Appendix G.5 Plant Species Assessment

PLANT SPECIES SPECIALIST ASSESSMENT FOR THE PROPOSED IGOLIDE WIND ENERGY FACILITY ELECTRICAL GRID INFRASTRUCTURE PROJECT

WSP Group Africa Pty (Ltd)

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Submitted to:
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Executive Summary

Introduction

Hawkhead Consulting was appointed by WSP Group Africa Pty (Ltd), on behalf of ENERTRAG South Africa (Pty) Ltd (the Applicant), to conduct the Plant Species Specialist Assessment for the proposed Igolide Wind Energy Facility Electrical Grid Infrastructure Project (hereafter referred to as the 'Project'), near Fochville in Gauteng Province.

The proposed Project is intended to feed the electricity generated by the approved 100MW Igolide Wind Energy Facility (WEF) (DFFE reference number: 14/12/16/3/3/2/2385, EA date 31 January 2024) to the national energy grid, with the point of connection being the existing East Drie Five Substation. This specialist study focused on plant species, and was conducted in line with the 'Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in Terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, When Applying for Environmental Authorisation', and specifically the 'Protocol for the Specialist Assessment and Minimum Content Requirements for Environmental Impacts on Terrestrial Plant Species.'

This report should be read in conjunction with, *inter alia*, the Terrestrial Biodiversity Specialist Assessment Report and the Animal Species Specialist Assessment Report.

Study Methodology

The primary scope of work included 1) Collating and reviewing information and data on terrestrial vegetation and flora species that occur or potentially occur on-site and in the surrounding landscape. A key literature source in this regard was the previous specialist study conducted for the Igolide WEF by Ekotrust (2023); 2) Conducting a field programme to collect data on vegetation communities and flora species present on-site; 3) 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 4) Recommending mitigation and management measures for inclusion in the proposed Project's Environmental Management Programme (EMP).

The proposed Project's infrastructure footprint was assessed at a desktop level using the National Web-based Environmental Screening Tool. According to the National Web Based Screening Tool, the Plant Species Theme for the study area was rated 'Medium' sensitivity on account of the potential presence of two threatened flora species, namely *Khadia beswickii* and Sensitive species 1248.

Regional Description of Baseline Vegetation

The study area is located in the Savanna Biome, and based on the South African National Biodiversity Institute's (SANBI) regional mapping of South Africa's vegetation types (2018), Gauteng Shale Mountain Bushveld (SVcb 10) is the dominant vegetation type. According to the National Environmental Management: Biodiversity Acs (NEMBA) Revised National List of Threatened Ecosystems (2022), this vegetation type is not listed as threatened (i.e., it is classed as Least Concern).

Habitat units in the Study Area

During the field survey, eight habitat units were identified in the study area, including both natural (and semi-natural) grassland and savanna habitats (namely *Hyparrhenia hirta – Eragrostis chloromelas* Grassland, Moist Grassland, *Lopholaena corifolia* Rocky Ridge/Outcrop Grassland, Mixed Rocky Grassland, *Vachellia karroo – Senegalia caffra* Bushveld. and Mixed Rocky Ridge Bushveld), as well as modified habitats (namely Alien Tree Plantations and Transformed and Degraded Sites).

The latter are of little conservation value and have Site Ecological Importance ratings of 'Very Low'. The natural/semi-natural habitats however, have Site Ecological Importance ratings ranging from "Low' to 'High'. These areas provide important habitat for flora and fauna. They also form part of a larger network of natural habitat and thus contribute to broader-scale habitat connectivity, which is an important component of maintaining landscape ecological processes and terrestrial biodiversity.

Flora of Conservation Importance

In terms of flora species of conservation concern (SCC), several suspected *Adromischus umbraticola* subsp*. umbraticola* (Near Threatened) plants were recorded in an area of *Lopholaena corifolia* Rocky Ridge/Outcrop Grassland in the study area. *Adromischus umbraticola* subsp*. umbraticola* is listed in priority group A2 in Gauteng Province (GDARD, 2014).

Based on reviewed literature and data sources, an additional eight flora species that that are known to occur in the region in which the study area is located are listed as threatened/Near Threatened on the national Red List. Habitat suitability assessments indicate that it is possible/probable that a number of these may be present in the study area. In addition, five flora species that are listed as Protected at a provincial level, according to the Gauteng Nature Conservation Ordinance (12 of 1983) were also recorded on-site during the 2024 field survey.

Declared Alien Invasive Species and Flora of Medicinal Value

Fifteen NEMBA declared alien invasive species (AIS) were recorded in the study area during the field visit. Seventeen flora species recorded in the study area have recognised medicinal value.

Impact Assessment

Several impacts were identified and assessed for the proposed Project. These are presented in the table below, and should be considered in conjunction with the impacts assessed in the Animal Species Specialist Assessment Report, the Terrestrial Biodiversity Specialist Assessment Report and other relevant specialist studies.

Impact	Impact Significance	
	Before Mitigation	After Mitigation
Construction Phase		
Direct loss and disturbance of natural habitat	High	Low
Habitat fragmentation impacting habitat connectivity and integrity	Medium	Low
Loss of Flora Species of Conservation Concern	High	Low
Establishment and spread of alien invasive species	Medium	Low
Operational Phase		

Establishment and spread of alien invasive species	Medium	Low
Decommissioning Phase		
Establishment and spread of alien invasive species	Medium	Low
Cumulative Impacts		
Cumulative loss of flora SCC due to habitat loss, disturbance and fragmentation of natural habitats	High	Low

Mitigation and Monitoring Measures

Several mitigation/management measures have been recommended to mitigate the identified impacts. These, along with the mitigation/management measures presented in the Animal Species Specialist Assessment Report, the Terrestrial Biodiversity Specialist Assessment Report and other relevant specialist studies, should be incorporated into the proposed Project's environmental management plan (EMP). Some of the main mitigation measures listed in this report include:

- Proposed Project infrastructure should be sited outside a 100 m buffer around the rocky outcrop in which the *Adromischus umbraticola* subsp*. umbraticola* were recorded;
- A pre-construction micro-siting walkdown of the approved development footprints should be conducted during the wet/growing season to identify sensitive biodiversity receptors (e.g., flora SCC) and inform micro-siting of infrastructure;
- Data from the micro-siting walkdown should inform the micro-siting of proposed Project infrastructure to:
    - Avoid as far as possible any sensitive biodiversity features; and.
    - Inform the development of a Flora SCC Management Plan, as per the requirements set on Section 8.3 of GDARD Biodiversity (2018). The plan should include *inter alia*:
        - *In situ* conservation measures to protected *Adromischus umbraticola* subsp*. umbraticola plants;*
        - Monitoring procedure for the *Adromischus umbraticola* subsp*. umbraticola* plants; and
        - Rescue and relocation procedures for species listed as Protected in Gauteng Province
- As much of the proposed Project infrastructure as possible should be located in disturbed/modified habitat units, such as *Hyparrhenia hirta – Eragrostis chloromelas* Grassland, Alien Tree Plantations, and Transformed and Degraded;
- As far as practical, access roads should be aligned with existing farm roads and access tracks, and if feasible, no permanent access roads should be constructed in Mixed Rocky Ridge Bushveld and *Lopholaena corifolia* Rocky Ridge/Outcrop Grassland;
- 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;
- A rehabilitation/ landscaping protocol should be developed and implemented to stabilise and revegetate all non-operational sites that have been disturbed by construction activities;

- An AIS control and eradication plan must be developed for the Project that focuses on controlling and eradicating AIS in, and immediately adjacent to, the construction footprints. The plan should also include regular AIS monitoring; and

The successful implementation of these management measures can effectively mitigate the identified impacts, resulting in 'Low' residual impact scores.

Specialist Opinion

The National Web Based Screening Tool rated the Plant Species Theme for the study area as 'Medium' sensitivity. Neither *Khadia beswickii* nor Sensitive species 1248 were recorded on-site. However, based on the findings of this specialist study, the Rocky Ridge/Outcrop Grassland and Mixed Rocky Ridge Bushveld units are rated as having 'High' sensitivity, with the remainder of the study area regarded as 'Medium' sensitivity.

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

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
GDARD	Gauteng Department of Agriculture and Rural Development
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	
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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 Igolide Wind Energy Facility Electrical Grid Infrastructure Project;
- Do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed;
- Do not have, nor will have, a vested interest in the proposed activity proceeding;
- Have no, and will not engage in, conflicting interests in the undertaking of the activity; and
- Undertake to disclose, to the competent authority, any information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document.

Andrew Zinn

1. Introduction

Hawkhead Consulting was appointed by WSP Group Africa Pty (Ltd), on behalf of ENERTRAG South Africa (Pty) Ltd, to conduct the Plant Species Specialist Assessment for the proposed Igolide Wind Energy Facility Electrical Grid Infrastructure Project (hereafter referred to as the 'Project'), near Fochville in Gauteng Province, South Africa.

The proposed Project is intended to feed the electricity generated by the approved 100 MW Igolide Wind Energy Facility (WEF) (DFFE reference number: 14/12/16/3/3/2/2385), EA dated 31 January 2024) to the national energy grid, with the point of connection being the existing East Drie Five Substation.

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.

This report should be read in conjunction with, *inter alia*, the Animal Species Specialist Assessment Report and the Terrestrial Biodiversity Specialist Assessment Report.

1.2. Location and Delimits of the Study Area

The proposed Project is located approximately 6 km north-east of Fochville, within the Merafong City Local Municipality in Gauteng Province (Error! Reference source not found.). The entire extent of the Project is located within the Central Corridor of the Strategic Transmission Corridors.

The 'study area' defined for this assessment is shown in Figure 1, and includes 250 m wide corridor along the centreline of the proposed powerline route and a 500 m buffer around the proposed switching station and existing East Drie Five Substation sites (refer to Section 1.3 for a description for proposed Project infrastructure and facilities).

1.3. Project Description

Proposed Project infrastructure and activities are presented in Table 1.

Table 1: Project Description – Technical details.

Facility Names	Igolide WEF Electrical Grid Infrastructure
Applicant:	ENERTRAG South Africa (Pty) Ltd
Municipalities:	Merafong City Local Municipality in the Gauteng Province of South Africa
132kV powerline (single or double circuit):	• Single or double circuit 132kV between the proposed switching station and the existing East Drie Five Substation. The powerline design may include: o Intermediate self-supporting monopole; o Inline or angle-strain self-supporting monopole; o Suspension self-supporting monopole; o Triple pole structure; o Steel lattice structure; or o Similar powerline design at 132kV specification. • The above designs may require anchors with guy-wires or be anchorless. For up to 132kV structures, concrete foundation sizes may vary depending on design type up to 80 m^2, with depths reaching up to 3.5 m typically in a rectangular 'pad' shape; • A working area of approximately 100 m x 100 m is needed for each of the proposed structures to be constructed; • Gridline length: approximately 4 km; • Height of powerline: up to 40 m; and • Width of gridline servitude: 32 m. A 250 m wide corridor (125 m on either side of the centre line) has been identified for the assessment and micro-siting of the powerline to avoid sensitivities and ensure technical feasibility.
Switching Station	• Development footprint (permanent infrastructure area): approximately 2.5 ha as the switching station will be located adjacent to the approved 33/132 kV on-site IPP substation (DFFE reference number: 14/12/16/3/3/2/2385), EA dated 31 January 2024), which was assessed as part of the Igolide WEF Environmental Authorisation process; • Capacity: 132kV; • Standard substation electrical equipment, including, but not limited to, busbars, control building, telecommunication infrastructure, office area, operation and control room, workshop and storage area, feeder bays, stringer strain breams, insulators, arrestors, relays, capacitor banks, batteries, wave trappers, switchyard, metering and

	indication instruments, equipment for carrier current, surge protection and outgoing feeders, as may be required; and • Associated infrastructure, including, but not limited to, lighting, fencing (~2 m high), gating, parking area, and buildings required for operation (ablutions, office, workshop and control room, concrete batching plant (if required), waste storage/disposal and storerooms).
Termination Point Upgrades	Upgrades to the existing East Drie Five Substation will also be required, including possible expansion within the yard, where required, with a footprint of up to 4 ha. This includes the installation of additional feeder bays to accommodate the power being evacuated from the proposed Igolide WEF and transformer upgrades.
Access roads:	• During construction, a permanent access road along the length of the powerline corridor, between 4 – 6m wide will be established to allow for large crane movement. This track will then be utilised for maintenance during operation; and • Permanent access roads to and within the substation, up to 8m wide, will be established.
Affected Farm Portion(s)	• Portion 20 of Kraalkop 147 IQ; • Portion 31 of Kraalkop 147 IQ; • Portion 45 of Kraalkop 147 IQ; • Porton 46 of Kraalkop 147 IQ; • Portion 53 of Kraalkop 147 IQ; • Portion 68 of Kraalkop 147 IQ; • Portion 11 of Leeuwpoort 356 IQ; and • Portion 77 of Leeuwpoort 356 IQ.

1.4. Results of the Environmental Screening Tool

According to the National Web Based Screening Tool, the Plant Species Theme for the study area was rated 'Medium' sensitivity on account of the potential presence of two threatened flora species:

- *Khadia beswickii*; and
- Sensitive species 1248.

