed Project.

Prior to any form of mitigation, the cumulative impact on flora SCC from vegetation clearing is rated 'high'. The proposed Project's contribution to cumulative impacts can be minimised by strictly implementing the required mitigation measures and addressing any significant residual impacts via additional conservation actions. The cumulative impacts on terrestrial flora SCC can therefore be reduced to 'Low' significance.

11. Assessment of the No Go Alternative

If the proposed Project does not proceed, it is anticipated that the current agricultural land use status quo will continue across most of the AOI and Project site into the future. The tracts of grassland and wetland habitat will continue to be used for livestock (cattle) production and game farming, and the croplands will continue to be actively cultivated to produce maize and other crop types.

Certain portions of the AOI are subject to heavy grazing and trampling by cattle, and it is possible that overtime, the condition of grassland and wetland habitat with respects to flora species diversity and ability to carry livestock (productivity) may deteriorate due to the effects of long-term overgrazing. This may compromise the agricultural profitability of on-site farming operations. With respects to biodiversity, overgrazing is likely to drive the homogenisation of habitats and flora diversity, including the persistence of SCC.

12. 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 12**Error! Reference source not found.** presents a summary of the proposed impact mitigation actions during the pre-construction, construction, operational, and decommissioning phases of the proposed Project.

Table 12: Recommended mitigation measures.

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	Terrestrial Flora	Direct loss and disturbance of flora habitat	<u>Avoidance</u> <ul style="list-style-type: none"> As far as possible, permanent Project infrastructure footprints should be located in areas of modified habitat (i.e., Cultivated Fields & Old Lands) to avoid/minimise impacts on natural habitats; Temporary Project infrastructure footprints (e.g., laydown areas) should only be located in areas of modified habitat; In areas of natural habitat, micro-site Project infrastructure to localised disturbed sites; and A pre-construction walkdown of the transmission line corridor and the other development footprints should be conducted during the wet/growing season to identify sensitive biodiversity and inform additional micro-siting 	N/A	Avoidance, Minimisation and Rehabilitation	During Construction and Pre-Construction Phase	Project Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			<p>options, and any other relevant management measures.</p> <p><u>Minimisation</u></p> <ul style="list-style-type: none"> • All vegetation clearing for the Project should be restricted to the proposed Project footprints only, with no clearing permitted outside of these areas; • The footprints to be cleared of vegetation should be clearly demarcated prior to construction to prevent unnecessary clearing outside of these areas; • No heavy vehicles should travel beyond the marked works zone; • Removed topsoil should be stockpiled and used to rehabilitate all disturbed areas. <p><u>Rehabilitation</u></p> <p>A rehabilitation/ landscaping protocol should be developed and implemented to stabilise and revegetate all non-operational sites that</p>				

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			<p>have been disturbed by construction. The protocol should include:</p> <ul style="list-style-type: none"> • Stockpiling of topsoil that was cleared from development footprints during site preparation; • Post-construction, the land form should be correctly contoured to limit potential erosion and compacted soils should be ripped and loosened to facilitate vegetation establishment; • Topsoil removed during construction should be applied to all non-operational sites that were disturbed during construction and require revegetation; and • Grass species used during rehabilitation should be indigenous, locally-occurring perennial species. 				
1.2	Terrestrial Flora	Fragmentation reducing natural habitat connectivity and integrity	<p><u>Avoidance and Minimisation</u></p> <p>See mitigation measures for <i>Direct loss and disturbance of natural habitat</i>.</p>	N/A	Avoidance, Minimisation and Rehabilitation	During Construction and Pre-Construction Phase	Project Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			<u>Rehabilitation</u> See rehabilitation measures for <i>Direct loss and disturbance of natural habitat</i> .				
1.3	Terrestrial Flora SCC	Loss of Flora Species of Conservation Concern	<u>Avoidance and Minimisation</u> <ul style="list-style-type: none"> Proposed pylons/tower footprints should be positioned outside a recommended 200 m buffer around the Sensitive species 41 locations. Deviation to a smaller buffer may only be considered if absolutely required, and if the pylon/tower development footprints are micro-sited to already disturbed habitat patches that are confirmed to not contain Sensitive species 41 plants, and that all construction disturbances/activities are strictly limited to these footprints; A pre-construction walkdown/survey of all proposed development footprints should be conducted during the wet/growing season to determine the identity and number of other potentially impacted flora SCC; 	N/A	Avoidance & Minimisation	During Construction Phase	Project Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			<ul style="list-style-type: none"> Data from the survey/walkdown should then be used to inform: <ul style="list-style-type: none"> The micro-siting of all proposed Project infrastructure footprints; and. The scope of a Flora SCC Management strategy with respects to obtaining permits should from the relevant authority to rescue and relocate impacted plants. 				
1.4	Terrestrial Flora	Establish and spread of alien invasive species	<p>An AIS control and eradication plan must be developed for the Project that focuses on controlling and eradicating AIS occurring at sites disturbed by project activities in the Project site. The plan must include:</p> <ul style="list-style-type: none"> Identification of AIS management units Prioritisation of sites and species requiring control; Targets and indicators of success; Scheduling of AIS control; 	Guidelines for Monitoring, Control and Eradication of AIS (DEA, 2015)	Minimisation	During Construction Phase	Project Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			<ul style="list-style-type: none"> Species-specific control methods, using a combined approach of both chemical and mechanical control methods; and Provision for follow-up treatments, as informed by regular AIS monitoring. 				
2. Operational Phase							
2.1	Terrestrial Flora	Establish and spread of alien invasive species	<ul style="list-style-type: none"> Active alien invasive species control should continue throughout the operational phase, as per the approved AIS control and eradication programme. 	Guidelines for Monitoring, Control and Eradication of AIS (DEA, 2015)	Minimisation	During Operational Phase	Facility Manager
2.2	Terrestrial Flora	Increase in wildfires from faulty/shorting powerline infrastructure	<ul style="list-style-type: none"> Project infrastructure should be regularly inspected and maintained to ensure operational efficiency and prevent electrical failures and accidental fires; The Project proponent should approach all relevant farmers and the local fire protection association (FPA) to investigate developing a co-ordinated Grassland Burning Management 	N/A	Minimisation	During Operational Phase	Facility Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			<p>Programme for the farms encompassing the Project site;</p> <ul style="list-style-type: none"> As required, firebreaks should be maintained around infrastructure that are susceptible to faults/shorts that may cause accidental wildfires; and Construction- and maintenance workers should be trained on the dangers of wildfire and the need to actively prevent unplanned/accidental fires. 				
3. Decommissioning Phase							
3.1	Terrestrial Flora	Establish and spread of alien invasive species	<ul style="list-style-type: none"> Active alien invasive species control should continue during the decommissioning phase and annual follow up control should be carried out for a five- year period following decommissioning. 	Guidelines for Monitoring, Control and Eradication of AIS (DEA, 2015)	Minimisation	Annually during decommissioning and annually for a five-year period after decommissioning	Facility Manager
3.2	Terrestrial Flora	General habitat restoration	<ul style="list-style-type: none"> To limit the potential for AIS encroachment, soil erosion and dust generation, all Project footprints and sites that were disturbed during decommissioning, should be actively 	N/A	Rehabilitation	During the Decommissioning Phase	Facility Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			rehabilitated using local-occurring perennial indigenous flora species.				

13. Monitoring Measures

The following section presents the proposed monitoring actions for monitoring and reporting on the implementation of the impact mitigation actions presented in the preceding Section **Error! Reference source not found..**

The content of this section is largely based on the monitoring requirements outlined in Appendix 4 of the EIA Regulations, 2014.

For each monitoring action, the following information is provided:

- Category: The category within which the potential impact and/or risk occurs
- Potential impact/risk: Identified potential impact/risk resulting from the pre-construction, construction, operation, and closure of the proposed Project
- Method for monitoring : The method for monitoring the implementation of the recommended mitigation measures
- Time period: The time period over which the monitoring actions must be implemented
- Frequency of monitoring: The frequency of monitoring the implementation of the recommended mitigation measures
- Mechanism for monitoring compliance: The mechanism for monitoring compliance with the impact management actions
- Responsible persons: The persons who will be responsible for the implementation of the monitoring actions

As with the impact management actions, the proposed monitoring actions have been arranged according to the following project phases:

- Pre-construction;
- Construction;
- Operational; and
- Decommissioning

Table 13 presents a summary of the proposed monitoring actions during the construction, operational and decommissioning phases

Table 13: Recommended monitoring measures

Ref. No.	Category	Method for monitoring	Time period	Frequency of monitoring	Mechanism for monitoring compliance	Responsible person
1. Construction and Operational phase						
1.1	Alien invasive species	<ul style="list-style-type: none"> Annual on-site alien invasive species monitoring should be conducted. Monitoring should focus on: <ul style="list-style-type: none"> All sites disturbed during the construction phase; Wetland areas adjacent to construction sites; and Monitoring should assess species type and density, and these data should inform the scope of ongoing alien invasive species control. 	Wet/growing season	Annual	Annual Monitoring Report	Project Manager
1.2	Flora SCC	<ul style="list-style-type: none"> Monitoring of the Sensitive species 41 plants should be conducted during the wet season flowering period; As required, the findings of monitoring should inform additional conservation actions to protect these plants. 	October – November	Annually during construction, and for a three period after construction.	Annual Monitoring Report	Project Manager
2. Decommissioning phase						

Ref. No.	Category	Method for monitoring	Time period	Frequency of monitoring	Mechanism for monitoring compliance	Responsible person
2.1	Alien invasive species	<ul style="list-style-type: none"> Alien invasive species monitoring should be conducted on an annual basis during decommissioning and annually for a five-year period following decommissioning. Monitoring should focus on: <ul style="list-style-type: none"> All sites disturbed during decommissioning; Wetland areas adjacent to former development sites; and Monitoring should assess species type and density, and these data should inform the scope of ongoing alien invasive species control. 	Wet/growing season	Annually during decommissioning and for a five-year period after decommissioning	Annual Monitoring Report	Facility Manager

14. Reasoned Opinion and Environmental Impact Statement

14.1. Summary of Main Findings

The proposed Project site is characterised by Eastern Highveld Grassland and Soweto Highveld Grassland vegetation types, which according to the NEMBA Threatened Ecosystems (2021), are listed as Endangered and Vulnerable, respectively.

Five habitat units are present across the Project site, including both natural habitats and modified habitats. Modified habitats (i.e., Cultivated Fields, Alien Tree Plantations and Old Lands), are of little conservation value and have Site Ecological Importance ratings of 'Very Low'. Natural habitat units (i.e., Mixed Dry Grassland and Moist Grassland) provide important habitat for flora, and they contribute to broader habitat connectivity, which is an important component of maintaining landscape-scale ecological processes, metapopulation dynamics and terrestrial biodiversity. These have Site Ecological Importance ratings of 'High'.

One threatened flora species on the national Red List was recorded in the Project site, namely Sensitive species 41 (Vulnerable). In addition, one species (*Kniphofia ensifolia* subsp. *ensifolia*) that is listed as Near Threatened on the Mpumalanga Red List was recorded in the AOI, but not within the proposed Project site. Habitat suitability assessments suggest that it is possible that a number of nationally threatened taxa may be present in patches of natural habitat in the AOI and Project site. Several flora species that are listed as protected at a provincial level, as per the Mpumalanga Nature Conservation Act (Act No. 10 of 1998), were also recorded on-site. It is therefore possible that flora SCC may be negatively impacted during construction phase vegetation clearing and associated earth works.

The National Web Based Screening Tool rated the Plant Species Theme for the Project site as 'Medium' sensitivity, based on the potential presence of several flora SCC. The findings of this study indicate that patches of undisturbed natural habitat have a High sensitivity rating.

Key mitigation and management measures that are recommended for the proposed Project with respects to minimising impacts on potential flora SCC, include *inter alia*: 1) positioning pylons/tower footprints outside a recommended 200 m buffer around the Sensitive species 41 locations; 2) positioning as much of the proposed Project infrastructure as possible to areas of modified habitat (e.g., Cultivated Fields), and in areas of natural habitat micro-siting all infrastructure to localised disturbed sites; 3) conducting a wet/growing season survey of the Project site to identify and locate any other flora SCC and inform micro-siting options and the protected plant rescue and relocation requirements; 4) strictly clearing only the minimum footprint areas required for construction activities; and 5) actively rehabilitating all disturbance footprints and controlling alien invasive species colonisation and erosion post-construction.

The successful implementation of the management measures presented in this report can effectively mitigate the identified impacts, resulting in 'Low' residual impact scores. It is recommended that all mitigation and management measures should be incorporated into the proposed Project's environmental management plan (EMP).

14.2. Conditions to be Included in the Environmental Authorisation

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

14.3. 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 on terrestrial plant species, 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
Terrestrial Ecologist
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South Africa
Date of birth: 14 July 1982
Nationality: South African

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	<ul style="list-style-type: none"> • Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or Critically Rare species that have a global EOO of < 10km²; • 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 • Globally significant populations of congregatory species (>10% of global population).
High	<ul style="list-style-type: none"> • Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10km², 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; • Small area (>0.01% but <0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (>0.1%) of natural habitat of VU ecosystem type; • Presence of Rare species; • Globally significant populations of congregatory species (>1% but < 10% of global population).
Medium	<ul style="list-style-type: none"> • Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals; • Any area of natural habitat of threatened ecosystem type with status of VU; • Presence of range-restricted species; and • >50% of receptor contains natural habitat to support SCC.
Low	<ul style="list-style-type: none"> • No confirmed or highly likely populations of SCC; • No confirmed or highly likely populations of range-restricted species; and • <50% of receptor contains natural habitat with limited potential to support SCC.
Very Low	<ul style="list-style-type: none"> • No confirmed and highly unlikely populations of SCC; • No confirmed and highly unlikely populations of range-restricted species; and • No natural habitat remaining.

Table 2: Functional Integrity (FI) criteria.

Functional Integrity (FI)	Fulfilling Criteria
Very High	<ul style="list-style-type: none"> • Very large (>100 ha) intact area for any conservation status of ecosystem type or >5a ha for CR ecosystem type; • High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches; • No or minimal current negative ecological impacts with no signs of major disturbance (e.g., ploughing)
High	<ul style="list-style-type: none"> • Large (>5 ha but < 100 ha) intact area for any conservation status ecosystem types; • Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches; and • 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	<ul style="list-style-type: none"> • Medium (>5ha but < 20 ha) semi-intact area for any conservation status ecosystem type or >20 ha for VU ecosystem type; • Only narrow corridors of good connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches; • Mostly minor current negative ecological impacts with some major impacts (e.g., established population of alien invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential.
Low	<ul style="list-style-type: none"> • Small (> 1 ha but <5ha) area; • Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential; and • Several minor and major current negative ecological impacts.
Very Low	<ul style="list-style-type: none"> • Very small (<1 ha) area; • No habitat connectivity except for flying species or flora with wind-dispersed seeds; • Several major current negative ecological impacts.

$$BI = CI + FI$$

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

Table 4: 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.

Appendix C: Flora species recorded in the AOI during the field survey.

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units				
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Mixed Dry Grassland	Rocky Shrubland	Moist Grassland	Old lands (secondary grassland)	Modified & Transformed Sites (e.g., Alien Tree Plantations, Cultivated Fields), road sides, farm yards)
Acanthaceae	<i>Blepharis species</i>	Herb	Indigenous	LC	-	-	x				
Achariaceae	<i>Kiggelaria africana</i>	Tree	Indigenous	LC	-	-		x			
Agavaceae	<i>Agave americana*</i>	Succulent	Alien	NE	-	-					x
Agavaceae	<i>Chlorophytum cooperi</i>	Herb	Indigenous	LC	-	-		x			
Aizoaceae	<i>Delosperma sutherlandii</i>	Succulent	Indigenous	LC	-	-			x		
Aizoaceae	<i>Mossia intervallaris</i>	Succulent	Indigenous	LC	-	-		x			
Amaranthaceae	<i>Achyranthes aspera</i> subsp. <i>aspera*</i>	Herb	Alien	NE	-	-		x			
Amaranthaceae	<i>Amaranthus hybridus*</i>	Herb	Alien	NE	-	-					x
Amaranthaceae	<i>Chenopodium album*</i>	Herb	Alien	NE	-	-					x
Amaranthaceae	<i>Gomphrena celosioides*</i>	Herb	Alien	NE	-	-	x	x			
Amaranthaceae	<i>Guilleminea densa*</i>	Herb	Alien	NE	-	-					x
Amaryllidaceae	<i>Boophone disticha</i>	Geophytic Herb	Indigenous	LC	-	Protected	x	x			
Amaryllidaceae	<i>Crinum bulbispermum</i>	Geophyte	Indigenous	LC	-	Protected			x		
Amaryllidaceae	<i>Haemanthus humilis</i>	Geophyte	Indigenous	LC	-	Protected		x			
Amaryllidaceae	<i>Nerine krigei</i>	Geophyte	Indigenous	LC	-	-			x		
Anacardiaceae	<i>Searsia dentata</i>	Dwarf Shrub	Indigenous	LC	-	-		x			
Anacardiaceae	<i>Searsia discolor</i>	Dwarf Shrub	Indigenous	LC	-	-		x			
Anacardiaceae	<i>Searsia pyroides</i> var. <i>gracilis</i>	Tree	Indigenous	LC	-	-		x			
Apiaceae	<i>Berula erecta</i>	Herb	Indigenous	LC	-	-			x		
Apiaceae	<i>Centella asiatica*</i>	Herb	Alien	NE	-	-	x		x		
Apiaceae	<i>Heteromorpha arborescens</i> var. <i>abyssinica</i>	Tree	Indigenous	LC	-	-		x			
Apiaceae	<i>Pimpinella transvaalensis</i>	Herb	Indigenous	LC	-	-	x	x	x		

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units				
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Mixed Dry Grassland	Rocky Shrubland	Moist Grassland	Old lands (secondary grassland)	Modified & Transformed Sites (e.g., Alien Tree Plantations, Cultivated Fields), road sides, farm yards)
Apocynaceae	<i>Acokanthera rotundata</i>	Shrub	Indigenous	LC	-	-		x			
Apocynaceae	<i>Asclepias stellifera</i>	Herb	Indigenous	LC	-	-			x		
Apocynaceae	<i>Gomphocarpus fruticosus</i>	Shrub	Indigenous	LC	-	-	x		x		
Apocynaceae	<i>Xysmalobium undulatum</i>	Herb	Indigenous	LC	-	-			x		
Asparagaceae	<i>Asparagus cf. virgatus</i>	Shrub	Indigenous	LC	-	-		x			
Asparagaceae	<i>Asparagus laricinus</i>	Shrub	Indigenous	LC	-	-	x	x			
Asphodelaceae	<i>Aloe ecklonis</i>	Succulent	Indigenous	LC	-	Protected		x			
Asphodelaceae	<i>Aloe species (maculata)</i>	Succulent	Indigenous	-	-	Protected		x			
Asphodelaceae	<i>Kniphofia ensifolia</i> subsp. <i>ensifolia</i>	Herb	Indigenous	LC	NT	Protected	x				
Asteraceae	<i>Berkheya pinnatifida ingrata</i>	Herb	Indigenous	LC	-	-	x	x	x	x	
Asteraceae	<i>Berkheya radula</i>	Herb	Indigenous	LC	-	-	x	x	x		
Asteraceae	<i>Berkheya setifera</i>	Herb	Indigenous	LC	-	-	x	x	x	x	
Asteraceae	<i>Berkheya speciosa</i>	Herb	Indigenous	LC	-	-	x		x		
Asteraceae	<i>Bidens pilosa</i> *	Herb	Alien	NE	-	-	x	x		x	
Asteraceae	<i>Campuloclinium macrocephalum</i> *	Herb	Alien	NE	-	-					x
Asteraceae	<i>Cirsium vulgare</i> *	Herb	Alien (NEMBA Category 1b)	NE	-	-	x	x	x	x	x
Asteraceae	<i>Conyza bonariensis</i> *	Herb	Alien	NE	-	-	x		x	x	
Asteraceae	<i>Conyza canadensis</i> *	Herb	Alien	NE	-	-	x			x	
Asteraceae	<i>Cosmos bipinnatus</i> *	Herb	Alien	NE	-	-					x
Asteraceae	<i>Felicia cf. pleiocephalus</i>	Herb	Indigenous	LC	-	-	x				
Asteraceae	<i>Felicia filifolia</i>	Shrub	Indigenous	LC	-	-	x	x			
Asteraceae	<i>Gazania species</i>	Herb	Indigenous	LC	-	-			x		
Asteraceae	<i>Gerbera piloselloides</i>	Geophytic herb	Indigenous	LC	-	-	x				
Asteraceae	<i>Geigeria burkei</i>	Herb	Indigenous	LC	-	-			x		
Asteraceae	<i>Haplocarpha lyrata</i>	Herb	Indigenous	LC	-	-	x		x		
Asteraceae	<i>Haplocarpha scaposa</i>	Herb	Indigenous	LC	-	-	x	x	x		

