Appendix F.5

PLANT SPECIES ASSESSMENT

PLANT SPECIES SPECIALIST ASSESSMENT FOR THE PROPOSED MUKONDELELI 1 SOLAR GRID CONNECTION AND ASSOCIATED INFRASTRUCTURE PROJECT

WSP Group Africa Pty (Ltd)

January 2024

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

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

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Acronyms and Abbreviations

Abbreviation	Explanation
AIS	Alien Invasive Species
AOO	Area of Occupancy
BI	Biodiversity Importance
CA	Conservation Areas
CI	Conservation Importance
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
EOO	Extent of Occurrence
FI	Functional Integrity
Ha	Hectare
NEMA	National Environmental Management Act
NEMBA	National Environmental Management Biodiversity Act
QDS	Quarter Degree Square
RR	Receptor Resilience
SANBI	South African National Biodiversity Institute
SCC	Species of Conservation Concern
SEI	Site Ecological Importance
ToPS	Threatened or Protected Species

Details of the Expertise of the Specialist

Specialist Information	
Name	Andrew D. Zinn Pr.Sci.Nat. - 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
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 (*Pr.Sci.Nat.*) – Ecological Science, with the South African Council of Natural Scientific Professions (SACNASP). Andrew has worked on projects in several African countries including Botswana, Democratic Republic of Congo, Ethiopia, Ghana, Mozambique, South Africa, Tanzania and Zambia.
Refer to Appendix A for a full Curriculum Vitae of Andrew Zinn.	

Declaration of Independence by Specialist

I, Andrew Zinn, declare that I –

- Act as the independent specialist for the undertaking of a specialist section for the proposed Mukondeleli 1 Solar Grid Connection and Associated 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 ENERTRAG South Africa (Pty) Ltd, to conduct the plant species assessment for the proposed Mukondeleli 1 Solar Grid Connection and Associated Infrastructure Project (hereafter referred to as the 'Project'), near Secunda 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;
- 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.

1.2. Project Description

The proposed Mukondeleli 1 Solar Grid Connection and associated infrastructure Project will support the proposed Mukondeleli 1 Solar PV Facility (part of a separate authorisation process) and will comprise of the following key components:

- Construction of 1 x up to 132kV OHPL (either single or double circuit);
- Establishment of the offtaker portion of the substation; and
- Standard substation electrical equipment.

These items are summarised in Table 1.

Table 1: Mukondeleli 1 Solar Grid Connection Project technical details

Detail	Information
Applicant Name	Mukondeleli 1 Solar (RF) (Pty) Ltd
Municipalities	• Govan Mbeki Local Municipality (GMM) • Gert Sibande District Municipality
Capacity	UP TO 132KV
Technology	Overhead Powerline (OHPL)
Transmission Line	• 132 KV OHPL • 40 m servitude • 500 m Assessment Corridor (250 m either side of centre line)
Substation and O&M Building Complex	This complex will house an O&M building, substation and Battery Energy Storage System (BESS). Total footprint will be up to 2ha in extent (for the BESS and the substation (inclusive of IPP and offtaker portions)). The offtaker Portion of the substation, which is applicable to this application, will be located on the side of the 132kV OHPL connection. A 100 m buffer has been included around the substations to allow for micro-siting
Standard Substation Electrical Equipment	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

1.2.1. Components of the Transmission Line

A brief overview of the physical/technical requirements of the project is as follows:

- 1 x up to 132kV OHPL (either single or double circuit)
- The powerline will have a 500 m Assessment Corridor – 250 m either side of centre line to allow for micro-siting. There are two scenarios for the Grid Infrastructure, and each scenario has two options:
    - Scenario 1: Preferred
        - Option 1: 6.92 km
        - Option 2: 7.26 km
    - Scenario 2: Alternative
        - Option 1: 6.92 km
        - Option 2: 7.26 km
- 40 m servitude
- A 500 m Assessment Corridor – 250 m either side of centre line to allow for micro-siting.
- The maximum height for an up to 132kV OHPL structure is approximately 40 m.
- Minimum conductor clearance is between 8.1 and 12.6 m.
- Span length between pylon structures is typically up to 250 m apart, depending on complexity and slope of terrain.

- The design of 132kV structure is currently unknown, the following options will be used to determine preferred design:
    - Intermediate self-supporting monopole
    - Inline or angle-strain self-supporting monopole
    - Suspension self-supporting monopole
    - Triple pole structure
    - Steel lattice structure
    - The up to 132 kV structures will have a concrete foundation and the sizes may vary depending on design type up to 80 m^2 (10 m by 8 m), with depths reaching up to 3.5 m typically in a rectangular 'pad' shape. The actual number of structures required will vary according to the final route alignment determined.

1.2.2. Clearance Requirements for the Transmission Lines

For safety reasons, transmission lines require certain minimum clearance distances. These are as follows:

- 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 OHPL is 9.4m – 11 m.
- The minimum distance between a 132kV OHPL 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.
- Minimum servitude to other parallel lines.

1.2.3. Proposed Associated Infrastructure

The proposed Grid Connection project will require the following with respect to the permanent infrastructure:

- Where the OHPL crosses a fence between neighbouring landowners and there is no suitable gate in place, a suitable gate will be erected in consultation with the landowner. These gates are necessary in order to ensure access to the line for maintenance and repair purposes.
- Existing road infrastructure will be used as far as possible to provide access for construction vehicles during the construction of the line. Thereafter, the roads are used for inspection and maintenance purposes. Where appropriate roads may be upgraded to access transmission lines and substations. Where no roads exist, access roads may be created for maintenance and inspection purposes.
- Fibre Optic cable could be strung on the earth cable if required for telecommunication
- Associated infrastructure including but not limited to lighting, fencing, and buildings required for operation (ablutions, office, workshop and control room, security fencing and gating, parking area and storerooms).

1.2.4. Substation, Operations and Maintenance (O&M) Building Complex

This complex will house an O&M building, substation and Battery Energy Storage System (BESS). Total footprint will be up to 2ha in extent (for the BESS and the substation (inclusive of IPP and

offtaker portions)). The offtaker Portion of the substation, which is applicable to this application, will be located on the side of the 132kV OHPL connection.

There are two locations proposed for the Substation and O&M Building Complex:

- Scenario 1: Preferred location for the substation and O&M Building Complex
- Scenario 2: Alternative location for the substation and O&M Building Complex

A 100 m buffer has been included around the substations to allow for micro-siting.

Electricity generated from the Mukondeleli 1 SEF will be distributed through the IPP substation to the Switching substation, from the Switching substation electricity will be distributed by the proposed 132kV grid connection.

1.3. Location and Delimits of the Study Area

The site of the proposed Project is located approximately 8 km to the south of Secunda, in the Gert Sibande District Municipality and the GMM Local Municipality in Mpumalanga Province (**Error! Reference source not found.**).

The 'study area' defined for this assessment is shown in **Error! Reference source not found.**. Proposed grid connection infrastructure, as well as planned infrastructure for the Mukondeleli 1 Solar PV Facility is shown in **Error! Reference source not found.**. It must be noted however, that the proposed Solar PV Facility development is not covered under this specialist reporting scope, and will form part of a separate authorisation process

1.4. Results of the Environmental Screening Tool

According to the National Web Based Screening Tool, the Plant Species Theme for the broader study area was rated 'Medium Sensitivity' on account of the potential presence of two threatened flora species. These species are listed below and discussed in more detail in Section 7.2.1 of this report:

- Sensitive species 1252; and
- Sensitive species 691.

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', *a*s per the species assessment guidelines (SANBI, 2020).

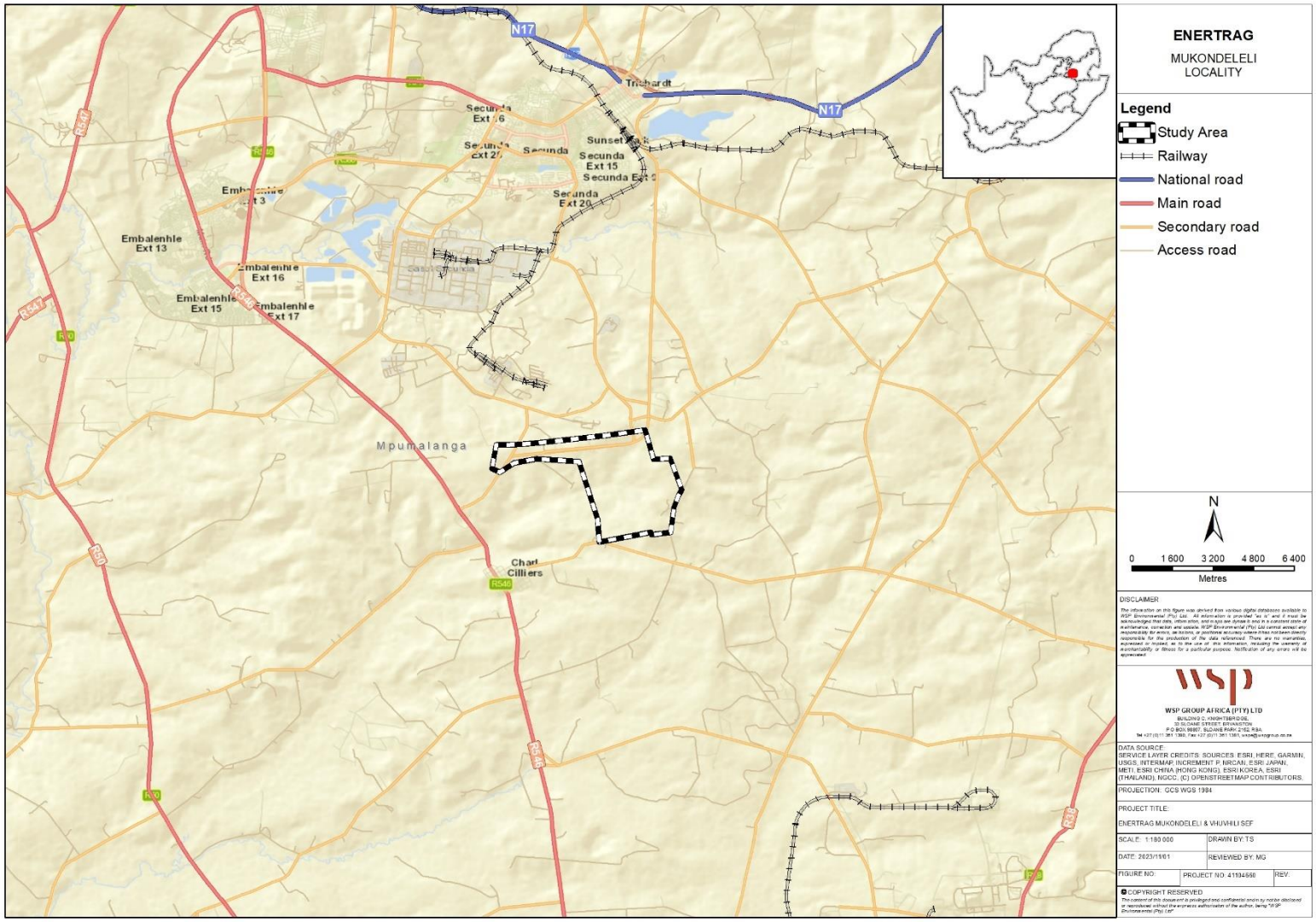

Figure 1: Map showing the regional location of the proposed Project.