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

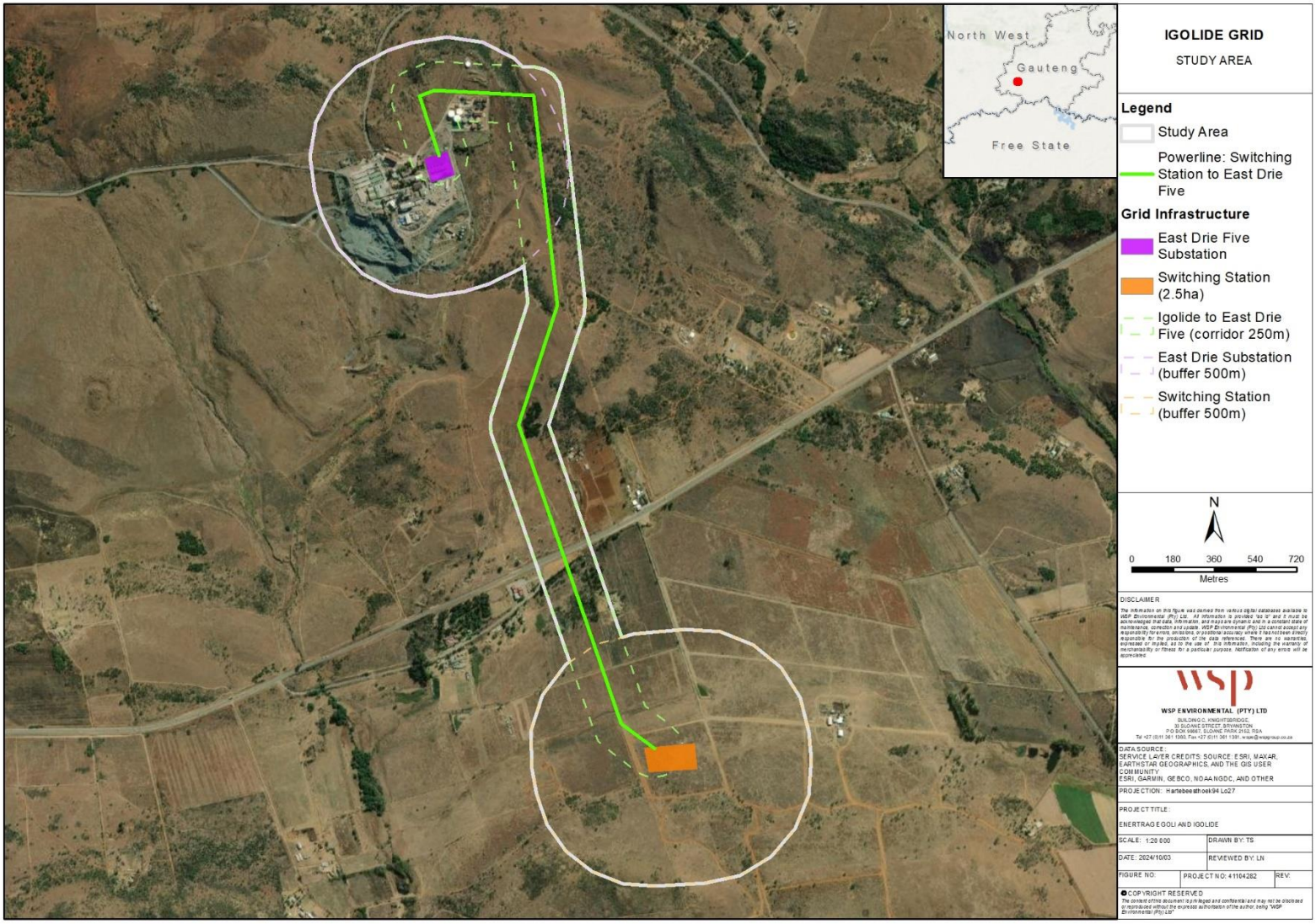

Figure 1: Map showing the regional location of the proposed Project.

2. Relevant Legislation and Guidelines

Relevant 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).
Nature Conservation Ordinance 12 of 1983, as amended by Gauteng General Law Amendment Act 4 of 2005.	• Amongst other provisions, the Nature Conservation Ordinance provides lists of specially protected and protected flora and fauna. Of particular relevance are Schedule 2, 2A, 4, 7, 11 and 12 concerning Protected and Specially Protected fauna and flora.
Other Relevant national and Provincial Policies, Plans and Guidelines	Other relevant policies, plans and guidelines that were considered during this study include: • Species Environmental Assessment Guideline (SANBI, 2020); • Standard for the Development and Expansion of Power Lines and Substations within Identified Geographical Areas Revision 2 (DFFE, 2022); • National Protected Area Expansion Strategy (2018); • Gauteng Conservation Plan (3.3); • The Ridges Guideline (2019) for Gauteng Province; • The Red List Plant Guideline (2018) for Gauteng Province; and • Gauteng Department of Agriculture and Rural Development Requirements for Biodiversity Assessments Version 3.

3. Study Methodology

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

3.1. Desktop Data Collation and Literature Review

The aim of the desktop literature review component was to collate and review data and information pertaining to terrestrial 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 for this study was the flora chapter in the terrestrial biodiversity assessment report compiled by Ekotrust (2023) for the proposed Igolide WEF. The proposed site for the Igolide WEF encompasses the southern portion of the study area defined for this assessment, and therefore the findings of the Ekotrust (2023) study have relevance.

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 SANBI's online Botanical Database of Southern Africa (BODATSA) and combined with the Ekotrust (2023) flora inventory to screen for flora species of conservation concern; and
- Flora species of conservation concern that were highlighted by the online environmental sensitivity screening tool for the study area, and those obtained from the Gauteng Department of Agriculture and Rural Development (GDARD) (Courtesy of S. Veldsman) for the 2627BC, were also included in the screening process.

3.2. Field Programme

The field programme comprised a walkdown of the proposed powerline route and associated infrastructure footprints. This was conducted over a one-day period, on the 4th April 2024. This period coincides with the late-wet season. The sampling methodologies used during the field survey were based, in part, on those recommended in SANBI (2020), and included the following:

- During the walkdown, vegetation was sampled using meander searches, with a focus on the presence / potential presence of flora SCC in areas of natural habitat;
- Data collected during the walkdown included habitat character and condition, general flora species composition and evidence of disturbances. Special emphasis was placed on the presence of flora species of conservation concern and alien invasive species;
- 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 on-site observations from the 2024 field survey, an analysis of composite aerial/satellite imagery, and the delineations of Ekotrust (2023).

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 Plants (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);
- Nature Conservation Ordinance 12 of 1983, as amended by Gauteng General Law Amendment Act 4 of 2005. Of particular relevance are Schedule 2, 2A, 4, 7, 11 and 12 concerning Protected and Specially Protected fauna and 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 were 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:

- Field work was conducted over a one-day period in April 2024. The timing of the field survey coincided with the late wet-season. Sufficient rain had fallen during the preceding wet season to allow for a productive vegetation community, and this was conducive to assessing flora condition and composition. Pursuant to this, the conditions during which the field work for the current study was conducted are not considered significantly limiting with respects to the findings presented in this report; and
- Notwithstanding the above, it is possible that certain small or cryptic taxa (e.g., annuals and geophytes) that are most readily visible or distinguishable (e.g., when in flowering) at other periods during the wet/growing season, may not have been detected during the field survey.

5. Regional Description of Baseline Vegetation

The study area is located in the Savanna Biome, and according to SANBI's regional mapping of South Africa's vegetation types (2018), Gauteng Shale Mountain Bushveld (SVcb 10) is the prevailing vegetation type across the study area (Figure 2).

The general characteristics of the Savanna Biome and Gauteng Shale Mountain Bushveld are discussed in more detail below:

5.1. Savanna Biome

The savanna biome is the largest biome in South Africa, covering approximately 35% of the country's land surface (Scholes and Walker, 1993). Savannas are characterised by a dominant grass layer, over-topped by a discontinuous, yet distinct woody plant component. Primary determinants of savanna composition, structure and functioning are; fire, a distinct seasonal climate, substrate type, and browsing and grazing by large herbivores (Scholes and Walker, 1993).

Compositionally, Africa's savannas are distinguished as either fine-leafed savannas or broad-leafed savannas. The distribution of these forms is based primarily on soil fertility (Scholes and Walker, 1993); fine-leafed savannas occur on nutrient rich soils and are dominated by microphyllous woody species of the Fabaceae family (most commonly indigenous Acacia's). These savannas have a

productive and diverse herbaceous layer that is dominated by grasses, and can support large populations of mammalian herbivores (Scholes and Walker, 1993). Conversely, broad-leafed savannas usually occur on nutrient poor soils and are dominated by macrophyllous woody species from the Combretaceae family (common genera: Combretum & Terminalia). Compared to fine-leafed savannas, broad-leafed savannas are less productive and support a lower herbivore biomass (Scholes and Walker, 1993).

5.2. Gauteng Shale Mountain Bushveld

Gauteng Shale Mountain Bushveld occurs in a narrow band along a series of low, rocky ridges of varying steepness from Carletonville-Westonaria-Lenasia (Mucina and Rutherford, 2011).

Vegetation is characterised by short, semi-open thicket consisting of a variety of fine- and broad-leaf woody species. The field layer is normally dominated by grasses (Mucina and Rutherford, 2011). The underlying geology comprises shale with some coarser clastic sediments and andesite from the Pretoria Group. Soils are shallow to deep Mispah (Mucina and Rutherford, 2011).

In Mucina and Rutherford's (2011) regional vegetation type descriptions, important plant taxa are those species that have a high abundance, a frequent occurrence (not being particularly abundant) or are prominent in the landscape within a particular vegetation type. They recognise the following species as important taxa in Gauteng Shale Mountain Bushveld:

Trees: *Dombeya rotundifolia, Celtis africana, Combretum molle, Cussonia spicata, Englerophytum magalismontanum, Protea caffra, Rhus leptodictya, Vangueria infausta, Senegalia caffra, Vachellia karroo, Zanthoxylum capense* and *Ziziphus mucronata*.

Shrubs: *Asparagus laricinus, Canthium gilfillanii, Chrysanthemoides monilifera, Dichrostachys cinerea, Diospyros austro-africana, Diospyros lycioides* subsp*. lycioides, Ehretia rigida* subsp*. rigida, Grewia occidentalis, Gymnosporia polyacantha* and *Olea europaea*.

Grasses: *Hyparrhenia dregeana, Cymbopogon caesius, Digitaria eriantha* and *Eragrostis curvula*.

Herbs: *Dicoma zeyheri, Helichrysum nudifolium, Helichrysum rugulosum, Hermannia lancifolia, Selaginella dregei, Senecio venosus, Vernonia natalensis, Vernonia oligocephala, Cheilanthes hirta, Pellaea calomelanos* and *Scadoxus puniceus*.

5.3. Threat Status of Gauteng Shale Mountain Bushveld

According to Mucina & Rutherford (2011), less than 1% of Gauteng Shale Mountain Bushveld is under statutory protection, and about 24 % has been transformed by urbanisation, mining, farming and plantations. These authors therefore describe Gauteng Shale Mountain Bushveld as being vulnerable. According to the NEMBA Revised National List of Threatened Ecosystems (2022) however, this vegetation type is not listed as threatened (i.e., it is classed as Least Concern) (see Figure 3).