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units				
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Mixed Dry Grassland	Rocky Shrubland	Moist Grassland	Old lands (secondary grassland)	Modified & Transformed Sites (e.g., Alien Tree Plantations, Cultivated Fields), road sides, farm yards)
Asteraceae	<i>Helichrysum acutatum</i>	Herb	Indigenous	LC	-	-	x				
Asteraceae	<i>Helichrysum aureonitens</i>	Herb	Indigenous	LC	-	-	x		x		
Asteraceae	<i>Helichrysum callicomum</i>	Herb	Indigenous	LC	-	-	x				
Asteraceae	<i>Helichrysum cephaloideum</i>	Herb	Indigenous	LC	-	-	x				
Asteraceae	<i>Helichrysum caespitium</i>	Herb	Indigenous	LC	-	-	x	x			
Asteraceae	<i>Helichrysum mundtii</i>	Herb	Indigenous	LC	-	-			x		
Asteraceae	<i>Helichrysum nudifolium</i> var. <i>nudifolium</i>	Herb	Indigenous	LC	-	-	x				
Asteraceae	<i>Helichrysum nudifolium</i> var. <i>pilosellum</i>	Herb	Indigenous	LC	-	-	x		x		
Asteraceae	<i>Helichrysum oreophilum</i>	Herb	Indigenous	LC	-	-	x				
Asteraceae	<i>Helichrysum rugulosum</i>	Herb	Indigenous	LC	-	-	x	x	x	x	
Asteraceae	<i>Hilliardiella aristata</i>	Herb	Indigenous	LC	-	-	x	x		x	
Asteraceae	<i>Hilliardiella elaeagnoides</i>	Herb	Indigenous	LC	-	-	x				
Asteraceae	<i>Hypochaeris radicata</i> *	Herb	Alien	NE	-	-	x	x			
Asteraceae	<i>Nidorella podocephala</i>	Herb	Indigenous	LC	-	-	x	x	x		
Asteraceae	<i>Nidorella sp.</i>	Herb	Indigenous	LC	-	-	x			x	
Asteraceae	<i>Pseudognaphalium luteo-album</i> *	Herb	Alien	NE	-	-			x	x	
Asteraceae	<i>Schistostephium crataegifolium</i>	Herb	Indigenous	LC	-	-	x				
Asteraceae	<i>Schkuhria pinnata</i> *	Herb	Alien	NE	-	-				x	
Asteraceae	<i>Senecio consanguineus</i>	Herb	Indigenous	LC	-	-	x		x	x	
Asteraceae	<i>Senecio coronatus</i>	Herb	Indigenous	LC	-	-	x				
Asteraceae	<i>Senecio erubescens</i>	Herb	Indigenous	LC	-	-			x		
Asteraceae	<i>Senecio gerrardii</i>	Herb	Indigenous	LC	-	-	x		x		
Asteraceae	<i>Senecio inornatus</i>	Herb	Indigenous	LC	-	-	x	x	x	x	
Asteraceae	<i>Senecio othonniflorus</i>	Herb	Indigenous	LC	-	-	x				
Asteraceae	<i>Seriphium plumosum</i>	Shrub	Indigenous	LC	-	-	x			x	
Asteraceae	<i>Sonchus cf. oleraceus</i> *	Herb	Alien	NE	-	-			x		

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units				
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Mixed Dry Grassland	Rocky Shrubland	Moist Grassland	Old lands (secondary grassland)	Modified & Transformed Sites (e.g., Alien Tree Plantations, Cultivated Fields), road sides, farm yards)
Asteraceae	<i>Tagetes minuta</i> *	Herb	Alien	NE	-	-				x	
Asteraceae	<i>Xanthium strumarium</i> *	Herb	Alien (NEMBA Category 1b)	NE	-	-					x
Blechnaceae	<i>Blechnum cf. australe</i>	Fern	Indigenous	LC	-	-		x			
Cactaceae	<i>Opuntia ficus-indica</i> *	Succulent	Alien (NEMBA Category 1b)	NE	-	-					x
Campanulaceae	<i>Wahlenbergia undulata</i>	Herb	Indigenous	LC	-	-	x	x		x	
Caryophyllaceae	<i>Pollichia campestris</i>	Shrub	Indigenous	LC	-	-	x	x			
Celastraceae	<i>Gymnosporia buxifolia</i>	Tree	Indigenous	LC	-	-		x			
Convolvulaceae	<i>Ipomoea ommaneyi</i>	Herb	Indigenous	LC	-	-	x				
Convolvulaceae	<i>Ipomoea transvaalensis</i>	Herb	Indigenous	LC	-	-	x				
Crassulaceae	<i>Crassula cf. peplodes</i>	Succulent	Indigenous	LC	-	-		x			
Crassulaceae	<i>Crassula lanceolata</i> subsp. <i>lanceolata</i>	Succulent	Indigenous	LC	-	-		x			
Crassulaceae	<i>Crassula setulosa</i>	Succulent	Indigenous	LC	-	-		x			
Crassulaceae	<i>Crassula</i> species	Succulent	Indigenous	-	-	-		x			
Cyperaceae	<i>Cyperus congesta</i>	Graminoid	Indigenous	LC	-	-			x		
Cyperaceae	<i>Cyperus denudatus</i>	Graminoid	Indigenous	LC	-	-			x		
Cyperaceae	<i>Cyperus esculentus</i> *	Graminoid	Alien	NE	-	-	x				
Cyperaceae	<i>Cyperus fastigiatus</i>	Graminoid	Indigenous	-	-	-			x		
Cyperaceae	<i>Cyperus marginatus</i>	Graminoid	Indigenous	-	-	-			x		
Cyperaceae	<i>Eleocharis limosa</i>	Graminoid	Indigenous	LC	-	-			x		
Cyperaceae	<i>Fuirena pubescens</i>	Herb	Indigenous	LC	-	-			x		
Cyperaceae	<i>Fuirena</i> species	Graminoid	Indigenous	LC	-	-			x		
Cyperaceae	<i>Kyllinga erecta</i>	Graminoid	Indigenous	LC	-	-	x		x		
Cyperaceae	<i>Pycnus mundii</i>	Graminoid	Indigenous	LC	-	-			x		
Cyperaceae	<i>Pycnus nitidus</i>	Graminoid	Indigenous	LC	-	-			x		
Cyperaceae	<i>Schoenoplectus brachyceras</i>	Graminoid	Indigenous	LC	-	-			x		
Cyperaceae	<i>Scirpoides burkei</i>	Graminoid	Indigenous	LC	-	-	x		x		
Cyperaceae	<i>Scirpoides</i> species	Graminoid	Indigenous	-	-	-			x		
Cyperaceae	<i>Scleria</i> species	Graminoid	Indigenous	LC	-	-			x		

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units				
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Dipsacaceae	<i>Scabiosa columbaria</i>	Herb	Indigenous	LC	-	-	x	x	x		
Ebenaceae	<i>Diospyros austro-africana</i>	Tree	Indigenous	LC	-	-		x			
Ebenaceae	<i>Diospyros lycioides</i>	Tree	Indigenous	LC	-	-	x	x		x	
Ebenaceae	<i>Euclea crispa</i>	Tree	Indigenous	LC	-	-		x			
Euphorbiaceae	<i>Acalypha angustata</i>	Herb	Indigenous	LC	-	-	x				
Euphorbiaceae	<i>Euphorbia striata</i>	Herb	Indigenous	LC	-	-	x				
Fabaceae	<i>Acacia dealbata</i> *	Tree	Alien (NEMBA Category 2)	NE	-	-	x	x			x
Fabaceae	<i>Acacia mearnsii</i> *	Tree	Alien (NEMBA Category 2)	NE	-	-		x			x
Fabaceae	<i>Commelina africana</i>	Herb	Indigenous	LC	-	-		x		x	
Fabaceae	<i>Erythrina zeyheri</i>	Tree	Indigenous	LC	-	-	x				
Fabaceae	<i>Indigofera daleoides</i>	Herb	Indigenous	LC	-	-	x				
Fabaceae	<i>Indigofera hedyantha</i>	Herb	Indigenous	LC	-	-	x		x		
Fabaceae	<i>Lespedeza cuneata</i> *	Shrub	Alien	NE	-	-	x		x		
Fabaceae	<i>Melilotus albus</i> *	Herb	Alien	NE	-	-					x
Fabaceae	<i>Robinia pseudoacacia</i> *	Tree	Alien (NEMBA Category 1b)	NE	-	-					x
Fabaceae	<i>Tephrosia capensis</i>	Herb	Indigenous	LC	-	-			x		
Fabaceae	<i>Trifolium repens</i> *	Herb	Alien	NE	-	-			x		
Fabaceae	<i>Vigna vexillata</i>	Herb	Indigenous	LC	-	-	x				
Fabaceae	<i>Zornia linearis</i>	Herb	Indigenous	LC	-	-			x		
Fagaceae	<i>Quercus ruber</i> *	Tree	Alien	NE	-	-			x		
Gentianaceae	<i>Chironia purpurascens</i>	Herb	Indigenous	LC	-	-			x		
Geraniaceae	<i>Pelargonium cf. dolomiticum</i>	Herb	Indigenous	LC	-	-			x		
Geraniaceae	<i>Pelargonium luridum</i>	Herb	Indigenous	LC	-	-	x		x		
Hyacinthaceae	<i>Dipcadi marlothii</i>	Herb	Indigenous	LC	-	-	x				
Hyacinthaceae	<i>Dipcadi viride</i>	Herb	Indigenous	LC	-	-	x				
Hyacinthaceae	<i>Ledebouria cooperi</i>	Herb	Indigenous	LC	-	-					

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Hyacinthaceae	<i>Ledebouria ovatifolia</i>	Herb	Indigenous	LC	-	-	x	x	x		
Hyacinthaceae	<i>Ledebouria revoluta</i>	Herb	Indigenous	LC	-	-		x			
Hydrocharitaceae	<i>Lagarosiphon</i> species	Herb	Indigenous	-	-	-			x		
Hypoxidaceae	<i>Hypoxis acuminata</i>	Herb	Indigenous	LC	-	-	x	x			
Hypoxidaceae	<i>Hypoxis argentea</i>	Herb	Indigenous	LC	-	-	x				
Hypoxidaceae	<i>Hypoxis costata</i>	Herb	Indigenous	LC	-	-	x				
Hypoxidaceae	<i>Hypoxis galpinii</i>	Herb	Indigenous	LC	-	-	x				
Hypoxidaceae	<i>Hypoxis iridifolia</i>	Herb	Indigenous	LC	-	-	x				
Hypoxidaceae	<i>Hypoxis rigidula</i>	Herb	Indigenous	LC	-	-	x				
Iridaceae	<i>Crocasmia paniculata</i>	Herb	Indigenous	LC	-	-			x		
Iridaceae	<i>Dierama</i> species	Herb	Indigenous	-	-	-			x		
Iridaceae	<i>Gladiolus crassifolius</i>	Geophytic herb	Indigenous	LC	-	Protected			x		
Iridaceae	<i>Gladiolus elliotii</i>	Geophytic herb	Indigenous	LC	-	Protected			x		
Iridaceae	<i>Gladiolus longicollis</i> subsp. <i>platypetalus</i>	Geophytic herb	Indigenous	LC	-	Protected			x		
Iridaceae	<i>Gladiolus sericeovillosus</i> subsp. <i>calvatus</i>	Geophytic herb	Indigenous	LC	-	Protected			x		
Iridaceae	<i>Gladiolus</i> species (no flowers)	Geophytic herb	Indigenous	LC	-	Protected	x			x	
Iridaceae	<i>Watsonia</i> species (no flowers)	Herb	Indigenous	-	-	Protected			x		
Juncaceae	<i>Juncus dregeanus</i>	Graminoid	Indigenous	LC	-	-			x		
Juncaceae	<i>Juncus effusus</i>	Graminoid	Indigenous	LC	-	-			x		
Juncaceae	<i>Juncus oxycarpus</i>	Graminoid	Indigenous	LC	-	-			x		
Juncaceae	<i>Juncus oxymeris</i>	Graminoid	Indigenous	LC	-	-			x		
Lamiaceae	<i>Acrotome</i> cf. <i>inflata</i>	Herb	Indigenous	LC	-	-		x			
Lamiaceae	<i>Leonotis dysophylla</i>	Shrub	Indigenous	LC	-	-		x			
Lamiaceae	<i>Mentha longifolia</i>	Herb	Indigenous	LC	-	-			x		
Lamiaceae	<i>Ocimum obovatum</i> subsp. <i>obovatum</i>	Herb	Indigenous	LC	-	-	x				

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Lamiaceae	<i>Coleus kirkii</i> (=Pycnostachys reticulata)	Herb	Indigenous	LC	-	-			x		
Lamiaceae	<i>Rabdosiella calycina</i>	Shrub	Indigenous	LC	-	-		x			
Lamiaceae	<i>Salvia repens</i>	Herb	Indigenous	LC	-	-	x				
Lamiaceae	<i>Syncolostemon pretoriae</i> (=Hemizygia pretoriae)	Herb	Indigenous	LC	-	-	x				
Lobeliaceae	<i>Lobelia flaccida</i>	Herb	Indigenous	LC	-	-	x	x	x	x	
Lobeliaceae	<i>Lobelia erinus</i>	Herb	Indigenous	LC	-	-	x				
Lobeliaceae	<i>Monopsis decipiens</i>	Herb	Indigenous	LC	-	-	x		x		
Lythraceae	<i>Nesaea radicans</i>	Herb	Indigenous	LC	-	-	x				
Malvaceae	<i>Hermannia depressa</i>	Herb	Indigenous	LC	-	-	x	x	x		
Malvaceae	<i>Hermannia transvaalensis</i>	Herb	Indigenous	LC	-	-	x	x	x		
Malvaceae	<i>Hibiscus microcarpus</i>	Herb	Indigenous	LC	-	-	x				
Malvaceae	<i>Hibiscus trionum</i> *	Herb	Alien	LC	-	-	x			x	
Malvaceae	<i>Malva parviflora</i> *	Herb	Alien	NE	-	-					x
Myrtaceae	<i>Eucalyptus</i> species*	Tree	Alien (NEMBA Category 2 or not listed)	NE	-	-		x	x		x
Onagraceae	<i>Ludwigia octovalvis</i>	Herb	Indigenous	LC	-	-			x		
Onagraceae	<i>Oenothera indecora</i> *	Herb	Alien	NE	-	-			x		
Onagraceae	<i>Oenothera rosea</i> *	Herb	Alien	NE	-	-	x		x		
Orobanchaceae	<i>Striga bilabiata</i>	Herb	Indigenous	LC	-	-		x			
Orobanchaceae	<i>Striga elegans</i>	Herb	Indigenous	LC	-	-	x				
Oxalidaceae	<i>Oxalis corniculata</i> *	Herb	Alien	NE	-	-	x				
Oxalidaceae	<i>Oxalis obliquifolia</i>	Herb	Indigenous	LC	-	-	x				
Papaveraceae	<i>Papaver aculeatum</i> *	Herb	Alien	NE	-	-					
Pinaceae	<i>Pinus patula</i> *	Tree	Alien (NEMBA Category 2)	NE	-	-					x
Plantaginaceae	<i>Plantago lanceolata</i> *	Herb	Alien	NE	-	-			x		

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Plantaginaceae	<i>Plantago major</i> *	Herb	Alien	NE	-	-	x	x			
Poaceae	<i>Agrostis eriantha</i>	Graminoid	Indigenous	LC	-	-			x		
Poaceae	<i>Agrostis lachnantha</i>	Graminoid	Indigenous	LC	-	-		x	x		
Poaceae	<i>Andropogon appendiculatus</i>	Graminoid	Indigenous	LC	-	-		x	x		
Poaceae	<i>Andropogon eucomus</i>	Graminoid	Indigenous	LC	-	-			x		
Poaceae	<i>Aristida aequiglumis</i>	Graminoid	Indigenous	LC	-	-	x				
Poaceae	<i>Aristida bipartita</i>	Graminoid	Indigenous	LC	-	-	x				
Poaceae	<i>Aristida congesta</i> subsp. <i>congesta</i>	Graminoid	Indigenous	LC	-	-	x	x		x	
Poaceae	<i>Aristida congesta</i> subsp. <i>barbicollis</i>	Graminoid	Indigenous	LC	-	-		x			
Poaceae	<i>Aristida junciformis</i>	Graminoid	Indigenous	LC	-	-	x		x		
Poaceae	<i>Arundinella nepalensis</i>	Graminoid	Indigenous	LC	-	-			x		
Poaceae	<i>Brachiaria serrata</i>	Graminoid	Indigenous	LC	-	-	x	x			
Poaceae	<i>Bromus catharticus</i>	Graminoid	Alien	NE	-	-		x			x
Poaceae	<i>Chloris virgata</i>	Graminoid	Indigenous	LC	-	-					x
Poaceae	<i>Cortaderia selloana</i> *	Graminoid	Alien (NEMBA Category 1b)	NE	-	-				x	
Poaceae	<i>Cymbopogon caesius</i>	Graminoid	Indigenous	LC	-	-	x	x			
Poaceae	<i>Cymbopogon nardus</i>	Graminoid	Indigenous	LC	-	-		x			
Poaceae	<i>Cymbopogon pospischilii</i>	Graminoid	Indigenous	LC	-	-	x	x	x		
Poaceae	<i>Cynodon dactylon</i>	Graminoid	Indigenous	LC	-	-			x		
Poaceae	<i>Digitaria eriantha</i>	Graminoid	Indigenous	LC	-	-	x				
Poaceae	<i>Elionurus muticus</i>	Graminoid	Indigenous	LC	-	-	x	x			
Poaceae	<i>Eragrostis capensis</i>	Graminoid	Indigenous	LC	-	-	x				
Poaceae	<i>Eragrostis chloromelas</i>	Graminoid	Indigenous	LC	-	-	x	x	x	x	
Poaceae	<i>Eragrostis curvula</i>	Graminoid	Indigenous	LC	-	-	x	x	x	x	
Poaceae	<i>Eragrostis gummiflua</i>	Graminoid	Indigenous	LC	-	-	x		x		
Poaceae	<i>Eragrostis</i> cf. <i>heteromera</i>	Graminoid	Indigenous	LC	-	-			x		
Poaceae	<i>Eragrostis plana</i>	Graminoid	Indigenous	LC	-	-	x	x	x	x	

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units				
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Mixed Dry Grassland	Rocky Shrubland	Moist Grassland	Old lands (secondary grassland)	Modified & Transformed Sites (e.g., Alien Tree Plantations, Cultivated Fields), road sides, farm yards)
Poaceae	<i>Eragrostis pseudosclerantha</i>	Graminoid	Indigenous	LC	-	-	x	x			
Poaceae	<i>Eragrostis racemosa</i>	Graminoid	Indigenous	LC	-	-	x	x			
Poaceae	<i>Eragrostis</i> species	Graminoid	Indigenous	LC	-	-	x	x		x	
Poaceae	<i>Harpachloa falx</i>	Graminoid	Indigenous	LC	-	-	x	x			
Poaceae	<i>Helictotrichon turgidulum</i>	Graminoid	Indigenous	LC	-	-	x	x			
Poaceae	<i>Heteropogon contortus</i>	Graminoid	Indigenous	LC	-	-		x			
Poaceae	<i>Hyparrhenia dregeana</i>	Graminoid	Indigenous	LC	-	-	x	x	x	x	x
Poaceae	<i>Hyparrhenia hirta</i>	Graminoid	Indigenous	LC	-	-	x	x	x	x	
Poaceae	<i>Hyparrhenia tamba</i>	Graminoid	Indigenous	LC	-	-	x			x	
Poaceae	<i>Imperata cylindrica</i>	Graminoid	Indigenous	LC	-	-			x	x	
Poaceae	<i>Koeleria capensis</i>	Graminoid	Indigenous	LC	-	-		x			
Poaceae	<i>Leersia hexandra</i>	Graminoid	Indigenous	LC	-	-			x		
Poaceae	<i>Lolium</i> cf. <i>multiflorum</i> *	Graminoid	Alien	NE	-	-					x
Poaceae	<i>Melinis nerviglumis</i>	Graminoid	Indigenous	LC	-	-		x			
Poaceae	<i>Microchloa caffra</i>	Graminoid	Indigenous	LC	-	-	x	x			
Poaceae	<i>Panicum schinzii</i>	Graminoid	Indigenous	LC	-	-					x
Poaceae	<i>Panicum maximum</i>	Graminoid	Indigenous	LC	-	-					x
Poaceae	<i>Paspalum dilatatum</i> *	Graminoid	Alien	NE	-	-	x		x		x
Poaceae	<i>Paspalum distichum</i>	Graminoid	Indigenous	LC	-	-			x		
Poaceae	<i>Paspalum urvillei</i> *	Graminoid	Alien	NE	-	-			x		x
Poaceae	<i>Pennisetum clandestinum</i> *	Graminoid	Alien (NEMBA Category 1b)	NE	-	-			x		x
Poaceae	<i>Pennisetum sphacelatum</i>	Graminoid	Indigenous	LC	-	-	x		x		
Poaceae	<i>Pennisetum thunbergii</i>	Graminoid	Indigenous	LC	-	-	x		x		
Poaceae	<i>Phragmites australis</i>	Graminoid	Indigenous	LC	-	-			x		
Poaceae	<i>Setaria pallide-fusca</i>	Graminoid	Indigenous	LC	-	-		x			
Poaceae	<i>Setaria</i> species	Graminoid	Indigenous	LC	-	-	x				
Poaceae	<i>Setaria sphacelata</i>	Graminoid	Indigenous	LC	-	-	x				