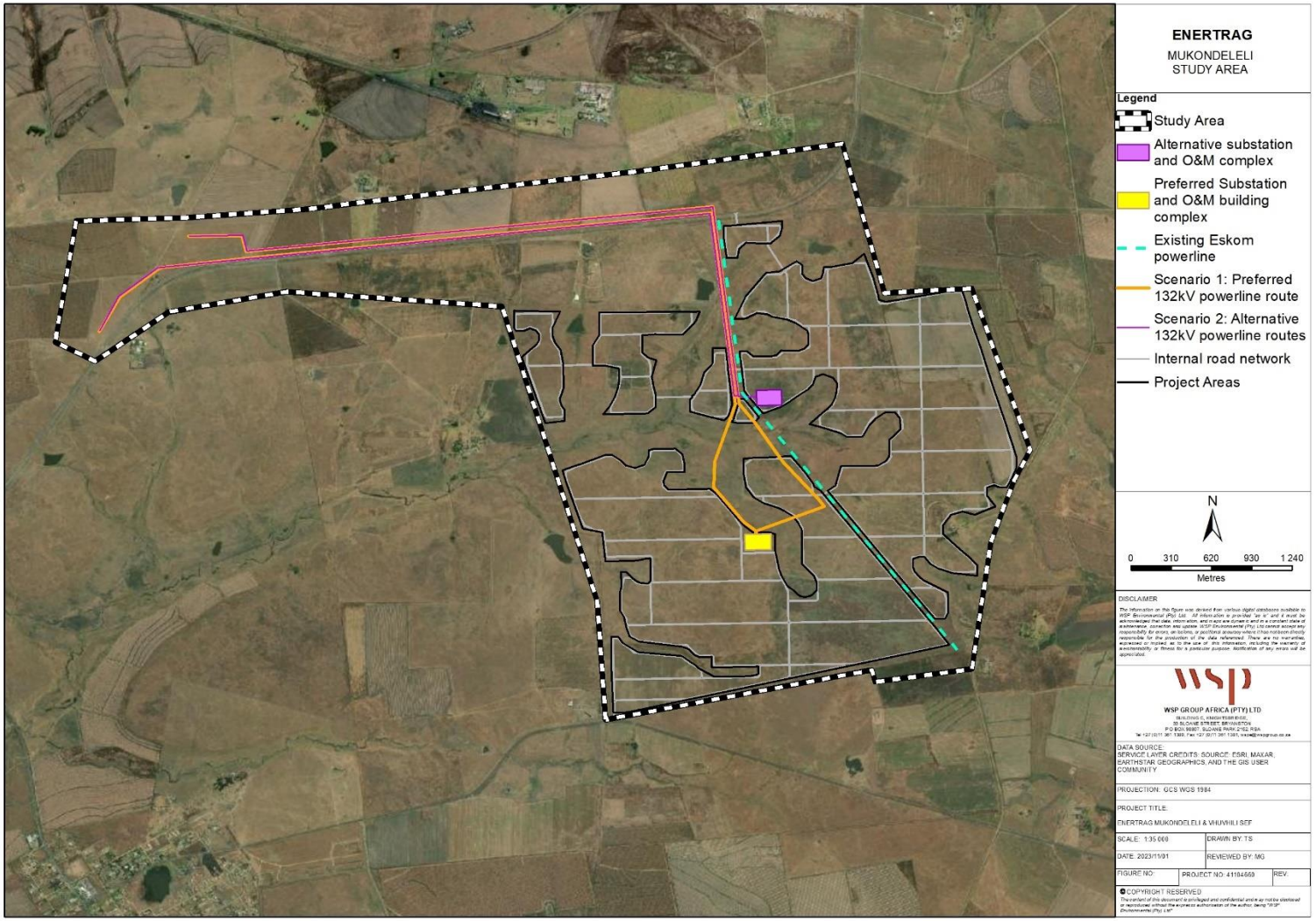

Figure 2: Aerial image showing the study area and surrounding landscape Note: infrastructure for both this proposed Project and the separate but associated Mukondeleli 1 Solar PV Facility Project are shown.

2. Relevant Legislation and Guidelines

Relevant international, 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	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. 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: • Protocol for the specialist assessment and report content requirements for environmental impacts on terrestrial plant species.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	The NEMBA is administered by the Department of Forestry, Fisheries and the Environment (DFFE) and provides the framework under the NEMA for the: • 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). Amongst other components, the NEMBA includes: • 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
	• 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. 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. Chapter 5 of NEMBA also provides a list of regulations and guidance concerning alien invasive species, including: • 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).
Mpumalanga Nature Conservation Act (Act No. 10 of 1998)	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: • Schedule 11 and 12: Protected and Specialist Protected Plants.
Other Relevant national and Provincial Policies, Plans and Guidelines	Other relevant policies, plans and guidelines that were considered during this study include: • Mpumalanga Biodiversity Sector Plan; • Species Environmental Assessment Guideline (SANBI, 2020); • National Protected Area Expansion Strategy (2016).

3. Study Methodology

A previous terrestrial biodiversity specialist study of the study area was conducted by Ekotrust (2023) as part of a larger field investigation for the Mukondeleli Wind Energy Facility project. Pursuant to this, the current study aimed to augment the existing terrestrial flora dataset that was developed by Ekotrust (2023). The methodology used for the current study therefore included a literature review component and a confirmatory field programme. The tasks associated with these are discussed below:

3.1. Desktop Data Collation and Literature Review

The aim of the desktop literature review component was to collate and review data and information pertaining to terrestrial flora species that may occur in the study area and surrounding landscape, based on historic distribution ranges or recent records. A key literature source that was reviewed was the flora chapter in Ekotrust (2023). Additional literature and data that were reviewed were obtained from a variety of online and literature sources, as discussed below:

3.1.1. Regional Ecosystems and Vegetation Types

General habitat descriptions relevant to the study area and the surrounding landscape 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 study area was obtained from the SANBI's online Botanical Database of Southern Africa (BODATSA) and combined with the Ekotrust (2023) flora inventory; and
- Lists of flora species of conservation concern (SCC) sourced from the Mpumalanga Parks and Tourism Agency (MPTA) for 2629CA and neighbouring 2629CB Quarter Degree Squares (QDS) and flora SCC highlighted by the online environmental sensitivity screening tool.

3.2. Field Programme

The field programme comprised one wet-season field survey, conducted on the 16-17th October 2023 and aimed to augment floristic data presented in Ekotrust (2023). The sampling methodologies used during the field survey were based, in part, on those recommended in SANBI (2020), and included the following:

- Vegetation was sampled using meander search transects at representative sites in the main natural/semi-natural habitat units identified by Ekotrust (2023). Ten meander search transects were surveyed across the study area;
- Data collected during flora surveys included habitat character and condition, flora species composition, evidence of disturbances, and presence of flora SCC and alien invasive. For habitat mapping purposes, these were supplemented with general notes/photographs taken at 23 reference points (refer to Appendix B for a map showing survey locations);
- Flora nomenclature is based on species names presented on SANBI's Red List of South African Plants website; and
- Vegetation structural classification was based on Edwards (1983).

3.3. Delineation and Mapping of Habitat Units

Mapping of habitat units in the study area was based on Ekotrust (2023), and refined using a combination of on-site observations from the 2023 field programme and an analysis of composite aerial/satellite imagery.

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 Red Lists of threatened/near threatened flora species, and the Protected status of species, as per national and provincial legislation. These included:

- Red List of South African Plans (Version 2020), presented by SANBI;
- 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 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 study area 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 study area 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 study area 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 study area;
- Probable: the species is likely to occur in the study area due to suitable habitat and resources being present;
- Possible: The species may occur in the study area due to potential habitat and/or resources; and
- Unlikely: the species will not likely occur in the study area 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 study area. 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 study area 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 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

Site Ecological Importance	Interpretation in relation to proposed development activities
	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 survey for the current study was conducted over a two-day period in October 2023. The timing of the field survey coincided with early wet-season; however, little rain had fallen prior to the site visit and vegetation was still mostly dormant/senescent. The findings of this report build upon the botanical field work conducted by Ekotrust during the December 2021 wet/growing season for the Mukondeleli WEF Project. Conditions at this time were optimal to assess vegetation condition and flora species composition (see Ekotrust 2023). Pursuant to this, the conditions during which the field work for the current study were conducted are not considered significantly limiting with respects to the findings presented in this report; and
- 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 surveys.

5. Regional Description of Baseline Vegetation

The study area is located in the grassland biome, and according to SANBI's regional mapping of South Africa's vegetation types (2018), Soweto Highveld Grassland is the prevailing vegetation type (

Figure 3). The general characteristics of the grassland biome and these vegetation types, are discussed in more detail below:

5.1. Grassland Biome

The regional study area 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 study area 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. 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 cola d 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*.

5.3. Threat Status of Soweto Highveld Grassland

Cultivation, urbanisation, road infrastructure and mining have 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. Mucina & Rutherford (2011) therefore regard the status of Soweto Highveld Grassland as Endangered.

Formally, however this vegetation type is listed as Vulnerable, according to the NEMBA Threatened Ecosystems (2021) (remaining extent shown in Figure 4).

Natural grassland habitat in the study area comprises Soweto Highveld Grassland, and considering the conservation status of this vegetation type, any potential loss of undisturbed natural grassland associated with the proposed Project is a concern.

Figure 3: Study area in relation to the SANBI (2018) vegetation types.

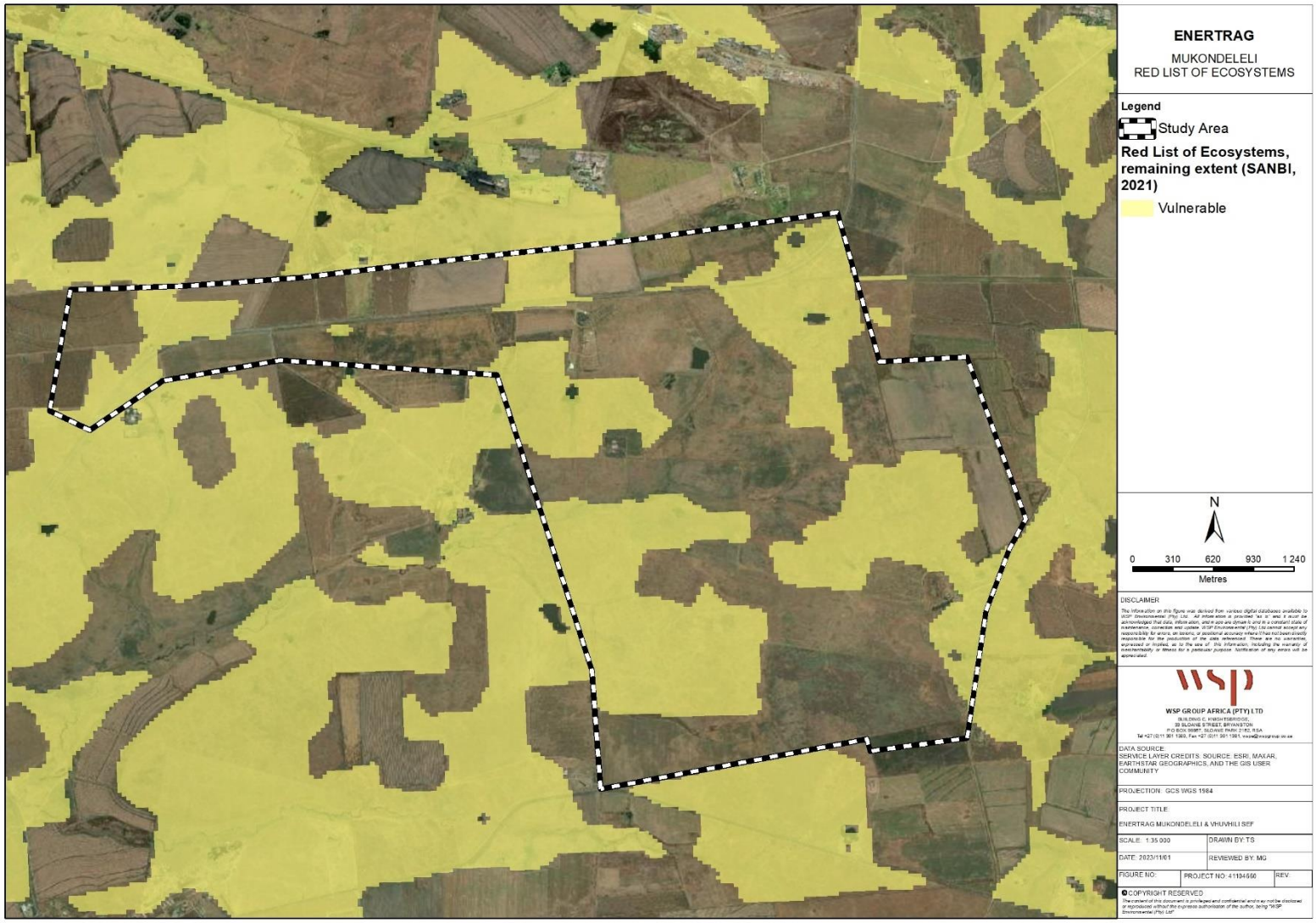

Figure 4: Study area in relation to delineations of the National Red List of Terrestrial Ecosystems.

6. Landscape Context and Existing Impacts on Biodiversity

The study area is embedded within a rural agricultural landscape that is highly fragmented and modified by farming, mining and industrial activities, urbanisation and various linear developments. The following notes summarise key existing impacts (anthropogenic activities and infrastructure) observed in the study area and in the surrounding landscape during the 2023 field visit:

- Farming is the main land use in the study area and across the surrounding landscape. Large areas are under dryland crop cultivation, while livestock farming (mostly cattle) is also common in grassland and wetland areas;
- Stands of alien invasive trees are not abundant or extensive in the landscape. Alien tree stands that were noted included small *Eucalyptus* windrows and small *Robinia pseudoacacia* stands; and
- Linear infrastructure noted during the field survey included both formal tarred roads, numerous gravel roads and informal vehicle tracks, farm fences and powerline corridors;

7. Vegetation and Flora Assessment

7.1. Habitat Units

Ekotrust (2023) identified six main habitat units (or vegetation communities) in the study area. These are listed below, and described as per Ekotrust (2023), in Section 7.1.1**Error! Reference source not found.** through to Section 7.1.6**Error! Reference source not found.**.