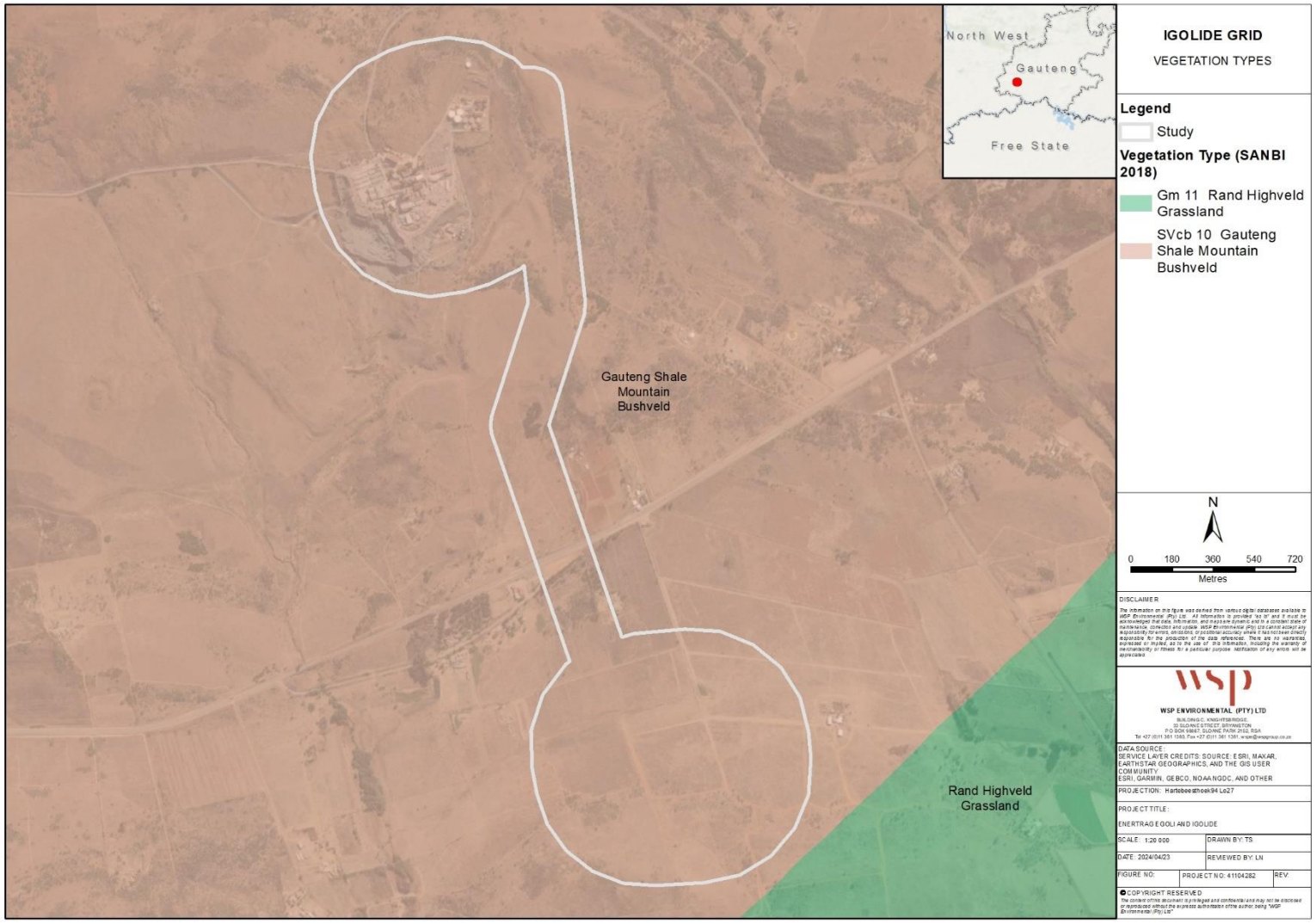

Figure 2: Study area in relation to the SANBI (2018) vegetation types.

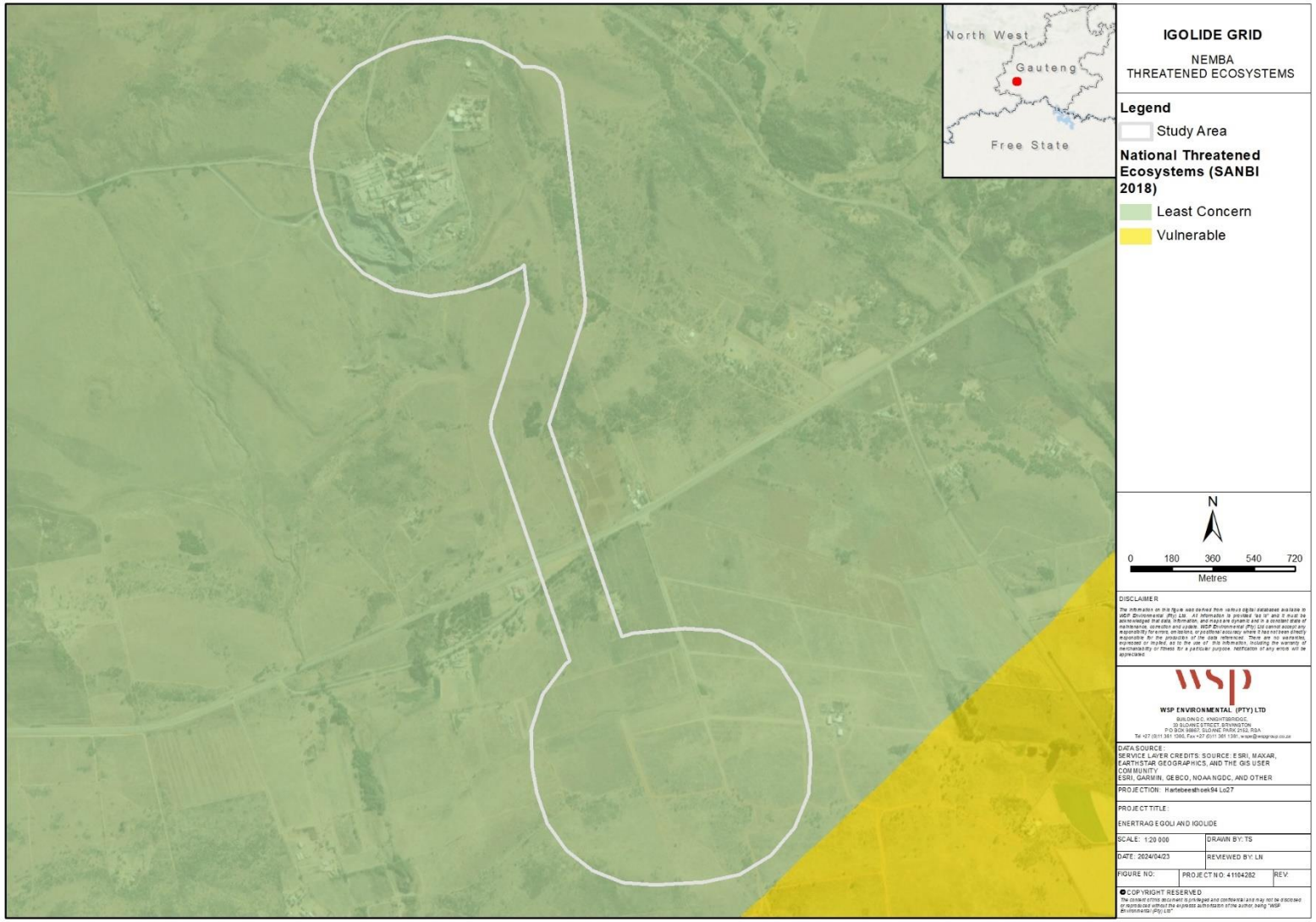

Figure 3: Study area in relation to delineations of the National Red List of Terrestrial Ecosystems.

6. Landscape Context and Existing Impacts on Biodiversity

The following notes summarise key existing impacts (anthropogenic activities and infrastructure) observed in the study area and in the surrounding landscape during the field survey:

- The dominant anthropogenic feature in the study area is the Sibanye Driefontein Gold 5 Shaft complex. This site is completely transformed and dominated by various mine facilities and infrastructure;
- The N12 Highway bisects the study area on an east-west axis. The N12 is a major arterial route linking Johannesburg in the east to Potchefstroom in the west;
- Across the landscape surrounding the study area, other existing impacts noted include:
    - Scattered alien tree stands, windrows and hedgerows;
    - Agricultural fields;
    - Residential dwellings (both formal and informal); and
    - Various forms of linear infrastructure, including gravel roads and informal vehicle tracks, farm and game fences, and existing electricity powerlines.

7. Vegetation and Flora Assessment

7.1. Habitat Units

Based on data collected during the field survey, eight habitat units were identified in the study area, including four grassland-type units, two savanna-type units, and two modified habitat units. These are:

- *Hyparrhenia hirta – Eragrostis chloromelas* Grassland;
- Moist Grassland;
- *Lopholaena corifolia* Rocky Ridge/Outcrop Grassland;
- Mixed Rocky Grassland;
- *Vachellia karroo – Senegalia caffra* Bushveld;
- Mixed Rocky Ridge Bushveld;
- Alien Tree Plantations; and
- Transformed and Degraded Sites.

Descriptions of each unit, with accompanying photographs are presented in Section 7.1.1 to Section 7.1.8. A habitat unit map for the study area is shown in Figure 4.

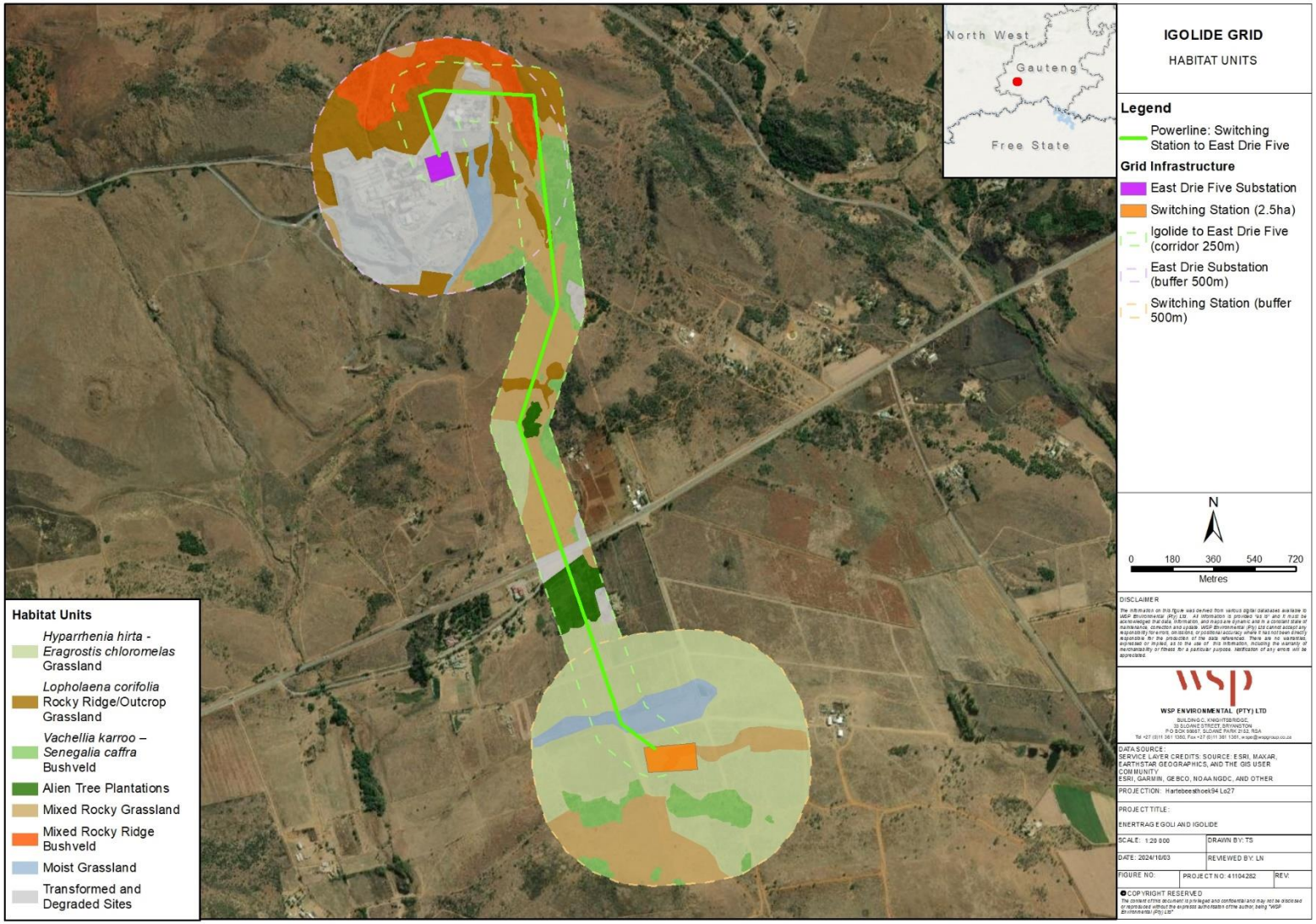

Figure 4: Habitat unit map of the study area.

7.1.1. *Hyparrhenia hirta - Eragrostis chloromelas* Grassland

This habitat unit is located in the south of the study area, and characterises patches of land that were formerly cultivated fields and have regenerated to secondary grassland (i.e., old lands).

In line with Edwards (1983) structural classification, structurally this community is defined as low open grassland. In terms of composition, these grasslands are generally species poor and dominated by dense stands of the tall thatching grass *Hyparrhenia hirta* (see Figure 5). Other recorded grasses include *Aristida congesta* subsp. *congesta, Cynodon dactylon, Digitaria eriantha, Eragrostis curvula, Eragrostis chloromelas* and *Eragrostis gummiflua.* Common forbs recorded in this habitat unit include *inter alia; Bidens bipinnata*, Cirsium vulgare*, Helichrysum rugulosum, Hermannia depressa, Ipomoea ommaneyi, Nidorella anomala, Richardia brasiliensis*, Verbena bonariensis** and *Verbena brasiliensis** (*indicates alien taxa).

Woody species are not abundant in this unit, and occur as scattered individual small trees and shrubs within the herbaceous layer. The following species were noted; *Diospyros lycioides, Vachellia karoo, Ziziphus mucronata* and *Seriphium plumosum* – with the latter frequently abundant.

Three NEMBA declared alien invasive were recorded in *Hyparrhenia hirta - Eragrostis chloromelas* Grasslands including *Cirsium vulgare, Verbena bonariensis* and *Verbena brasiliensis.* These are all listed as Category 1b.

No flora SCC were recorded in this habitat unit, and it is considered unlikely that such species are present. Thirty-six flora species were recorded in this habitat unit. For a full list of flora species recorded in this habitat unit refer to Appendix C.