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units				
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Mixed Dry Grassland	Rocky Shrubland	Moist Grassland	Old lands (secondary grassland)	Modified & Transformed Sites (e.g., Alien Tree Plantations, Cultivated Fields), road sides, farm yards)
Poaceae	<i>Sorghum halepense*</i>	Graminoid	Alien (NEMBA Category 2)	LC	-	-					
Poaceae	<i>Sporobolus africanus</i>	Graminoid	Indigenous	LC	-	-	x	x			
Poaceae	<i>Stipagrostis species</i>	Graminoid	Indigenous	LC	-	-	x				
Poaceae	<i>Themeda triandra</i>	Graminoid	Indigenous	LC	-	-	x	x	x		
Poaceae	<i>Trachypogon spicatus</i>	Graminoid	Indigenous	LC	-	-	x				
Poaceae	<i>Tragus berteronianus</i>	Graminoid	Indigenous	LC	-	-					x
Poaceae	<i>Tristachya leucothrix</i>	Graminoid	Indigenous	LC	-	-	x	x			
Poaceae	<i>Urochloa panicoides</i>	Graminoid	Indigenous	LC	-	-					x
Polygalaceae	<i>Polygala hottentotta</i>	Herb	Indigenous	LC	-	-	x		x		
Polygonaceae	<i>Persicaria decipiens</i>	Herb	Indigenous	LC	-	-			x		
Polygonaceae	<i>Persicaria lapathifolia*</i>	Herb	Alien	NE	-	-			x		
Polygonaceae	<i>Rumex acetosella*</i>	Herb	Alien	NE	-	-	x		x	x	
Polygonaceae	<i>Rumex crispus*</i>	Herb	Alien	NE	-	-			x		
Pteridaceae	<i>Cheilanthes hirta</i> var. <i>hirta</i>	Fern	Indigenous	LC	-	-		x			
Pteridaceae	<i>Pellaea calomelanos</i> var. <i>calomelanos</i>	Fern	Indigenous	LC	-	-		x			
Rhamnaceae	<i>Phyllica paniculata</i>	Shrub	Indigenous	LC	-	-		x			
Rosaceae	<i>Agrimonia procera</i>	Herb	Indigenous	LC	-	-		x	x		
Rosaceae	<i>Cotoneaster franchetii*</i>	Tree	Alien	NE	-	-		x			
Rosaceae	<i>Prunus persica*</i>	Tree	Alien	NE	-	-					x
Rosaceae	<i>Pyracantha angustifolia*</i>	Tree	Alien (NEMBA Category 1b)	NE	-	-		x	x		
Rosaceae	<i>Rubus ludwigii</i>	Shrub	Indigenous	LC	-	-		x			
Rubiaceae	<i>Oldenlandia herbacea</i>	Herb	Indigenous	LC	-	-		x			
Rubiaceae	<i>Pentanisia prunelloides</i>	Shrub	Indigenous	LC	-	-	x				
Rubiaceae	<i>Pygmaeothamnus zeyheri</i> var. <i>zeyheri</i>	Dwarf Shrub	Indigenous	LC	-	-	x				
Rubiaceae	<i>Richardia brasiliensis*</i>	Herb	Alien	NE	-	-	x			x	x
Salicaceae	<i>Populus cf. niger*</i>	Tree	Alien	NE	-	-					x

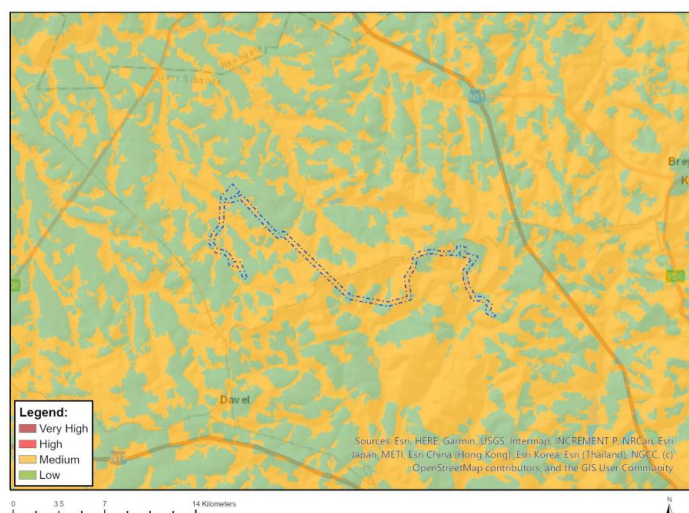
Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units				
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Mixed Dry Grassland	Rocky Shrubland	Moist Grassland	Old lands (secondary grassland)	Modified & Transformed Sites (e.g., Alien Tree Plantations, Cultivated Fields), road sides, farm yards)
Salicaceae	<i>Populus x canescens*</i>	Tree	Alien (NEMBA Category 2)	NE	-	-			x		x
Salicaceae	<i>Salix babylonica*</i>	Tree	Alien	NE	-	-			x		x
Scrophulariaceae	<i>Chaenostoma cf. cordatum</i>	Herb	Indigenous	LC	-	-			x		
Scrophulariaceae	<i>Jamesbrittenia aurantiaca</i>	Herb	Indigenous	LC	-	-	x				
Scrophulariaceae	<i>Limosella</i> sp.	Herb	Indigenous	LC	-	-			x		
Scrophulariaceae	<i>Nemesia fruticans</i>	Herb	Indigenous	LC	-	-	x		x		
Scrophulariaceae	<i>Selago densiflora</i>	Herb	Indigenous	-	-	-	x		x	x	
Selaginellaceae	<i>Selaginella dregei</i>	Fern	Indigenous	LC	-	-		x			
Solanaceae	<i>Datura stramonium*</i>	Herb	Alien (NEMBA Category 1b)	NE	-	-					x
Solanaceae	<i>Physalis angulata*</i>	Shrub	Alien	NE	-	-					
Solanaceae	<i>Solanum elaeagnifolium*</i>	Herb	Alien (NEMBA Category 1b)	NE	-	-	x	x			
Solanaceae	<i>Solanum panduriforme</i>	Shrub	Indigenous	LC	-	-	x	x			
Solanaceae	<i>Solanum sisymbriifolium*</i>	Herb	Alien (NEMBA Category 1b)	NE	-	-	x	x			
Typhaceae	<i>Typha capensis</i>	Graminoid	Indigenous	LC	-	-			x		
Verbenaceae	<i>Verbena brasiliensis*</i>	Herb	Alien (NEMBA Category 1b)	NE	-	-		x	x	x	
Verbenaceae	<i>Verbena bonariensis*</i>	Herb	Alien (NEMBA Category 1b)	NE	-	-	x		x	x	x
Verbenaceae	<i>Verbena rigida*</i>	Herb	Alien (NEMBA Category 1b)	NE	-	-	x			x	x
-	Sensitive species 41	Geophytic herb	Indigenous	VU	VU	Protected	x		x		

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units				
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Mixed Dry Grassland	Rocky Shrubland	Moist Grassland	Old lands (secondary grassland)	Modified & Transformed Sites (e.g., Alien Tree Plantations, Cultivated Fields), road sides, farm yards)
<u>Red List Categories</u> NE = Not Evaluated LC = Least Concern NT = Near Threatened VU = Vulnerable											
*Indicates alien species											

Appendix D: Summary and Comment on the Sensitivity Rating of the DFFE Screening Tool

Sensitivity Rating of the National Web Based Screening Tool

The National Web-based Environmental Screening Tool rates the Plant Species Theme for the proposed Project as 'Medium' sensitivity on account of the potential presence of several flora species of conservation concern that are listed in the table below. Also refer to the map showing the spatial sensitivity.



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Medium	Sensitive species 1252
Medium	Khadia carolinensis
Medium	Aspidoglossum xanthosphaerum
Medium	Miraglossum davyi
Medium	Sensitive species 41
Medium	Sensitive species 691
Medium	Pachycarpus suaveolens

Appraisal of the Sensitivity Rating

Sensitive species 41 was recorded in the Project site during the field programme. Habitat suitability assessments also indicate that it is probable that a number of such taxa may be present in the AOI, including species highlighted by the screening tool, such as *Pachycarpus suaveolens*, Sensitive species and 691 Sensitive species 851. Based on the findings of this study, the sensitivity rating for the Project site is therefore rated 'high'.

Appendix E: Compliance with Plant Species Protocol.

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Plant Species	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 7.2.1
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 7.2.1
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 7.2.1
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 10.3
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 7.2.1
2.2.6 determine the potential impact of the proposed development on the habitat of the SCC located within the study area;	Section 10.3
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 7.2.1
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 8
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 8 & Section 10.3
2.2.10 determine buffer distances as per the Species Environmental Assessment Guidelines used for the population of each SCC;	Section 12
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 species ¹⁰ ; or roosting and breeding or foraging areas used by migratory species where these species show significant congregations, occurring in the vicinity	Section 7.2.1
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 9
3.1 This report must include as a minimum the following information:	
3.1.1 contact details and relevant experience as well as the SACNASP	Page 3 & Appendix A

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Plant Species	Relevant Section in Report
registration number of the specialist preparing the assessment including a curriculum vitae;	
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 10.1
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 & Appendix B
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 7.2.1
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 10.3.4
3.1.11 impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	Section 12 & Section 13
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 14
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

ANIMAL SPECIES SPECIALIST ASSESSMENT FOR THE PROPOSED PHEFUMULA EMOYENI ONE - UP TO 400KV ELECTRICAL GRID INFRASTRUCTURE PROJECT

WSP Group Africa Pty (Ltd)

January 2025



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

Report Compiled By:
Andrew Zinn (*Pr.Sci.Nat.*)
Hawkhead Consulting

Acronyms and Abbreviations

Abbreviation	Explanation
AIS	Alien Invasive Species
AOI	Area of Influence
AOO	Area of Occupancy
BI	Biodiversity Importance
CA	Conservation Areas
CI	Conservation Importance
DFFE	Department of Forestry, Fisheries and the Environment
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
EOO	Extent of Occurrence
FI	Functional Integrity
Ha	Hectare
IUCN	International Union for the Conservation of Nature
MPTA	Mpumalanga Parks and Tourism Agency
NEMA	National Environmental Management Act
NEMBA	National Environmental Management Biodiversity Act
NEMPA	National Environmental Management: Protected Areas Act
OHL	Overhead Line
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	
Name	Andrew D. Zinn <i>Pr.Sci.Nat.</i> - Ecological Science (400687/15)
Designation	Report Author – Terrestrial Ecologist
Cell Phone Number	+27 83 361 0373
Email Address	andrew@hawkhead.co.za
Qualifications	M.Sc. Resource Conservation Biology B.Sc. Hons. Ecology and Conservation Biology B.Sc. Zoology and Grassland Science
Affiliations	Member of the South African Council of Natural Scientific Professions Member of the South African Wildlife Management Association 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 a decade of experience working in the fields of ecology and conservation research, and is registered as a Professional Natural Scientist (<i>Pr.Sci.Nat.</i>) – 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 Phefumula Emoyeni One - Up to 400 kV Electrical Grid Infrastructure 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), on behalf of Phefumula Emoyeni One (Pty) Ltd, to conduct the Animal Species Specialist Assessment for the proposed Phefumula Emoyeni One - Up to 400 kV Electrical Grid Infrastructure Project (hereafter referred to as the 'Project'), near Ermelo in Mpumalanga 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. Separate avifauna and bat specialist assessments have been undertaken for the proposed Project. This report therefore only provides high-level comment on any bird species of conservation concern that were observed on-site during the field surveys for this specialist study (For additional detailed information on birds, refer to the Avifauna Specialist Assessment 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 occurring on-site, 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.

This report should be read in conjunction with the Plant Species Specialist Assessment and Terrestrial Biodiversity Specialist Assessment reports, as well as any other biodiversity-related reports.

1.2. Project Location

The proposed Project is located approximately 18 km north of Ermelo in the Msukaligwa Local Municipality and Gert Sibande District Municipality, in Mpumalanga Province, South Africa (Figure 1).

1.3. Project Description

The proposed Project is intended to feed the electricity generated by the proposed Phefumula Emoyeni One Wind Energy Facility (WEF) (part of a separate application for Environmental Authorisation) to the national energy grid. A Project description is outlined in Table 1.

During the scoping phase, two proposed Project layouts (Alternative 1 and Alternative 2) were considered. Following the scoping phase, Alternative 2 was selected as the preferred layout from a Project proponent perspective, and was taken forward for further consideration during this impact assessment phase. The Alternative 2 layout is also preferred from a biodiversity perspective, as it has significantly less impact on patches of natural habitat compared to Alternative 1. The Alternative 2 layout is the focus of this report.

Table 1: Phefumula Emoyeni One – Up to 400kV Electrical Grid Infrastructure Project technical details.

Detail	Information
Up to 400kV Transmission Line	<ul style="list-style-type: none"> • 400kV Loop-In-Loop-Out (LILO) Overhead Line (OHL). • Servitude width for 1 x up to 400kV transmission line is 60m for Loop-In-Loop-Out • Height of 1 x 400kV power line structure is on average 48 m, but may reach up to 50 m in exceptional circumstances depending on the complexity and slope of the terrain. • Minimum conductor clearance is between 8.1 and 12.6 m. • Span length between pylon structures is typically up to 100 – 250 m apart, depending on complexity and slope of terrain. • For up to 400kV structures footprint sizes may vary depending on design type up to 110 m² (10.5 m by 10.5 m), with concrete foundations of up to 80 m² and depths reaching up to 3.5 m typically depending on the number and design of the foundations (to be determined during the detailed design engineering phase). The actual number of structures required will vary according to the final route alignment determined. • Pylon structures will be either monopole or lattice structures depending on what is identified as appropriate during final design. <p>For safety reasons, transmission lines require certain minimum clearance distances. These are as follows:</p> <ul style="list-style-type: none"> • The minimum vertical clearance distance between the ground and the transmission line is 6.7 m. • The minimum vertical clearance to any fixed structure that does not form part of the transmission line is 9.4 m – 11 m. • The minimum distance between an up to 400kV transmission line and an existing road is 60 m – 120 m (depending on the type of road). • Any farming activity can be practiced under the conductors provided that safe working clearances and building restrictions are adhered to.
Up to 132kV Transmission Line	<ul style="list-style-type: none"> • The servitude width for 3 x up to 132kV transmission line is 31 m. A 300 m corridor must be assessed (150m on either side of the centre line) to allow for micro-siting. In the case of the Loop-In-Loop-Out alternative this servitude will apply to each of the two connecting power lines.

Detail	Information
	<ul style="list-style-type: none"> • The maximum height for an up to 132kV powerline structure is 40 m. • Pylon structures will be either monopole or lattice structures depending what is identified as appropriate during final design. • Pylon structures may require anchors with guy-wires or be anchorless. • For up to 132kV structures, concrete foundation sizes may vary depending on design type up to 80 m² (10 m by 8 m), with depths reaching up to 3.5 m typically in a rectangular 'pad' shape. • A working area of approximately 100 m x 100 m is needed for each of the proposed structures to be constructed.
Main Transmission Substation (MTS) (Approx. 31 ha)	<ul style="list-style-type: none"> • A high voltage substation yard to allow for multiple 132kV and 400kV feeder bays and transformers, with infrastructure to allow for step-up to 400kV as required. • Standard substation electrical equipment, including but not limited to transformers, busbars, office area, operation and control room, workshop, and storage area, feeder bays, transformers, busbars, stringer strain beams, insulators, isolators, conductors, circuit breakers, lightning arrestors, relays, capacitor banks, batteries, wave trappers, switchyard, metering and indication instruments, equipment for carrier current, surge protection and outgoing feeders, as may be needed. • The control building, telecommunication infrastructure, oil dam(s) etc. • Workshop and office area within the collector substation footprint. • Fencing around the Substation. • All the access road infrastructure to and within the substation.
Three Distribution Substations	<ul style="list-style-type: none"> • Dx1-approx. 7.85Ha footprint • Dx2- approx. 20.45Ha footprint • Dx3- approx. 13.60Ha footprint
Temporary / Construction Phase Infrastructure	<ul style="list-style-type: none"> • Construction compound at the MTS (3ha) (site offices including conservancy tank for ablutions, stores, material laydown area, generator, fuel storage, etc.) • 3 x construction compound / laydown areas, including site office of 3 ha each at each of the Dx locations (150 m x 200 m each) (including conservancy tank for ablutions) • Batch plant of 4-7 ha (unless a commercial source is used and concrete trucked to site, preferable to keep options open) • Portable ablation facilities will be used along the powerline routes

1.4. Study Spatial Scales

The 'area of interest' (AOI) for this assessment refers to the broader area in which flora and fauna field data were collected during the field programme. This area encompasses the entire Phefumula Emoyeni One WEF project site and is shown in Figure 1.

The 'Project site' refers to the proposed Alternative 2 OHL assessment corridor and MTS footprints, which are located in the centre of the AOI (also shown in Figure 1). It is within this footprint that direct

and indirect impacts on terrestrial biodiversity receptors (e.g., direct habitat loss) associated with this proposed Project could occur.

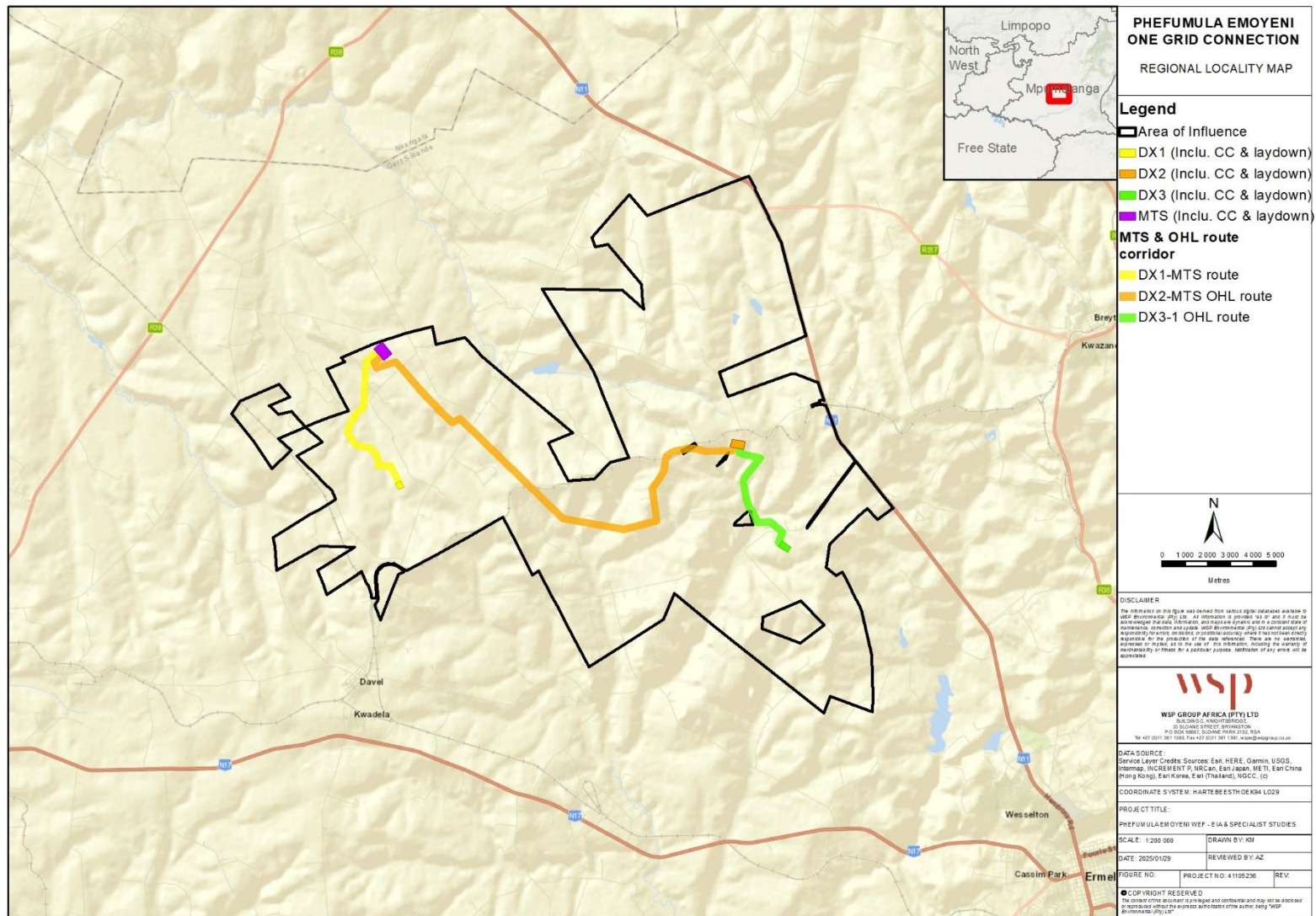


Figure 1: Map showing the regional location of the proposed Project site (i.e., the OHL assessment corridor and substation footprints) and the broader Phefumula Emoyeni One AOI.

1.5. Results of the Environmental Screening Tool

The proposed Project site was assessed at a desktop level using the Department of Forestry, Fisheries and the Environment's (DFFE) National Web-based Environmental Screening Tool. According to the screening tool, the Animal Species Theme for the Project site was rated 'High' sensitivity on account of the potential presence of several threatened fauna species, including:

- Three mammal species:
 - Maquassie Musk Shrew (*Crocidura maquassiensis*);
 - Spotted-necked Otter (*Hydriectis maculicollis*);
 - Oribi (*Ourebia ourebi ourebi*);
- Several bird species:
 - Southern Bald Ibis (*Geronticus calvus*);
 - Martial Eagle (*Polemaetus bellicosus*);
 - Secretarybird (*Sagittarius serpentarius*);
 - Yellow-billed Stork (*Mycteria ibis*)
 - Caspian Tern (*Hydroprogne caspia*);
 - African Grass Owl (*Tyto capensis*);
 - White-bellied Bustard (*Eupodotis senegalensis*); and
- One invertebrate species: Potchefstroom Blue (*Lepidochrysops procera*).