- *Themeda triandra – Eragrostis chloromelas – Helichrysum pilosellum* Grassland;
- *Eragrostis curvula – Hyparrhenia hirta* Grassland;
- *Trisetopsis imbersis – Crinum bulbispermum* Moist Grassland;
- *Digitaria eriantha/Eragrostis curvula* planted pasture;
- Croplands; and
- Disturbed Areas.

A habitat unit map for the study area is shown in Figure 5.

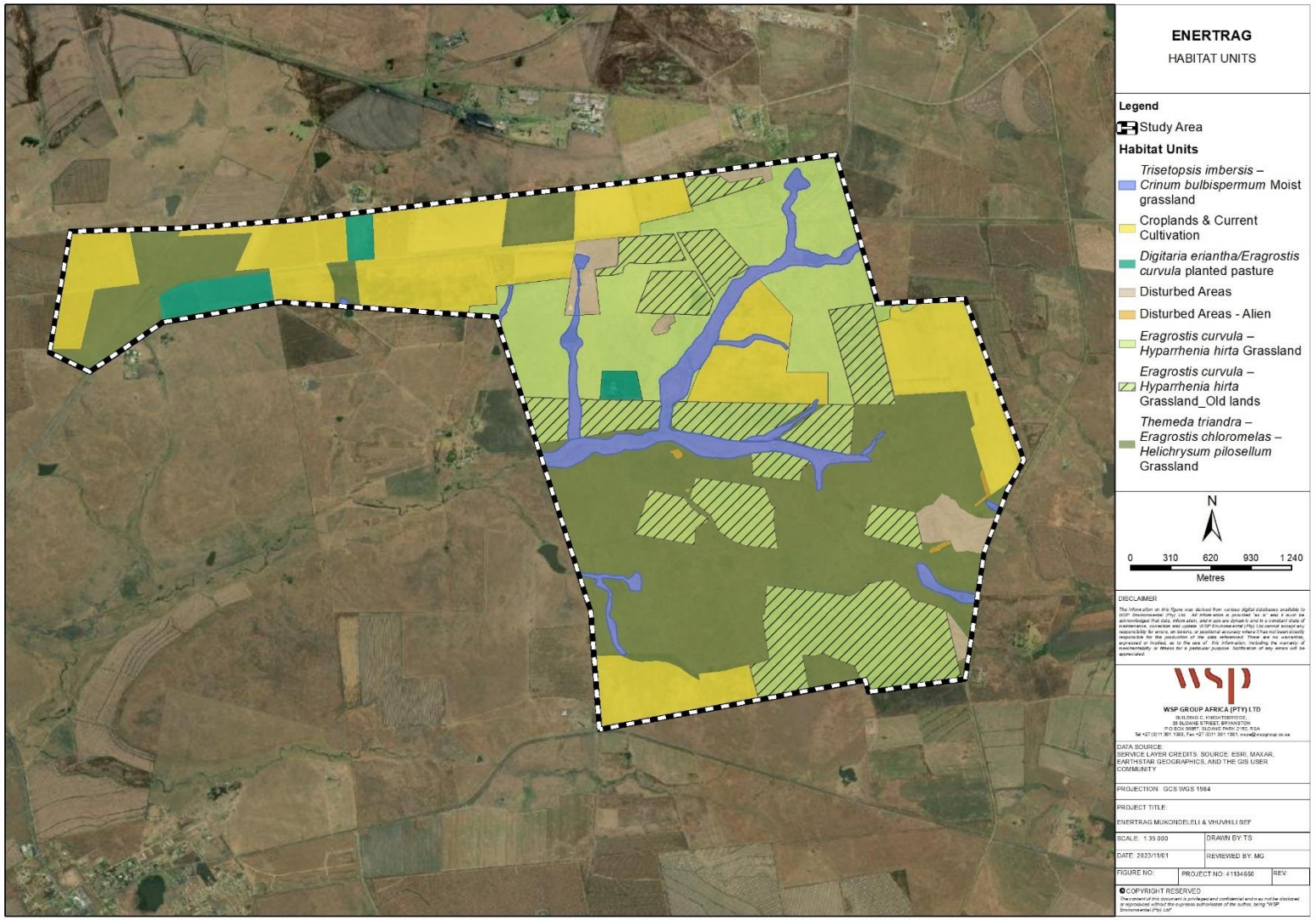

Figure 5: Habitat unit map of the study area.

7.1.1. *Themeda triandra – Eragrostis chloromelas – Helichrysum pilosellum* Grassland

This habitat unit mostly occurs across the central portions of the study area, and is characterised by low closed grassland, as per Edwards (1983) (Figure 6).

The dominant grass species are T*hemeda triandra, Eragrostis chloromelas Setaria incrassata, Elionurus muticus* and *Brachiaria serrata*. Other common grasses noted in this unit include *Cynodon dactylon, Eragrostis curvula, Eragrostis plana, Eragrostis planiculmis, Hyparrhenia hirta, Setaria nigrirostris* (Ekotrust, 2023).

Forbs are not abundant in this community. Those commonly recorded include *Asclepias stellifera, Berkheya radula, Berkheya setifera, Convolvulus sagittatus, Conyza podocephala, Gazania krebsiana, Helichrysum pilosellum, Helichrysum rugulosum, Indigofera hedyantha, Ipomoea crassipes, Jamesbrittenia aurantiaca, Oenothera rosea*, Oenothera tetraptera*, Scabiosa columbaria, Senecio inaequidens, Senecio erubescens, Hermannia erodioides* and *Pseudognaphalium luteo-album** (Ekotrust, 2023). Recorded succulents include *Aloe transvaalensis and Euphorbia clavarioides*, while common geophytes are *Hypoxis rigidula, Hypoxis acuminata, Hypoxis hemerocallidea*, Pelargonium minimum and *Ledebouria* cf. *revoluta* (Ekotrust, 2023).

Alien invasive species noted in this habitat unit are *Cirsium vulgare, Cuscuta campestris, Datura ferox, Verbena bonariensis, Verbena brasiliensis* and *Solanum elaeagnifolium* (Ekotrust, 2023).

Flora SCC recorded in this unit include the following species listed as protected at a provincial level; *Aloe ecklonis, Aloe transvaalensis, Boophone disticha, Gladiolus crassifolius* and *Gladiolus dalenii*, and *Hypoxis hemerocallidea* (Ekotrust, 2023).

Figure 6: Themeda triandra – Eragrostis chloromelas – Helichrysum pilosellum Grassland

7.1.2. *Eragrostis curvula – Hyparrhenia hirta* Grassland

This is a broad habitat unit that includes areas of natural grassland that have been disturbed (e.g., by heavy grazing) (Figure 7), as well as abandoned cultivated fields (old lands) that have generated as grassland (Figure 8).

Vegetation is characterised by low closed grassland (Edwards, 1983). In terms of flora composition, dominant grass species recorded in this unit include *Eragrostis curvula* and *Hyparrhenia hirta*, as well as *Eragrostis chloromelas, Eragrostis plana, Paspalum dilatatum, Setaria incrassata* and *Themeda*

triandra (Ekotrust, 2023). Other common grasses recorded by Ekotrust (2023) in this unit, include *Aristida bipartita, Brachiaria serrata, Cynodon dactylon, Elionurus muticus, Eragrostis planiculmis, Hyparrhenia tamba, Setaria nigrirostris* and *Setaria sphacelata*.

Common species herbaceous species recorded in this unit include *Asclepias cf. gibba, Asclepias stellifera, Berkheya radula, Berkheya setifera, Helichrysum aureonitens, Helichrysum rugulosum, Hermannia erodioides, Leobordea divaricata, Oenothera rosea*, Oenothera tetraptera*, Pseudognaphalium luteo-album*, Scabiosa columbaria, Schkuhria pinnata*, Senecio erubescens, Senecio inaequidens, Solanum elaeagnifolium** and *Ranunculus multifidus* (Ekotrust, 2023). *Aloe transvaalensis* is the only recorded succulent, while common geophytes recorded include *Boophone disticha, Gladiolus crassifolius, Cyrtanthus stenanthus, Haemanthus humilis Hypoxis rigidula, Hypoxis argentea, Pelargonium luridum* and *Ledebouria* cf. *revoluta* (Ekotrust, 2023).

Alien invasive species recorded in this unit include *Cirsium vulgare, Cuscuta campestris, Verbena bonariensis, Verbena brasiliensis* and *Solanum elaeagnifolium* (Ekotrust, 2023).

Flora SCC recorded in this unit include the following species listed as protected at a provincial level; *Aloe transvaalensis, Boophone disticha, Crinum bulbispermum, Gladiolus crassifolius, Cyrtanthus stenanthus* and *Hypoxis hemerocallidea* (Ekotrust, 2023).

Figure 7: Eragrostis curvula – Hyparrhenia hirta Grassland

Figure 8: Old land dominated by stands of Hyparrhenia hirta.

7.1.3. *Trisetopsis imbersis – Crinum bulbispermum* Moist Grassland

This habitat unit is associated with streams and wetland in the study area (Figure 9) and includes three sub-units as identified by Ekotrust, (2023).

According to Ekotrust, (2023), dominant species recorded include *Andropogon appendiculatus, Ischaemum fasciculatum, Paspalum dilatatum, Leersia hexandra, Setaria nigrirostris* and *Trisetopsis imberbis*, while other common grass species are *Bromus catharticus*, Eragrostis curvula, Eragrostis plana, Fingerhuthia sesleriiformis, Harpochloa falx, Themeda triandra,* and *Pennisetum clandestinum*.* Common sedges *Cyperus esculentus*, Cyperus longus* and *Schoenoplectus cf. muricinux.*

Common herbaceous species recorded in this unit include *Berkheya radula, Plantago lanceolata*, Cosmos bipinnatus*, Galium capense, Gomphocarpus fruticosus, Haplocarpha scaposa, Lepidium africanum, Oenothera rosea, Oenothera tetraptera* and *Ranunculus multifidus* (Ekotrust, 2023).

Commonly recorded geophytes *Crinum bulbispermum, Hypoxis argentea* and *Ledebouria cf. revoluta* (Ekotrust, 2023).

Alien invasive species noted in this habitat unit are *Cirsium vulgare, Datura ferox, Solanum elaeagnifolium, Verbena bonariensis* and *Verbena brasiliensis* (Ekotrust, 2023).

Flora SCC recorded in this unit include the following species listed as protected at a provincial level; *Boophone disticha, Crinum bulbispermum* and *Haemanthus humilis* (Ekotrust, 2023).

Figure 9: Trisetopsis imbersis – Crinum bulbispermum Moist Grassland

7.1.4. *Digitaria eriantha/Eragrostis curvula* Planted Pasture

This is an anthropogenic habitat unit, that is characterised by planted pasture grasses for baling and use as a foraging resource for grazing livestock (Figure 10). Two grass species are dominant, namely *Digitaria eriantha* and *Eragroastis curvla*. Other abundant grasses inlude *Eragrostis chloromelas, Hyparrhenia hirta, Paspalum dilatatum* and *Setaria sphacelata* (Ekotrust, 2023).

Herbaceous species are not abundant in this unit. Commonly recorded taxa include *Cosmos bipinnatus, Hibiscus trionum, Nasturtium officinale, Pseudognaphalium luteo-album* and *Senecio erubescens* (Ekotrust, 2023).

Two listed alien invasive species were recordee, viz. *Cuscuta campestris* and *Solanum elaeagnifolium* (Ekotrust, 2023).

Figure 10: Digitaria eriantha/Eragrostis curvula Planted Pasture

7.1.5. Croplands

In the study area, croplands are under maize production. These are subject to regular anthropogenic disturbances in the form of ploughing, seeding and harvesting, and are denuded of vegetation. Considering the degree of ongoing disturbance and modification, cultivated fields are considered a modified habitat unit.

7.1.6. Disturbed Areas

This habitat unit refers to those sites in the study area that have been permanently transformed by anthropogenic infrastructure. These sites include, farm residences and associated building. Also included within this unit are the stands/windrows of exotic trees (*Eucalyptus camaldulensis* and *Robinia pseudoacacia*), which in the study area are typically associated with, or in close proximity to, farmsteads.

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.

Flora SCC Potentially Occurring in the Study Area

Based on reviewed literature and data sources, 12 flora species that occur, or potentially occur, in the study area are listed on the national and/or provincial Red Lists. These are listed in Table 4, along with the conservation statuses, habitat preferences and a probability of occurrence, based on habitat suitability. Of these, one species (*Crinum bulbispermum,* Declining–- MP) has been recorded in the study area (Ekotrust, 2023).