Figure 5: Hyparrhenia hirta – Eragrostis chloromelas Grassland

7.1.2. Moist Grassland

This habitat unit is associated with the moist soils of both natural and anthropogenic drainage features (i.e., water discharge channel from the Sibanye Driefontein Gold 5 Shaft complex) in the study area, and incorporates the *Eragrostis plana – Trisetopsis imberbis* wetlands/floodplains community described by Ekotrust (2023). Anthropogenic disturbance levels in this unit are high.

Vegetation structure ranges from low- to tall closed grassland (*sensu*. Edwards 1983) (Figure 6). Compositionally, shorter grasses tend to dominate most temporarily and seasonally wet areas, while

the taller rush *Typha capensis* and the reed *Phragmites australis* dominate more permanently wet locations (Figure 7).

Common grass species recorded in this unit include *Agrostis lachnantha, Andropogon eucomus, Cynodon dactylon, Eragrostis curvula, Eragrostis gummiflua, Eragrostis plana, Hyparrhenia hirta, Panicum schinzii, Paspalum dilatatum*, Pennisetum clandestinum** and *Sporobolus africanus.* Other taxa noted include *Conyza* species*, *Juncus effusus, Helichrysum aureonitens, Persicaria lapathifolia*, Plantago lanceolata, Pseudognaphalium luteo-album** and *Rumex crispus*.* Thirty-six flora species were recorded in this habitat unit. For a full list of flora species recorded in this habitat unit refer to Appendix C.

NEMBA declared alien invasive were recorded in this unit include *Cirsium vulgare, Phytolacca octandra, Verbena brasiliensis and Verbena bonariensis.* No flora SCC were recorded in this habitat unit, and considering the generally high level of anthropogenic disturbances, it is considered unlikely that such species are present.

Figure 6: Moist grassland habitat in the south of the study area.

Figure 7: Moist grassland habitat associated with water discharge from the Sibanye Driefontein Gold 5 Shaft complex.

7.1.3. *Lopholaena corifolia* Rocky Ridge/Outcrop Grassland

This habitat unit occurs on small rocky outcrops and along larger south-facing ridge/hillsides in the north of the study area, and is characterised by the visible prevalence of large protruding rocks. In line with Edwards (1983), structurally, vegetation is defined as low open grassland, with woody vegetation occurring only as scattered individual small trees and shrubs (see Figure 8 and Figure 9).

The herbaceous layer is well-developed between rocks and is grass dominated. Commonly recorded graminoids in this habitat unit include, *inter alia; Aristida aequiglumis, Bulbostylis burchellii, Chrysopogon serrulatus, Cymbopogon caesius, Elionurus muticus, Eragrostis chloromelas, Loudetia simplex, Melinis repens* and *Tristachya rehmannii*.

Other common herbaceous species recorded include various forbs such as *inter alia; Anthospermum hispidulum, Clematis villosa, Indigofera hilaris, Indigofera melanadenia, Hemizygia canescens, Helichrysum setosum, Plectranthus ramosior, Polydora poskeana* and *Tephrosia capensis;* and ferns including *Cheilanthes hirta, Selaginella dregei* and *Pellaea calomelanos* var. *calomelanos.*

Woody species recorded include the often-abundant small shrubs *Lopholaena coriifolia and Searsia magalismontana* subsp. *magalismontana*, as well as scattered larger trees, such as *Senegalia caffra,*

Brachylaena rotundata, Mundulea sericea, Vangueria infausta and the dwarf shrub *Elephantorrhiza elephantina.* Several succulents were noted to occur in this community including *Aloe davyana, Aloe verecunda, Cotyledon orbiculata, Crassula setulosa, Kalanchoe paniculata* and *Kalanchoe thyrsiflora.*

No NEMBA declared alien invasive were recorded in this habitat unit, although it is likely that such species are present across the broader unit. In terms of SCC, one suspected Red List flora species was recorded, namely *Adromischus umbraticola* subsp*. umbraticola* (Near Threatened). The provincially protected *Aloe verecunda* and *Cussonia paniculata* were also recorded in this unit – refer to Section 7.2.1 for more information on SCC.

Forty-eight flora species were recorded in this habitat unit. For a full list of flora species recorded in this habitat unit refer to Appendix C. Refer to Section 8.1 for additional discussion on the ecological attributes and biodiversity importance of rocky outcrops and ridges.

Figure 8: Lopholaena coriifolia Rocky Ridge/Outcrop Grassland in the north of the study area.

Figure 9: Lopholaena coriifolia is a prominent woody species in this habitat unit.

7.1.4. Mixed Rocky Grassland

Mixed Rocky Grassland is a variable habitat unit, and an expansion of the *Cymbopogon caesius - Elionurus muticus* rocky grasslands described by Ekotrust (2023). This unit occurs on shallow rocky soils to the north- and south of the N12 highway. Structurally, mixed rocky grasslands are characterised by low closed grassland (Figure 10), as per Edwards (1983).

Floristically, this unit comprises a mixture of grasses and forb species. Commonly recorded grass species include *Aristida aequiglumis, Cymbopogon caesius, Elionurus muticus, Eragrostis chloromelas, Eragrostis racemosa, Hyparrhenia hirta, Loudetia simplex, Panicum natalense, Sporobolus africanus, Themeda triandra, Triraphis andropogonoides* and *Urelytrum agropyroides;* while recorded forbs include *inter alia; Chamaecrista comosa, Cleome monophylla, Clematis villosa, Eriosema cordatum, Geigeria burkei, Helichrysum nudifolium* var. *nudifolium, Helichrysum rugulosum, Helichrysum setosum, Selago densiflora, Senecio coronatus* and *Tephrosia capensis* var. *capensis.*

Woody species generally occur at low abundances and as scattered small trees and shrubs in this habitat unit. The following indigenous species were noted; *Diospyros lycioides, Lopholaena coriifolia, Pollichia campestris, Seriphium plumosum* and *Vachellia karroo*. The dwarf tree *Elephantorrhiza elephantina* was also noted to grow in localised aggregations in this unit. *Seriphium plumosum* is a common encroacher species in areas of this unit that have been disturbed (Figure 11).

In terms of NEMBA declared alien invasive species, scattered alien wattle species (*Acacia dealbata* and *Acacia mearnsii*) were noted in this habitat unit. Provincially protected plant species recorded include *Crinum graminicola.* Seventy-one flora species were recorded in this habitat unit. For a full list of flora species recorded in this habitat unit refer to Appendix C.

Figure 10: Mixed Rocky Grassland.

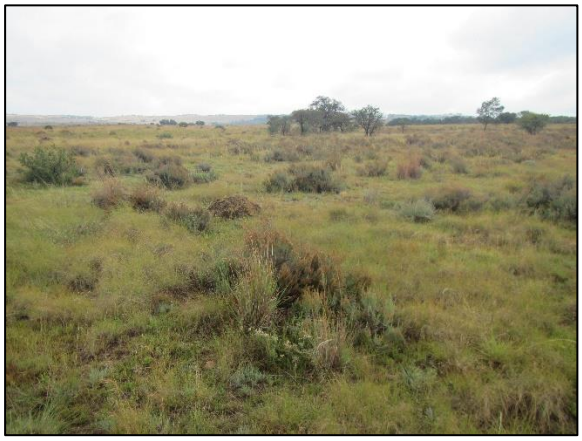

Figure 11: Abundance of Seriphium plumosum

7.1.5. *Vachellia karroo – Senegalia caffra* Bushveld

Excluding alien tree plantations, this is one of two indigenous woody habitat units identified in the study area, and incorporates the *Vachellia karroo – Ehretia rigida* Bushveld described by Ekotrust (2023) in the south of the study area.

Vegetation structure ranges from low open woodland to short closed woodland, as per Edwards (1983) structural classification (Figure 12 and Figure 13).

The woody species composition of this unit is dominated by fine-leafed woody species, with the thorn trees *Senegalia caffra* and in particular, *Vachellia karoo,* dominant. Other less abundant woody species recorded include *Asparagus laricinus, Buddleja saligna, Celtis africana, Diospyros lycioides, Ehretia rigida, Gymnosporia polyacanthus* subsp. *vaccinifolia, Osyris lanceolata, Searsia lancea, Searsia leptodictya, Searsia pyroides, Vangueria infausta* and *Ziziphus mucronata*.

In the more open areas of this unit, the herbaceous layer is generally well-developed and grass dominated. In more densely wooded locations, the herbaceous layer is poorly-developed. Commonly recorded grasses include *Cymbopogon caesius, Cynodon dactylon, Eragrostis chloromelas, Eragrostis curvula, Eragrostis plana, Hyparrhenia hirta, Melinis repens*, *Setaria sphacelata, Sporobolus africana* and *Themeda triandra*. Common forbs recorded include a mixture of indigenous and naturalised alien taxa such as *inter alia; Achyranthes aspera*, Bidens bipinnata*, Conyza canadensis*, Helichrysum rugulosum, Hermannia depressa, Indigofera* species*, Kyphocarpa angustifolia, Plectranthus hereroensis, Schkuhria pinnata*, Selago densiflora, Tagetes minuta** and *Zinnia peruviana*.*

Several NEMBA declared alien invasive were recorded in this habitat unit including the woody species *Acacia dealbata, Acacia mearnsii, Acacia melanoxylon, Melia azedarach, Solanum mauritianum,* the succulent *Opuntia ficus-indica* and the forb *Verbena brasiliensis.*

In terms of flora SCC, two provincially protected plant species were recorded in this unit, namely *Protea caffra* and *Scadoxus puniceus*. Twenty-eight flora species were recorded in this habitat unit. For a full list of flora species recorded in this habitat unit refer to Appendix C.

Figure 12: Vachellia karroo – Senegalia caffra Bushveld in the south of the study area.

Figure 13: Vachellia karroo – Senegalia caffra Bushveld in the north of the study area.

7.1.6. Mixed Rocky Ridge Bushveld

This habitat unit occurs on the north- and east-facing ridge/hillsides in the north of the study area, and like the *Lopholaena corifolia* Rocky Ridge/Outcrop Grassland unit, is characterised by the abundance of large protruding rocks. It is noticeably dissimilar to the grassland unit by the abundance of larger woody taxa (shown in Figure 14 and Figure 15).

Vegetation structure ranges from low to short open woodland (*sensu*. Edwards, 1983). Woody species composition is variable, with both fine- and broad-leafed woody species locally prevalent, including the thorn trees *Senegalia caffra*, *Vachellia karoo* and *Vachellia robusta,* as well as the broad-leafed *Celtis africana*, *Diospyros lycioides, Ehretia rigida, Euclea crispa, Gymnosporia polyacanthus* subsp. *vaccinifolia, Heteromorpha arborescens, Searsia lancea, Searsia leptodictya, Searsia magalismontana* subsp. *magalismontana, Searsia pyroides, Vangueria infausta* and *Ziziphus mucronata*.

The herbaceous layer shares many of the same grass, forb and herb species as the *Lopholaena corifolia* Rocky Ridge/Outcrop Grassland unit, including the grasses *Aristida aequiglumis, Aristida congesta* subsp. *congesta, Cymbopogon caesius, Cynodon dactylon, Digitaria eriantha, Eragrostis chloromelas, Eragrostis curvula, Loudetia simplex and Melinis repens;* and forbs including *inter alia, Clematis villosa, Indigofera melanadenia, Hemizygia canescens* and *Plectranthus ramosior.* Succulents noted include *Aloe davyana* and *Kalanchoe paniculata.*

NEMBA declared alien invasive were recorded in this habitat unit include *Acacia melanoxylon, Melia azedarach, Solanum mauritianum, Trichocereus spachianus* and *Opuntia ficus-indica.*

One provincially protected plant species was recorded in this unit, namely *Scadoxus puniceus,* and it is considered probable that other SCC are present in this unit. Sixty-six flora species were recorded in this habitat unit. For a full list of flora species recorded in this habitat unit refer to Appendix C.

Refer to Section 8.1 for additional discussion on the ecological attributes and biodiversity importance of rocky outcrops and ridges.

Figure 14: Mixed Rocky Ridge Bushveld in the far north of the study area.

Figure 15: Densely wooded ridge.

7.1.7. Alien Tree Plantations

In the study area, two small patches are dominated by alien tree species. A small stand of *Acacia mearnsii* trees is located to the north of the N12. This stand is characterised by an almost complete absence of herbaceous vegetation growing beneath the trees (Figure 16).

A large stand dominated by *Eucalyptus camaldulensis* is located immediately south of the N12 in the study area. Unlike the *Acacia mearnsii* stands, herbaceous vegetation is present beneath the *Eucalyptus* trees (Figure 17) and includes grass species such as *Aristida congesta* subsp. *congesta, Cynodon dactylon, Eragrostis curvula, Eragrostis gummiflua, Hyparrhenia hirta, Pogonarthria squarrosa* and *Themeda triandra*. Indigenous woody species recorded include *Asparagus laricinus, Diospyros lycioides* and *Seriphium plumosum.*

Alien tree plantations are a modified habitat type. No flora SCC were observed in these areas, and the probability of such taxa being present is unlikely to negligible. Fourteen flora species were recorded in this habitat unit. For a full list of flora species recorded in this habitat unit refer to Appendix C.

Figure 16: Stand of Acacia mearnsii trees. Note: absence of undergrowth vegetation.

Figure 17: Stand of Eucalyptus camaldulensis trees.