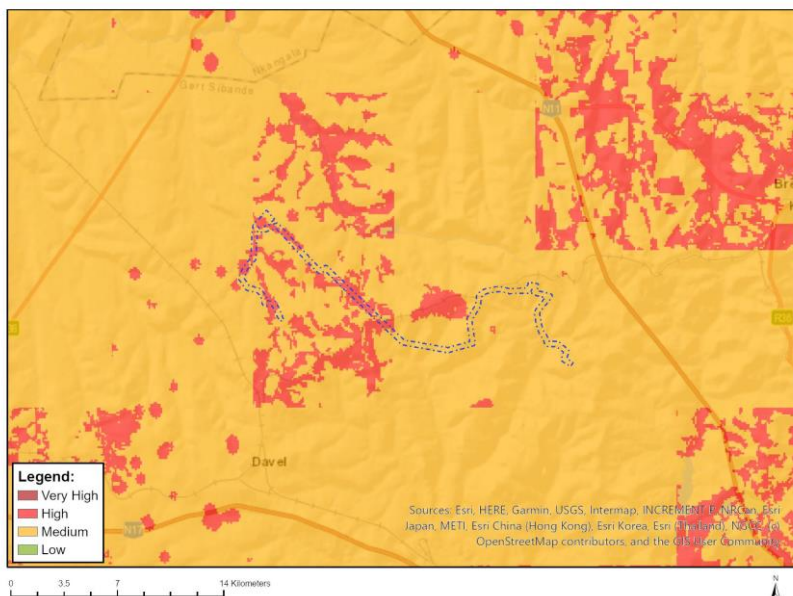


Figure 2: Animal Species sensitivity for the Project site, as per the DFFE National Web-based Environmental Screening Tool.

2. Relevant Legislation and Guidelines

National and provincial legislation, 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)	<p>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.</p> <p>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:</p> <ul style="list-style-type: none"> • 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)	<p>The NEMBA is administered by the Department of Forestry, Fisheries and the Environment (DFFE) and provides the framework under the NEMA for the:</p> <ul style="list-style-type: none"> • Management and conservation of South Africa’s biodiversity; • The protection of species and ecosystems that warrant protection; • The fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources; and • The establishment and functions of a South African National Biodiversity Institute (SANBI). <p>Amongst other components, the NEMBA includes:</p> <ul style="list-style-type: none"> • 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; • Threatened or Protected Species Regulations (February 2007); and

Applicable Legislation and Guideline	Relevance to the Proposed Project
	<ul style="list-style-type: none"> • National list of threatened terrestrial ecosystems for South Africa (2011, and 2021 revision), published under Section 51(1)(a) of NEMBA. • National Biodiversity Offset Guideline (2023), which provides guidance on the need to develop biodiversity offsets. <p>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.</p> <p>Chapter 5 of NEMBA also provides a list of regulations and guidance concerning alien invasive species, including:</p> <ul style="list-style-type: none"> • A guideline for Monitoring, Control and Eradication Plans (September 2015); • 2020 Alien and Invasive Species Regulations (September 2020); and • 2016 and 2020 Alien and Invasive Species Lists (March 2021).
National Environmental Management: Protected Areas Act (2003) (NEMPA)	<ul style="list-style-type: none"> • 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 • 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.
Mpumalanga Nature Conservation Act (Act No. 10 of 1998)	<p>Amongst other provisions, the Mpumalanga Nature Conservation Act (Act No. 10 of 1998) provides lists of specially protected and protected flora and fauna. Of particular relevance to this specialist study are species of flora that are listed under:</p> <ul style="list-style-type: none"> • Schedule 1: Specially Protected Game; • Schedule 2: Protected Game; and • Schedule 4: Protected Wild Animals.
Other Relevant national and Provincial Policies, Plans and Guidelines	<p>Other relevant policies, plans and guidelines that were considered during this study include:</p> <ul style="list-style-type: none"> • Mpumalanga Biodiversity Sector Plan (2022); • Species Environmental Assessment Guideline (SANBI, 2020); • National Protected Area Expansion Strategy (2019); and • Mpumalanga Protected Area Expansion Strategy – 20-year Plan.

3. Study Methodology

The methodology used for this study included a desktop literature review component and a field programme. The various tasks associated with these components 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 Project site, AOI and surrounding landscape, 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 2629BD and 2629BC Quarter Degree Squares (QDS) on the MammalMAP database (Fitzpatrick Institute of African Ornithology, 2023).

3.1.2. Birds

- To obtain a list of bird species of conservation concern that may be present in the AOI, a list of bird species was obtained from Southern African Bird Atlas Project 2 (SABAP2) for the main pentads that cover the AOI, viz. 2615_2945, 2620_2935, 2620_2940, 2620_2945, 2620_2950 and 2625_2950.

3.1.3. Herpetofauna (Reptiles and Amphibians)

- A list of herpetofauna that potentially occur in the AOI 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 2629BD and 2629BC QDS (Fitzpatrick Institute of African Ornithology, 2023).

3.1.4. Invertebrates of Conservation Concern

- Lists of invertebrate species potentially occurring in the AOI were obtained from LepiMAP, LacewingMAP, OdonataMAP, DungbeetleMAP, ScorpionMAP and SpiderMAP for the 2629BD and 2629BC QDS in which the AOI is located (Fitzpatrick Institute of African Ornithology, 2023); and
- These were screened against available Red Lists to identify potential species of conservation concern.

3.2. Field Programme

The field programme comprised two wet-season field surveys, conducted over the mid-summer from 22-26th January 2024 and again from 14th-15th January 2025. During the January period, there is increased activity levels amongst many fauna species and therefore it is an optimal time to survey fauna communities.

The field programme focused on fauna assemblages occurring in the broader AOI, and the sampling methodologies were based, in part, on those recommended in SANBI (2020), and included the following:

3.2.1. Mammals

Mammal sampling included both active and passive sampling methodologies:

- Active sampling of mammals was conducted during the 2024 field survey and included the use of baited motion-triggered camera traps (large- and medium-sized mammals) placed at select sampling sites in the AOI:
 - Camera traps were placed at seven fauna sampling sites (ratio of one trap per approx. 4 808 ha). Sites were selected based on consideration of a combination of factors including 1) habitat type (grassland and wetland/riparian), 2) coverage of the AOI, 3) proximity to water source, 4) presence of game trails/paths, and 5) general accessibility to field workers (refer to Appendix B (1) for map showing the location). 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 were used as a bait; and
 - A grid of six Sherman traps was laid at three of the sampling sites in the AOI. A home-made bait consisting of a mixture of oats, peanuts, peanut-butter, syrup and polony was used for the Sherman traps. Sherman traps were inspected each morning of the survey and rebaited as required;
- Passive sampling was conducted during both field surveys and aimed to record mammals of all sizes and included direct observations, indirect observations and anecdotal evidence:
 - Direct observations included the visual sighting and identification of a species. These were made while walking and driving in the AOI (opportunistic encounters) or during point scans of the landscape (32 point-scan locations across the AOI) using a pair of binoculars;
 - Indirect observations included the identification of mammal tracks, faeces, burrows and mounds made while walking and driving in the AOI; and
 - Farmers were also consulted to obtain anecdotal evidence of mammal species present in the AOI.

3.2.2. Birds

A separate Avifauna Specialist Assessment was conducted for the proposed Project, and therefore no formal bird sampling was conducted as part of this study scope. However, any opportunistic encounters/observations of bird SCC that were made while driving and walking in the AOI were recorded and are reported on in Section 6.2 of this report.

3.2.3. Herpetofauna (reptiles and amphibians)

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

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 based on regional- and provincial Red Lists of threatened (Vulnerable, Endangered and Critically Endangered) and Near Threatened fauna species. Also included in the discussion of fauna SCC, are species listed as threatened and/or Protected, according to national and provincial legislation. Relevant Red Lists and legislation included:

- Red List of Mammals of South Africa, Lesotho and Swaziland (Child *et al.*, 2016);
- The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor, *et al.*, 2014);
- 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);
- Mpumalanga Nature Conservation Act (Act No. 10 of 1998); and
- Mpumalanga Province Red List of Threatened Fauna.

3.3.2. Habitat Suitability Assessments for Species of Conservation Concern

Based on the lists of SCC potentially present on-site, a 'probability of occurrence' of a species being present in the AOI/Project site was determined by conducting habitat suitability assessments. 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 AOI/Project site 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 AOI/Project site 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 AOI/Project site;
- Probable: the species is likely to occur in the AOI/Project site due to suitable habitat and resources being present;
- Possible: The species may occur in the AOI/Project site, or move through the AOI/Project site (in the case of mobile species), due to potential habitat and/or resources; and
- Unlikely: the species will not likely occur in the AOI/Project site 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 International Union for Conservation of Nature (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 in January 2024 and 2025. The timing of the field surveys covered the mid-wet season period. During this period, fauna presence and activity across the Mpumalanga Highveld are generally high, as summer aligns with the breeding periods of many fauna species. Seasonality was therefore not considered a limiting factor with respect to assessing the character of on-site fauna communities;
- Notwithstanding the above, it is possible that certain rare, cryptic, migrating, aestivating 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 AOI 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 in the AOI, as they relate to fauna spatial use and life-cycle requirements. Six primary habitat units were identified in the AOI during the field survey. These include three units regarded as natural habitat, and three units regarded as modified habitats:

Natural Habitats

- Mixed Dry Grassland;
- Rocky Shrubland;
- Moist Grassland;

Modified Habitats

- Cultivated Fields;
- Old Lands; and
- Alien Tree Plantations.

The proposed Project site (i.e., the proposed OHL assessment corridors and substation footprints), is dominated by natural habitat, principally Mixed Dry Grassland, with small areas of and Moist Grassland. Small patches characterised by the three modified habitat units are also present.

Habitat units are briefly described below, with Figure 3 presenting a habitat unit map of the Project site. For full habitat unit descriptions refer to the Plant Species Specialist Assessment Report.



Figure 3: Habitat unit map of the proposed Project site and adjacent portions of the AOI.

5.1.1. Mixed Dry Grassland

Mixed Dry Grassland is a variable habitat unit that characterises the large intact grasslands of the AOI, and most of the Project site. Based on contemporary and former farming activities disturbance levels in areas of Mixed Dry Grassland vary.

As per Edwards (1983) structural classification system, the vegetation structure of this unit is defined as low- closed grassland (Figure 4). Compositionally, areas of Mixed Dry Grassland are characterised by a diverse flora assemblage, that is typically grass dominated and forb rich, and with woody species generally occurring as scattered individual trees and shrubs.

Predicated on past livestock grazing levels and wildfire patterns, the grass species composition of these grasslands varies. Areas that have likely experienced high-levels of past selective grazing and/or too frequent wildfires tend to be dominated by early-seral grass species, such as *Eragrostis plana* and *Eragrostis chloromelas*, whereas in areas that have been less intensely grazed, other species are more common, such as the often-dominant *Themeda triandra*, as well as *Brachiaria serrata*, *Cymbopogon pospischilii*, *Eragrostis racemosa*, *Harpochloa falx*, *Setaria* species and *Tristachya leucothrix*.

In conjunction with adjacent Moist Grassland habitat, areas of Mixed Dry Grassland 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 in the AOI, including many species of conservation concern, will depend on the continued integrity of on-site Mixed Dry Grassland habitat.



Figure 4: Mixed Dry Grassland in the AOI.

5.1.2. Rocky Shrubland

Rocky Shrubland is a relatively small habitat unit that occurs along rocky hillside and ridges in the AOI, but is not present within the proposed Project site and therefore will not be impacted by proposed Project activities. Unlike adjacent areas of open grassland, this habitat unit is characterised by a notably higher abundance of indigenous woody vegetation, coupled with the presence of numerous large protruding rocks (Figure 5).

In line with Edwards (1983) structural classification, this habitat unit is defined as low- to short sparse shrubland, with woody vegetation growing as small trees and shrubs (typically < 3m in height). These typically grow in either dense, but spatially discrete aggregations around exposed rocks, or as scattered individuals within the broader grassland matrix.

The combination of indigenous woody vegetation and exposed rocks creates a distinctive rocky shrubland habitat that is relatively uncommon within the AOI's typical open grassland dominated land cover. Accordingly, areas of Rocky Shrubland increase landscape-scale heterogeneity, and provide important niche habitat for a variety of flora and fauna, including species of conservation concern that have an affinity for more wooded and/or rocky areas.



Figure 5: Rocky Shrubland.

5.1.3. Moist Grassland (i.e., Wetland/Aquatic Habitats)

Moist Grassland habitat characterises wetland and riparian systems across the AOI. Vegetation structure ranges from low- to tall closed grassland (*sensu* Edwards 1983) (Figure 6), and although not widespread or abundant in most areas of Moist Grassland, alien woody vegetation is present and well-established at certain locations.

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 6: Moist grassland flanking an open water stream in the AOI.

5.1.4. Old Lands

As the name suggests, this habitat unit characterises old cultivated fields that have been left fallow, for several years, and as a result have subsequently regenerated to a secondary grassland community. As such, this is considered a modified habitat unit.

Vegetation structure is low closed grassland (*sensu*. Edwards, 1983). Compositionally, compared to natural grasslands, Old Lands are depleted of nutrients and thus floristically depauperate. Dominant grass species recorded in this unit during the field survey include *inter alia*; tall, robust thatching grasses and early-seral taxa (Figure 7).

Despite past disturbances and a secondary vegetation community, Old Lands can retain some of the functional attributes of natural grasslands, and therefore these areas can constitute habitat for some fauna species.



Figure 7: Old Land dominated by *Hyparrhenia* grass species.

5.1.5. Cultivated Fields

Large portions of the AOI, but only a small area of the Project site are characterised by cultivated agricultural fields, which is considered a modified habitat type. Cultivated Fields include both pivot-irrigated crop fields and dry-land crop fields (Figure 8). These are typically under maize production, and are regularly disturbed through ploughing and harvesting.

This habitat unit also includes open fields that are actively-managed as grass pastures. Unlike areas of natural grassland, grass pastures are often fertilised, and regularly mown and baled to provide reserve forage for livestock during the dry season.

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 8: Cultivated Field.

5.1.6. Alien Tree Plantations

Alien Tree Plantations is a broad-term to describe the numerous and localised stands of alien woody vegetation in the AOI. These stands range from narrow wind-rows (typically associated with farms residences and farm roads) to defined plantation-type stands and informal thickets.

Vegetation structure is defined as short- to tall closed woodland (*sensu*. Edwards, 1983). Dominant alien tree species include alien *Eucalyptus*, *Acacia* (wattle) and *Populus* (e.g., *Populus x canescens*) species. Little indigenous vegetation is present in dense, well-established Alien Tree Plantations, with herbaceous flora typically suppressed or in most cases, largely absent (Figure 9).

Alien Tree Plantations 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 habitat by *inter alia* raptors.



Figure 9: Alien Tree Plantations.

6. Fauna Assessment

6.1. Mammals

6.1.1. Mammal Species Richness and Habitat Availability

Nineteen mammal species were recorded in the AOI during the field surveys. These are listed in Table 4, with Figure 10 to Figure 17 showing select photographs of mammals (or evidence of their presence) taken in the AOI.

The recorded mammal's range in size from small rodents to medium-sized antelope, and include herbivores, carnivores and omnivores. Apart from Blesbok (*Damaliscus pygargus phillipsi*), which is a managed taxon (i.e. actively bred and managed by local farmers), all recorded taxa are free-roaming species, i.e., part of self-sustaining populations that are able move freely across the landscape, and occur naturally in the Mpumalanga Highveld grasslands.

According to a review of historic distribution range maps presented in Stuart & Stuart (2007) and Child *et al.*, (2016), up to 70 mammal species have distribution ranges that overlap with the AOI and therefore potentially occur in the AOI and Project site (listed in Appendix C). Of these, MammalMAP records indicate that 23 mammal species have previously been reported for the 2629BD and 2629BC QDS (Fitzpatrick Institute of African Ornithology, 2023).

The extent of natural habitat across the AOI and in the Project site, coupled with the confirmed presence of free-roaming medium-sized taxa, such as the two Reedbuck species, indicates that the AOI possesses a diversity of functional habitats that are in good condition, and characterised by a high-level of connectivity. This suggests that the AOI, including patches of natural habitat within the Project site, likely supports a rich mammal community, that approximates a present-day reference assemblage for the region.

Table 4: Mammal species recorded in the AOI during the field surveys.

Family	Scientific Name	Common Name	Field Surveys
Bovidae	<i>Damaliscus pygargus phillipsi</i>	Blesbok	Visual observation
Bovidae	<i>Redunca arundinum</i>	Southern Reedbuck	Tracks
Bovidae	<i>Redunca fulvorufula fulvorufula</i>	Mountain Reedbuck	Visual observation
Bovidae	<i>Raphicerus campestris</i>	Steenbok	Anecdotal evidence*
Canidae	<i>Canis mesomelas</i>	Black-backed Jackal	Camera trap data Tracks
Erinaceidae	<i>Atelerix frontalis</i>	South African Hedgehog	Anecdotal evidence
Felidae	<i>Leptailurus serval</i>	Serval	Camera trap data
Felidae	<i>Caracal caracal</i>	Caracal	Anecdotal evidence
Herpestidae	<i>Atilax paludinosus</i>	Water Mongoose	Tracks Camera trap data
Herpestidae	<i>Cynictis penicillata</i>	Yellow Mongoose	Visual observation
Herpestidae	<i>Herpestes sanguineus</i>	Slender Mongoose	Camera trap data
Herpestidae	<i>Suricata suricatta</i>	Suricate	Visual observation
Hystriidae	<i>Hystrix africaeaustralis</i>	Cape Porcupine	Scat
Leporidae	<i>Lepus saxatilis</i>	Scrub Hare	Visual observation
Mustelidae	<i>Aonyx capensis</i>	Cape Clawless Otter	Tracks
Mustelidae	<i>Mellivora capensis</i>	Honey Badger	Anecdotal evidence
Soricidae	<i>Crocidura mariquensis</i> [#]	Swamp Musk Shrew	Sherman trapping
Suidae	<i>Potamochoerus larvatus</i>	Bushpig	Anecdotal evidence
Viverridae	<i>Genetta genetta</i>	Small-spotted Genet	Camera trap data
*Anecdotal evidence is based on an interview with local farmer Mr. J. Jacobsz			
[#] Identified by the Small Mammal Department at Ditsong Museum of Natural History. Catalogue No. TM 50905.			

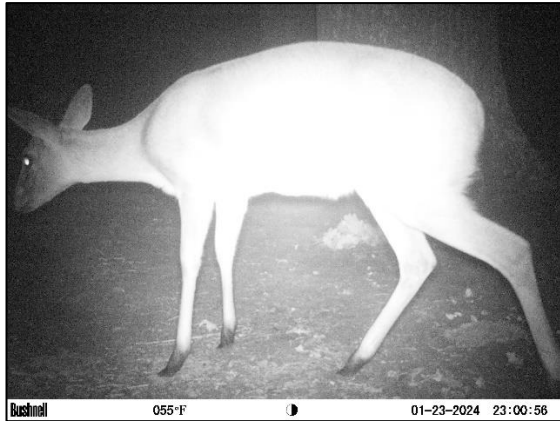


Figure 10: Common Duiker (*Sylvicapra grimmia*).



Figure 11: Black-backed Jackal (*Canis mesomelas*).



Figure 12: Serval (*Leptailurus serval*).



Figure 13: Slender Mongoose (*Herpestes sanguineus*).



Figure 14: Yellow Mongoose (*Cynictis penicillata*).



Figure 15: Small-spotted genet (*Genetta genetta*).



Figure 16: Water Mongoose (*Atilax paludinosus*)



Figure 17: Cape Clawless Otter (*Aonyx capensis*) track

6.1.2. Mammal Species of Conservation Concern

Four mammal species that were recorded in the AOI during the field surveys are listed as threatened or Near Threatened on the regional mammal Red List (Child *et al.*, 2016), namely the Mountain Reedbuck (*Redunca fulvorufula fulvorufula*), Serval (*Leptailurus serval*), Cape Clawless Otter (*Aonyx capensis*) and Swamp Musk Shrew (*Crocidura mariquensis*). These are discussed in more detail in the subsections below.

Furthermore, discussed in more detail are the three mammal species that were highlighted by the DFFE web-based screening tool as potentially sensitive features for the Project site, namely the Maquassie Musk Shrew (*Crocidura maquassiensis*), Spotted-necked Otter (*Hydricetus maculicollis*) and Oribi (*Ourebia ourebi ourebi*).

It is noted that reviewed literature and datasets also indicate that an additional 24 mammal SCC potentially occur in the AOI. These are listed in Table 5: Mammal species of conservation concern occurring or potentially occurring in the AOI., along with their national and provincial conservation statuses, habitat preferences and a 'probability of occurrence', based on field observations or habitat suitability assessments.

6.1.2.1. Mountain Reedbuck

The Mountain Reedbuck is listed as Endangered on the regional Red List (Taylor *et al.*, 2016a). This medium-sized grazing antelope favours rolling grassy hillsides and mountain slopes above 1 500 m (Estes, 1991). Mountain Reedbuck are territorial and gregarious, and found in small herds ranging from 3 to 6 individuals (Taylor *et al.*, 2016a). The estimated regional population size of Mountain Reedbuck is between 10 217 and 13 669 mature individuals, with purported densities in protected areas ranging from 10 to 1 150 individuals per 100 km² (Taylor *et al.*, 2016a). It is noted that no data are cited for private agriculture land. Moreover, no data are available on the EOO or AOO of this species. The primary threats to Mountain Reedbuck include poaching, increased natural predation, and disturbance from cattle herders and livestock (Taylor *et al.*, 2016a).

A single Mountain Reedbuck was observed in Mixed Dry Grassland habitat in the centre of the AOI. It is expected that this individual is likely part of a small breeding herd. Considering the Red List status of this species (i.e., Endangered), the conservation importance of Mountain Reedbuck in the AOI is considered high.