An additional four flora species that are listed as protected at a provincial level according to Mpumalanga Nature Conservation Act (Act No. 10 of 1998) have been recorded in the study area by Ekotrust (2023) (listed in Table 5), while an additional 13 provincially protected taxa potentially occur in the study area, based on literature (Table 5).

No flora species listed on the NEMBA ToPS (2007) List were recorded or potentially occur in the study area.

Table 4: Regionally or provincially threatened and Near Threatened flora species that occur or potentially occurring in the study area.

Family	Scientific Name	Regional Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
Aizoaceae	*Khadia beswickii*	Vulnerable	Vulnerable	-	Species has an EOO of only 475 km^2 and an AOO of 3-7 km^2. It is known from only ten locations, mostly across Gauteng Province, but also scattered sites in Mpumalanga. Favours open shallow soils, over rocks in grassland (Victor and Pfab, 2005).	Unlikely – limited suitable habitat
Amaryllidaceae	*Crinum bulbispermum*	Least Concern	Declining	Protected	Wetland species, occurs along rivers and streams and near pans and depressions (Williams, *et al*., 2016b).	Recorded (Ekotrust, 2023)
Apocynaceae	*Stenostelma umbelluliferum*	Near Threatened	-	-	This species is known from 13 locations, and has an EOO of 9 7000 km^2. It favours deep black turf clay soils, in open woodland close to drainage lines (Victor *et al*., 2007).	Unlikely – no suitable habitat, and out of range.
Asphodelaceae	*Kniphofia typhoides*	Near Threatened	Near Threatened	Protected	Favours low-lying wetland habitats in *Themeda triandra* grassland on heavy black clay soils (von Staden & Victor, 2005).	Possible–- Suitable habitat present
Asphodelaceae	*Trachyandra erythrorrhiza*	Least Concern	Least Concern	-	Favours wetlands with black turf soils. This species has an EOO of 31 999 km^2, and is known from more than 30 locations (Mills and Raimondo, 2013). This species is not listed as threatened, but is endemic to South Africa.	Possible – suitable present.
Fabaceae	*Argyrolobium campicola*	Near Threatened	Near Threatened	-	Species has a large range, with an EOO of 45 000 km^2, but with highly disjunct small subpopulations, many of which have been lost. Favour highveld grasslands (Edwards and Raimondo, 2006).	Possible–- Suitable habitat present
Hyacinthaceae	*Eucomis autumnalis*	Least Concern	Declining	Protected	Favours damp open places (Williams, *et al.,* 2016c).	Probable –suitable present.
Iridaceae	*Gladiolus robertsoniae*	Near Threatened	Near Threatened	Protected	Known from 10 to 20 locations within an EOO of 12 783 km^2 and an estimated AOO of 3.17	Possible –suitable present.

Family	Scientific Name	Regional Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
					km^2 (SANBI, 2020). Occurs in moist highveld grassland, where it favours wet rock crevices on dolerite outcrops (Lötter *et al*., 2013a).	
Iridaceae	*Gladiolus paludosus*	Vulnerable	Vulnerable	Protected	Favours permanent wetland areas in high altitude grasslands, Widespread (EOO <19 940 km^2), but rare (AOO <2 000 km^2) species that is known from six to ten locations (Von Staden & Lötter, 2013).	Possible –suitable present.
Orchidaceae	*Habenaria barbertoni*	Near Threatened	Near Threatened	Protected	Known from nine locations, with an EOO of 46 300 km^2. This species is mostly found in rocky hillsides in Acacia bushveld habitats, between 1000-1500 m (Victor *et al.,* 2005).	Unlikely – no suitable habitat
-	Sensitive species 1252	Vulnerable	Vulnerable	Protected	Moist bushveld habitats, including wooded mountain kloofs. AOO estimated at 73.01 km^2 (SANBI, 2020).	Unlikely – no suitable habitat
-	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.	Possible – limited suitable present.

Table 5: Provincially protected species that occur or potentially occurring in the study area.

Family	Scientific Name	Regional Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
Amaryllidaceae	*Boophone disticha*	Least Concern	Least Concern	Protected	Widespread species favouring dry grassland and rocky areas (Williams, *et al.,* 2016a).	Recorded (Ekotrust, 2023)
Amaryllidaceae	*Crinum graminicola*	Least Concern	Least Concern	Protected	Occurs in areas of grassland areas.	Probable –suitable present.
Amaryllidaceae	*Cyrtanthus stenanthus*	Least Concern	Least Concern	Protected	Wide range of habitats, including grassland.	Recorded (Ekotrust, 2023)

Family	Scientific Name	Regional Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
Amaryllidaceae	*Haemanthus humilis*	Least Concern	Least Concern	Protected	Grows in rocky shady locations in grassland.	Recorded (Ekotrust, 2023)
Amaryllidaceae	*Haemanthus montanus*	Least Concern	Least Concern	Protected	Favours grassland and wetlands.	Probable –suitable present.
Apocynaceae	*Huernia hystrix*	Least Concern	Least Concern	Protected	Grassland habitats	Probable –suitable present.
Asphodelaceae	*Aloe ecklonis*	Least Concern	Least Concern	Protected	Occurs in areas of grassland of the escarpment (van Wyk and Smith, 2014).	Recorded (Ekotrust, 2023)
Asphodelaceae	*Aloe transvaalensis*	Least Concern	Least Concern	Protected	Occurs in open grassland and savanna (van Wyk and Smith, 2014).	Recorded (Ekotrust, 2023)
Hyacinthaceae	*Drimia angustifolia*	Least Concern	Least Concern	Protected	Grassland habitats	Probable –suitable present.
Hypoxidaceae	*Hypoxis hemerocallidea*	Least Concern	Least Concern	Protected	Grassland habitats.	Recorded (Ekotrust, 2023)
Iridaceae	*Gladiolus crassifolius*	Least Concern	Least Concern	Protected	Grassland habitats.	Recorded (Ekotrust, 2023)
Iridaceae	*Gladiolus dalenii*	Least Concern	Least Concern	Protected	Grassland habitats.	Recorded (Ekotrust, 2023)
Iridaceae	*Gladiolus elliotii*	Least Concern	Least Concern	Protected	Moist, but well-drained areas in grassland habitat.	Probable –suitable present.
Iridaceae	*Gladiolus sericeovillosus*	Least Concern	Least Concern	Protected	Grassland habitats.	Probable –suitable present.
Orchidaceae	*Eulophia ovalis*	Least Concern	Least Concern	Protected	Widespread species. Occurs in open grassland (Johnson *et al.,* 2015).	Probable –suitable present.
Orchidaceae	*Habenaria epipactidea*	Least Concern	Least Concern	Protected	Seasonally damp or marshy grasslands (Johnson *et al.,* 2015).	Probable –suitable present.
Orchidaceae	*Orthochilus foliosus*	Least Concern	Least Concern	Protected	Widespread species, found in sour grassland, from sea level to 2000 m (Johnson *et al.,* 2015).	Probable –suitable present.
Orchidaceae	*Orthochilus welwitschii*	Least Concern	Least Concern	Protected	Dry to marshy grassland, from 200 to 1800 m (Johnson *et al.,* 2015).	Probable –suitable present.

7.2.2. Declared Alien Invasive Species

Based on the findings of Ekotrust (2023) and the field visit conducted for this proposed Project, 15 NEMBA declared alien invasive plant species were recorded in and adjacent to the study area. These are listed in Table 6, along with their growth form and NEMBA Category.

Table 6: Declared alien invasive species recorded in the study area.

Scientific Name	**Common Name**	**Growth Form**	**NEMBA Category**
Acacia mearnsii	Black Wattle	Tree	2
Argemone ochroleuca	White-flowered Mexican Poppy	Herbaceous forb	1b
Arundo donax	Spanish Reed	Graminoid	1b
Cereus jamacaru	Queen of the Night	Succulent Tree	1b
Cirsium vulgare	Spear Thistle	Herbaceous forb	1b
Cuscuta campestris	Common Dodder	Parasitic plant	1b
Datura ferox	Large Thorn Apple	Herbaceous forb	1b
Eucalyptus camaldulensis	Gum	Tree	1b or 2
Opuntia ficus-indica	Sweet Prickly Pear	Succulent Tree	1b
Pennisetum clandestinum	Kikuyu	Graminoid	1b
Robinia pseudoacacia	Black Locust	Tree	1b
Salix babylonica	Weeping Willow	Tree	-
Solanum elaeagnifolium	Potato Creeper	Herbaceous forb	1b
Verbena bonariensis	Wild Verbena	Herbaceous forb	1b
Verbena brasiliensis	Brazilian Verbena	Herbaceous forb	1b
Xanthium spinosum	Spiny Cocklebur	Herbaceous forb	1b

7.2.3. Flora of Medicinal Value

Several flora species recorded in the study area 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 study area that have recognised medicinal value.

Scientific Name	**Medicinal Use***
Boophone disticha	Bulbs scales are used to treat boils and septic wounds, as well as alleviate pains.
Datura ferox	Relieves asthma and acts to reduce pain. Weak infusions are used as an aphrodisiac.
Helichrysum species	Treats a variety of afflictions, including coughs, colds, fever, headaches and infections.
Hypoxis species	Infusions of the corm are used to treat dizziness, bladder disorders and insanity.
Pelargonium luridum	Taken orally to treat diarrhoea and dysentery.
Rumex crispus	Used as a remedy for internal parasites, as well as vascular diseases and internal bleeding.
Scabiosa columbaria	Used to treat colic and heartburn.
Typha capensis	Decoctions used to treat venereal disease, as well as diarrhoea, dysentery and enhance male libido.
*Medicinal use, as per Van Wyk, *et al*. (2009).	

8. Key Ecological Attributes and Processes

8.1. Habitat Corridors, Resources and Refugia

Despite the presence of numerous tracts of modified habitat (mostly cultivated fields) and the presence of linear infrastructure, such as roads, farm tracks and farm fences, there is a large network of grassland and wetland habitat in the study area and across surrounding landscape.

The degree of natural habitat connectivity across the landscape therefore remains fairly high, and this will contribute to the maintenance of on-site flora and fauna communities. It is anticipated that the proposed Project is likely to cause only small-scale disruptions of local habitat connectivity through habitat loss and fragmentation. This is unlikely to have a significant effect on the movement and dispersal of flora pollinators and propagules across the landscape, which may impact on-site flora diversity.

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 study area.

8.2.1. Alien Invasive Species Colonisation

Fifteen declared NEMBA AIS have been recorded in the study area. AIS have the capacity to spread into areas of natural habitat, where they can potentially shade-out and competitively exclude indigenous flora species, including flora SCC.

The spread of alien invasive vegetation is therefore considered a potentially significant driver of change in the study area, and one that is capable of negatively impacting local flora SCC populations. The earthworks, machinery movements and soil disturbance during the construction phase of the proposed Project may facilitate AIS colonisation.

8.2.2. 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).

Wildfires have several key ecological effects on vegetation and flora species. These include *inter alia*: removing moribund vegetation and enhancing plant primary productivity, stimulating germination / flowering of fire-adapted flora species (e.g., certain orchid species), and, controlling the encroachment of both alien and indigenous woody plant species and weeds into grassland and wetland habitats. Too frequent or intense wildfires can however, have negative consequences, such as the direct killing of flora species, including SCC, that are poorly adapted to fire.

Fire is considered an important driver of change in the study area. However, it is anticipated that the proposed Project is unlikely to impact fire frequency across the study area.

8.2.3. Herbivory–- Livestock Grazing and Trampling

High levels of grazing (overgrazing) and associated trampling by large ungulates are common causes of dryland degradation (Scholes, 2009). Both occur 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 can be linked to selective overgrazing, at least in part, is a change in plant species composition. In grassland habitats, this typically manifests as decreases in palatable grass species abundances, overall species richness, and primary productivity (Scholes, 2009).

Trampling can damage individual plants, resulting in a reduction in vegetive cover and associated increases in erosion. Cattle grazing and trampling is therefore considered an important ecosystem driver, that can impact vegetation dynamics and the viability of local flora SCC populations.

Cattle grazing and trampling are considered important drivers of change in the study area, and it was noted during the field survey that large portions of the study area were heavily grazed. However, it is anticipated that the proposed Project is unlikely to impact cattle grazing patterns across the study area.

9. Analysis of Site Ecological Importance

The ecological importance (SEI) of identified habitat units in the study area were assessment 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 11.