7.1.8. Transformed and Degraded Sites

Transformed and Degraded Sites comprise all areas that have been permanently transformed or are significantly degraded as a result of anthropogenic activities. At such sites, little- to no vegetation remains present and where vegetation is present, it is typically characterised by weedy ruderal species. Examples of Transformed and Degraded Sites in the study area include all mine (Sibanye Driefontein) infrastructure and associated facilities, residential dwellings and infrastructure, and the N12 Highway.

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).

At a provincial level, 50 Red List flora species are known to occur in Gauteng (GPEMF, 2014). Of these, 22 are threatened and comprise one Extinct species, one Critically Endangered species, six Endangered species, and 15 Vulnerable species (GPEMF, 2014). The remainder include 22 species listed as Near Threatened, nine as Declining, four are Rare/Rare-Sparse and one is Data Deficient (GPEMF, 2014).

Also included in this section are flora species that are listed as threatened or protected according to national and/or provincial environmental legislation; specifically, flora listed on the NEMBA ToPS List (2007) and under Gauteng Province's Nature Conservation Ordinance (12 of 1983) (as amended). As per the relevant legislation, these taxa require specific conservation management.

7.2.1.1. Red List Flora Species Occurring and Potentially Occurring in the Study Area

Several suspected *Adromischus umbraticola* subsp*. umbraticola* (shown in Figure 18) plants were recorded in an area of *Lopholaena corifolia* Rocky Ridge/Outcrop Grassland in the study area. *Adromischus umbraticola* subsp*. umbraticola* is listed as Near Threatened on the national Red List (Helme and Raimondo, 2006) and is a South African endemic, where it is restricted to Gauteng and North West provinces. This species has an EOO of 14 600 km^2 and is known from 14 locations. It

grows in rock crevices on south-facing slope ridges (Helme and Raimondo, 2006). Note: Positive identification of *Adromischus umbraticola* subsp*. umbraticola* requires examination of its flowers, which are typically emergent between September and January. As a precautionary measure, however, it's crucial to manage and conserve these plants as if they are *Adromischus umbraticola* subsp*. umbraticola* until definitive identification is achieved. This approach aligns with the precautionary principle, ensuring potential harm is minimized while awaiting conclusive evidence of identification.

Adromischus umbraticola subsp*. umbraticola* is listed in priority group A2 in Gauteng Province (GDARD, 2014). According to GDARD Biodiversity (2018), the recommended buffer for flora species listed in priority group A2 is 500 m. The presence of a buffer is required to reduce edge-effects and protect potential ecological processes (e.g., pollinator movement) that are important to the maintenance of SCC populations. It is motivated in this report, that this buffer can be reduced (refer to Section 10.3.1.3).

Refer to Table 4 for co-ordinates of the suspected *Adromischus umbraticola* subsp*. umbraticola* plants recorded during the field survey. The location of the recorded plants relative to proposed infrastructure is shown in Figure 22.

Table 4: Location of suspected Adromischus umbraticola subsp. umbraticola plants in the study area

Co-ordinates	No. of Observed Plants
S26 24.951 E27 30.509	1
S26 24.962 E27 30.539	1
S26 24.956 E27 30.531	3
S26 24.951 E27 30.529	2
S26 24.947 E27 30.525	1
S26 24.942 E27 30.505	2

Based on reviewed literature and data sources, an additional eight flora species that that are known to occur in the region in which the study area is located, are listed as threatened/Near Threatened on the national Red List. These are listed in Table 5, along with their conservation statuses, habitat preferences and a 'probability of occurrence', based on findings of habitat suitability assessments.

Although neither species was observed on-site during the field survey, it is noted that suitable habitat is present in the study area for both taxa highlighted by the environmental screening report for the study area, *viz*. *Khadia beswickii* and Sensitive species 1248 – refer to Table 5 for habitat preferences and 'probability of occurrences'.

7.2.1.2.Protected Flora Species Occurring and Potentially Occurring in the Study Area

Five flora species that are listed as Protected at a provincial level, according to the Gauteng Nature Conservation Ordinance (12 of 1983), were recorded during the 2024 field survey, including *Aloe verecunda*, *Cussonia paniculata*, *Crinum graminicola, Protea caffra* and *Scadoxus puniceus* (see Figure 19 to Figure 21).

During their field work, Ekotrust (2023) recorded one additional provincially Protected taxon *viz., Gladiolus permeabilis.* Reviewed literature indicates that several other provincially protected flora

species may occur in the study area. These are listed in Table 6.Table 6: Provincially protected species that occur or potentially occurring in the study area.

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

Figure 18: Suspected Adromischus umbraticola subsp. umbraticola (Near Threatened).

Figure 19: Aloe vercunda (Protected, GP).

Figure 20: Scadoxus puniceus (Protected, GP).

Figure 21: Crinum graminicola (Protected, GP).

Table 5: 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	Gauteng Status	Habitat Preferences	Probability of Occurrence
Aizoaceae	*Khadia beswickii*	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).	Probable –suitable habitat present.
Aizoaceae	*Frithia pulchra*	Rare	Protected	A range-restricted, but locally abundant species, with and EOO estimated at 325 km$^{2.}$ Favours course, shallow quartzitic soils on sandstone in Gauteng and North West provinces (Pfab *et al*., 2016)	Probable – suitable habitat present.
Aizoaceae	*Lithops lesliei*	Vulnerable	Protected	This species has a widespread distribution, but is experiencing local losses due to urbanisation. This species favours rocky locations in arid grassland habitat (Mtshali, *et al*., 2023)	Probable – suitable habitat present.
Asphodelaceae	*Kniphofia typhoides*	Near Threatened	Protected	*Kniphofia typhoides* occurs in the black clay soils of low-lying wetlands and seasonally wet habitats in *Themeda triandra* grasslands (von Staden and Victor, 2005)	Unlikely – no suitable habitat present.
Asteraceae	*Cineraria austrotransvaalensis*	Near Threatened	-	Known from 12 locations across a EOO of 20 000 km^2 spanning Gauteng, Mpumalanga and North West provinces. Occurs amongst rocks beneath trees, or on the edges of bush on steep hills and ridges, between 1400-1700 m (Cron, *et al*., 2006).	Probable – suitable habitat present.
Asteraceae	*Gnaphalium nelsonii*	Near Threatened	-	Widespread species, with an estimated EOO of 29 356 km^2, but occurs in 10 scattered locations. Favours seasonally wet habitats and dry water courses in grassland and savanna (Von Staden, 2016).	Unlikely – limited suitable habitat present.

Family	Scientific Name	Regional Red List Status	Gauteng Status	Habitat Preferences	Probability of Occurrence
Crassulaceae	*Adromischus umbraticola* subsp. *umbraticola*	Near Threatened	-	Species has an EOO of 14 600 km^2 and is known from 14 locations. Grows in rock crevices on south-facing slope ridges. (Helme and Raimondo, 2006).	Recorded
Hyacinthaceae	*Drimia sanguinea*	Near Threatened	-	This species favours open veld and scrubby woodland across northern South Africa (Willaims, *et al*., 2008).	Possible – limited suitable habitat present.
-	Sensitive species 1248	Vulnerable	-	Found in open woodland and steep rocky hills in shady situations at low- and medium altitudes. No EOO for this species is listed, but its AOO is estimated at 30.70 km^2 (SANBI, 2020).	Probable – suitable habitat present.

Table 6: Provincially protected species that occur or potentially occurring in the study area.

Family	Scientific Name	Regional Red List Status	Gauteng Status	Field Records
Amaryllidaceae	*Nerine laticoma*	Least Concern	Protected	
Amaryllidaceae	*Scadoxus puniceus*	Least Concern	Protected	Recorded
Amaryllidaceae	*Crinum graminicola*	Least Concern	Protected	Recorded
Apocynaceae	*Brachystelma circinatum*	Least Concern	Protected	
Apocynaceae	*Brachystelma oianthum*	Least Concern	Protected	
Apocynaceae	*Ceropegia rendallii*	Least Concern	Protected	
Apocynaceae	*Orbea lutea*	Least Concern	Protected	
Apocynaceae	*Orbea lutea* subsp. *lutea*	Least Concern	Protected	
Apocynaceae	*Riocreuxia polyantha*	Least Concern	Protected	
Araliaceae	*Cussonia paniculata* subsp. *sinuata*	Least Concern	Protected	Recorded
Araliaceae	*Cussonia spicata*	Least Concern	Protected	
Asphodelaceae	*Aloe subspicata*	Least Concern	Protected	
Asphodelaceae	*Aloe transvaalensis*	Least Concern	Protected	
Asphodelaceae	*Aloe verecunda*	Least Concern	Protected	Recorded
Asphodelaceae	*Kniphofia porphyrantha*	Least Concern	Protected	
Colchicaceae	*Littonia modesta*	Least Concern	Protected	
Ericaceae	*Erica alopecurus* var. *alopecurus*	Least Concern	Protected	
Gesneriaceae	*Streptocarpus vandeleurii*	Least Concern	Protected	
Hyacinthaceae	*Eucomis autumnalis* subsp. *clavata*	Least Concern	Protected	
Hyacinthaceae	*Eucomis montana*	Least Concern	Protected	
Iridaceae	*Babiana bainesii*	Least Concern	Protected	
Iridaceae	*Gladiolus permeabilis*	Least Concern	Protected	Recorded (Ekotrust, 2023)
Iridaceae	*Gladiolus antholyzoides*	Least Concern	Protected	
Iridaceae	*Gladiolus crassifolius*	Least Concern	Protected	
Nymphaeaceae	*Nymphaea nouchali* var. *caerulea*	Least Concern	protected	
Orchidaceae	*Bonatea antennifera*	Least Concern	Protected	
Orchidaceae	*Disperis micrantha*	Least Concern	Protected	
Orchidaceae	*Eulophia hians var. hians*	Least Concern	Protected	
Orchidaceae	*Eulophia ovalis var. ovalis*	Least Concern	Protected	
Orchidaceae	*Habenaria galpinii*	Least Concern	Protected	
Orchidaceae	*Orthochilus leontoglossa*	Least Concern	Protected	
Proteaceae	*Protea caffra*	Least Concern	Protected	Recorded

7.2.2. Declared Alien Invasive Species

Fifteen NEMBA declared alien invasive species (AIS) were recorded in the study area during the field visit. These are listed in Table 7 along with their growth form and NEMBA category. Also listed in Table 7 are an additional 16 declared AIS that were recorded by Ekotrust (2023).

Table 7: Declared alien invasive species recorded in the study area.

Scientific Name	Common Name	Growth Form	NEMBA Category	Field Visit (2024)
Acacia dealbata	Silver Wattle	Tree	2	x
Acacia mearnsii	Black Wattle	Tree	2	x
Acacia melanoxylon	Australian Blackwood	Tree	2	x
Argemone ochroleuca	White-flowered Mexican Poppy	Herbaceous forb	1b	
Araujia sericifera	Moth Catcher	Herbaceous forb	1b	
Campuloclinium macrocephalum	Pompom Weed	Herbaceous forb	1b	
Cestrum parqui	Chilean cestrum	Tree	1b	
Cirsium vulgare	Spear Thistle	Herbaceous forb	1b	x
Cuscuta campestris	Common Dodder	Parasitic plant	1b	
Cortaderia selloana	Pampas Grass	Graminoid	1b	x
Datura ferox	Large Thorn Apple	Herbaceous forb	1b	
Eucalyptus camaldulensis	Gum	Tree	1b or 2	x
Trichocereus spachianus	Torch Cactus	Succulent Tree	1b	x
Ipomoea purpurea	Morning Glory	Herbaceous forb	1b	x
Melia azedarach	Seringa	Tree	1b	
Opuntia ficus-indica	Sweet Prickly Pear	Succulent Tree	1b	x
Phytolacca octandra	Forest Inkberry	Herbaceous forb	1b	
Phytolacca dioica	Belhambra	Tree	1b	
Populus canescens	Grey poplar	Tree	2	
Pyracantha angustifolia	Yellow Firethorn	Tree	1b	x
Pyracantha crenulata	Himalayan Firethorn	Tree	1b	
Ricinus communis	Castor-oil Plant	Tree	1b	
Robinia pseudoacacia	Black Locust	Tree	1b	
Solanum elaeagnifolium	Potato Creeper	Herbaceous forb	1b	
Solanum mauritianum	Bugweed	Tree	1b	x
Solanum pseudocapsicum	Jerusalem Berry	Herbaceous forb	1b	x
Solanum sisymbriifolium	Wild Tomato	Herbaceous forb	1b	x
Verbena bonariensis	Wild Verbena	Herbaceous forb	1b	x
Verbena brasiliensis	Brazilian Verbena	Herbaceous forb	1b	x
Xanthium spinosum	Spiny Cocklebur	Herbaceous forb	1b	
Xanthium strumarium	Large Cocklebur	Herbaceous forb	1b	

7.2.3. Flora of Medicinal Value

Seventeen flora species recorded in the study area have recognised medicinal value. These are listed in Table 8, accompanied by a description of their purported use, as per Van Wyk *et al*., (2009).

Table 8: Flora species recorded in the study area that have recognised medicinal value.