6.1.2.2. 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 (Ramesh, *et al.*, 2016). Population densities range from 0.1 to 1.5 individuals per km², 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). Indeed, the highest known Serval densities (between 76.20 - 101.21 animals per 100 km²) were recorded at an industrial site 50 km west of the AOI (Loock, *et al.*, 2018). Serval were recorded on one camera trap along a stream in the AOI during the field programme. It is likely that this species is abundant in Moist Grassland and adjacent Mixed Dry Grassland habitat in the AOI.

6.1.2.3. 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 were observed along a stream channel in the centre of the AOI (Figure 17). It is likely that this species is fairly abundant in areas of suitable aquatic habitat (e.g., streams and farm dams) in the AOI.

6.1.2.4. Swamp Musk Shrew

The Swamp Musk Shrew is listed as Near Threatened on the regional Red List (Taylor, *et al.*, 2016b). This species occurs in a patchy distribution across the eastern half of South Africa, with an inferred EOO of 397 992 km² (Taylor, *et al.*, 2016b). Applying a 500 m buffer to suitable habitat, the calculated AOO is estimated at between 50 377-63400 km². With a more restrained buffer of 32 m, the AOO is estimated at 2 395 - 2 794 km² (Taylor, *et al.*, 2016b). The preferred habitat of Swamp Musk Shrew is reedbeds, wetlands and thick moist grassland in riverine habitats, and it can be locally common and abundant (Taylor, *et al.*, 2016b). A single Swamp Musk Shrew was recorded in Moist Grassland habitat in the AOI during the 2024 field survey (Catalogue No. TM 50905¹).

6.1.2.5. Spotted-necked Otter

Spotted-necked Otter is listed as Vulnerable on the regional Red List (Ponsonby, *et al.*, 2016). 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 approximately 17 117 individuals (Ponsonby, *et al.*, 2016). The numerous open water farm dams in the AOI provide suitable habitat for this species, and therefore it is probable that Spotted-necked Otter is present.

6.1.2.6. Maquassie Musk Shrew

Maquassie Musk Shrew (Vulnerable) is a rare shrew species. The EOO is estimated at 284 735 km²; 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 km² and 1 790-2 089 km² (based on a 500 and 32 m buffer around wetland habitat, respectively) (Taylor *et al.*, 2016c). The population size of Maquassie

¹ Ditsong Museum of Natural History

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 AOI, but this species has not been recorded in Mpumalanga since 1999 (Taylor *et al.*, 2016c). It is therefore considered 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 (Schrader *et al.*, 2016). 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 km² (Schrader *et al.*, 2016). The minimum estimated population size of Oribi in South Africa is 3 098 individuals, with approximately 274 occurring on private land in Mpumalanga (Schrader *et al.*, 2016). The AOO of Oribi is estimated at 158.61 km² (SANBI, 2020). This species favours short open grassland and floodplains, with patches of taller grass (Schrader *et al.*, 2016). Although suitable habitat is present in the AOI, during interviews local farmers indicated they have never observed this species on their farms. It is therefore considered unlikely/possible that Oribi are present.

Table 5: Mammal species of conservation concern occurring or potentially occurring in the AOI.

Family	Scientific Name	Common Name	Regional Red List Status (2016)	NEMBA ToPS List (2007)	Mpumalanga Status	Habitat Preferences*	Probability of Occurrence
Bathyergidae	<i>Cryptomys hottentotus</i>	Common Mole-rat	Data Deficient	-	Data Deficient	Prefers deep sandy soils along rivers and in montane areas.	Probable – suitable habitat present.
Bovidae	<i>Connochaetes gnou</i>	Black Wildebeest	Least Concern	Protected	-	Open grassland plains and arid shrubland.	Unlikely – some suitable habitat present, but an actively managed taxon.
Bovidae	<i>Ourebia ourebi ourebi</i>	Oribi	Endangered	Endangered	Endangered / Protected	Short open grassland, with patches of taller grass.	Unlikely/Possible – suitable habitat present.
Bovidae	<i>Pelea capreolus</i>	Grey Rhebok	Near Threatened	-	Protected	Sourveld grassland and scrubland in hills and mountainous areas.	Probable – suitable habitat present.
Bovidae	<i>Raphicerus campestris</i>	Steenbok	Least Concern	-	Protected	Range of habitats, including grassland and savanna.	Recorded
Bovidae	<i>Redunca arundinum</i>	Southern Reedbuck	Least Concern	Protected	Protected	Savanna and grassland habitats in mountainous areas.	Recorded
Bovidae	<i>Redunca fulvorufula fulvorufula</i>	Mountain Reedbuck	Endangered	-	Protected	Rolling grassy hillsides and mountain slopes.	Recorded
Canidae	<i>Vulpes chama</i>	Cape Fox	Least Concern	Protected	-	Range of habitats, including grassland and arid savanna.	Possible – suitable habitat present.
Chrysochloridae	<i>Amblysomus robustus</i>	Robust Golden Mole	Vulnerable	Endangered	Vulnerable	Sandy soils in grassland areas.	Possible – suitable habitat present.
Chrysochloridae	<i>Amblysomus septentrionalis</i>	Highveld Golden Mole	Near Threatened	-	Near Threatened	Sandy soils in grassland areas.	Possible – suitable habitat present.
Chrysochloridae	<i>Chrysospalax villosus</i>	Rough-haired Golden Mole	Vulnerable	Critically Endangered	-	Sandy soils in grassland areas.	Possible – suitable habitat present.

Family	Scientific Name	Common Name	Regional Red List Status (2016)	NEMBA ToPS List (2007)	Mpumalanga Status	Habitat Preferences*	Probability of Occurrence
Felidae	<i>Felis nigripes</i>	Black-footed Cat	Vulnerable	Protected	Near Threatened	Open short grass areas in savanna and grassland habitats.	Possible - suitable habitat present.
Felidae	<i>Leptailurus serval</i>	Serval	Near Threatened	Protected	Near Threatened	Wetland, tall grassland and well-watered savanna habitats.	Recorded
Felidae	<i>Panthera pardus</i>	Leopard	Vulnerable	Vulnerable	Near Threatened	Wide range of habitats, including grassland and savanna.	Unlikely – suitable habitat present, but a large and shy predator that is vulnerable to human persecution.
Hyaenidae	<i>Parahyaena brunnea</i>	Brown Hyaena	Near Threatened	Protected	Near Threatened / Protected	Savanna and grassland habitats.	Possible – suitable habitat present, but a large and shy predator that is vulnerable to human persecution.
Hyaenidae	<i>Proteles cristata</i>	Aardwolf	Least Concern	-	Protected	Savanna and grassland habitats.	Probable - suitable habitat present.
Muridae	<i>Dasymys incommutus</i>	African Marsh Rat	Near Threatened	-	Near Threatened	Moist grassland and wetland habitats.	Probable - suitable habitat present.
Muridae	<i>Otomys auratus</i>	Vlei Rat (Grassland type)	Near Threatened	-	-	Moist grassland and wetland habitats.	Probable - suitable habitat present.
Mustelidae	<i>Aonyx capensis</i>	Cape Clawless Otter	Near Threatened	Protected	Protected	Riparian habitats, with permanent water.	Recorded
Mustelidae	<i>Hydricus maculicollis</i>	Spotted-necked Otter	Vulnerable	Protected	Near Threatened / Protected	Riparian habitats, favouring large, open water bodies.	Probable - suitable habitat present.
Mustelidae	<i>Mellivora capensis</i>	Honey Badger	Least Concern	Protected	Near Threatened / Protected	Savanna and grassland habitats	Recorded

Family	Scientific Name	Common Name	Regional Red List Status (2016)	NEMBA ToPS List (2007)	Mpumalanga Status	Habitat Preferences*	Probability of Occurrence
Orycteropodidae	<i>Orycteropus afer</i>	Aardvark	Least Concern	-	Protected	Savanna and grassland habitats.	Probable - suitable habitat present.
Muridae	<i>Mystromys albicaudatus</i>	White-tailed Rat	Vulnerable	-	Vulnerable	Known from calcrete soils sites in grassland habitat.	Unlikely – limited suitable habitat present
Soricidae	<i>Crocidura maquassiensis</i>	Maquassie Musk Shrew	Vulnerable	-	Vulnerable	Moist grassland habitats in savanna and grassland ecosystems.	Unlikely - suitable habitat present, but no recent records in Mpumalanga
Soricidae	<i>Crocidura mariquensis</i>	Swamp Musk Shrew	Near Threatened	-	Near Threatened	Reedbeds, wetlands and thick moist grassland in riverine habitats.	Recorded
*Habitat preferences as per Stuart and Stuart (2007) and Child <i>et al.</i> , (2016).							

6.2. Birds

6.2.1. Bird Species Richness and Habitat Availability

A separate Avifauna Specialist Assessment has been undertaken for the proposed Project. This section therefore provides only high-level comment on bird species, and specifically any SCC opportunistically observed on-site during the field surveys. For additional detailed information on birds, refer to the Avifauna Specialist Assessment Report.

The AOI is located within the Amersfoort-Bethal-Carolina District Important Bird Area (IBA) (SA018). This IBA is 343 320 ha in extent and extends from Carolina in the north to Bethal in the east, and southward through Ermelo to Amersfoort (Marnewick, *et al.*, 2015).

According to Marnewick, *et al.*, (2015), the region has a potentially rich bird assemblage, which includes several globally threatened trigger species occur including, *inter alia*, Botha's Lark (*Spizocorys fringillaris*), Blue Crane (*Grus paradisea*), Southern Bald Ibis (*Geronticus calvus*), Black Harrier (*Circus maurus*), Black-winged Pratincole (*Vanellus melanopterus*), Secretary Bird (*Sagittarius serpentarius*) and Martial Eagle (*Polemaetus bellicosus*).

Data retrieved from SABAP 2 indicates that up to 134 bird species have previously been recorded in the primary pentads that encompass the AOI.

6.2.2. Bird Species of Conservation Concern

During the 2024 field survey, six bird SCC were noted in the AOI based on opportunistic observations, including the Blue Crane (*Anthropoides paradiseus*), Lesser Flamingo (*Phoeniconaias minor*), Greater Flamingo (*Phoenicoperus roseus*), Southern Bald Ibis (*Geronticus calvus*), Yellow-billed Stork (*Mycteria ibis*) and Blue Korhaan (*Eupodotis caerulescens*).

These SCC are discussed in more detail in the subsections below, along with the four bird taxa highlighted by the DFFE national web-based screening tool as potentially sensitive features for the AOI, i.e., the Secretary Bird (*Sagittarius serpentarius*), White-bellied Bustard (*Eupodotis senegalensis*), Caspian Tern (*Hydroprogne caspia*) and African Marsh Harrier (*Circus ranivorus*).

Based on the SABAP 2 records, it is also noted that 22 additional bird species that have previously been documented in the landscape surrounding the AOI are of conservation concern. These are listed in Table 6, along with their national and provincial conservation statuses, habitat preferences and a 'probability of occurrence' - based on habitat suitability assessments.

6.2.2.1. Blue Crane

The Blue Crane is listed as Near Threatened on the regional bird Red List (Shaw, 2015), but it is listed as Endangered on the NEMBA ToPS List (2007) and Vulnerable on the Mpumalanga Provincial Red List. This species is near endemic to South Africa, with a regional population estimated at approximately 21 000 mature individuals, of which, about 2 600 occur in the eastern grasslands of Mpumalanga, KwaZulu-Natal and north-eastern Free State (Shaw, 2015). Blue Crane favour dry grasslands, but are also known to utilise pastures and crop fields (Shaw, 2015). This species was observed in grassland habitat in the AOI during the 2024 field survey (Figure 18).



Figure 18: Blue Crane (*Grus paradisea*) photographed in the AOI during the 2024 field survey.

6.2.2.2. Southern Bald Ibis

Southern Bald Ibis is listed as Vulnerable on both the regional bird Red List (Henderson, 2015) and on the NEMBA ToPS List (2007). This species is endemic to the region, and available estimates indicate the existence of approximately 1 825 breeding pairs and about 3 290 mature individuals (Henderson, 2015). The AOO is estimated at 33 362.67 km² (SANBI, 2020). Southern Bald Ibis favour high-altitude grassland and wetland habitats (Henderson, 2015). They have also been known to use sports fields, golf courses and grass pastures (Henderson, 2015). A large group of Southern Bald Ibis was recorded in moist grassland in the AOI during the 2024 field survey.

6.2.2.3. Blue Korhaan

The Blue Korhaan is listed as Least Concern on the regional bird Red List (Taylor, *et al.*, 2015), but it is listed as Vulnerable on the NEMBA ToPS List (2007) and Near Threatened on the Mpumalanga Provincial Red List. This species favours open grassland habitats, and was recorded in the AOI during the 2024 field survey.

6.2.2.4. Lesser Flamingo

The Lesser Flamingo (Near Threatened) occurs throughout sub-Saharan Africa. In South Africa, its non-breeding range is centred on the Highveld (McCulloch, *et al.*, 2015). The South African population of Lesser Flamingo is estimated at anywhere between 40 000 and 60 000 birds, although this may be an underestimate. This species is a colonial nester (McCulloch, *et al.*, 2015). Lesser Flamingo favour open, eutrophic and shallow saline wetland habitats, including inland pans, coastal lagoons and estuaries (McCulloch, *et al.*, 2015). Lesser Flamingo were observed at a farm dam, immediately adjacent to the AOI.

6.2.2.5. Greater Flamingo

The Greater Flamingo is listed as Near Threatened on the regional bird Red List (Anderson, 2015). This species occurs throughout Africa, and is fairly common on the central plateau (Anderson, 2015). The South Africa population of Greater Flamingo is estimated at between 50 000 and 60 000 birds (Anderson, 2015). Greater Flamingo favour saline or brackish shallow pans, large dams and coastal mudflats (Anderson, 2015). Greater Flamingo were observed at a farm dam in the centre of the AOI.

6.2.2.6. Yellow-billed Stork

The Yellow-billed Stork is listed as Endangered on the regional bird Red List (Evans, 2015). This species occurs throughout sub-Saharan Africa. The regional population is estimated at between 150-350 individuals, although large fluctuations in bird number are likely (Evans, 2015). Yellow-billed Stork

favour seasonal and permanent wetland habitats, where open, shallow water free of vegetation is present (Evans, 2015). Two Yellow-billed Storks were observed at a large dam in the AOI during the field survey (shown in Figure 19).



Figure 19: Yellow-billed Stork (*Mycteria ibis*) photographed in the AOI during the 2024 field survey.

6.2.2.7. Secretary Bird

Secretary Bird is listed as Vulnerable on the regional bird Red List (Retief, 2015). Population estimates vary; however, the South Africa population is estimated at between 3 500 and 5 000 mature individuals (Retief, 2015). Secretary Bird favour open grassland and scrub, with scattered trees to use as roosting and nesting sites (Retief, 2015). The AOO for this species is 27 547.79 km² (SANBI, 2020). Suitable habitat is present in the AOI, and it is therefore probable that Secretary Bird is present.

6.2.2.8. White-bellied Bustard

The White-bellied Bustard is listed as Vulnerable on the regional bird Red List (Du Plessis, *et al.*, 2015). It is patchily distributed across West Africa and eastern South Africa and has a AOO of 67 249 km² (Du Plessis, *et al.*, 2015). White-bellied Bustard favour tall dense grassland and occasionally ecotones between savanna and fynbos (Du Plessis, *et al.*, 2015). It has also been known to occur in cultivated grass pastures and recently harvested crop fields. In suitable habitat it has an estimated population density of 2-2.5 birds per km² (Du Plessis, *et al.*, 2015). Suitable habitat is present in the AOI, and it is therefore probable that White-bellied Bustard is present.

6.2.2.9. Caspian Tern

Caspian Tern is listed as Vulnerable on the regional bird Red List (Ortman, *et al.*, 2015). The global population of Caspian Tern is estimated at 420 000 mature individuals; however, the regional population comprises only a small portion of this, with an estimated 300-316 breeding pairs (Ortman, *et al.*, 2015). At inland locations, this species' breeding sites include large natural and man-made water bodies (dams) (Ortman, *et al.*, 2015). Suitable habitat is present in the AOI, and it is therefore probable that this species is present.

6.2.2.10. African Marsh Harrier

African Marsh Harrier is listed as Endangered on the regional bird Red List (Taylor, 2015) and the Mpumalanga Provincial Red List. The estimated South Africa population is between 3 500 and 4 500 mature individuals (Taylor, 2015). It is sparsely distributed across central, and east and southern Africa and has a AOO of 12 615.35 km² (SANBI, 2020). African Marsh Harrier occur in permanent wetland habitats and are known to forage over dry floodplains, grassland and crop fields (Taylor, 2015). Suitable habitat is present in the AOI, and it is therefore probable that African Marsh Harrier is present.

Table 6: Bird species of conservation concern recorded / potentially occurring in the AOI

Family	Scientific Name	Common Name	Regional Red List (2015)	NEMBA ToPS List (2007)	Mpumalanga Status	Habitat Preferences*	Probability of Occurrence
Accipitridae	<i>Circus maurus</i>	Black Harrier	Endangered	-	Endangered	Riparian and wetland habitats.	Probable – suitable habitat present.
Accipitridae	<i>Circus ranivorus</i>	African Marsh Harrier	Endangered	Protected	Endangered	Wetlands and reedbeds.	Probable – suitable habitat present.
Accipitridae	<i>Circus macrourus</i>	Pallid Harrier	Near Threatened	-	Near Threatened	Grasslands, with open pans and floodplains, as well as crop fields.	Probable – suitable habitat present.
Alaudidae	<i>Spizocorys fringillaris</i>	Botha's Lark	Endangered	-	Endangered	Short dense and heavily grazed grasslands on plateaus and hill slopes	Probable – suitable habitat present.
Anatidae	<i>Oxyura maccoa</i>	Maccoa Duck	Near Threatened	-	Near Threatened	Deep water bodies with emergent vegetation.	Probable – suitable habitat present.
Ciconiidae	<i>Mycteria ibis</i>	Yellow-billed Stork	Endangered	-	Endangered	Seasonal and permanent wetland habitats	Recorded
Coraciidae	<i>Coracias garrulus</i>	European Roller	Near Threatened	-	Near Threatened	Open woodland.	Possible – limited suitable habitat present.
Falconidae	<i>Falco biarmicus</i>	Lanner Falcon	Vulnerable	-	Vulnerable	Range of habitats, including open grassland and savanna.	Probable – suitable habitat present.
Falconidae	<i>Falco vespertinus</i>	Red-footed Falcon	Near Threatened	-	-	Open semi-arid and arid grasslands and savanna	Probable – suitable habitat present.
Gruidae	<i>Grus paradisea</i>	Blue Crane	Near Threatened	Endangered	Vulnerable	Grassland and wetland habitats.	Recorded
Gruidae	<i>Grus carunculata</i>	Wattled Crane	Critically Endangered	Critically Endangered	Critically Endangered	Grassland and wetland habitats.	Probable – suitable habitat present.

Family	Scientific Name	Common Name	Regional Red List (2015)	NEMBA ToPS List (2007)	Mpumalanga Status	Habitat Preferences*	Probability of Occurrence
Laridae	<i>Hydroprogne caspia</i>	Caspian Tern	Vulnerable	-	Endangered	Inland habitats include large natural and man-made water bodies.	Probable – suitable habitat present.
Otididae	<i>Eupodotis caerulescens</i>	Blue Korhaan	-	Vulnerable	Near Threatened	Range of habitats, including grassland.	Recorded
Otididae	<i>Eupodotis senegalensis</i>	White-bellied Bustard	Vulnerable	-	Vulnerable	Tall dense grassland and savanna.	Probable – suitable habitat present.
Phoenicopteridae	<i>Phoeniconaias minor</i>	Lesser Flamingo	Near Threatened	-	Near Threatened	Shallow wetland habitats and salt pans.	Recorded
Phoenicopteridae	<i>Phoenicopus roseus</i>	Greater Flamingo	Near Threatened	-	Near Threatened	Shallow wetland habitats and salt pans.	Recorded
Rostratulidae	<i>Rostratula benghalensis</i>	Greater Painted-snipe	Near Threatened	-	Vulnerable	Wetland habitats, with exposed muddy flats.	Probable – suitable habitat present.
Sagittariidae	<i>Sagittarius serpentarius</i>	Secretarybird	Vulnerable	-	Vulnerable	Open grassland and scrub with scattered trees.	Probable – suitable habitat present.
Threskiornithidae	<i>Geronticus calvus</i>	Southern Bald Ibis	Vulnerable	Vulnerable	Vulnerable	Grassland and wetland habitats.	Recorded
Tytonidae	<i>Tyto capensis</i>	African Grass Owl	Vulnerable	Vulnerable	Vulnerable	Tall rank grassland and short dense grassland.	Probable – suitable habitat present.

*Source: Habitat preferences as per Roberts VII Multimedia App.

6.3. Herpetofauna

6.3.1. Herpetofauna Richness and Habitat Availability

Herpetofauna observed in the AOI during the field programme include the Common River Frog (*Amieta delalandii*), Water Monitor (*Varanus niloticus*) and Rinkhals (*Hemachatus haemachatus*). Anecdotal evidence from a local farmer indicate that other common encountered species include the Mole Snake (*Pseudaspis cana*) and Red-lipped Snake (*Crotaphopeltis hotamboeia*). These are all common and widespread species.