Table 8: Site Ecological Importance of habitat unit in the study area

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Themeda triandra – Eragrostis chloromelas – Helichrysum pilosellum Grassland	MEDIUM: Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN, VU). 50% of receptor contains natural habitat to support SCC.	MEDIUM: Semi-intact area >20 ha for VU ecosystem type. Mostly minor current negative ecological impacts with some major impacts (e.g., overgrazing, established population of alien invasive flora).	MEDIUM	MEDIUM: Habitat that can recover slowly (˜ more than 10 years) to restore >75% of the original species composition and functionality.	MEDIUM
Eragrostis curvula – Hyparrhenia hirta Grassland	LOW: No confirmed or highly likely populations of SCC. <50% of receptor contains natural habitat with limited potential to support SCC.	LOW: Several minor and major current negative ecological impacts. (=overgrazing, historic cultivation)	LOW	MEDIUM: Habitat that can recover slowly (˜ more than 10 years) to restore >75% of the original species composition and functionality.	LOW
Trisetopsis imbersis – Crinum bulbispermum Moist Grassland	MEDIUM: Highly likely occurrence of populations of NT species, threatened species (CR, EN, VU). Any area of natural habitat of threatened ecosystem type with status of VU. 50% of receptor contains natural habitat to support SCC.	MEDIUM: Semi-intact area >20 ha for VU ecosystem type. Mostly minor current negative ecological impacts with some major impacts (e.g., overgrazing, erosion).	MEDIUM	LOW: Habitat that is unlikely to be able to recover fully after a relatively long period.	HIGH

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Digitaria eriantha/Eragrostis curvula planted pasture	VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	VERY LOW: Several major current negative ecological impacts.	VERY LOW	VERY HIGH: Habitat that can recover rapidly (˜less than 5 years) to restore >75% of the original species composition and functionality	VERY LOW
Croplands	VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	VERY LOW: Several major current negative ecological impacts.	VERY LOW	VERY HIGH: Habitat that can recover rapidly (˜less than 5 years) to restore >75% of the original species composition and functionality	VERY LOW
Disturbed Areas	VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	VERY LOW: Several major current negative ecological impacts.	VERY LOW	VERY HIGH: Habitat that can recover rapidly (˜less than 5 years) to restore >75% of the original species composition and functionality	VERY LOW

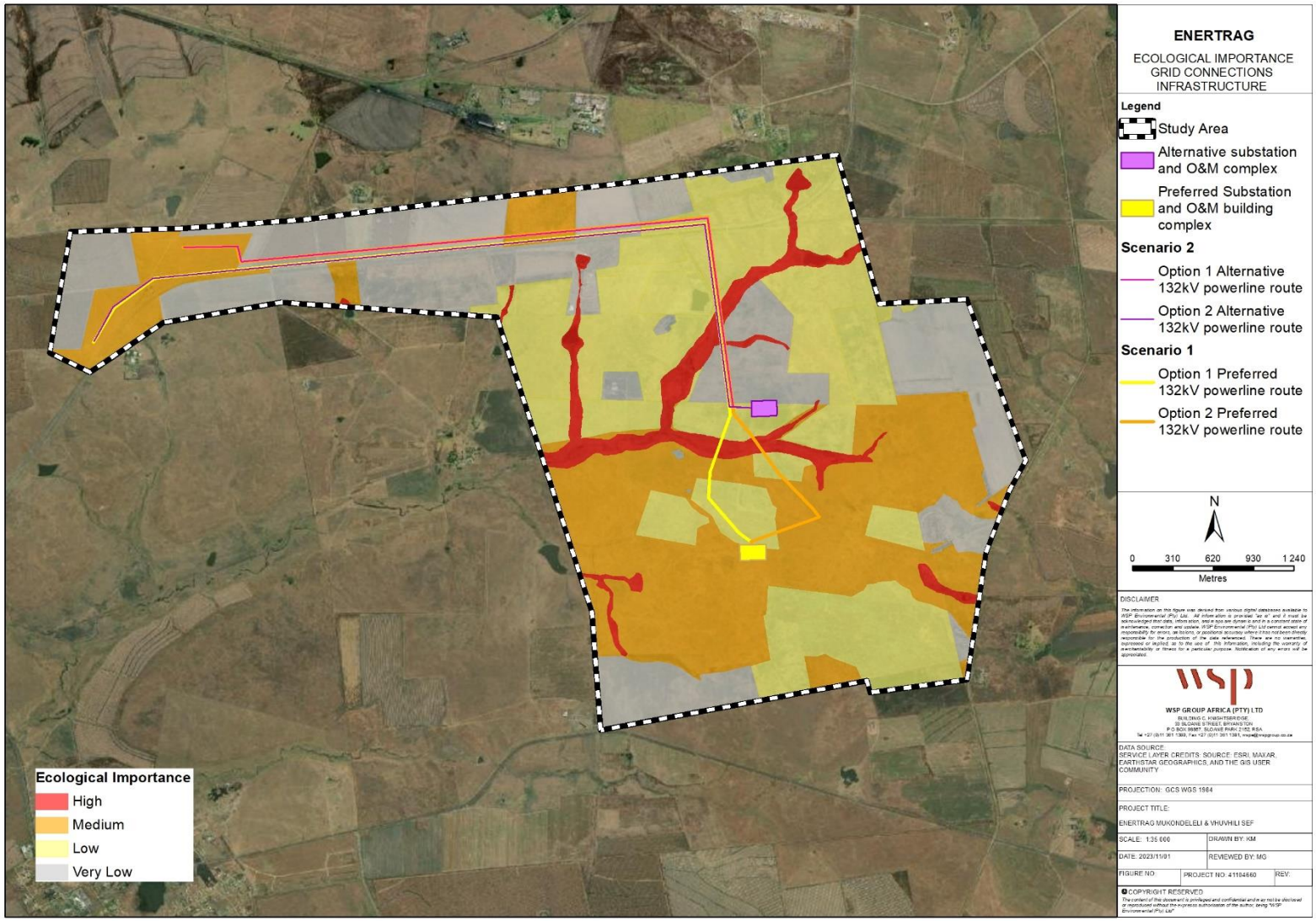

Figure 11: Site Ecological Importance of the study area, showing current proposed layout of the Project infrastructure.

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 direct[1], indirect[2], secondary[3] as well as cumulative[4] impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e., residual impact). The significance of environmental aspects is determined and ranked by considering the criteria[5] 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 ExtentI) 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 ReversibilI (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

[1] Impacts that arise directly from activities that form an integral part of the Project.
[2] Impacts that arise indirectly from activities not explicitly forming part of the Project.
[3] Secondary or induced impacts caused by a change in the Project environment.
[4] Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects
[5] 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 12 below.

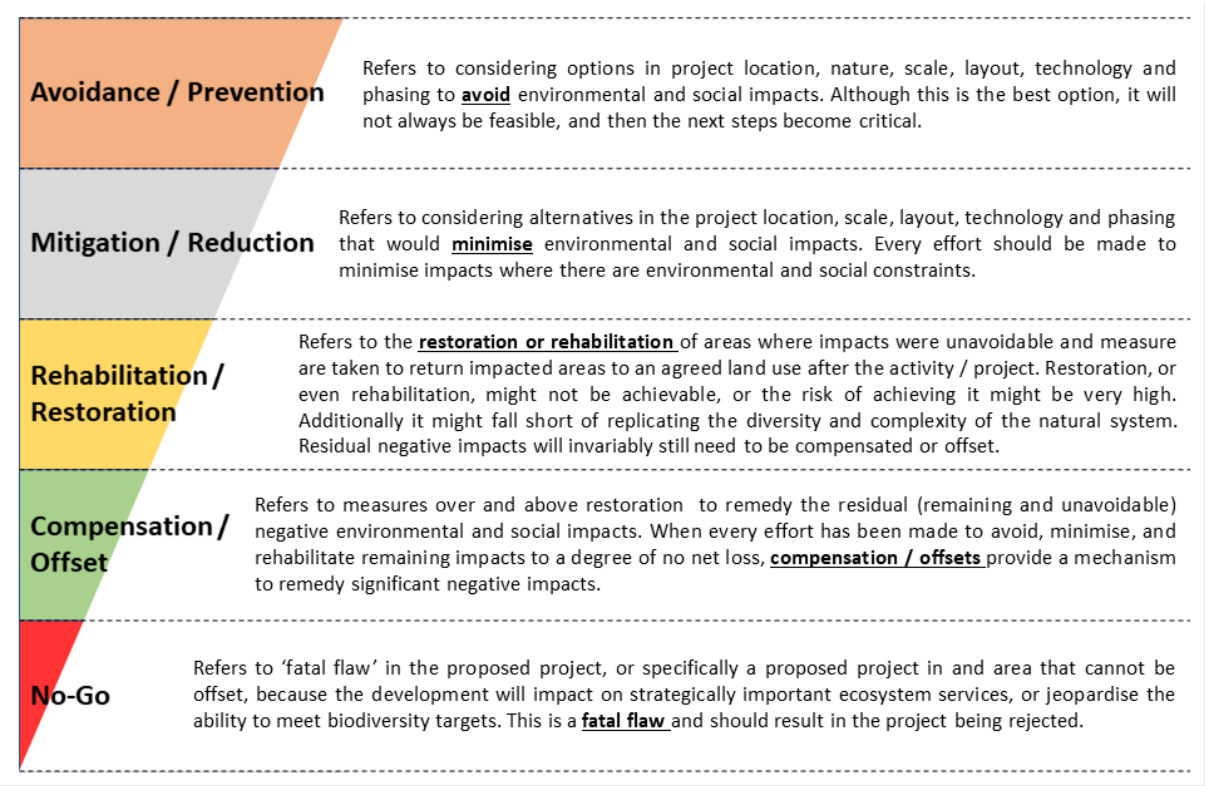

Figure 12: Mitigation Sequence/Hierarchy

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 flora 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 study area, including SCC.

The proposed Project will result in the clearing of land for the installation of infrastructure (shown in Figure 13). For the proposed powerline pylon/towers, the approximate extent of possible habitat loss/disturbance is based on an estimated pylon/tower development footprint of 80 m^2 and a pylon/tower placement of every 250 m.

Powerline length (metres) and estimated extent of direct habitat loss (hectares) per habitat unit based on the current proposed Project infrastructure layout scenarios, is presented in Table 10. Overall, it is noted that the extent of natural habitat loss associated with the development of permanent Project infrastructure remains relatively small for each scenario.

The favoured substation and O&M location is Scenario 2 – Alternative, as this location will have the smallest impact on natural habitat. For this scenario, the favoured powerline route is Alternative Option 1, as this will also have the smallest impact on natural habitat.

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

Several measures can be taken to minimise impact significance, including *inter alia*, micro-siting infrastructure to already disturbed footprints, minimising disturbance footprints to the absolute necessary for construction and operational, and rehabilitating all disturbed areas after construction. With the application of these, and other recommended mitigation measures (listed in Section 12), 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 impact of "Low" significance.

Table 10: Extent of each habitat unit in the study area and approximate extent of habitat loss, based on the current proposed Project layout.

Habitat Unit	**Approximate Extent of Direct Habitat Loss (Ha)**					
	Substation Alternatives		**Powerline Alternatives**			
	Scenario 1 (preferred)	**Scenario 2 (alternative)**	**Preferred 1**	**Preferred 2**	**Alternative 1**	**Alternative 2**
Themeda triandra – Eragrostis chloromelas – Helichrysum pilosellum Grassland	1.8	0.0	0.06	0.05	0.03	0.05
Eragrostis curvula – Hyparrhenia hirta Grassland	0.3	1.7	0.06	0.06	0.04	0.04
Trisetopsis imbersis – Crinum bulbispermum Moist Grassland	0.0	0.0	0.01	0.01	0.01	0.01
Digitaria eriantha/Eragrostis curvula planted pasture	0.0	0.0	0.01	0.01	0.01	0.01
Croplands	0.0	0.3	0.08	0.09	0.09	0.08
Disturbed Areas	0.0	0.0	0.0	0.0	0.0	0.0
Total	**2.2**	**2.0**	**0.23**	**0.22**	**0.17**	**0.19**