Scientific Name	Medicinal Use*
Asparagus laricinus	Rhizomes and fleshy roots are used for a variety of ailments including tuberculosis, kidney complaints and rheumatism.
Boophone disticha	Bulbs scales are used to treat boils and septic wounds, as well as alleviate pains.
Cotyledon orbiculata	Leaves are applied to warts to remove them, and eaten as a vermifuge.
Elephantorrhiza elephantina	Taken as a remedy for diarrhoea, dysentery, stomach disorders and haemorrhoids.
Gomphocarpus fruticosus	Dried leaves are ground and used as snuff to treat headaches and tuberculosis.
Helichrysum species	Treats a variety of afflictions, including coughs, colds, fever, headaches and infections.
Heteromorpha arborescens	Plant is used to treat tuberculosis, abdominal pains and colic. Also used for mental disorders.
Hilliardiella oligocephala	Infusions taken to treat stomach ailments, rheumatism, dysentery and diabetes.
Hypoxis species	Infusions of the corm are used to treat dizziness, bladder disorders and insanity.
Olea europaea	Used to treat high blood pressure and to enhance renal function.
Pelargonium luridum	Taken orally to treat diarrhoea and dysentery.
Pellaea calomelanos	Used to treat boils and abscesses and for internal parasites
Rumex crispus	Plant is used to treat internal parasites.
Scadoxus puniceus	Used to treat coughs and gastrointestinal ailments.
Typha capensis	Decoctions used to treat venereal disease, as well as diarrhoea, dysentery and enhance male libido.
Vachellia karroo	Barks and leaves used to treat diarrhoea and dysentery. Gum, barks and leaves also used to treat colds and oral thrush.
Zanthoxylum capense	Widely used as a remedy for flatulent colic, stomach ache and fever.
Ziziphus mucronata	Bark and leaves are used as an expectorant in coughs and chest ailments, while roots extracts are used to treat diarrhoea and dysentery.
*Medicinal use, as per Van Wyk, *et al*. (2009).	

8. Key Ecological Attributes and Processes

8.1. Habitat Corridors, Resources and Refugia

Rocky outcrops and ridges are recognised for their high biodiversity importance, and for their role as landscape corridors, refugia and as critical hydrological features (Pfab, 2001). The combination and interaction of several factors including altitude, aspect, slope, geology, soils, light and hydrological patterns create highly diverse and unique micro-habitats that significantly increase local- and landscape-scale habitat heterogeneity. This in turn, promotes a high degree of both flora and fauna diversity (Pfab, 2001).

In Gauteng Province, rocky ridges are recognised as both biodiversity hotspots and as vital functional habitats for various ecological processes and for many flora and fauna SCC. Indeed, 65% of Gauteng Provinces Red List flora species have been recorded growing on ridges (Pfab, 2001).

It is noted that despite the presence of linear infrastructure, including the N12 Highway, several farm roads/tracks, and numerous farm- and game fences, and patches of modified habitat, the landscape in which the study area is located is characterised by extensive tracts of natural and semi-natural grassland and bushveld habitats. The degree of natural habitat connectivity across the landscape therefore remains high, and this will have a positive effect on maintaining many local flora and fauna communities, including SCC populations.

It is anticipated that the proposed Project is likely to cause some habitat disturbances, which may impact local habitat connectivity through habitat loss and fragmentation.

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

In total, 31 declared NEMBA AIS have been recorded in or adjacent to the study area during the current study or by Ekotrust (2023). 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. Both *Acacia dealbata* and *Acacia mearnsii* were observed in the study area and are noted to be particularly aggressive invaders, capable of spreading into adjacent areas of undisturbed habitat.

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 disturbances 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 and savanna 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. Herbivore grazing and trampling is therefore considered an important ecosystem driver, that can impact vegetation dynamics and the viability of local flora SCC populations.

Evidence of both cattle and game grazing were noted in the study area and are likely to be important local drivers of change. This notwithstanding, it is anticipated that the proposed Project is unlikely to impact herbivore grazing patterns across the study area.

9. Analysis of Site Ecological Importance

The site ecological importance (SEI) of identified habitat units in the study area were assessed using the SANBI (2020) protocol (refer to Section 3.7 and Appendix B for the methodology). The results of the assessment are presented in Table 9 and shown in Figure 22.

Also shown in Figure 22 are the locations of the observed *Adromischus umbraticola* subsp. *umbraticola* plants, and both a 500 m buffer and a 100 m buffer – refer to Section 10.3.1.3 for further discussion on these buffers.

Table 9: Site Ecological Importance of habitat unit in the study area

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Hyparrhenia hirta – Eragrostis chloromelas Grassland	LOW: No confirmed or highly likely populations of SCC or range-restricted species. Limited potential to support SCC.	LOW: Migrations still possible across some modified or degraded natural habitat. Several minor and major current negative ecological impacts (=past cultivation).	LOW	HIGH: Habitat that can recover relatively quickly (~ 5-10 years) to restore >75% of the original species composition and functionality of the receptor functionality	LOW
Moist Grassland	LOW: No confirmed or highly likely populations of SCC or range-restricted species. Limited potential to support SCC.	LOW: Several minor and major current negative ecological impacts (=earth works, past cultivation).	LOW	HIGH: Habitat that can recover relatively quickly (~ 5-10 years) to restore >75% of the original species composition and functionality of the receptor functionality	LOW
Lopholaena corifolia Rocky Ridge/Outcrop Grassland	HIGH: Confirmed and highly likely occurrence of CR, EN, VU species (=*Adromischus umbraticola* subsp. *umbraticola,* NT).	HIGH: Large intact area for any conservation status ecosystem types. Good habitat connectivity with potentially functional ecological corridors. Only minor current negative ecological impacts with limited signs of major past disturbance and good rehabilitation potential.	HIGH	MEDIUM: Habitat that can recover slowly (~ more than 10 years) to restore >75% of the original species composition and functionality of the receptor functionality	HIGH

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Mixed Rocky Grassland	MEDIUM: Confirmed or highly likely occurrence of NT, CR, EN, VU species. >50% of receptor contains natural habitat to support SCC.	HIGH: Large intact area for any conservation status ecosystem types. Good habitat connectivity with potentially functional ecological corridors. Only minor current negative ecological impacts (=alien invasive flora, past cultivation) with limited signs of major past disturbance and good rehabilitation potential.	MEDIUM	MEDIUM: Habitat that can recover slowly (~ more than 10 years) to restore >75% of the original species composition and functionality of the receptor functionality	MEDIUM
Vachellia karroo – Senegalia caffra Bushveld	MEDIUM: Highly likely populations of SCC or range-restricted species. >50% of receptor contains natural habitat to support SCC	HIGH: Large intact area for any conservation status ecosystem types. Good habitat connectivity with potentially functional ecological corridors. Only minor current negative ecological impacts with limited signs of major past disturbance and good rehabilitation potential.	MEDIUM	MEDIUM: Habitat that can recover slowly (~ more than 10 years) to restore >75% of the original species composition and functionality of the receptor functionality	MEDIUM
Mixed Rocky Ridge Bushveld	HIGH: Confirmed or highly likely occurrence of CR, EN, VU species.	HIGH: Large intact area for any conservation status ecosystem types. Good habitat connectivity with potentially functional ecological corridors.	HIGH	MEDIUM: Habitat that can recover slowly (~ more than 10 years) to restore >75% of the original species composition and functionality of the receptor functionality	HIGH

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
		Only minor current negative ecological impacts with limited signs of major past disturbance and good rehabilitation potential.			
Alien Tree Plantations	VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remains.	VERY LOW: Several major current negative ecological impacts.	VERY LOW	VERY HIGH: Habitat that can recover rapidly to restore >75% of the original species composition and functionality.	VERY LOW
Transformed and Degraded Sites	VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remains.	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

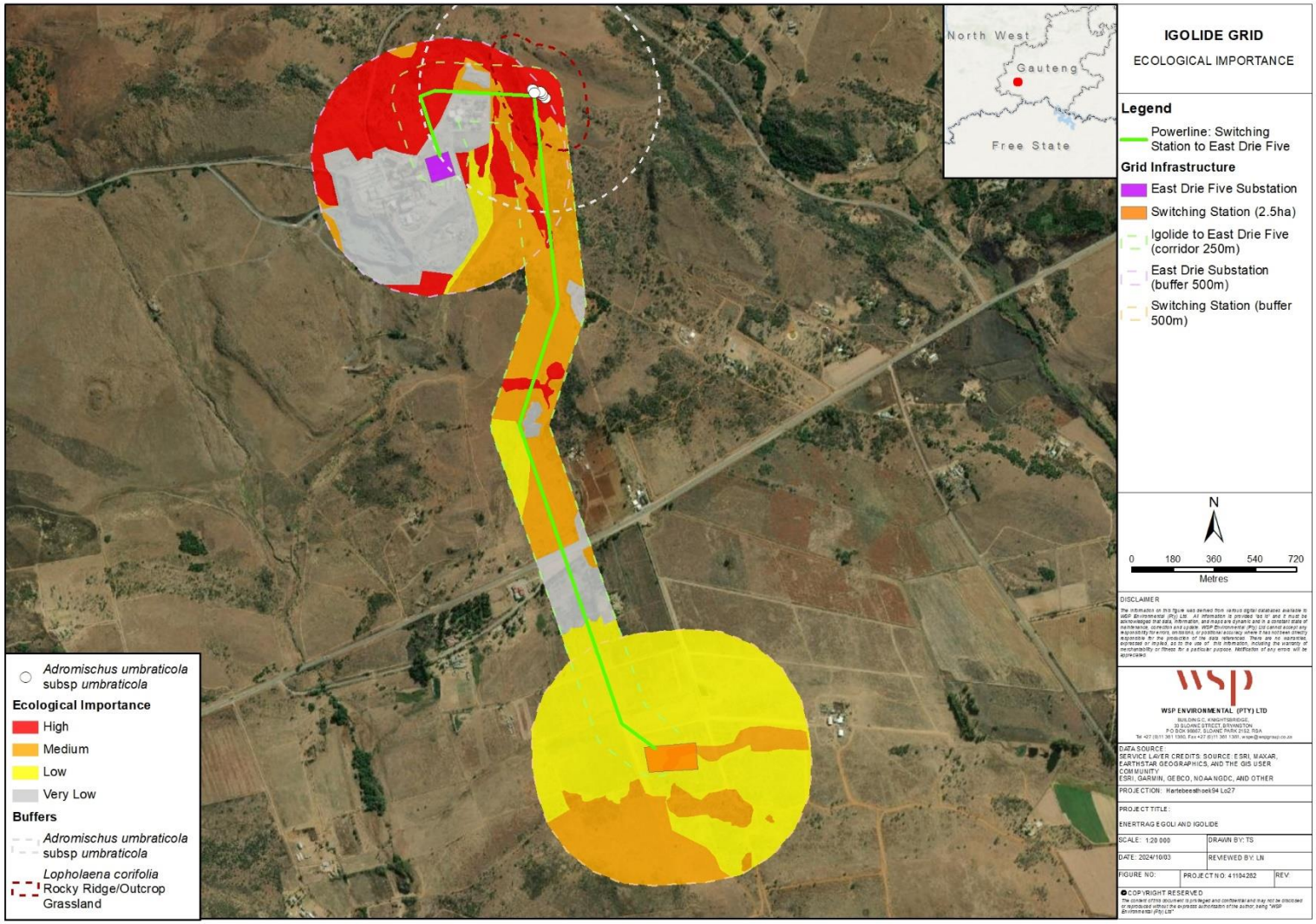

Figure 22: Site Ecological Importance of the study area. The observed locations of the suspected Adromischus umbraticola subsp. umbraticola plants (white dots) are shown, along with a 500 m (white dotted line) and a 100 m buffer (red dotted line).

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 10.

Table 10: Impact Assessment Criteria and Scoring System

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

[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 23 below.