Considering the availability of suitable habitat, it is expected that several herpetofauna taxa are likely to be present. Key habitat for amphibians includes streams and farm dams in areas of moist grassland, while all grassland- and rocky shrubland habitats will be utilised by reptiles. Based on known distribution ranges presented in Du Preez and Carruthers (2009) and Bates *et al.*, (2014), up to 24 amphibian- and 65 reptile species are known from the region in which the AOI is located (Appendix E). Of these, FrogMAP and ReptileMAP records indicate that 12 amphibian and 16 reptile species have previously been recorded in the 2629BD and 2629BC QDS (Fitzpatrick Institute of African Ornithology, 2023) (also listed in Appendix E). The documented taxa are common species, with widespread distributions.

6.3.2. Herpetofauna Species of Conservation Concern

Seven reptile and two amphibian SCC potentially occur in the AOI. These are listed in Table 7 and Table 8, along with their conservation status, habitat preferences and a probability of occurrence. None of these taxa are listed as threatened on regional Red Lists. They are however, listed as threatened or Near Threatened on the Mpumalanga Red List, with the Giant Bullfrog (*Pyxicephalus adspersus*) also listed as Protected on the NEMBA ToPS List (2007).

Table 7: Reptile species of conservation concern potentially occurring in the AOI.

Family	Scientific Name	Common Name	Regional Red List Status	NEMBA ToPS List (2007)	Mpumalanga Status	Habitat Preferences*	Probability of Occurrence
Colubridae	<i>Dasypeltis inornata</i>	Southern Brown Egg-eater	Least Concern	-	Near Threatened	Moist savanna in rocky areas.	Probable – suitable habitat present.
Cordylidae	<i>Chamaesaura aenea</i>	Coppery Grass Lizard	Least Concern	-	Near Threatened	Grassy slopes and plateau.	Probable – suitable habitat present.
Lamprophiidae	<i>Amplorhinus multimaculatus</i>	Many-spotted Snake	Least Concern	-	Near Threatened	Reed beds, wetlands and riparian vegetation in grasslands.	Probable – suitable habitat present.
Lamprophiidae	<i>Homoroselaps dorsalis</i>	Striped Harlequin Snake	Least Concern	-	Near Threatened	Semi-fossorial, favouring abandoned termitaria in grassland.	Probable – suitable habitat present.
Lamprophiidae	<i>Homoroselaps lacteus</i>	Spotted Harlequin Snake	Least Concern	-	Near Threatened	Semi-fossorial, favouring sandy soils, abandoned termitaria and rocky areas.	Probable – suitable habitat present.
Lamprophiidae	<i>Lamprophis fuscus</i>	Yellow-bellied Snake	Least Concern	-	Near Threatened	Fairly widespread, but rarely encountered species. Favours abandoned termitaria.	Possible – suitable habitat present.
Scincidae	<i>Acontias breviceps</i>	Short-headed Legless Skink	Least Concern	-	Vulnerable	Fossorial and found in montane grassland.	Probable – suitable habitat present.
*Habitat preferences as per Branch (1998) and Bates <i>et al.</i> , (2014).							

Table 8: Amphibian species of conservation concern potentially occurring in the AOI.

Family	Scientific Name	Common Name	Regional Red List Status	NEMBA ToPS List (2007)	Mpumalanga Status	Habitat Preferences*	Probability of Occurrence
Hyperoliidae	<i>Hyperolius semidiscus</i>	Yellow-striped Reed Frog	Least Concern	-	Vulnerable	Favours savanna habitats, where it occurs in dense reeds along rivers and pans.	Unlikely –limited suitable habitat present.

Family	Scientific Name	Common Name	Regional Red List Status	NEMBA ToPS List (2007)	Mpumalanga Status	Habitat Preferences*	Probability of Occurrence
Pyxicephalidae	<i>Pyxicephalus adspersus</i>	Giant Bullfrog	Least Concern	Protected	Vulnerable	Shallow pans, wetland and rained-filled depressions in savanna and grassland.	Possible – suitable habitat present.

*Habitat preferences as per Du Preez and Carruthers (2009) and www.speciesstatus.sanbi.org

6.4. Invertebrates of Conservation Concern

Limited data are available on the invertebrate diversity of the AOI and surrounding landscape. The invertebrate profiles on the Virtual Museum database lists 18 butterfly, one dragonfly, one scorpion and one spider for the 2629BD and 2629BC QDS (Fitzpatrick Institute of African Ornithology, 2023). Of these, two are of conservation concern, namely the Marsh Sylph (*Metisella meninx*) and the Golden Star-dust Baboon Spider (*Harpactira hamiltoni*).

The national environmental screening tool highlighted the Potchefstroom Blue (*Lepidochrysops procera*) as a potentially sensitive feature for the AOI. These three SCC are discussed in more detail in the subsections below:

6.4.1. Potchefstroom Blue

The Potchefstroom Blue is a butterfly species that is listed as Rare in South Africa, and is endemic to the country. It is a habitat specialist that is known from only a few locations across an EOO of 93 799 km² (Dobson & Dobson, 2018). This species favours rocky areas in grassland, where it is dependent on the presence of the larval host plant *Ocimum obovatum*, and potentially also a host ant, viz., *Camponotus* species (Dobson & Dobson, 2018). The Potchefstroom Blue thrives in grasslands subject to annual winter fires (Dobson & Dobson, 2018). The larval host plant *Ocimum obovatum* was recorded in the AOI during the 2024 field survey, and it is therefore possible that the Potchefstroom Blue is present.

6.4.2. Marsh Sylph

The Marsh Sylph is listed as Near Threatened. This butterfly species favours pristine wetland habitats, where it feeds on the host grass *Leersia hexandra* (Henning, 2018). It has an EOO of 80 348 km², but only occurs in small areas of suitable habitat across its range (Henning, 2018). The total population size is approximately 12 000 mature individuals, but each subpopulation only numbers about 250 individuals (Henning, 2018). Considering the availability of suitable moist grassland habitat, it is probable that this species is present in the AOI.

6.4.3. Golden Star-dust Baboon Spider

The Golden Star-dust Baboon Spider is listed as protected at both a provincial level according to Mpumalanga Nature Conservation Act (Act No. 10 of 1998), and at a national level according to the NEMBA ToPS (2007) List. According to the distribution maps in Dippenaar-Schoeman (2014) is known from grassland habitats, and suitable habitat is present in the AOI. It is therefore probable that this species is present in the AOI.

7. Key Ecological Attributes and Processes

7.1. Habitat Corridors, Resources and Refugia

The AOI is a multi-functional landscape that is characterised by large areas of cultivation (Cultivated Fields), but also large intact areas of natural dry grassland and moist grassland habitat. Various forms of linear infrastructure, such as formal roads, farm tracks, farm fences and an old railway line, and the presence of modified habitat patches, have caused habitat fragmentation. However, it is noted that the general level of habitat connectivity across the AOI and to the broader landscape surrounding the AOI remains high.

On-site natural habitat patches provide a large network of dispersal and movement corridors for fauna, and the topographically-linked ecological productivity gradients of dry upland sites and moist low-lying sites (i.e. wetland and watercourses) also provide important and functionally-adaptive foraging resources for fauna. This will sustain local metapopulation dynamics and a diverse fauna community that includes several species of conservation concern.

Within the grassland-dominated habitat matrix, the altitudinal variability, exposed rocks and abundance of indigenous woody flora that defines the Rocky Shrubland habitat unit, also creates diverse and unique micro-habitats that significantly increase broader-scale habitat heterogeneity. This will increase local flora and fauna diversity by providing niche habitats for, amongst others, obligate and facultative rupicolous² and shrubland-favouring species that are unlikely to be resident in adjacent open grassland.

Although Alien Tree Plantations are considered a modified habitat type, it is also noted that within the context of generally grassland-dominated habitat-matrix, these tall, densely wooded areas are likely to provide a form of refuge (or sheltering) habitat for several fauna species that are sensitive to disturbance and/or are persecuted. They are also likely to provide important roosting and nesting habitat for raptors, amongst other bird species.

The proposed Project may have an impact local habitat connectivity through habitat loss and fragmentation, and this may affect various ecological processes, such as the movement and dispersal of fauna across the landscape.

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 grassland ecosystems. Mesic Highveld Grasslands are considered fire-prone and fire-dependent landscapes, and fire is essential to the maintenance of biodiversity patterns and ecological processes (SANBI, 2013). Wildfire's have several key ecological effects with respects to fauna, including:

- Removal of moribund vegetation and increasing plant productivity and palatability, which improves grazing for wild herbivores;
- 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.

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

Fire is considered an important driver of change in the AOI. It is anticipated that the proposed Project may result in altered wildfire patterns across the AOI due to increased accidental fires from

² Flora and fauna species that are specifically adapted to rocky habitat.

faulty/shorting Project infrastructure. Changes in local fire may impact vegetation productivity, which may affect the local fauna and flora diversity community, including SCC.

7.2.2. Herbivory - 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), which can negatively affect local fauna communities. Excessive cattle grazing and trampling can also cause soil erosion and gulley formation, and modify and homogenise vegetation structure, which can potentially impact sensitive fauna species that have specific life-cycle habitat requirements.

Cattle grazing (Figure 20) and trampling are considered important drivers of change in the AOI. However, it is anticipated that the proposed Project is unlikely to alter livestock grazing patterns in the AOI.

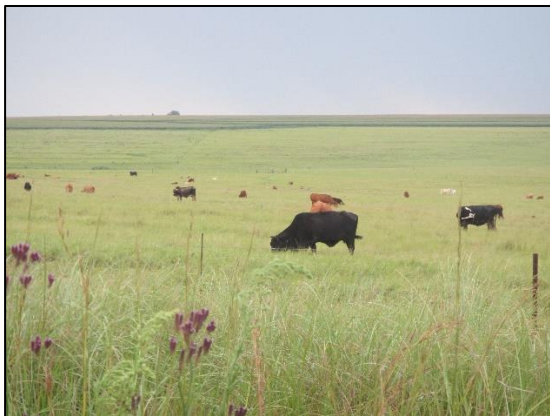


Figure 20: Cattle grazing is common in the AOI.

7.2.3. Alien Invasive Species Colonisation

Several alien tree plantations (e.g., *Eucalyptus* trees) and wattle infestations (*Acacia mearnsii* and *Acacia dealbata*) are present in the AOI, and many disturbed sites (e.g., cultivated fields) are encroached by herbaceous alien invasive species (e.g., *Verbena bonariensis*). If not actively controlled, species such as wattle may spread into adjacent natural habitats, where they will shade-out and 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 fauna communities;
- A reduction in grass productivity for grazing herbivores (e.g., Mountain Reedbuck), and
- Increased exposed soil surfaces and incidences of erosion.

The spread of alien invasive vegetation is therefore considered a significant driver of change in the AOI and surrounding landscape, and one capable of negatively impacting SCC.

7.2.4. Subsistence Bushmeat Hunting

Small- and medium-sized antelope were recorded in the AOI, and these species, amongst others, are frequently the target of subsistence bushmeat hunting. Common subsistence hunting techniques include the use of snares (which is essentially indiscriminate) and hunting dogs (which is partly discriminate). Local subsistence hunters with hunting dogs were observed in the AOI during the field surveys.

An escalation of bush-meat hunting is likely to negatively affect local fauna communities, with species like the Mountain Reedbuck (Endangered) particularly at risk. Subsistence bushmeat hunting is therefore regarded as a potential driver of change in the AOI, which could impact certain mammals SCC.

An increase in on-site construction workers and contractors linked with the proposed Project may result in a temporary increase in levels of subsistence bushmeat hunting in the AOI, and this will need to be correctly managed during Project implementation.

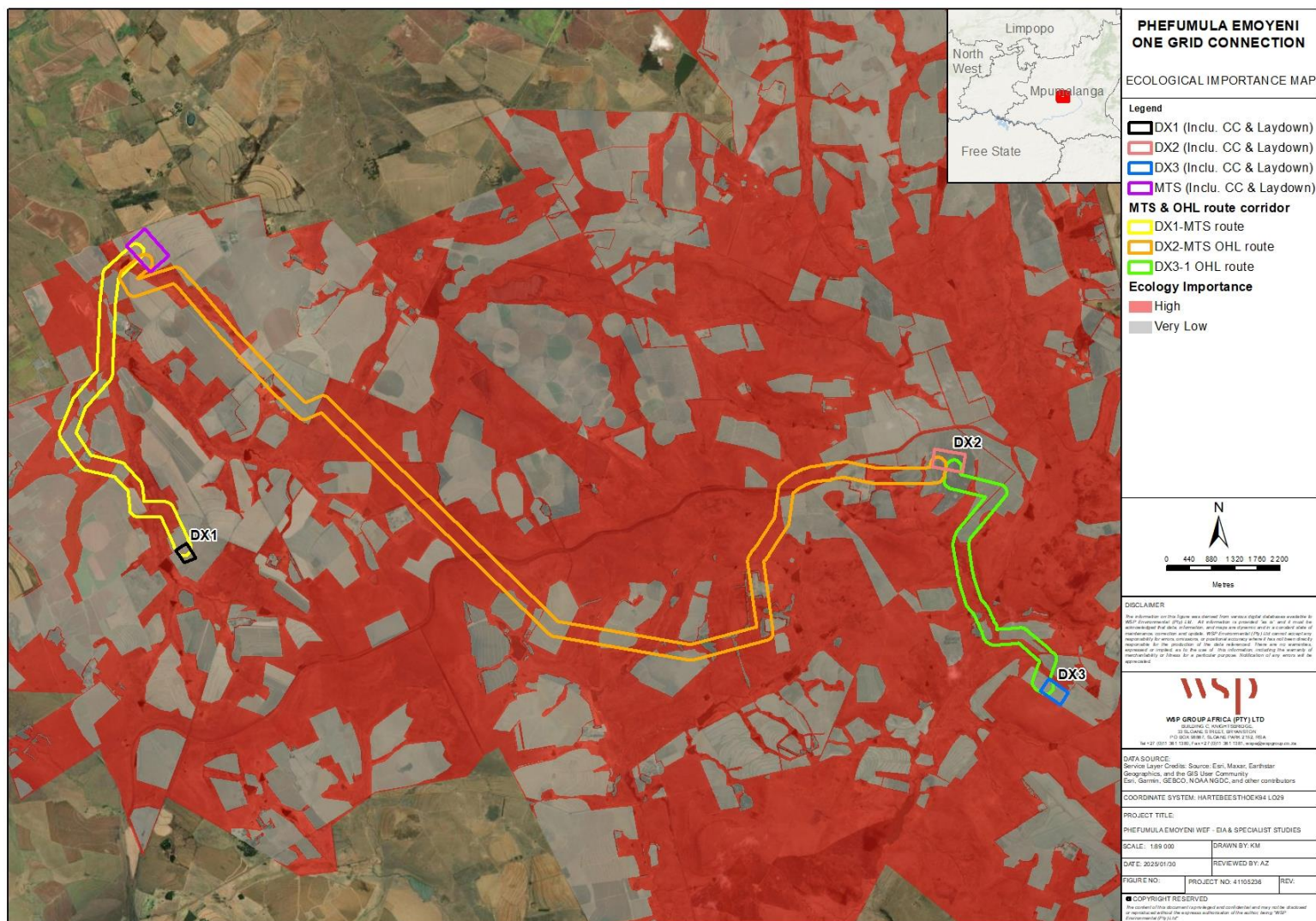
8. Analysis of Site Ecological Importance

The site ecological importance (SEI) of identified habitat units in the Project site 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 9, and shown in Figure 21.

Table 9: Site Ecological Importance of habitat units in the Project site

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Mixed Dry Grassland	<u>HIGH</u> : Highly likely occurrence of CR, EN, VU species (=Mountain Reedbuck, EN). Small area of natural habitat of EN ecosystem (=Eastern Highveld Grassland, EN & Soweto Highveld Grassland, VU).	<u>HIGH</u> : Very large (>100 ha) intact area for any conservation status of ecosystem type. Good habitat connectivity with potentially functional ecological corridors. BUT Mostly minor current negative ecological impacts, with some major impacts and a few signs of past disturbance.	HIGH	<u>MEDIUM</u> : Habitat that can recover slowly to restore >75% of the original species composition and functionality	HIGH
Rocky Shrubland	<u>HIGH</u> : Highly likely occurrence of CR, EN, VU species (=Mountain Reedbuck, EN). Small area of natural habitat of EN ecosystem (=Eastern Highveld Grassland, EN & Soweto Highveld Grassland, VU).	<u>HIGH</u> : Large (> 5 ha but <100 ha) intact area for any conservation status. Good habitat connectivity with potentially functional ecological corridors. Only minor current negative ecological impacts with limited signs of major past disturbance and good rehabilitation potential.	HIGH	<u>MEDIUM</u> : Habitat that can recover slowly to restore >75% of the original species composition and functionality	HIGH
Moist Grassland	<u>HIGH</u> : <u>Highly</u> likely occurrence of CR, EN, VU species (=Yellow-billed Stork, EN & Southern Bald Ibis, VU). Small area of natural habitat of EN ecosystem (=Eastern Highveld Grassland, EN &	<u>HIGH</u> : Very large (>100 ha) intact area for any conservation status of ecosystem type. Good habitat connectivity with potentially functional ecological corridors. BUT	HIGH	<u>MEDIUM</u> : 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
	Soweto Highveld Grassland, VU).	Mostly minor current negative ecological impacts, with some major impacts and a few signs of past disturbance.			
Old Lands	LOW: No confirmed or highly likely populations of SCC or range-restricted species.	<u>MEDIUM/LOW</u> : Narrow corridors of good connectivity. Mostly minor current negative ecological impacts, BUT with major past impacts (i.e., former cultivation).	LOW	HIGH: Habitat that can recover relatively quickly to restore >75% of the original species composition and functionality.	VERY LOW
Cultivated Fields	<u>VERY LOW</u> : No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	<u>VERY LOW</u> : Several major current negative ecological impacts.	VERY LOW	<u>VERY HIGH</u> : Habitat that can recover rapidly to restore >75% of the original species composition and functionality.	VERY LOW
Alien Tree Plantations	<u>VERY LOW</u> : No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	<u>VERY LOW</u> : Several major current negative ecological impacts.	VERY LOW	<u>VERY HIGH</u> : Habitat that can recover rapidly to restore >75% of the original species composition and functionality.	VERY LOW



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 direct³, indirect⁴, secondary⁵ as well as cumulative⁶ 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 criteria⁷ presented in Table 10.

Table 10: 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

³ Impacts that arise directly from activities that form an integral part of the Project.

⁴ Impacts that arise indirectly from activities not explicitly forming part of the Project.

⁵ Secondary or induced impacts caused by a change in the Project environment.

⁶ Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects

⁷ 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	Moderate	High	Very High
Environmental Significance Rating (Positive (+))	Very low	Low	Moderate	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 22 below.

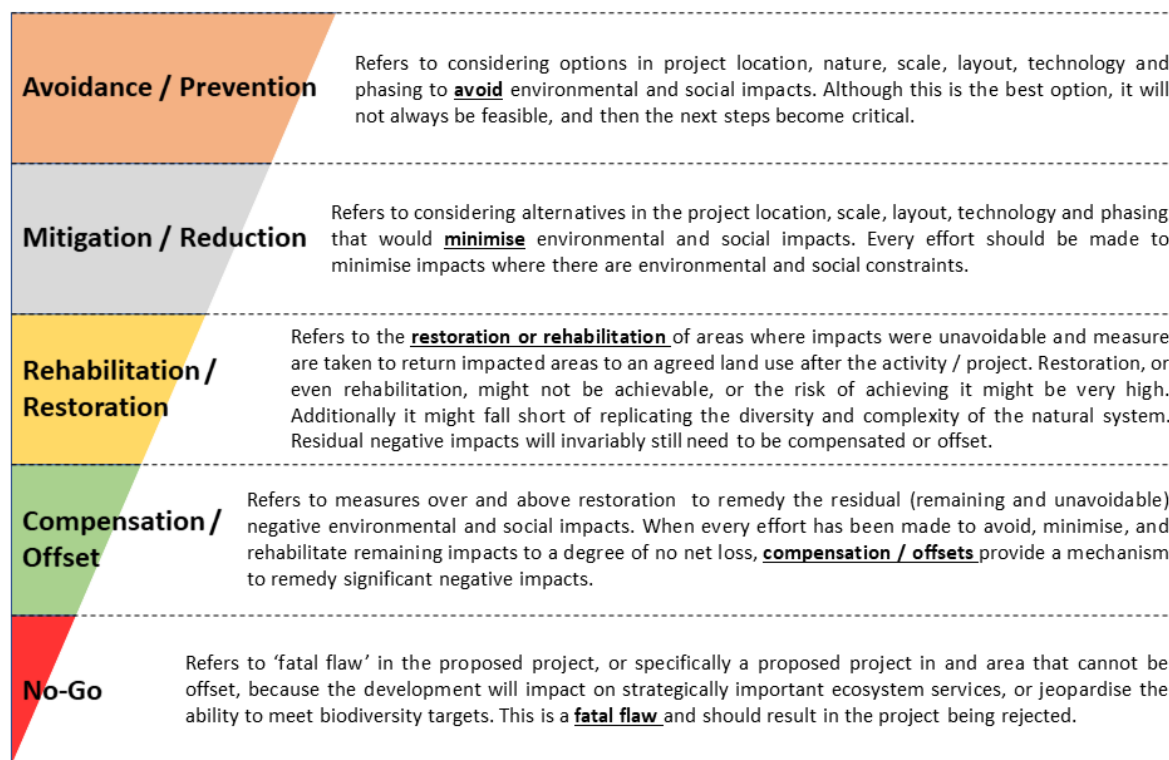


Figure 22: Mitigation Sequence/Hierarchy

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 12.

9.3. Assessment of Impacts on Terrestrial Fauna

9.3.1. Construction Phase

9.3.1.1.1. 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.