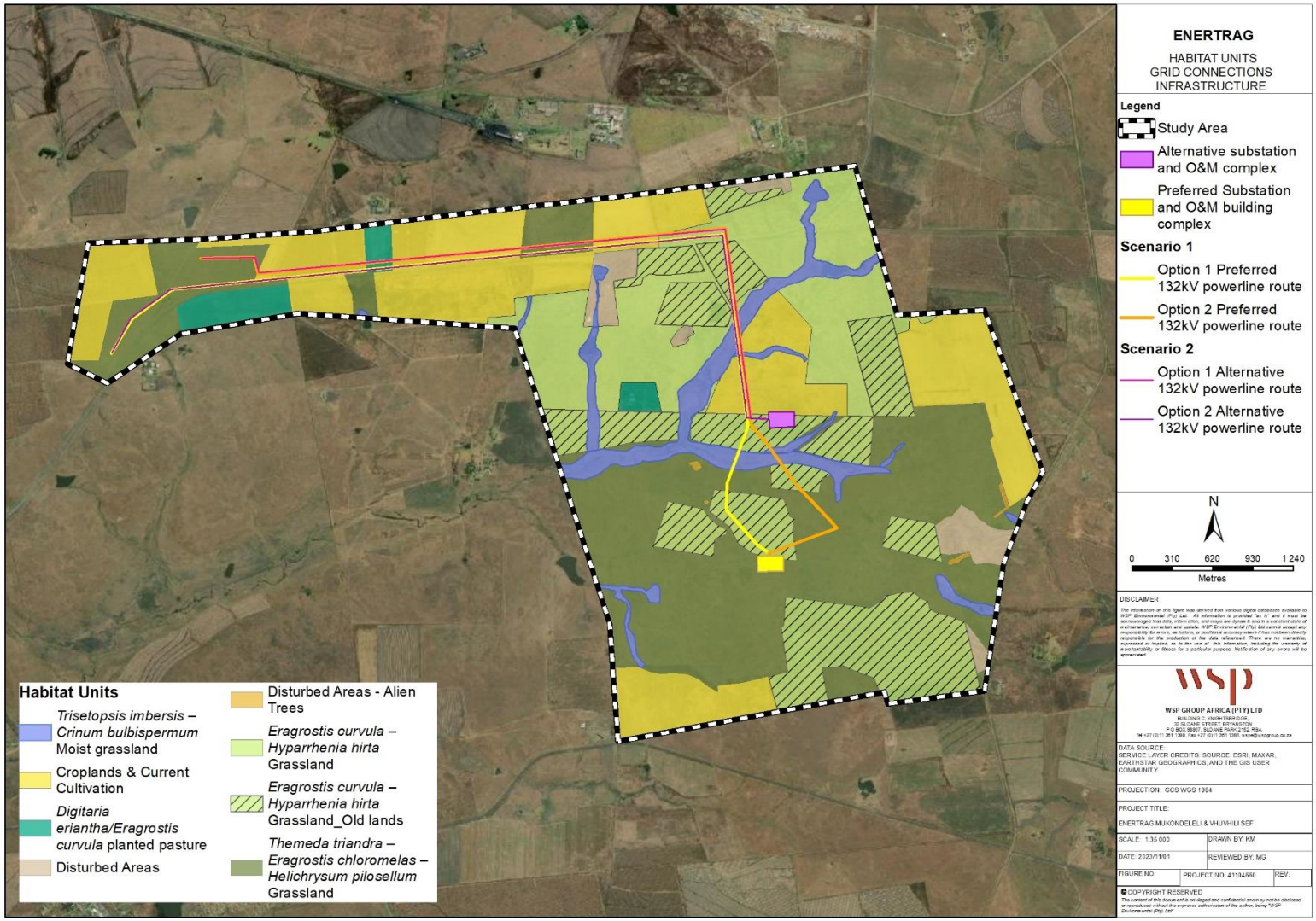

Figure 13: Habitat units and the currently proposed infrastructure layout

10.3.1.2. Loss of Flora Species of Conservation Concern

Several flora species recorded in the study area by Ekotrust (2023) are listed as provincially protected, according to the Mpumalanga Nature Conservation Act (Act No. 10 of 1998). It is likely that some of these will occur within the proposed infrastructure footprints, and therefore may be lost/damaged during vegetation clearing and earth works.

Before mitigation, impact magnitude is high, while duration is immediate. 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 "medium" significance.

This impact can be effectively mitigated through the successful completion of a search and rescue operation focusing on the proposed infrastructure footprints. With the application of mitigation, 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.

10.3.1.3. 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. Fifteen NEMBA listed AIS have been recorded in the study area. 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 "medium" 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 study area 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 "medium" 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

10.3.3. 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 study area.

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 “medium” 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 flora habitat	Construction	Negative	Low	3	2	3	5	5	**65**	**N3**	2	1	3	4	2	**20**	**N1**
					Significance	**N3 - High**							**N1 - Low**						
Impact 2:	Flora SCC	Loss of flora of conservation concern	Construction	Negative	High	4	2	5	1	4	**48**	**N2**	3	1	3	2	2	**18**	**N1**
					Significance	**N2 - Medium**							**N1 - Low**						
Impact 3:	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**
					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	All	Negative	Moderate	3	3	3	5	3	**42**	**N2**	2	3	3	4	2	**24**	**N1**
					Significance	**N2 - Medium**							**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 study area is located is already highly modified and fragmented as a consequence of historic and current agriculture, and other land use activities including mining and various industrial activities associated with Sasol Secunda.

The 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.

Several other renewable energy projects have been authorised or are planned within a 55 km radius of the study area. These include *inter alia*, the Tutuka Solar PV Energy Facility, Halfgewonnen Solar PV Energy Facility, Vhuvhili Solar Energy Facility, Mukondeleli Wind Energy Facility, Tournee 1 Solar PV Energy Facility and Tournee 2 Solar PV Energy Facility. 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.

Prior to any form of mitigation, the cumulative impact on flora SCC from vegetation clearing is rated 'medium'. 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. The cumulative impacts on terrestrial fauna 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 into the future. The tracts of grassland and wetland habitat in the study area 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.

It was noted during the field visit that the study area was subject to heavy grazing and trampling by cattle. It is thus expected that overtime, the condition of grassland and wetland habitat with respects to grass species composition (diversity) and ability to carry livestock (productivity) may deteriorate due to 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;

- 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; and
    - Rehabilitation or restoration.
- 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 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. Construction phase							
1.1	Terrestrial Flora	Direct loss and disturbance of flora habitat	<u>Avoidance</u> • As far as possible, proposed Project infrastructure footprints should avoid areas designated CBA and ESA, and delineated wetland and their buffer (refer to terrestrial biodiversity and wetland specialist reports for additional detail); • As much of the proposed Project infrastructure as possible should be located in modified and disturbed areas (i.e., Croplands, Planted Pastures and *Eragrostis curvula – Hyparrhenia hirta* Grassland - Old lands); • A pre-construction walkdown of the approved development footprints should be conducted during the wet/growing season to identify sensitive biodiversity features (i.e., flora SCC) which may require permits	N/A	Avoidance, Minimisation & Rehabilitation	During Construction Phase	Project Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			for removal/translocation; and inform the micro-siting of Project infrastructure. <u>Minimisation</u> • 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; • Temporary facilities associated with construction, such as portable toilets, storage and laydown areas, should be located on land that is modified (i.e., croplands).				

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			• Removed topsoil should be stockpiled and used to rehabilitate all disturbed areas. <u>Rehabilitation</u> A rehabilitation/ landscaping protocol should be developed and implemented to stabilise and revegetate all non-operational sites that have been disturbed by construction. The protocol should include: • Stockpiling of topsoil 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				

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			• Grass species used during rehabilitation should be indigenous and locally occurring species, and include a mixture of pioneer, sub-climax and climax species.				

1.2	Terrestrial Flora SCC	Loss of Flora Species of Conservation Concern	<u>Avoidance and Minimisation</u>
			• A pre-construction walkdown/survey of the proposed development footprints should be conducted during the wet/growing season to determine the identity and number of potentially impacted flora SCC;
			• Data from the survey/walkdown should then be to inform:
			  ○ The micro-siting of proposed Project infrastructure; 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.
				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
1.3	Terrestrial Flora	Establish and spread of alien invasive species	An AIS control and eradication plan must be developed for the Project that focuses on controlling and eradicating all AIS occurring throughout the LSA. The plan must include: • 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 • Provision for follow-up treatments, as informed by regular AIS monitoring.	Guidelines for Monitoring, Control and Eradication of AIS (DEA, 2015)	Minimisation	During Construction Phase	Project Manager
2. Operational phase							
2.1	Terrestrial Biodiversity	Establish and spread of alien invasive species	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
3. Decommissioning phase							
3.1	Terrestrial Biodiversity	Establish and spread of alien invasive species	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 Biodiversity	General habitat restoration	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 rehabilitated using local occurring indigenous flora species.	N/A	Rehabilitation	During the Decommissioning Phase	Facility Manager

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
- 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	• Annual on-site alien invasive species monitoring should be conducted. Monitoring should focus on:
		  ○ All sites disturbed during the construction phase; and
		  ○ Wetland areas adjacent to construction sites;
		• 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	• 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: ○ All sites disturbed during decommissioning; and	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
		○ Wetland areas adjacent to former development sites; • Monitoring should assess species type and density, and these data should inform the scope of ongoing alien invasive species control.				

14. Reasoned Opinion and Environmental Impact Statement

14.1. Summary of Main Findings

The study area is located within the Soweto Highveld Grassland vegetation type, and is characterised by tracts of natural/semi-natural grassland habitat, moist grassland (wetland) habitat, and anthropogenically modified areas.

Six habitat units have been identified in the study area. These comprise both natural habitats (albeit often disturbed), as well as highly modified habitats. Modified habitats are of little conservation value and have Site Ecological Importance ratings of 'Very Low'. The natural/semi-natural habitats have Site Ecological Importance ratings ranging from "Low' to 'High'. These areas provide habitat for flora, and they also contribute to broader habitat connectivity, which is an important component of maintaining landscape-scale ecological processes and terrestrial biodiversity.

No flora species listed as Near Threatened or threatened on the national Red List were recorded on-site. However, several flora species that are listed as protected at a provincial level, as per the Mpumalanga Nature Conservation Act (Act No. 10 of 1998), have been recorded in the study area (Ekotrust, 2023). It is likely that some of these will occur within the proposed infrastructure footprints, and therefore may be lost/damaged during the construction phase vegetation clearing and associated earth works.

The National Web Based Screening Tool rated the Plant Species Theme for the study area as 'Medium Sensitivity', based on the potential presence of two flora SCC. It is noted that limited suitable habitat is present for Sensitive species 691 and this species was not recorded on-site during field work. No suitable habitat is present in the study area for Sensitive species 1252. Based on the findings of the current study and the findings is Ekotrust (2023), the overall Plant Species Theme is therefore rated 'Low' sensitivity (refer to Appendix D for further comment on the Plant Species Theme sensitivity rating).

It is noted that the estimated extent of habitat loss associated with proposed Project infrastructure is relatively small. This notwithstanding, several potential negative impacts on flora have been identified and assessed.

From a flora SCC, the favoured substation and O&M location is Scenario 2 – Alternative, as this location will have the smallest impact on natural habitat. For this scenario, the favoured powerline route is Alternative Option 1, as this will also have the smallest impact on natural habitat and potential flora SCC.

Key management measures that are recommended for the proposed Project to minimise impacts on potential flora SCC, include *inter alia*,1) micro-siting as much of the proposed Project infrastructure as possible in areas that have already been modified (i.e., croplands) or disturbed areas of grassland (*Eragrostis curvula – Hyparrhenia hirta* Grassland – Old lands), 2) conducting a wet/growing season survey of the study area to identify and locate flora SCC and inform the rescue and relocation permit applications, and 3) implementing an alien invasive species control programme for the duration of the Project.

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. Comment on the Optimised Layout

Based on inputs provided by specialists, the proposed layout of the Mukondeleli 1 Solar PV Facility (part of a separate authorisation process), has been optimised to avoid sensitive areas, and accordingly, the proposed layout for this Project has also been optimised.

It is noted that, with respects to the optimised layout for the proposed Mukondeleli 1 Solar Grid Connection and Associated Infrastructure Project, no additional impacts on flora species or changes in impact significance are anticipated, and no new/additional mitigation measures are recommended.

14.3. Conditions to be Included in the Environmental Authorisation

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

14.4. 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
B.Sc. (Hons.), M.Sc., Pr.Sci.Nat.

Email: andrew@hawkhead.com
Mobile: +27 83 361 0373
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 Wildlife Management Association
- Member of the South African Council of Natural Scientific Professions – Professional Natural Scientist (400687/15).