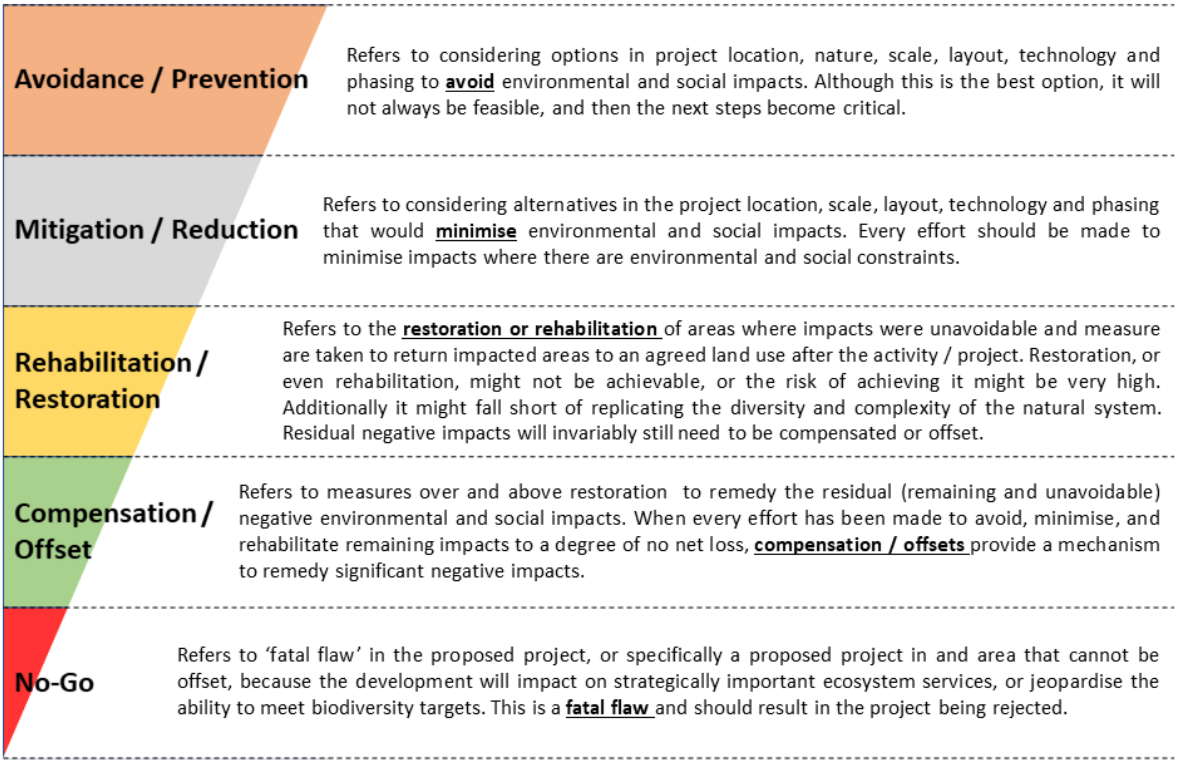

Figure 23: Mitigation Sequence/Hierarchy

A discussion on assessed impacts for each phase (i.e., Construction, Operational and Decommissioning) of the proposed Project is provided in the sections below, along with an analysis of anticipated cumulative impacts in Section 10.3.4. A summary table is presented in Table 12.

10.3. Assessment of Impacts on Terrestrial Flora

This impact assessment section should be read in conjunction with the impact assessment sections in the Animal Species Specialist Assessment Report and the Terrestrial Biodiversity Specialist Assessment Report.

10.3.1. Construction Phase

10.3.1.1. Direct loss and disturbance of natural habitat

Habitat loss refers to the removal or complete degradation of natural habitat. In terrestrial ecosystems, this primarily occurs through vegetation clearing and bulk earth works during construction. Habitat disturbance refers to the modification of habitat to the extent that it loses important functionality. These impacts can negatively impact the viability of flora occurring in the study area, including SCC.

The proposed Project will result in the clearing of approximately 4.63 ha of natural habitat for the construction of infrastructure. The proposed powerline pylon/towers, switching station and access road footprints will be permanent features of the Project (shown in Figure 24):

- For the proposed powerline pylon/towers, based on an estimated pylon/tower footprint of 80 m^2 and an approximate pylon/tower placement of about every 250 m, the approximate extent of permanent habitat loss/disturbance is 0.11 ha, with the loss per habitat unit presented in Table 11;
- The proposed switching station has a proposed footprint of 2.5 ha and will result in the loss of approximately 1.68 ha of *Hyparrhenia hirta – Eragrostis chloromelas* Grassland and 0.81 ha of Mixed Rocky Grassland; and
- A layout of the proposed access road is not available at this time. However, it is understood that the proposed access road will run the length (4 km) of the powerline corridor and will be up to 6 m wide. Based on these metrics and the current alignment of the powerline, the extrapolated/indicative extent of habitat loss is about 2.03 ha, with the loss per habitat unit presented in Table 11.

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

Several 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, impact magnitude can be reduced to medium, and it can be confined to the site scale. Duration can be reduced to the long-term, and probability to low. This results in an after-mitigation impact of "Low" significance.

Table 11: Extent of habitat loss associated with proposed Project infrastructure

Habitat Class	Habitat Unit	Approximate Extent of Direct Habitat Loss (Ha)		
		Powerline	Switching Station	Access Road
Natural Habitat	*Hyparrhenia hirta – Eragrostis chloromelas* Grassland	0.02	1.68	0.32
	Moist Grassland	0.00	0.00	0.07
	Lopholaena corifolia Rocky Ridge/Outcrop Grassland	0.02	0.00	0.35
	Mixed Rocky Grassland	0.06	0.81	1.04
	Vachellia karroo – Senegalia caffra Bushveld	0.01	0.00	0.13
	Mixed Rocky Ridge Bushveld	0.01	0.00	0.11
Modified Habitat	Alien Tree Plantations	0.01	0.00	0.15
	Transformed and Degraded Sites	0.01	0.00	0.11
Total		0.12	2.49	2.30

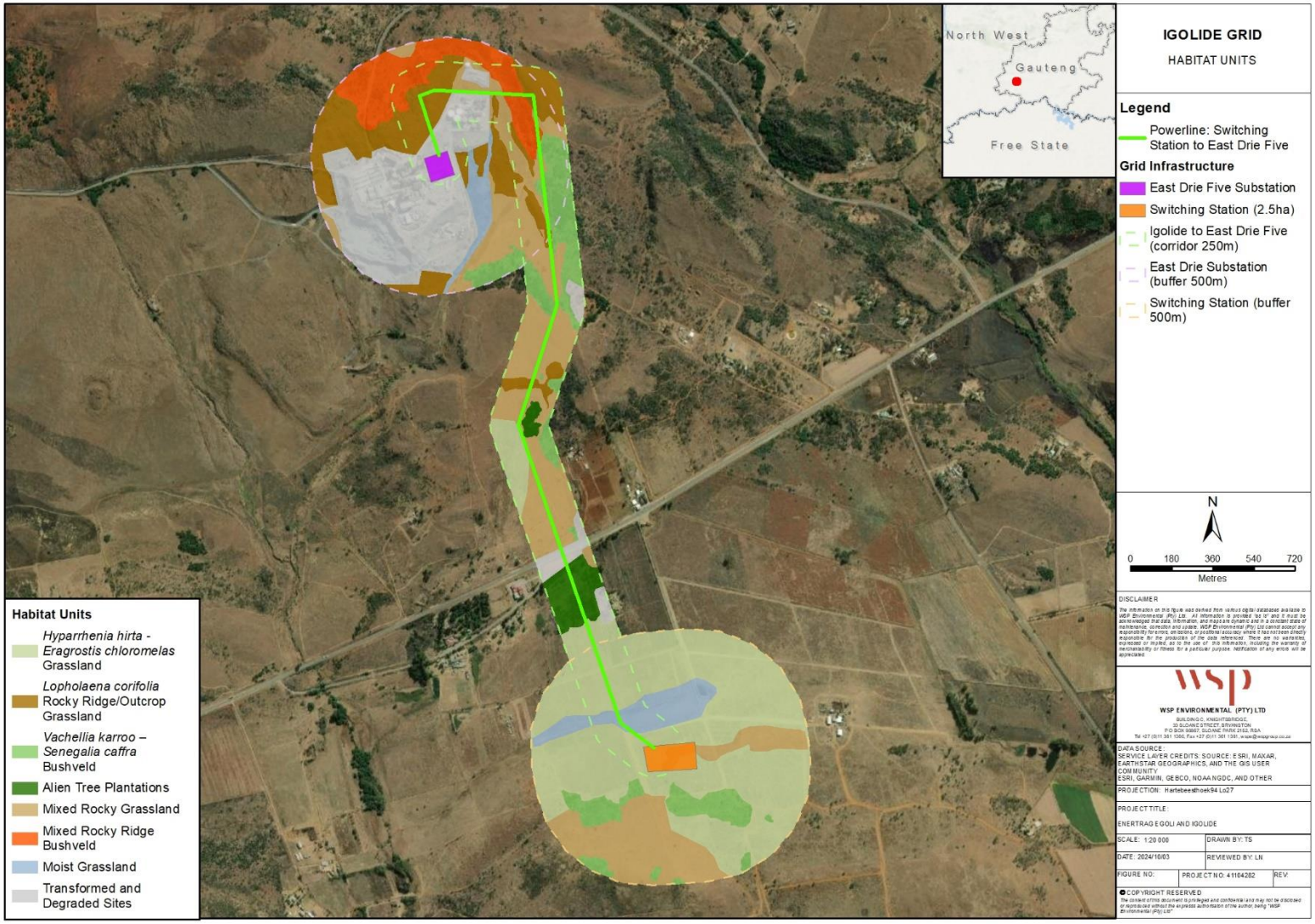

Figure 24: Habitat units and the currently proposed infrastructure layout

10.3.1.2. Habitat fragmentation impacting habitat connectivity and integrity.

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

Of proposed Project infrastructure, the development of the planned 4 km access road is likely to cause habitat fragmentation, as it will be permanent feature that is routed across patches of natural habitat. The impact prior to mitigation is considered to be of high magnitude, permanently affecting fauna habitat within and potentially adjacent to the development footprint (local). It is also considered to have a high probability, resulting in an impact of "medium" significance.

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

10.3.1.3. Loss of Flora Species of Conservation Concern

One suspected Red List flora taxa, *Adromischus umbraticola* subsp*. umbraticola* (Near Threatened), was observed in the study area during the field survey (locations shown in Figure 22), and it is possible that several other Red List flora species may be present.

A number of flora species that are listed as Protected in Gauteng Province were also recorded on-site during the field survey (refer to Section 7.2.1). It is possible 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 very high, while duration is long-term. 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 "high" significance.

According to GDARD Biodiversity (2018), the recommended buffer for flora species listed in priority group A2, such as *Adromischus umbraticola* subsp*. umbraticola,* is 500 m. A 500 m buffer around the recorded plants will however, encompasses the entire East Drie Five Substation, and this will in effect, prevent any proposed Project activities at this location in the study area.

The proposed Project involves the construction of a powerline*,* and it is anticipated that the extent of permanent habitat loss associated with individual powerline pylons/towers is relatively small – at about 80 m^2. As such, it contended that a routing of the powerline to ideally avoid a 100 m buffer around the rocky outcrop in which the *Adromischus umbraticola* subsp*. umbraticola* plants were observed, coupled with the careful micro-siting of pylon/tower and access road footprints, and the strict implementation of additional management and monitoring measures, will act as effective mitigation against any negative impacts on the *Adromischus umbraticola* subsp*. umbraticola* plants. It is therefore suggested that the 500 m buffer recommended under GDARD Biodiversity (2018) is not required.

With the application of mitigation briefly described above and discussed in detail in Section 12, this impact can be reduced to a medium magnitude, while duration will remain of long-term. Spatial extent will be reduced to the site only, but probability will be reduced to low. After mitigation, this impact is rated to be of "Low" significance.

10.3.1.4. Establishment and spread of alien invasive species

Several declared AIS were recorded in the study area during the field survey. Species such as *Acacia dealbata, Acacia mearnsii, Verbena bonariensis*, *Verbena brasiliensis* and *Solanum mauritianum* are aggressive invaders that are capable of establishing in varied habitat types, including rocky ridge areas.

Habitat disturbances caused by vegetation clearing and earth works during construction is likely to facilitate spread of AIS which may have a negative impact on ecological integrity and functioning, as well as flora SCC.

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 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

The dismantling and removal of proposed Project infrastructure are likely to cause disturbances which may facilitate alien invasive species colonisation in, and immediately adjacent to, the infrastructure footprints.

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 12: Impact assessment scoring for terrestrial flora species

CONSTRUCTION																			
Impact number	Receptor	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating	(M+	E+	R+	D)x	P=	S	Rating
Impact 1:	Flora habitat	Direct loss and disturbance of natural habitat	Construction	Negative	Low	5	2	3	5	5	75	N3	3	1	3	4	2	22	N1
					Significance	N3 - High							N1 - Low						
Impact 2:	Flora habitat	Habitat fragmentation impacting habitat connectivity and integrity.	Construction	Negative	Medium	5	2	3	5	4	60	N2	3	2	3	4	2	24	N1
						N2 - Medium							N1 - Low						
Impact 3:	Flora SCC	Loss of flora of conservation concern	Construction	Negative	High	5	2	5	4	4	64	N3	3	1	3	4	2	22	N1
					Significance	N3 - High							N1 – Low						
Impact 4:	Flora habitat	Establishment and spread of alien invasive species	Construction	Negative	High	4	2	3	4	4	52	N2	2	1	3	2	2	16	N1
						N2 - Medium							N1 - Low						
OPERATIONAL																			
Impact number	Receptor	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation						
						(M+	E+	R+	D)x	P=	S		(M+	E+	R+	D)x	P=	S	
Impact 1:	Flora habitat	Establishment and spread of alien invasive species	Operational	Negative	High	4	2	3	4	3	39	N2	2	1	3	2	2	16	N1
					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	Decomissioning	Negative	High	4	2	3	4	4	52	N2	2	1	3	2	2	16	N1
					Significance	N2 - Medium							N1 - Low						
CUMULATIVE																			
Impact number	Receptor	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation						
						(M+	E+	R+	D)x	P=	S		(M+	E+	R+	D)x	P=	S	
Impact 1:	Flora habitat & SCC	Cumulative loss of flora SCC due to natural habitat loss, disturbance and fragmentation	Construction	Negative	Moderate	4	3	3	5	5	75	N3	3	3	3	4	2	26	N1
					Significance	N3 - High							N1 - Low						

10.3.4. Cumulative Impacts

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

Portions of the landscape in which the study area is located are modified and fragmented as a consequence of various anthropogenic land use activities, including *inter alia* mining (i.e., Sibanye Driefontein's mine shaft complexes), formal and inform residential areas, existing powerline servitudes, and the N12 Highway.