Two project layouts (Alternative 1 & Alternative 2) were considered during the scoping phase. Alternative 2 was preferred as it minimizes disturbance to natural habitat, especially (Critical Biodiversity Area (CBA Irreplaceable and CBA Optimal areas, by optimizing infrastructure placement within modified habitats, like cultivated fields.

Based on the currently proposed infrastructure layout (Alternative 2), only approximately 1.47 ha of natural habitat is likely to be lost due to Project infrastructure development, with Figure 23 showing an overlay of proposed infrastructure on the habitat unit map. Table 11 presents an indication of the approximate infrastructure footprints directly impacting each of the identified habitat units. Note: Estimated development footprints for the proposed powerlines are predicated on an approximate inter-pylon distance of 175 m (which is the median between the 100-250 m range stated in the project description) and individual pylon structure footprints of 110 m².

The impact prior to mitigation is considered to be of 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 high. This results in an impact of “medium” significance.

Several management/mitigation measures can be taken to further minimise impact significance. These include: 1) in-field micro-siting of tower/pylon footprints to already disturbed sites; 2) clearing only the minimum footprint areas required for construction activities; and 3) actively rehabilitating all disturbance footprints after construction.

With the application of these, and other recommended mitigation measures, impact magnitude can be reduced to low, and it can be confined to the site scale. Duration can be reduced to the long-term, and probability to low. This results in an after-mitigation (residual) impact of “Low” significance.

Table 11: Indicative extent of impacts on the identified habitat units.

Impacted Habitat Units	Infrastructure Footprints (Ha)				Estimated Total Powerline Pylon Footprints (Ha)*			TOTAL (Ha)
	DX 1 (Incl. construction camp and laydown)	DX 2(Incl. construction camp and laydown)	DX 3(Incl. construction camp and laydown)	MTS (Incl. construction camp and laydown)	DX1-MTS route (9.58 km)	DX2-MTS OHL route (1.44 km)	DX3-1 OHL route (7.18 km)	
Mixed Dry Grassland	-	-	-	0.18	0.14	0.72	0.06	1.10
Cultivated Field	7.87	20.74	13.54	33.23	0.20	0.40	0.17	76.15
Moist Grassland	-	-	-	0.04	0.09	0.17	0.06	0.37
Old Lands	-	-	-	-	0.01	0.04	0.11	0.15
*Estimates based on inter-pylon distance of 175 m (i.e. median between 100 m - 250 m range) and an individual pylon footprint of 110 m ² .								



Figure 23: Habitat units and the proposed infrastructure layout.

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 Project involves, in part, the construction of linear infrastructure (i.e. OHL). Linear infrastructure has the potential to cause habitat fragmentation. It is noted however, that the actual pylon footprints where permanent habitat loss is expected, are relatively small and estimated at 110 m² per pylon structure. As such, it is anticipated that potential fragmentation effects from the OHL will be limited.

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

With the application of mitigation measures, such as in-field micro-siting pylon footprints to already disturbed sites, minimising the clearance footprint to the minimum area required for construction and operational purposes, and rehabilitating all disturbed footprints, impact magnitude can be reduced to low. 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 *inter alia*, burrowing mammals (e.g., rodents), reptiles and amphibians. Other common potential causes of fauna death, injury and disturbance during the construction phase across the AOI may include:

- Vehicle collisions along 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 high probability, resulting in an impact of “moderate” significance.

With mitigation, which includes *inter alia*, the active and correct management of all human-animal interactions, magnitude is reduced to medium and probability of the impact can be reduced to low, and scale to local. This results in a residual impact of “Low” significance.

9.3.1.4. Loss of fauna species of conservation concern

Fauna SCC, such as Mountain Reedbuck and Serval, were observed on-site, and based on habitat suitability assessments, it is possible that several other SCC may be present. Proposed Project activities

may lead to the disturbance of fauna SCC through the loss of functional habitat or direct mortality (e.g., 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 high probability, resulting in an impact of “moderate” 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 local. This results in a residual impact of “Low” significance.

9.3.2. Operational Phase

Note: Impacts associated with powerline 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 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 “moderate” significance. With mitigation, magnitude is reduced to medium and probability of the impact can be reduced to low, and scale will remain at local. This results in a residual impact of “Low” significance.

9.3.2.2. Increase in wildfires from faulty/shorting powerline infrastructure

Wildfires are considered a natural and important disturbance agent in grassland ecosystems, and are essential to the maintenance of biodiversity patterns and ecological processes. They are also important in maintaining grassland productivity for local livestock farmers. An increase in unplanned or undesirable wildfire frequency from faulty/shorting electrical infrastructure may negatively impact ecological processes, which may affect grassland productivity and fauna diversity.

Before mitigation, this impact is of medium magnitude, with a long-term duration (i.e., Project life) affecting terrestrial biodiversity within and potentially adjacent to the development footprint (local). It is also considered to have a high probability, resulting in an impact of “Moderate” significance.

With the application of the recommended mitigation measures, impact magnitude can be reduced to low. Duration will remain the long-term, and probability will reduce to low, but spatial scale will remain local. This results in a residual impact 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 local. This results in a residual impact of “Low” significance.

Table 12: 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	4	56	N2	2	1	3	4	2	20	N1		
Significance						N2- Medium								N1 - Low							
Impact 2:	Fauna habitat	Fragmentation reducing natural habitat connectivity and integrity.	Construction	Negative	Low	3	2	3	5	4	52	N2	2	2	3	4	2	22	N1		
Significance						N2- Medium								N1 - Low							
Impact 4:	Fauna SCC	Injury, mortality and disturbance of fauna.	Construction	Negative	High	4	2	3	2	4	44	N2	3	2	1	2	2	16	N1		
Significance						N2 - Medium								N1 - Low							
Impact 5:	Fauna SCC	Loss of fauna species of conservation concern.	Construction	Negative	Low	5	2	3	2	4	48	N2	4	2	1	2	2	18	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	3	2	1	2	2	16	N1		
Significance						N2 - Medium								N1 - Low							
Impact 2:	Fauna, incl. SCC	Increase in wildfires from faulty/shorting powerline infrastructure	Operational	Negative	High	3	2	3	4	4	48	N2	2	2	1	4	2	18	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	2	1	2	2	16	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	5	3	3	5	5	80	N3	3	3	3	4	2	26	N1		
Significance						N3 - High								N1 - Low							
Impact 2:	Fauna SCC	Cumulative impact of fauna SCC due to Injury, mortality and disturbance of fauna.	Construction	Negative	All	4	3	3	3	4	52	N2	2	3	3	3	2	22	N1		
Significance						N2 - Medium								N1 - Low							

9.3.4. Cumulative Impacts

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

The landscape in which the AOI is located is already modified and fragmented as a consequence of historic and current agriculture, and other land use activities such as mining. The current degree of existing habitat modification and fragmentation in the landscape places significant pressure on the functioning and integrity of remaining natural and semi-natural habitat patches, and their ability to support viable populations of SCC.

At a local scale, the proposed Project is located within the broader planned development area for the Phefumula Emoyeni One WEF. At a regional scale, several renewable energy developments are, or may be, taking place in the broader region surrounding the AOI. Some of the main developments within a 55 km radius of the AOI include *inter alia*; Halfgewonnen solar photovoltaic (PV) facilities, Forzando North Coal Mine Solar PV Facility, Eskom Arnot PV Facility, Haverfontein WEF, Camden I WEF, Camden I Solar, Camden II WEF, Hendrina North WEF, Hendrina South WEF and Ummbila Emoyeni WEF.

Collectively, these projects will cause direct habitat loss, disturbance and fragmentation through vegetation clearing that is much greater in extent than that of a single constituent project, and this is a cumulative impact of concern with respects to fauna SCC and the proposed Project.

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 renewable energy projects mentioned in Section 9.3.4.1, will result in a higher number of construction locations, construction workers, and higher levels of vehicle activity across the surrounding landscape. This is likely to increase the potential for, and number of, fauna SCC that may be killed, injured or disturbed.

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

If the proposed Project does not proceed, it is anticipated that the current agricultural land use status quo will continue across most of the AOI and Project site into the future. The tracts of grassland and wetland habitat will continue to be used for livestock (cattle) production and game farming, and the croplands will continue to be actively cultivated to produce maize and other crop types.

Certain portions of the AOI are subject to heavy grazing and trampling by cattle, and it is possible that overtime, the condition of grassland and wetland habitat with respects to flora species diversity and ability to carry livestock (productivity) may deteriorate due to the effects of long-term overgrazing.

This may compromise the agricultural profitability of on-site farming operations. With respects to biodiversity, overgrazing is likely to drive the homogenisation of habitats and fauna diversity, including the persistence of SCC.

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 pre-construction, 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> <ul style="list-style-type: none"> As far as possible, permanent Project infrastructure footprints should be located in areas of modified habitat (i.e., Cultivated Fields & Old Lands) to avoid/minimise impacts on natural habitats; Temporary Project infrastructure footprints (e.g., laydown areas) should only be located in areas of modified habitat; In areas of natural habitat, micro-site Project infrastructure to localised disturbed sites; and A pre-construction walkdown of the transmission line corridor and the other development footprints should be conducted during the wet/growing season to identify sensitive biodiversity and inform additional micro-siting 	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
			<p>options, and any other relevant management measures.</p> <p><u>Minimisation</u></p> <ul style="list-style-type: none"> • All vegetation clearing for the Project should be restricted to the proposed Project footprints only, with no clearing permitted outside of these areas; • The footprints to be cleared of vegetation should be clearly demarcated prior to construction to prevent unnecessary clearing outside of these areas; • No heavy vehicles should travel beyond the marked works zone; • Removed topsoil should be stockpiled and used to rehabilitate all disturbed areas. <p><u>Rehabilitation</u></p> <p>A rehabilitation/ landscaping protocol should be developed and implemented to stabilise and revegetate all non-operational sites that have</p>				

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			<p>been disturbed by construction. The protocol should include:</p> <ul style="list-style-type: none"> • Stockpiling of topsoil that was cleared from development footprints during site preparation; • Post-construction, the land form should be correctly contoured to limit potential erosion and compacted soils should be ripped and loosened to facilitate vegetation establishment; • Topsoil removed during construction should be applied to all non-operational sites that were disturbed during construction and require revegetation; and • Grass species used during rehabilitation should be indigenous, locally-occurring perennial species. 				
1.2	Fauna, incl. SCC	Fragmentation reducing natural habitat connectivity and integrity	<p><u>Minimisation</u></p> <p>See mitigation measures for <i>Direct loss and disturbance of natural habitat</i>.</p>	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
			<u>Rehabilitation</u> See mitigation measures for <i>Direct loss and disturbance of natural habitat</i>				
1.3	Fauna, incl. SCC	Injury, mortality and disturbance of fauna.	<u>Avoidance and Minimisation</u> <ul style="list-style-type: none"> • An Environmental Control Officer (ECO) should be on-site during vegetation clearing to monitor and manage any wildlife-human interactions; • As appropriate, temporary barriers should be erected around construction trenches and excavations to prevent fauna becoming trapped; • Any fauna species trapped in construction areas, should be safely and correctly relocated to an adjacent area of natural habitat; • A low-speed limit (recommended 20-40 km/h) should be enforced on site to reduce wildlife collisions; • No fauna may be intentionally killed or injured by on-site contractors and workers. Handling, poisoning, snaring 	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
			<p>and killing of on-site fauna by contractors and workers must be strictly prohibited;</p> <ul style="list-style-type: none"> • General noise abatement equipment should be fitted to construction machinery and vehicles; • Dust suppression using water bowsers should be undertaken on all roads and other sites where dust entrainment occurs; • The rules and regulations concerning fauna should be communicated to contractors through on-site signage and awareness training; and • 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. • <i>Refer to the Avifauna Specialist Assessment for mitigation and</i> 				

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			<i>management measures concerning birds.</i>				
1.4	Fauna SCC	Loss of fauna of conservation concern	<u>Avoidance and Minimisation</u> See mitigation measures for: <i>Direct loss and disturbance of natural habitat; Fragmentation reducing natural habitat connectivity and integrity; and, Injury, mortality and disturbance of Fauna.</i>	N/A	Avoidance and Minimisation	During Construction Phase	Project Manager
2. Operational phase							
2.1	Fauna, incl. SCC	Injury, mortality disturbance of fauna, including SCC	<u>Avoidance and Minimisation</u> <ul style="list-style-type: none"> No off-road driving is permitted for vehicles and mobile machinery used during operations and for maintenance purposes. A low-speed limit (recommended 20-40 km/h) should be enforced on site to reduce wildlife collisions; No fauna may be intentionally killed or injured by on-site contractors and workers. Handling, poisoning, snaring 	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
			<p>and killing of on-site fauna by contractors and workers must be strictly prohibited;</p> <ul style="list-style-type: none"> The rules and regulations concerning fauna should be communicated to maintenance personnel through on-site signage and awareness training. <i>Refer to the Avifauna Specialist Assessment for mitigation and management measures concerning birds.</i> 				
2.2	Fauna Habitats and SCC	Increase in wildfires from faulty/shorting powerline infrastructure	<ul style="list-style-type: none"> Project infrastructure should be regularly inspected and maintained to ensure operational efficiency and prevent electrical failures and accidental fires; The Project proponent should approach all relevant farmers and the local fire protection association (FPA) to investigate developing a co-ordinated Grassland Burning Management Programme for the farms encompassing the Project site; 	N/A	Minimisation	During Operational Phase	Facility Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			<ul style="list-style-type: none"> As required, firebreaks should be maintained around infrastructure that are susceptible to faults/shorts that may cause accidental wildfires; and Construction- and maintenance workers should be trained on the dangers of wildfire and the need to actively prevent unplanned/accidental fires. 				
3. Decommissioning phase							
3.1	Fauna incl. SCC	Injury, mortality disturbance of fauna, including SCC	<u>Avoidance and Minimisation</u> <ul style="list-style-type: none"> No off-road driving is permitted for vehicles and mobile machinery used during decommissioning phases activities; A low-speed limit (recommended 20-40 km/h) should be enforced on site to reduce wildlife collisions; The handling, poisoning and killing of on-site fauna by on-site workers must be strictly prohibited; 	N/A	Avoidance and Minimisation	During Decommissioning Phase	Facility Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			<ul style="list-style-type: none"> The rules and regulations concerning fauna should be communicated to maintenance personnel through on-site signage and awareness training. 				

12. Monitoring Measures

With respects to terrestrial animal species, no additional monitoring measures are recommended.

13. Reasoned Opinion and Environmental Impact Statement

13.1. Summary of Main Findings

Natural dry- and moist grassland habitat in the Project site and across the broader AOI provides suitable life-cycle habitat and an important network of movement and dispersal corridors for many fauna species. The continued integrity and functioning of on-site natural habitat is therefore important in maintaining the metapopulation dynamics of fauna, including that of SCC.

During the field programme, several fauna SCC were documented in the AOI and it is possible that these may be impacted by proposed Project activities taking place within the OHL assessment corridors and substation footprints. Fauna SCC observed on-site include:

- Four mammal species of conservation concern:
 - Serval - Near Threatened;
 - Mountain Reedbuck - Endangered;
 - Cape Clawless Otter - Near Threatened;
 - Swamp Musk Shrew – Near Threatened; and
- Six bird species of conservation concern:
 - Blue Crane - Near Threatened;
 - Lesser Flamingo - Near Threatened;
 - Greater Flamingo - Near Threatened;
 - Southern Bald Ibis - Vulnerable;
 - Yellow-billed Stork - Endangered; and
 - Blue Korhaan - Vulnerable (NEMBA ToPS, 2007).

The DFFE National Web Based Screening Tool rated the Animal Species Theme for the Project site as 'High' Sensitivity on account of the potential presence of several threatened fauna species, of which, two species (*viz.* Southern Bald Ibis and Yellow-billed Stork) were confirmed in the broader AOI during the field programme for this study. Habitat suitability assessment also indicate that several other fauna SCC are also likely to be present. Based on the findings of this study, the 'High' sensitivity rating for the Project site is therefore confirmed.

The proposed Project will result in small-scale habitat loss, disturbance and fragmentation through vegetation clearing, and this may impact local fauna and metapopulation dynamics. Moreover, it is also possible that some fauna may be killed, injured or disturbed during the various Project phases through *inter alia*, vehicle collisions, hunting/snaring and sensory disturbances from noise and dust.

The loss, disturbance and fragmentation of natural fauna habitat can be mitigated by the implementation of the recommended management measures, which include *inter alia*: 1) micro-siting as much of the proposed Project infrastructure as possible to localised disturbed sites; 2) clearing only the minimum footprint areas required for construction activities; and 3) actively rehabilitating all disturbance footprints and controlling alien invasive species colonisation and erosion post-construction.

Direct impacts on individual fauna can also be mitigated through the appointment of an ECO on-site during the construction phase to manage any human-fauna interactions, and through the implementation of several responsible operation and land use practices, such as *inter alia*, enforcing a speed limit for construction vehicles, banning hunting/snaring by on-site workers, and implementing dust suppression.

It is contended that the proactive implementation of the management measures outlined in this report, will provide effective mitigation and ensure minimal impacts on fauna SCC as a result of the proposed Project. It is therefore recommended that all mitigation measures are included in the proposed Project's environmental management plan (EMP).

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
Terrestrial Ecologist
B.Sc. (Hons.), M.Sc., Pr.Sci.Nat.

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Address: 58 Central Rd, Linden Ext., Johannesburg, 2195
South Africa
Date of birth: 14 July 1982
Nationality: South African

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

- Zinn, A.D., D.E., Burkepile and D.I. Thompson (In prep). Impacts of fire and herbivores on tree seedling establishment in a South African savanna.
- Burkepile, D.E., C.E. Burns, E. Amendola, G.M. Buis, N. Govender, V. Nelson, C.J. Tambling, D.I. Thompson, A.D. Zinn and M.D. Smith (2013). Habitat selection by large herbivores in a southern African savanna: the relative roles of bottom-up and top-down forces. *Ecosphere*, 4(11):139.
- Knapp, A.K., D.L. Hoover, J.M. Blair, G. Buis, D.E. Burkepile, A. Chamberlain, S.L. Collins, R.W.S Fynn, K.P. Kirkman, M.D. Smith, D. Blake, N. Govender, P. O'Neal, T. Schreck and A. Zinn (2012). A test of two mechanisms proposed to optimize grassland aboveground primary productivity in response to grazing. *Journal of Plant Ecology*, 5, 357-365.
- Zinn, A.D., D. Ward and K. Kirkman (2007). Inducible defences in *Acacia sieberiana* in response to giraffe browsing. *African Journal of Range and Forage Science*, 24, 123-129.
- Zinn, A.D. (2007). Exploitation vs. Conservation: A Burgeoning Fifth Column. *African Wildlife*, 61, 9-11.
- Andrew Zinn (2006). Conflict Resolution. *Africa Birds and Birding*. Vol. 11, No. 5, 12-13.

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 AOI 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	<ul style="list-style-type: none"> • Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or Critically Rare species that have a global EOO of < 10km²; • 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 • Globally significant populations of congregatory species (>10% of global population).
High	<ul style="list-style-type: none"> • Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10km², 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; • Small area (>0.01% but <0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (>0.1%) of natural habitat of VU ecosystem type; • Presence of Rare species; • Globally significant populations of congregatory species (>1% but < 10% of global population).
Medium	<ul style="list-style-type: none"> • Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals; • Any area of natural habitat of threatened ecosystem type with status of VU; • Presence of range-restricted species; and • >50% of receptor contains natural habitat to support SCC.
Low	<ul style="list-style-type: none"> • No confirmed or highly likely populations of SCC; • No confirmed or highly likely populations of range-restricted species; and • <50% of receptor contains natural habitat with limited potential to support SCC.
Very Low	<ul style="list-style-type: none"> • No confirmed and highly unlikely populations of SCC; • No confirmed and highly unlikely populations of range-restricted species; and • No natural habitat remaining.

Table 2: Functional Integrity (FI) criteria.

Functional Integrity (FI)	Fulfilling Criteria
Very High	<ul style="list-style-type: none"> • Very large (>100 ha) intact area for any conservation status of ecosystem type or >5a ha for CR ecosystem type; • High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches; • No or minimal current negative ecological impacts with no signs of major disturbance (e.g., ploughing)
High	<ul style="list-style-type: none"> • Large (>5 ha but < 100 ha) intact area for any conservation status ecosystem types; • Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches; and • 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	<ul style="list-style-type: none"> • Medium (>5ha but < 20 ha) semi-intact area for any conservation status ecosystem type or >20 ha for VU ecosystem type; • Only narrow corridors of good connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches; • Mostly minor current negative ecological impacts with some major impacts (e.g., established population of alien invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential.
Low	<ul style="list-style-type: none"> • Small (> 1 ha but <5ha) area; • Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential; and • Several minor and major current negative ecological impacts.
Very Low	<ul style="list-style-type: none"> • Very small (<1 ha) area; • No habitat connectivity except for flying species or flora with wind-dispersed seeds; • Several major current negative ecological impacts.

$$BI = CI + FI$$

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 Potentially Occurring in the AOI

Species highlighted in **bold** text have been recorded in the 2629BD and 2629BC QDS as per MammalMap (Fitzpatrick Institute of African Ornithology, 2023).