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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- 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.
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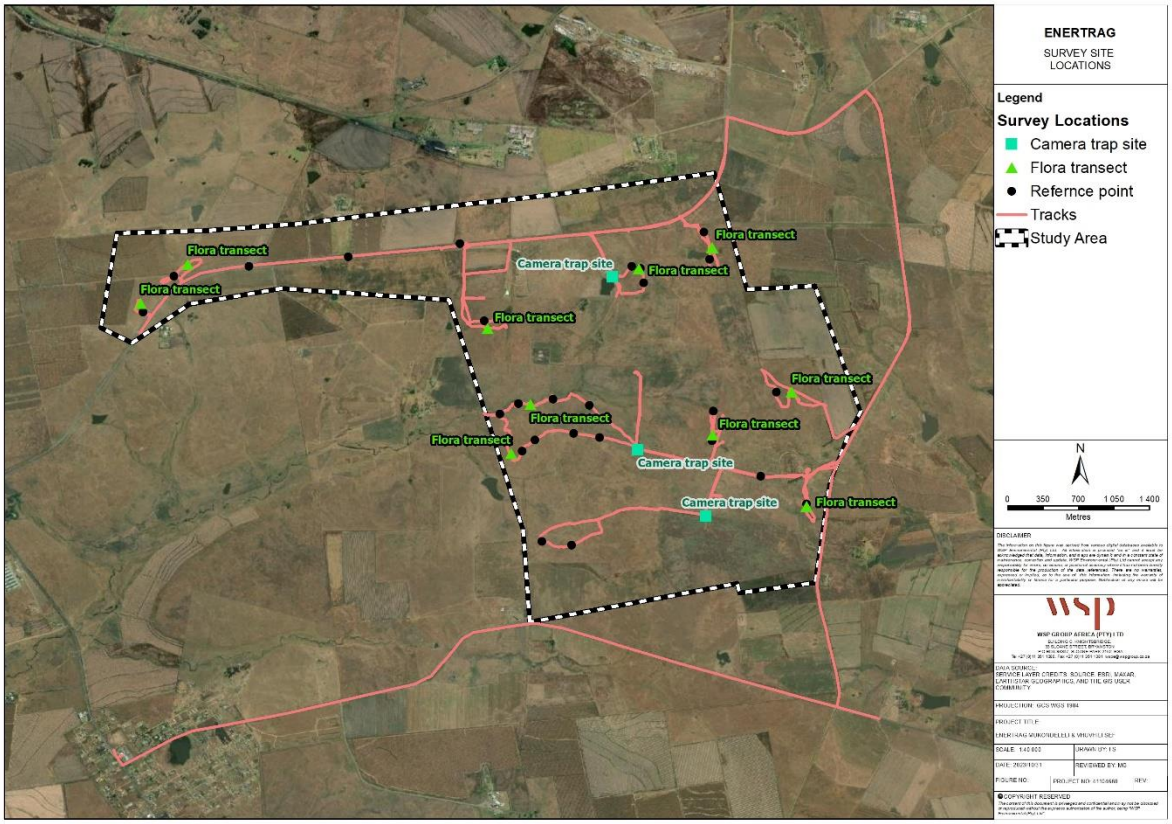
Appendix B: Methodology Supplement

Appendix B (1): Location of surveying locations



Appendix B2:

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

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

$$SEI = BI + RR.$$

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

$$BI = CI + FI$$

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

Table 1: Conservation Importance (CI) criteria.

Conservation Importance (CI)	Fulfilling Criteria
Very High	• Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or Critically Rare species that have a global EOO of < 10km^2; • 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	• Confirmed of highly likely occurrence of CR, EN, VU species that have a global EOO of > 10km^2, IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A. If listed threatened only under Criterion A, include if there are less than 10 locations or < 10 000 mature individuals remaining; • Small area (>0.01% but <0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (>0.1%) of natural habitat of VU ecosystem type; • Presence of Rare species; • Globally significant populations of congregatory species (>1% but < 10% of global population).
Medium	• Confirmed or highly likely occurrence of populations of 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	• 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	• 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	• 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	• 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	• 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	• 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	• 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 List as per Ekotrust (2023)

Family	Scientific Name
Acanthaceae	*Blepharis integrifolia*
Acanthaceae	*Chaetacanthus costatus*
Acanthaceae	*Crabbea acaulis*
Acanthaceae	*Ruellia patula*
Acanthaceae	*Ruellia sp.*
Agavaceae	*Chlorophytum cooperi*
Agavaceae	*Chlorophytum fasciculatum*
Aizoaceae	*Khadia beswickii*
Alliaceae	*Tulbaghia acutiloba*
Alliaceae	*Tulbaghia leucantha*
Amaranthaceae	*Alternanthera sessilis*
Amaranthaceae	*Amaranthus hybridus*
Amaranthaceae	*Amaranthus sp.*
Amaranthaceae	*Dysphonia pumilio*
Amaranthaceae	*Gomphrena celosioides*
Amaranthaceae	*Guilleminea densa*
Amaryllidaceae	*Boophone disticha*
Amaryllidaceae	*Crinum bulbispermum*
Amaryllidaceae	*Crinum graminicola*
Amaryllidaceae	*Crinum lugardiae*
Amaryllidaceae	*Cyrtanthus stenanthus*
Amaryllidaceae	*Haemanthus humilis*
Amaryllidaceae	*Haemanthus montanus*
Amaryllidaceae	*Haemanthus sp.*
Amaryllidaceae	*Nerine gracilis*
Amaryllidaceae	*Nerine krigei*
Anacardiaceae	*Searsia discolor*
Anacardiaceae	*Searsia lancea*
Anacardiaceae	*Searsia magalismontana*
Anacardiaceae	*Searsia rigida*
Apiaceae	*Afrosciadium magalismontanum*
Apiaceae	*Cyclospermum leptophyllum*
Apocynaceae	*Asclepias albens*
Apocynaceae	*Asclepias gibba var. gibba*
Apocynaceae	*Asclepias multicaulis*
Apocynaceae	*Asclepias sp.*
Apocynaceae	*Asclepias stellifera*
Apocynaceae	*Ascolepis sp.*
Apocynaceae	*Aspidoglossum lamellatum*
Apocynaceae	*Brachystelma foetidum*
Apocynaceae	*Cordylogyne globosa*
Apocynaceae	*Gomphocarpus fruticosus subsp. fruticosus*

Family	Scientific Name
Apocynaceae	*Gomphocarpus rivularis*
Apocynaceae	*Huernia hystrix*
Apocynaceae	*Orbea cooperi*
Apocynaceae	*Raphionacme sp.*
Apocynaceae	*Schizoglossum bidens*
Apocynaceae	*Stenostelma periglossoides*
Apocynaceae	*Stenostelma umbelluliferum*
Apocynaceae	*Xysmalobium undulatum*
Asparagaceae	*Agave americana*
Asparagaceae	*Asparagus cooperi*
Asparagaceae	*Asparagus setaceus*
Asphodelaceae	*Aloe ecklonis*
Asphodelaceae	*Aloe transvaalensis*
Asphodelaceae	*Bulbine abyssinica*
Asphodelaceae	*Bulbine capitata*
Asphodelaceae	*Kniphofia typhoides*
Asphodelaceae	*Trachyandra asperata*
Asphodelaceae	*Trachyandra erythrorrhiza*
Asphodelaceae	*Trachyandra saltii var. saltii*
Asphodelaceae	*Trachyandra sp.*
Aspleniaceae	*Asplenium adiantum-nigrum var. solidum*
Aspleniaceae	*Asplenium aethiopicum*
Asteraceae	*Arctotis arctotoides*
Asteraceae	*Artemisia afra var. afra*
Asteraceae	*Aster harveyanus*
Asteraceae	*Athrixia elata*
Asteraceae	*Berkheya pinnatifida*
Asteraceae	*Berkheya radula*
Asteraceae	*Berkheya setifera*
Asteraceae	*Bidens bipinnata*
Asteraceae	*Bidens pilosa*
Asteraceae	*Cineraria geraniifolia*
Asteraceae	*Cirsium vulgare*
Asteraceae	*Conyza albida*
Asteraceae	*Conyza podocephala*
Asteraceae	*Cosmos bipinnatus*
Asteraceae	*Cotula sp.*
Asteraceae	*Dimorphotheca caulescens*
Asteraceae	*Euryops laxus*
Asteraceae	*Euryops transvaalensis subsp. transvaalensis*
Asteraceae	*Felicia muricata*
Asteraceae	*Galinsoga parviflora*
Asteraceae	*Garuleum woodii*

Family	Scientific Name
Asteraceae	*Gazania krebsiana*
Asteraceae	*Gazania sp.*
Asteraceae	*Geigeria burkei*
Asteraceae	*Geigeria burkei subsp. burkei var. burkei*
Asteraceae	*Geigeria burkei subsp. burkei var. zeyheri*
Asteraceae	*Haplocarpha lyrata*
Asteraceae	*Haplocarpha scaposa*
Asteraceae	*Helichrysum aureonitens*
Asteraceae	*Helichrysum lepidissimum*
Asteraceae	*Helichrysum nudifolium*
Asteraceae	*Helichrysum pilosellum*
Asteraceae	*Helichrysum rugulosum*
Asteraceae	*Hilliardiella elaeagnoides*
Asteraceae	*Lactuca inermis*
Asteraceae	*Launaea rarifolia var. rarifolia*
Asteraceae	*Nidorella hottentotica*
Asteraceae	*Nidorella resedifolia subsp. resedifolia*
Asteraceae	*Nolletia jeanettae*
Asteraceae	*Osteospermum muricatum*
Asteraceae	*Pseudognaphalium luteo-album*
Asteraceae	*Schkuhria pinnata*
Asteraceae	*Senecio consanguineus*
Asteraceae	*Senecio coronatus*
Asteraceae	*Senecio erubescens*
Asteraceae	*Senecio inaequidens*
Asteraceae	*Senecio inornatus*
Asteraceae	*Senecio isatideus*
Asteraceae	*Senecio othonniflorus*
Asteraceae	*Senecio sp.*
Asteraceae	*Seriphium plumosum*
Asteraceae	*Sonchus oleraceus*
Asteraceae	*Tagetes minuta*
Asteraceae	*Tragopogon dubius*
Asteraceae	*Vernonia glabra*
Asteraceae	*Xanthium spinosum*
Boraginaceae	*Cynoglossum hispidum*
Brassicaceae	*Capsella bursa-pastoris*
Brassicaceae	*Erucastrum austroafricanum*
Brassicaceae	*Lepidium africanum*
Brassicaceae	*Nasturtium officinale*
Cactaceae	*Cereus jamacaru*
Cactaceae	*Opuntia ficus-indica*
Campanulaceae	*Wahlenbergia sp.*

Family	Scientific Name
Cannabaceae	*Cannabis sativa*
Caprifoliaceae	*Scabiosa columbaria*
Caryophyllaceae	*Dianthus basuticus subsp. basuticus var. basuticus*
Caryophyllaceae	*Dianthus mooiensis*
Colchicaceae	*Colchicum striatum*
Commelinaceae	*Commelina africana var. africana*
Commelinaceae	*Cyanotis speciosa*
Convolvulaceae	*Convolvulus multifidus*
Convolvulaceae	*Convolvulus sagittatus*
Convolvulaceae	*Cuscuta campestris*
Convolvulaceae	*Ipomoea bathycolpos*
Convolvulaceae	*Ipomoea bolusiana*
Convolvulaceae	*Ipomoea crassipes*
Convolvulaceae	*Ipomoea oblongata*
Convolvulaceae	*Ipomoea sp.*
Convolvulaceae	*Turbina oblongata*
Crassulaceae	*Crassula cf. setulosa*
Crassulaceae	*Crassula lanceolata*
Crassulaceae	*Crassula sp.*
Cucurbitaceae	*Cucumis hirsutus*
Cucurbitaceae	*Cucumis zeyheri*
Cyperaceae	*Abildgaardia ovata*
Cyperaceae	*Bulbostylis humilis*
Cyperaceae	*Carex glomerabilis*
Cyperaceae	*Cyperus albostriatus*
Cyperaceae	*Cyperus capensis*
Cyperaceae	*Cyperus esculentus var. esculentus*
Cyperaceae	*Cyperus longus var. tenuiflorus*
Cyperaceae	*Cyperus marginatus*
Cyperaceae	*Cyperus rupestris*
Cyperaceae	*Cyperus semitrifidus*
Cyperaceae	*Cyperus sp.*
Cyperaceae	*Eleocharis dregeana*
Cyperaceae	*Eleocharis limosa*
Cyperaceae	*Fimbristylis complanata*
Cyperaceae	*Kyllinga erecta*
Cyperaceae	*Pycreus cooperi*
Cyperaceae	*Schoenoplectus cf. muricinux*
Cyperaceae	*Schoenoplectus decipiens*
Cyperaceae	*Schoenoplectus sp.*
Dipsacaceae	*Cephalaria zeyheriana*
Ebenaceae	*Diospyros lycioides*
Euphorbiaceae	*Acalypha angustata*

Family	Scientific Name
Euphorbiaceae	*Acalypha caperonioides var. caperonioides*
Euphorbiaceae	*Chamaesyce hirta*
Euphorbiaceae	*Euphorbia clavarioides*
Euphorbiaceae	*Euphorbia inaequilatera*
Euphorbiaceae	*Euphorbia striata*
Fabaceae	*Acacia mearnsii*
Fabaceae	*Argyrolobium campicola*
Fabaceae	*Chamaecrista mimosoides*
Fabaceae	*Dolichos falciformis*
Fabaceae	*Dolichos linearis X*
Fabaceae	*Eriosema salignum*
Fabaceae	*Erythrina zeyheri*
Fabaceae	*Indigofera dregeana*
Fabaceae	*Indigofera hedyantha*
Fabaceae	*Indigofera hilaris*
Fabaceae	*Indigofera sp.*
Fabaceae	*Indigofera sp.*
Fabaceae	*Leobordea divaricata*
Fabaceae	*Leobordea mucronata*
Fabaceae	*Lessertia stricta*
Fabaceae	*Lotononis sp.*
Fabaceae	*Medicago laciniata var. laciniata*
Fabaceae	*Melolobium calycinum*
Fabaceae	*Rhynchosia adenodes*
Fabaceae	*Rhynchosia caribaea*
Fabaceae	*Rhynchosia monophylla*
Fabaceae	*Senna italica*
Fabaceae	*Sphenostylis angustifolium*
Fabaceae	*Tephrosia capensis*
Fabaceae	*Trifolium cf. africanum*
Fabaceae	*Trifolium pratense*
Fabaceae	*Vachellia karroo*
Fabaceae	*Vigna vexillata*
Gentianaceae	*Sebaea leiostyla*
Geraniaceae	*Monsonia angustifolia*
Geraniaceae	*Pelargonium alchemilloides*
Geraniaceae	*Pelargonium luridum*
Geraniaceae	*Pelargonium minimum*
Hyacinthaceae	*Albuca sp. 1*
Hyacinthaceae	*Albuca sp. 2*
Hyacinthaceae	*Albuca sp. 3*
Hyacinthaceae	*Albuca virens subsp. virens*
Hyacinthaceae	*Dipcadi ciliare*

Family	Scientific Name
Hyacinthaceae	*Dipcadi viride*
Hyacinthaceae	*Drimia angustifolia*
Hyacinthaceae	*Drimia depressa*
Hyacinthaceae	*Drimia intricata*
Hyacinthaceae	*Drimia pauciflora*
Hyacinthaceae	*Eucomis autumnalis*
Hyacinthaceae	*Ledebouria burkei subsp. burkei*
Hyacinthaceae	*Ledebouria cf. minima*
Hyacinthaceae	*Ledebouria cf. revoluta*
Hyacinthaceae	*Ledebouria cooperi*
Hyacinthaceae	*Ledebouria graminifolia*
Hyacinthaceae	*Ledebouria sp.*
Hyacinthaceae	*Schizocarphus nervosus*
Hypoxidaceae	*Hypoxis acuminata*
Hypoxidaceae	*Hypoxis argentea*
Hypoxidaceae	*Hypoxis hemerocallidea*
Hypoxidaceae	*Hypoxis rigidula*
Hypoxidaceae	*Hypoxis rigidula var. rigidula*
Iridaceae	*Gladiolus crassifolius*
Iridaceae	*Gladiolus dalenii*
Iridaceae	*Gladiolus elliotii*
Iridaceae	*Gladiolus longicollis subsp. longicollis*
Iridaceae	*Gladiolus robertsoniae*
Iridaceae	*Lapeirousia sp.*
Lamiaceae	*Aeollanthus buchnerianus*
Lamiaceae	*Ajuga ophrydis*
Lamiaceae	*Becium obovatum*
Lamiaceae	*Becium sp.*
Lamiaceae	*Hemizygia pretoriae*
Lamiaceae	*Hemizygia sp.*
Lamiaceae	*Leucas sp.*
Lamiaceae	*Mentha longifolia*
Lamiaceae	*Plectranthus cf. madagascariensis*
Lamiaceae	*Plectranthus ramosior*
Lamiaceae	*Salvia sp.*
Lamiaceae	*Syncolostemon canescens*
Malvaceae	*Corchorus asplenifolius*
Malvaceae	*Grewia flava*
Malvaceae	*Hermannia coccocarpa*
Malvaceae	*Hermannia cristata*
Malvaceae	*Hermannia depressa*
Malvaceae	*Hermannia erodioides*
Malvaceae	*Hermannia grandistipula*

Family	Scientific Name
Malvaceae	*Hibiscus aethiopicus*
Malvaceae	*Hibiscus microcarpus*
Malvaceae	*Hibiscus trionum*
Molluginaceae	*Psammotropha myriantha*
Myrtaceae	*Eucalyptus cf. camaldulensis*
Onagraceae	*Oenothera rosea*
Onagraceae	*Oenothera tetraptera*
Orchidaceae	*Bonatea porrecta*
Orchidaceae	*Disa aconitoides subsp. aconitoides*
Orchidaceae	*Disa cooperi*
Orchidaceae	*Eulophia hians var. inaequalis*
Orchidaceae	*Eulophia hians var. nutans*
Orchidaceae	*Habenaria barbertoni*
Orchidaceae	*Habenaria epipactidea*
Orchidaceae	*Orthochilus leontoglossa*
Orchidaceae	*Pterygodium nigrescens*
Orchidaceae	*Satyrium stenopetalum subsp. brevicalcarata*
Orobanchaceae	*Alectra orobanchoides*
Orobanchaceae	*Striga elegans*
Oxalidaceae	*Oxalis corniculata*
Oxalidaceae	*Oxalis obliquifolia*
Oxalidaceae	*Oxalis sp.*
Peraceae	*Clutia pulchella var. pulchella*
Phyllanthaceae	*Phyllanthus parvulus var. garipensis*
Plantaginaceae	*Plantago lanceolata*
Plantaginaceae	*Veronica anagallis-aquatica*
Poaceae	*Andropogon appendiculatus*
Poaceae	*Andropogon schirensis*
Poaceae	*Aristida adscensionis*
Poaceae	*Aristida bipartita*
Poaceae	*Aristida diffusa*
Poaceae	*Aristida sp.*
Poaceae	*Arundo donax*
Poaceae	*Brachiaria advena*
Poaceae	*Brachiaria eruciformis*
Poaceae	*Brachiaria serrata*
Poaceae	*Bromus catharticus*
Poaceae	*Catalepis gracilis*
Poaceae	*Chloris virgata*
Poaceae	*Cymbopogon caesius*
Poaceae	*Cymbopogon pospischilii*
Poaceae	*Cynodon dactylon*
Poaceae	*Cynodon incompletus*

Family	Scientific Name
Poaceae	*Digitaria eriantha*
Poaceae	*Echinochloa colona*
Poaceae	*Eleusine coracana subsp. africana*
Poaceae	*Elionurus muticus*
Poaceae	*Eragrostis capensis*
Poaceae	*Eragrostis chloromelas*
Poaceae	*Eragrostis cilianensis*
Poaceae	*Eragrostis curvula*
Poaceae	*Eragrostis inamoena*
Poaceae	*Eragrostis plana*
Poaceae	*Eragrostis planiculmis*
Poaceae	*Eragrostis racemosa*
Poaceae	*Eragrostis superba*
Poaceae	*Fingerhuthia sesleriiformis*
Poaceae	*Harpochloa falx*
Poaceae	*Heteropogon contortus*
Poaceae	*Hyparrhenia anamesa*
Poaceae	*Hyparrhenia hirta*
Poaceae	*Hyparrhenia tamba*
Poaceae	*Imperata cylindrica*
Poaceae	*Ischaemum fasciculatum*
Poaceae	*Koeleria capensis*
Poaceae	*Leersia hexandra*
Poaceae	*Leptochloa fusca*
Poaceae	*Lolium perenne*
Poaceae	*Melinis nerviglumis*
Poaceae	*Melinis repens*
Poaceae	*Microchloa caffr*
Poaceae	*Oropetium capense*
Poaceae	*Panicum natalense*
Poaceae	*Panicum repens*
Poaceae	*Panicum sp.*
Poaceae	*Paspalum dilatatum*
Poaceae	*Paspalum distichum*
Poaceae	*Pennisetum clandestinum*
Poaceae	*Phragmites australis*
Poaceae	*Polypogon viridis*
Poaceae	*Setaria incrassata*
Poaceae	*Setaria nigrirostris*
Poaceae	*Setaria pumila*
Poaceae	*Setaria sphacelata*
Poaceae	*Setaria sphacelata var. sericea*
Poaceae	*Setaria sphacelata var. sphacelata*

Family	Scientific Name
Poaceae	*Sporobolus africanus*
Poaceae	*Sporobolus discosporus*
Poaceae	*Themeda triandra*
Poaceae	*Tragus berteronianus*
Poaceae	*Trisetopsis imberbis*
Poaceae	*Tristachya biseriata*
Poaceae	*Tristachya leucothrix*
Poaceae	*Urochloa panicoides*
Polygalaceae	*Polygala amatymbica*
Polygalaceae	*Polygala hottentotta*
Polygonaceae	*Persicaria lapathifolia*
Polygonaceae	*Rumex crispus*
Polygonaceae	*Rumex lanceolatus*
Portulacaceae	*Portulaca hereroensis*
Portulacaceae	*Portulaca kermesina*
Portulacaceae	*Portulaca quadrifida*
Potamogetonaceae	*Potamogeton thunbergii*
Pteridaceae	*Cheilanthes sp.*
Pteridaceae	*Pellaea calomelanos*
Ranunculaceae	*Ranunculus multifidus*
Rhamnaceae	*Ziziphus zeyheriana*
Rosaceae	*Prunus persica*
Rubiaceae	*Anthospermum rigidum subsp. pumilum*
Rubiaceae	*Galium capense*
Rubiaceae	*Kohautia amatymbica*
Rubiaceae	*Kohautia cynanchica*
Ruscaceae	*Eriospermum flagelliforme*
Ruscaceae	*Eriospermum sp.*
Salicaceae	*Salix babylonica*
Santalaceae	*Thesium cf. goetzeanum*
Scrophulariaceae	*Chaenostoma calycina*
Scrophulariaceae	*Chaenostoma patrioticum*
Scrophulariaceae	*Chaenostoma sp.*
Scrophulariaceae	*Diclis rotundifolia*
Scrophulariaceae	*Jamesbrittenia aurantiaca*
Scrophulariaceae	*Jamesbrittenia stricta*
Scrophulariaceae	*Nemesia cf. umbonata*
Scrophulariaceae	*Selago densiflora*
Scrophulariaceae	*Selago tenuifolia*
Selaginellaceae	*Selaginella caffrorum var. caffrorum*
Solanacaea	*Datura ferox*
Solanaceae	*Physalis viscosa*
Solanaceae	*Solanum campylacantha*

Family	Scientific Name
Solanaceae	*Solanum elaeagnifolium*
Solanaceae	*Solanum nigrum*
Thymelaeaceae	*Gnidia gymnostachya*
Thymelaeaceae	*Gnidia sp.*
Typhaceae	*Typha capensis*
Verbenaceae	*Verbena bonariensis*
Verbenaceae	*Verbena brasiliensis*
Verbenaceae	*Verbena rigida*
Zygophyllaceae	*Tribulus terrestris*
Source: Ekotrust (2023)	

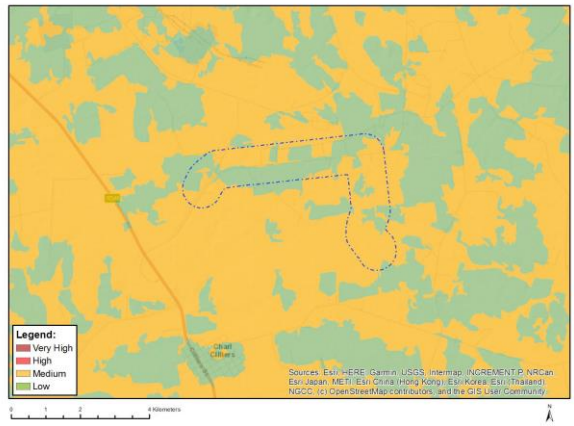
Appendix D: Summary and Comment on the Sensitivity Rating of the DFFE Screening Tool

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 two flora species of conservation concern that are listed in the table below. Also refer to the map showing the spatial sensitivity.

OHPL Alternative Option 1

OHPL Alternative Option 2



OHPL Preferred Option 1

OHPL Preferred Option 2

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Medium	Sensitive species 1252
Medium	Sensitive species 691

Appraisal of the Sensitivity Rating

There is some suitable habitat (moist areas in undulating grassland) available for Sensitive species 691. However, this species was not recorded in the study area during the field work conducted for the current study or by Ekotrust (2023). Sensitive species 1252 favours wooded mountain kloof habitat. No suitable habitat for this species is present in the study area. Based on the findings of the current

study and the findings is Ekotrust (2023), the overall Plant Species Theme is rated therefore rated ‘Low’ sensitivity.

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, viability9 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;	N/A
2.2.11 discuss the presence or likelihood of additional SCC including threatened species not identified by the screening tool, Data Deficient or Near Threatened Species, as well as any undescribed species10; or roosting and breeding or foraging areas used by migratory species where these species show significant congregations, occurring in the vicinity	Section 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:	

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Plant Species	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 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;	N/A
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