Family	Scientific Name	Common Name	Regional Red List Status (2016)	NEMBA ToPS List (2007)	Mpumalanga Status
Bathyergidae	<i>Cryptomys hottentotus</i>	Common Mole-rat	Least Concern	-	Data Deficient
Bathyergidae	<i>Georchus capensis</i>	Cape Mole-rat	Data Deficient	-	-
Bovidae	<i>Connochaetes gnou</i>	Black Wildebeest	Least Concern	Protected	-
Bovidae	<i>Damaliscus pygargus phillipsi</i>	Blesbok	Least Concern	-	-
Bovidae	<i>Ourebia ourebi ourebi</i>	Oribi	Endangered	Endangered	Endangered Protected /
Bovidae	<i>Pelea capreolus</i>	Grey Rhebok	Near Threatened	-	Protected
Bovidae	<i>Raphicerus campestris</i>	Steenbok	Least Concern	-	Protected
Bovidae	<i>Redunca arundinum</i>	Southern Reedbuck	Least Concern	Protected	Protected
Bovidae	<i>Redunca fulvorufula fulvorufula</i>	Mountain Reedbuck	Endangered	-	Protected
Bovidae	<i>Sylvicapra grimmia</i>	Common Duiker	Least Concern	-	-
Canidae	<i>Canis mesomelas</i>	Black-backed Jackal	Least Concern	-	-
Canidae	<i>Vulpes chama</i>	Cape Fox	Least Concern	Protected	Protected
Cercopithecidae	<i>Chlorocebus pygerythrus</i>	Vervet Monkey	Least Concern	-	-
Cercopithecidae	<i>Papio ursinus</i>	Chacma Baboon	Least Concern	-	-
Chrysochloridae	<i>Amblysomus septentrionalis</i>	Highveld Golden Mole	Near Threatened	-	Protected
Chrysochloridae	<i>Chrysospalax villosus</i>	Rough-haired Golden Mole	Vulnerable	Critically Endangered	Protected
Erinaceidae	<i>Atelerix frontalis</i>	South African Hedgehog	Near Threatened	Protected	-
Felidae	<i>Caracal caracal</i>	Caracal	Least Concern	-	-
Felidae	<i>Felis nigripes</i>	Black-footed Cat	Vulnerable	Protected	Near Threatened
Felidae	<i>Felis silvestris</i>	African Wildcat	Least Concern	-	-
Felidae	<i>Leptailurus serval</i>	Serval	Near Threatened	Protected	Near Threatened
Felidae	<i>Panthera pardus</i>	Leopard	Vulnerable	Vulnerable	Near Threatened
Gliridae	<i>Graphiurus murinus</i>	Woodland Dormouse	Least Concern	-	-
Herpestidae	<i>Atilax paludinosus</i>	Water Mongoose	Least Concern	-	-
Herpestidae	<i>Cynictis penicillata</i>	Yellow Mongoose	Least Concern	-	-

Family	Scientific Name	Common Name	Regional Red List Status (2016)	NEMBA ToPS List (2007)	Mpumalanga Status
Herpestidae	<i>Herpestes sanguineus</i>	Slender Mongoose	Least Concern	-	-
Herpestidae	<i>Ichneumia albicauda</i>	White-tailed Mongoose	Least Concern	-	-
Herpestidae	<i>Suricata suricatta</i>	Suricate	Least Concern	-	-
Hyaenidae	<i>Parahyaena brunnea</i>	Brown Hyaena	Near Threatened	Protected	Near Threatened / Protected
Hyaenidae	<i>Proteles cristata</i>	Aardwolf	Least Concern	-	Protected
Hystriidae	<i>Hystrix africaeauralis</i>	Cape Porcupine	Least Concern	-	-
Leporidae	<i>Lepus saxatilis</i>	Scrub Hare	Least Concern	-	-
Leporidae	<i>Pronolagus crassicaudatus</i>	Natal Red Rock Rabbit	Least Concern	-	-
Leporidae	<i>Pronolagus rupestris</i>	Smith's Red Rock Rabbit	Least Concern	-	-
Macroscelididae	<i>Elephantulus myurus</i>	Eastern Rock Sengi	Least Concern	-	-
Muridae	<i>Aethomys chrysophilus</i>	Red Veld Rat	Least Concern	-	-
Muridae	<i>Dasymys incommutus</i>	African Marsh Rat	Near Threatened	-	Near Threatened
Muridae	<i>Gerbilliscus brantsii</i>	Highveld Gerbil	Least Concern	-	-
Muridae	<i>Lemniscomys rosalia</i>	Single-striped Mouse	Least Concern	-	-
Muridae	<i>Mastomys natalensis</i>	Natal Multimammate Mouse	Least Concern	-	-
Muridae	<i>Micaelamys namaquensis</i>	Namaqua Rock Mouse	Least Concern	-	-
Muridae	<i>Mus minutoides</i>	Pygmy Mouse	Least Concern	-	-
Muridae	<i>Otomys angoniensis</i>	Angoni Vlei Rat	Least Concern	-	-
Muridae	<i>Otomys auratus</i>	Vlei Rat (Grassland type)	Near Threatened	-	-
Muridae	<i>Otomys laminatus</i>	Laminate Vlei Rat	Near Threatened	-	-
Muridae	<i>Rhabdomys pumilio</i>	Xeric Four-striped Mouse	Least Concern	-	-
Muridae	<i>Thallomys paedulus</i>	Tree Rat	Least Concern	-	-
Muridae	<i>Dendromus melanotis</i>	Grey Climbing Mouse	Least Concern	-	-
Muridae	<i>Dendromus mesomelas</i>	Brant's Climbing Mouse	Least Concern	-	-
Muridae	<i>Dendromus mystacalis</i>	Chestnut Climbing Mouse	Least Concern	-	-
Muridae	<i>Mystromys albicaudatus</i>	White-tailed Rat	Vulnerable	-	-
Muridae	<i>Steatomys pratensis</i>	Fat Mouse	Least Concern	-	-

Family	Scientific Name	Common Name	Regional Red List Status (2016)	NEMBA ToPS List (2007)	Mpumalanga Status
Mustelidae	<i>Aonyx capensis</i>	Cape Clawless Otter	Near Threatened	Protected	Protected
Mustelidae	<i>Hydricis maculicollis</i>	Spotted-necked Otter	Vulnerable	Protected	Near Threatened / Protected
Mustelidae	<i>Ictonyx striatus</i>	Striped Polecat	Least Concern	-	-
Mustelidae	<i>Mellivora capensis</i>	Honey Badger	Least Concern	Protected	Near Threatened / Protected
Orycteropodidae	<i>Orycteropus afer</i>	Aardvark	Least Concern	-	Protected
Pedetidae	<i>Pedetes capensis</i>	Springhare	Least Concern	-	-
Procaviidae	<i>Procapra capensis</i>	Rock Hyrax	Least Concern	-	-
Soricidae	<i>Crocidura cyanea</i>	Reddish-grey Musk Shrew	Least Concern	-	-
Soricidae	<i>Crocidura flavescens</i>	Greater Red Musk Shrew	Least Concern	-	-
Soricidae	<i>Crocidura fuscomurina</i>	Tiny Musk Shrew	Least Concern	-	-
Soricidae	<i>Crocidura mariquensis</i>	Swamp Musk Shrew	Near Threatened	-	Near Threatened
Soricidae	<i>Myosorex cafer</i>	Dark-Footed Forest Shrew	Vulnerable	-	-
Soricidae	<i>Myosorex varius</i>	Forest Shrew	Least Concern	-	-
Soricidae	<i>Crocidura maquassiensis</i>	Maquassie Musk Shrew	Vulnerable	-	Vulnerable
Suidae	<i>Potamochoerus larvatus</i>	Bushpig	Least Concern	-	-
Sciuridae	<i>Xerus inauris</i>	South African Ground Squirrel	Least Concern	-	-
Viverridae	<i>Genetta maculata</i>	Rusty-spotted Genet	Least Concern	-	-
Source: Master list based on distribution maps in Stuart and Stuart (2007).					

Appendix D: List of Herpetofauna Species Recorded and Potentially Occurring in the AOI

Reptiles

Species highlighted in **bold** text have been recorded in the 2629BD and 2629BC QDS, as per ReptileMap (Fitzpatrick Institute of African Ornithology, 2023)

Family	Scientific Name	Common Name	Regional Red List Status	NEMBA TOPS List (2007)	Mpumalanga Status
Agamidae	<i>Agama aculeata distantii</i>	Eastern Ground Agama	Least Concern	-	-
Agamidae	<i>Agama atra</i>	Southern Rock Agama	Least Concern	-	-
Chamaeleonidae	<i>Chamaeleo dilepis</i>	Flap-neck Chameleon	Least Concern	-	-
Colubridae	<i>Crotaphopeltis hotamboeia</i>	Red-lipped Snake	Least Concern	-	-
Colubridae	<i>Dasypeltis inornata</i>	Southern Brown Egg-eater	Least Concern	-	Near Threatened
Colubridae	<i>Dasypeltis scabra</i>	Rhombic Egg-eater	Least Concern	-	-
Colubridae	<i>Dispholidus typus</i>	Boomslang	Least Concern	-	-
Colubridae	<i>Philothamnus hoplogaster</i>	Green Water Snake	Least Concern	-	-
Colubridae	<i>Philothamnus natalensis natalensis</i>	Eastern Natal Green Snake	Least Concern	-	-
Colubridae	<i>Philothamnus semivariegatus</i>	Spotted Bush Snake	Least Concern	-	-
Colubridae	<i>Thelotornis capensis capensis</i>	Southern Twig Snake	Least Concern	-	-
Cordylidae	<i>Chamaesaura aenea</i>	Coppery Grass Lizard	Least Concern	-	Near Threatened
Cordylidae	<i>Chamaesaura anguina anguina</i>	Cape Grass Lizard	Least Concern	-	-
Cordylidae	<i>Cordylus vittifer</i>	Common Girdled Lizard	Least Concern	-	-
Cordylidae	<i>Pseudocordylus melanotus melanotus</i>	Common Crag Lizard	Least Concern	-	-
Cordylidae	<i>Pseudocordylus melanotus subviridis</i>	Drakensberg Crag Lizard	Least Concern	-	-
Cordylidae	<i>Smaug warren barbertonensis</i>	Barberton Dragon Lizard	Least Concern	-	-
Elapidae	<i>Elapsoidea boulengeri</i>	Boulenger's Garter Snake	Least Concern	-	-
Elapidae	<i>Elapsoidea sundevallii</i>	Sundevall's Garter Snake	Least Concern	-	-
Elapidae	<i>Hemachatus heamachatus</i>	Rinkhals	Least Concern	-	-
Elapidae	<i>Naja annulifera</i>	Snouted Cobra	Least Concern	-	-
Elapidae	<i>Naja mossambica</i>	Mozambique Spitting Cobra	Least Concern	-	-
Gekkonidae	<i>Homopholis wahbergii</i>	Wahlberg's Velvet Gecko	Least Concern	-	-
Gekkonidae	<i>Lygodactylus capensis capensis</i>	Common Dwarf Gecko	Least Concern	-	-

Family	Scientific Name	Common Name	Regional Red List Status	NEMBA TOPS List (2007)	Mpumalanga Status
Gekkonidae	<i>Lygodactylus ocellatus ocellatus</i>	Spotted Dwarf Gecko	Least Concern	-	-
Gekkonidae	<i>Pachydactylus vansonii</i>	Van Son's Gecko	Least Concern	-	-
Gerrhosauridae	<i>Gerrhosaurus flavigularis</i>	Yellow-throated Plated Lizard	Least Concern	-	-
Lacertidae	<i>Nucras lalandii</i>	Delalande's Sandveld Lizard	Least Concern	-	-
Lacertidae	<i>Pedioplanis burchelli</i>	Burchell's Sand Lizard	Least Concern	-	-
Lamprophiidae	<i>Amplorhinus multimaculatus</i>	Many-spotted Snake	Least Concern	-	-
Lamprophiidae	<i>Aparallactus capensis</i>	Cape centipede-eater	Least Concern	-	-
Lamprophiidae	<i>Atractaspis bibronii</i>	Bibron's Stiletto Snake	Least Concern	-	-
Lamprophiidae	<i>Boaedon capensis</i>	Common House Snake	Least Concern	-	-
Lamprophiidae	<i>Duberria lutrix lutrix</i>	South African Slug Eater	Least Concern	-	-
Lamprophiidae	<i>Homoroselaps dorsalis</i>	Striped Harlequin Snake	Least Concern	-	Near Threatened
Lamprophiidae	<i>Homoroselaps lacteus</i>	Spotted Harlequin Snake	Least Concern	-	Near Threatened
Lamprophiidae	<i>Inyoka swazicus</i>	Swazi Rock Snake	Least Concern	-	-
Lamprophiidae	<i>Lamprophis aurora</i>	Aurora Snake	Least Concern	-	-
Lamprophiidae	<i>Lamprophis fuscus</i>	Yellow-bellied Snake	Least Concern	-	Near Threatened
Lamprophiidae	<i>Lamprophis guttatus</i>	Spotted Rock Snake	Least Concern	-	-
Lamprophiidae	<i>Lycodonomorphus inornatus</i>	Live Ground Snake	Least Concern	-	-
Lamprophiidae	<i>Lycodonomorphus rufulus</i>	Brown Water Snake	Least Concern	-	-
Lamprophiidae	<i>Lycophidion capense</i>	Cape Wolf Snake	Least Concern	-	-
Lamprophiidae	<i>Psammophis brevirostris</i>	Short-snouted Grass Snake	Least Concern	-	-
Lamprophiidae	<i>Psammophis crucifer</i>	Montane Grass Snake	Least Concern	-	-
Lamprophiidae	<i>Psammophylax tritaeniatus</i>	Striped Grass Snake	Least Concern	-	-
Lamprophiidae	<i>Psammophylax rhombeatus rhombeatus</i>	Spotted Grass Snake	Least Concern	-	-
Lamprophiidae	<i>Pseudaspis cana</i>	Mole Snake	Least Concern	-	-
Leptotyphlopidae	<i>Leptotyphlops scutifrons</i>	Peter's Thread Snake	Least Concern	-	-
Scincidae	<i>Acontias breviceps</i>	Short-headed Legless Skink	Least Concern	-	Vulnerable
Scincidae	<i>Acontias gracilicauda</i>	Thin-tailed Legless Skink	Least Concern	-	-

Family	Scientific Name	Common Name	Regional Red List Status	NEMBA TOPS List (2007)	Mpumalanga Status
Scincidae	<i>Afroablepharus wahlbergii</i>	Wahlberg's Snake-eyed Skink	Least Concern	-	-
Scincidae	<i>Scelotes mirus</i>	Montane Dwarf Burrowing Skink	Least Concern	-	-
Scincidae	<i>Trachylepis capensis capensis</i>	Cape Skink	Least Concern	-	-
Scincidae	<i>Trachylepis homalocephala</i>	Red-sided Skink	Least Concern	-	-
Scincidae	<i>Trachylepis margaritifer</i>	Rainbow Skink	Least Concern	-	-
Scincidae	<i>Trachylepis punctatissima</i>	Montane Rock Skink	Least Concern	-	-
Scincidae	<i>Trachylepis varia</i>	Variable Skink	Least Concern	-	-
Typhlopidae	<i>Afrotyphlops bibronii</i>	Bibron's Blind Snake	Least Concern	-	-
Typhlopidae	<i>Rhinotyphlops lalandei</i>	Delalande's Beaked Blind Snake	Least Concern	-	-
Varanidae	<i>Varanus niloticus</i>	Water Monitor	Least Concern	-	-
Viperidae	<i>Bitis arietans arietans</i>	Puff Adder	Least Concern	-	-
Viperidae	<i>Bitis atropos</i>	Berg Adder	Least Concern	-	-
Viperidae	<i>Causus rhombeatus</i>	Rhombic Night Adder	Least Concern	-	-
Source: Master list based on Bates <i>et al.</i> , (2014)					

Amphibians

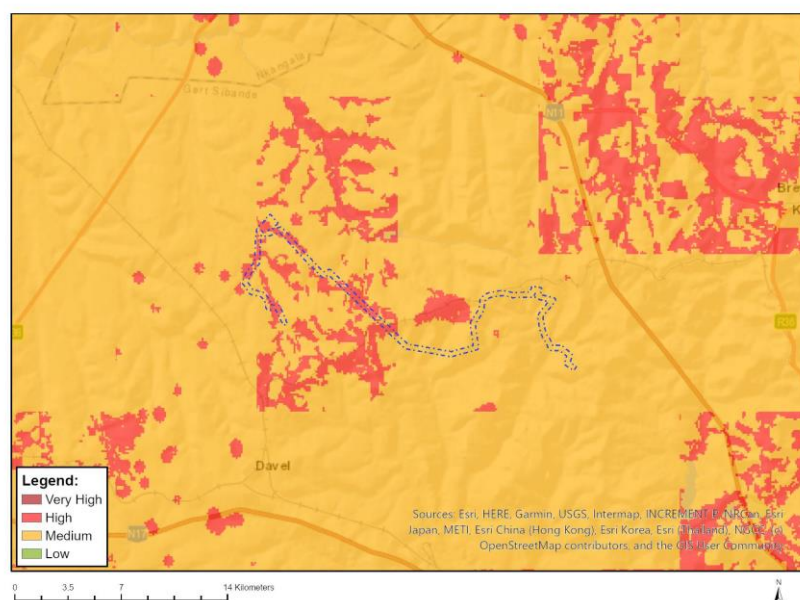
Species highlighted in **bold** text have been recorded in the 2629BD and 2629BC QDS, as per FrogMap (Fitzpatrick Institute of African Ornithology, 2023).

Family	Scientific Name	Comon Name	Regional Red List	NEMBA 2007	Mpumalanga Status
Brevipectidae	<i>Breviceps adspersus</i>	Bushveld Rain Frog	Least Concern	-	-
Brevipectidae	<i>Breviceps mossambicus</i>	Mozambique Rain Frog	Least Concern	-	-
Bufonidae	<i>Amietophrynus gutturalis</i>	Guttural Toad	Least Concern	-	-
Bufonidae	<i>Amietophrynus maculatus</i>	Flat-backed Toad	Least Concern	-	-
Bufonidae	<i>Amietophrynus rangeri</i>	Raucous Toad	Least Concern	-	-
Hyperoliidae	<i>Hyperolius marmoratus</i>	Painted Reed Frog	Least Concern	-	-
Hyperoliidae	<i>Hyperolius semidiscus</i>	Yellow-striped Reed Frog	Least Concern	-	Vulnerable
Hyperoliidae	<i>Kassina senegalensis</i>	Bubbling Kassina	Least Concern	-	-
Hyperoliidae	<i>Semnodactylus wealii</i>	Rattling Frog	Least Concern	-	-
Microhylidae	<i>Phrynomantis bifasciatus</i>	Banded Rubber Frog	Least Concern	-	-
Phrynobatrachidae	<i>Phrynobatrachus natalensis</i>	Snoring Puddle Frog	Least Concern	-	-
Pipidae	<i>Xenopus laevis</i>	Common Platanna	Least Concern	-	-
Ptychadenidae	<i>Ptychadena porosissima</i>	Striped Grass Frog	Least Concern	-	-
Pyxicephalidae	<i>Amietia angolensis</i>	Common River Frog	Least Concern	-	-
Pyxicephalidae	<i>Amietia fuscigula</i>	Cape River Frog	Least Concern	-	-
Pyxicephalidae	<i>Cacosternum boettgeri</i>	Common Caco	Least Concern	-	-
Pyxicephalidae	<i>Cacosternum nanum</i>	Bronze Caco	Least Concern	-	-
Pyxicephalidae	<i>Cacosternum parvum</i>	Mountain Caco	Least Concern	-	-
Pyxicephalidae	<i>Pyxicephalus adspersus</i>	Giant Bullfrog	Least Concern	Protected	Vulnerable
Pyxicephalidae	<i>Strongylopus fasciatus</i>	Striped Stream Frog	Least Concern	-	-
Pyxicephalidae	<i>Strongylopus grayii</i>	Clicking Stream Frog	Least Concern	-	-
Pyxicephalidae	<i>Tomopterna cryptotis</i>	Tremolo Sand Frog	Least Concern	-	-
Pyxicephalidae	<i>Tomopterna natalensis</i>	Natal Sand Frog	Least Concern	-	-
Pyxicephalidae	<i>Tomopterna tandyi</i>	Tandy's Sand Frog	Least Concern	-	-

Appendix E: Summary and Comment on the Sensitivity Rating of the DFFE Screening Tool

Sensitivity Rating of the National Web Based Screening Tool

The National Web-based Environmental Screening Tool rates the Animal Species Theme for the proposed Project as 'High' sensitivity on account of the potential presence of nine bird, one invertebrate, and three mammal species of conservation concern. These are listed in the table below. Also refer to the map showing the spatial sensitivity.



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Polemaetus bellicosus
High	Aves-Geronticus calvus
High	Aves-Mycteria ibis
Medium	Aves-Tyto capensis
Medium	Aves-Hydroprogne caspia
Medium	Aves-Sagittarius serpentarius
Medium	Aves-Geronticus calvus
Medium	Aves-Eupodotis senegalensis
Medium	Insecta-Lepidochrysops procera
Medium	Mammalia-Crocidura maquassiensis
Medium	Mammalia-Hydricis maculicollis

Appraisal of the Sensitivity Rating

Two bird species highlighted by the Environmental Screening Tool were confirmed in the AOI during the field programme for this specialist study, namely *Geronticus calvus* and *Mycteria ibis*. Field observations, coupled with habitat suitability assessments, also indicate that several other fauna SCC, including other taxa highlighted by the screening report either occur, or are likely to occur, in the AOI and the Project site. Based on the findings of this study, the 'High' Animal Species sensitivity rating for Project site is therefore confirmed.

Appendix F: 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 & Section 6.4
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 & Section 6.4
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 & Section 6.4
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 & Section 6.4
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 & Section 6.4
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 8
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 7.1, Section 8 & 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 species; 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 & Section 6.4
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 6.3.2 & Section 6.4
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