The authorised Igolide WEF (DFFE reference number: 14/12/16/3/3/2/2385), EA dated 31 January 2024), which is associated with this proposed Electrical Grid Infrastructure Project, but is part of a separate authorisation process, is also located within the immediate landscape surrounding the study area.

Collectively, the development of both the Igolide WEF and the proposed Igolide Electrical Grid Infrastructure, will cause direct habitat loss, disturbance and fragmentation through vegetation clearing that is 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 'high'. The project contribution to cumulative impacts can be minimised by strictly implementing the required mitigation measures, and addressing any significant residual impacts via additional conservation actions. The cumulative impacts on terrestrial flora SCC can therefore be reduced to 'Low' significance.

11. Assessment of the No Go Alternative

If the proposed Project does not proceed, it is anticipated that the current land use status quo will continue into the future. The tracts of grassland and savanna habitat in the study area will continue to be used for livestock and game farming, which may lead to incidences of overgrazing, which may drive local changes in flora species composition. It is also likely that overtime, AIS growing in the study area (such as *Acacia mearnsii* and *Solanum mauritianum*) will continue to expand their current distribution. This may compromise habitat integrity and flora diversity, including the persistence of flora 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;
    - Rehabilitation or restoration;
    - Offsetting;
- Time period: The time period when the impact management actions must be implemented; and
- Responsible persons: The persons who will be responsible for the implementation of the impact management actions.

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

Table 13: Recommended mitigation measures.

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
1. Pre-Construction Phase							
1.1	Terrestrial Flora SCC	Loss of Flora Species of Conservation Concern	<u>Avoidance and Minimisation</u> • Proposed Project infrastructure should be sited outside a 100 m buffer around the rocky outcrop in which the *Adromischus umbraticola* subsp. *umbraticola* were recorded; • A pre-construction micro-siting walkdown of the approved development footprints should be conducted during the wet/growing season to identify sensitive biodiversity receptors (flora SCC) and inform micro-siting of infrastructure.; • Data from the micro-siting walkdown should also be used to inform the development of a Flora SCC Management Plan, as per the requirements set on Section 8.3 of GDARD Biodiversity (2018). The plan should include *inter alia*:	GDARD Biodiversity (2018) - The Red Listed Plant Guideline for Gauteng Province.	Avoidance & Minimisation	Pre-Construction Phase	Project Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			o *In situ* conservation measures to protected *Adromischus umbraticola* subsp*. umbraticola plants;* o Monitoring procedure for the *Adromischus umbraticola* subsp*. umbraticola* plants; and o Rescue and relocation procedures for species listed as Protected in Gauteng Province				
2. Construction Phase							
2.1	Terrestrial Flora	Direct loss and disturbance of flora habitat	<u>Avoidance</u> • As much of the proposed Project infrastructure as possible should be located in disturbed/modified habitat units, such as *Hyparrhenia hirta – Eragrostis chloromelas* Grassland, Alien Tree Plantations, and Transformed and Degraded Areas) and localised disturbed sites;	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
			• As far as practical, access roads should be aligned with existing farm roads and access tracks, and if feasible, no permanent access roads should be constructed in Mixed Rocky Ridge Bushveld and *Lopholaena corifolia* Rocky Ridge/Outcrop Grassland; <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				

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			toilets, storage and laydown areas, should be located on land that is modified. <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 perennial species, and include a mixture of pioneer, sub-climax and climax species.				
2.2	Terrestrial Flora	Habitat fragmentation impacting habitat connectivity and integrity	<u>Avoidance and Minimisation</u> See mitigation measures for: *Direct loss and disturbance of natural habitat*	N/A	Avoidance and Minimisation	During Construction Phase	Project Manager
2.3	Terrestrial Flora SCC	Loss of Flora Species of Conservation Concern	See mitigation measures listed in the Pre-Construction Phase for: *Loss of Flora Species of Conservation Concern*	GDARD Biodiversity (2018) - The Red Listed Plant Guideline for Gauteng Province.	Avoidance & Minimisation	During Construction Phase	Project Manager
2.4	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 AIS in, and	Guidelines for Monitoring, Control and Eradication	Minimisation	During Construction Phase	Project Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			immediately adjacent to, the construction footprints. 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.	of AIS (DEA, 2015)			
3. Operational phase							
3.1	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
4. Decommissioning phase							

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
4.1	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
4.2	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 14 presents a summary of the proposed monitoring actions during the construction, operational and decommissioning phases

Table 14: 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 • 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
2.2	Flora SCC	• Monitoring of the *Adromischus umbraticola* subsp. *umbraticola* plants should be conducted during the September – January flowering period. • As required, the findings of monitoring should inform additional conservation actions to protected these plants.	September - January	Annually during construction, and for a three period after construction.	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	Wet/growing season	Annually during decommissioning	Annual Monitoring Report	Facility Manager

Ref. No.	Category	Method for monitoring	Time period	Frequency of monitoring	Mechanism for monitoring compliance	Responsible person
		decommissioning and annually for a five-year period following decommissioning. Monitoring should focus on all sites disturbed during decommissioning; and • Monitoring should assess species type and density, and these data should inform the scope of ongoing alien invasive species control.		for a five-year period after decommissioning		

14. Reasoned Opinion and Environmental Impact Statement

14.1. Summary of Main Findings

The study area is located in the Gauteng Shale Mountain Bushveld vegetation type, which is listed as Least Concern.

During the field survey, eight habitat units were identified in the study area, including both natural (and seminatural) grassland and savanna habitats, as well as highly modified habitats (i.e., Alien Tree Plantations and Transformed and Degraded Sites). The latter 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 important habitat for flora, and they also form part of a larger network of natural habitat and thus contribute to broader-scale habitat connectivity, which is an important component of maintaining landscape ecological processes and terrestrial biodiversity.

In terms of flora SCC, several suspected *Adromischus umbraticola* subsp*. umbraticola* (Near Threatened) plants were recorded on one rocky outcrop in the study area. Habitat suitability assessments also indicate that other Red List flora taxa may be present in the study area.

It is contended that a routing of the powerline to avoid a 100 m buffer around the rocky outcrop in which the *Adromischus umbraticola* subsp*. umbraticola* plants were observed, coupled with the careful micro-siting of pylon/tower and access road footprints in the 250 m wide assessment corridor, and the strict implementation of additional management and monitoring measures, will act as effective mitigation against any negative impacts on the *Adromischus umbraticola* subsp*. umbraticola* plants. It is therefore contended that the 500 m buffer recommended for A2 Red List plants under GDARD Biodiversity (2018), is not required.

With respects to the flora SCC highlighted by the National Web Based Screening Tool as potential sensitive receptors for the study area, *Khadia beswickii* favours open shallow soils, over rocks in grassland, and Sensitive species 1248 occurs in open woodland and steep rocky hills in shady situations. These habitats are present in the study area (Rocky Ridge/Outcrop Grassland and Mixed Rocky Ridge Bushveld), and it is therefore possible that both taxa may be present.

With regards to the Plant Species Theme sensitivity rating for the study area, the Rocky Ridge/Outcrop Grassland and Mixed Rocky Ridge Bushveld units are rated as having 'High' sensitivity, with the remainder of the study area regarded as 'Medium' sensitivity.

The proposed Project will require vegetation clearing and earth works, which will result in some habitat loss and potential impacts to flora SCC. Several management measures have been recommended in this report to mitigate these, and other identified impacts. The successful implementation of these management measures can effectively mitigate the identified impacts, resulting in 'Low' residual impact scores. It is therefore recommended that all mitigation and management measures should be incorporated into the proposed Project's environmental management plan (EMP).

14.2. Conditions to be Included in the Environmental Authorisation

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

14.3. Specialist Opinion

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

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

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

Appendix A: Curriculum Vitae – Andrew Zinn

Hawkhead Consulting

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

Details

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

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

Profile

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

Education and Qualifications

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

Affiliations

- Member of the South African 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.
- Andrew Zinn (2006). Conflict Resolution. Africa Birds and Birding. Vol. 11, No. 5, 12-13.

Appendix B: Methodology Supplement

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

The ecological sensitivity of habitats in the 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: List of flora species recorded in the study area during the 2024 field survey.

Family	Species Name	Growth Form	Origin	Conservation Status		Habitat Units						
				National Red List Status	Gauteng Province Protected Status	*H. hirta – E. chloromelas* Grassland	Moist Grassland	*L. corifolia* Rocky Ridge/Outcrop Grassland	Mixed Rocky Grassland	Mixed Rocky Ridge Bushveld	*V. karroo – S. caffra* Bushveld	Alien Tree Plantations
Fabaceae	*Acacia dealbata**	Tree	Alien (NEMBA Category 2)	NE	-				x		x	x
Fabaceae	*Acacia mearnsii**	Tree	Alien (NEMBA Category 2)	NE	-				x		x	x
Fabaceae	*Acacia melanoxylon**	Tree	Alien (NEMBA Category 2)	NE	-						x	
Amaranthaceae	*Achyranthes aspera**	Herb	Alien	NE	-						x	
Crassulaceae	*Adromischus umbraticola subsp. umbraticola*	Succulent	Indigenous	NT				x				
Poaceae	*Agrostis lachnantha*	Graminoid	Indigenous	LC	-		x					
Poaceae	*Alloteropsis semialata*	Graminoid	Indigenous	LC	-				x			
Asphodelaceae	*Aloe davyana*	Succulent	Indigenous	LC	Protected				x			
Asphodelaceae	*Aloe verecunda*	Succulent	Indigenous	LC	Protected			x				
Poaceae	*Andropogon eucomus*	Graminoid	Indigenous	LC	-		x					
Poaceae	*Andropogon chinensis*	Graminoid	Indigenous	LC	-							
Rubiaceae	*Anthospermum hispidulum*	Shrub	Indigenous	LC	-			x				
Apocynaceae	*Ancylobotrys capensis*	Shrub	Indigenous	LC	-					x		
Poaceae	*Aristida aequiglumis*	Graminoid	Indigenous	LC	-			x	x			
Poaceae	*Aristida bipartita*	Graminoid	Indigenous	LC	-				x			
Poaceae	*Aristida congesta* subsp. *congesta*	Graminoid	Indigenous	LC	-	x			x			x
Asparagaceae	*Asparagus laricinus*	Shrub	Indigenous	LC	-		x				x	x
Astercaeae	*Athrixia elata*	Shrub	Indigenous	LC	-			x				
Asteraceae	*Bidens bipinnata**	Herb	Alien	NE	-	x					x	
Asteraceae	*Bidens pilosa**	Herb	Alien	NE	-	x	x					

Family	Species Name	Growth Form	Origin	Conservation Status		Habitat Units						
				National Red List Status	Gauteng Province Protected Status	*H. hirta – E. chloromelas* Grassland	Moist Grassland	*L. corifolia* Rocky Ridge/Outcrop Grassland	Mixed Rocky Grassland	Mixed Rocky Ridge Bushveld	*V. karroo – S. caffra* Bushveld	Alien Tree Plantations
Amaryllidaceae	*Boophone disticha*	Geophytic Herb	Indigenous	LC	-				x			
Asteraceae	*Brachylaena rotundata*	Tree	Indigenous	LC	-			x				
Scrophulariaceae	*Buddleja saligna*	Tree	Indigenous	LC	-			x			x	
Cyperaceae	*Bulbostylis burchellii*	Graminoid	Indigenous	LC	-			x				
Solanaceae	*Cestrum laevigatum**	Tree	Alien (NEMBA Category 1b)	NE	-						x	
Ulmaceae	*Celtis africana*	Tree	Indigenous	LC	-						x	
Scrophulariaceae	*Chaenostoma leve*	Herb	Indigenous	LC	-					x		
Sinopteridaceae	*Cheilanthes hirta*	Fern	Indigenous	LC	-			x		x		
Cyperaceae	*Coleochloa setifera*	Graminoid	Indigenous	LC	-			x				
Fabaceae	*Chamaecrista comosa*	Herb	Indigenous	LC	-				x			
Poaceae	*Chrysopogon serrulatus*	Graminoid	Indigenous	LC	-			x		x		
Asteraceae	*Cirsium vulgare**	Herb	Alien (NEMBA Category 1b)	NE	-	x	x					
Ranunculaceae	*Clematis villosa*	Herb	Indigenous	LC	-			x	x			
Brassicaceae	*Cleome monophylla*	Herb	Indigenous	LC	-				x			
Commelinaceae	*Commelina africana*	Herb	Indigenous	LC	-	x			x			
Commelinaceae	*Commelina benguelensis*	Herb	Indigenous	LC	-					x		
Asteraceae	*Conyza bonariensis**	Herb	Alien	NE	-		x				x	
Asteraceae	*Conyza canadensis**	Herb	Alien	NE	-		x				x	
Poaceae	*Cortaderia selloana**	Graminoid	Alien (NEMBA Category 1b)	NE	-							
Crassulaceae	*Cotyledon orbiculata*	Succulent	Indigenous	LC	-			x				
Crassulaceae	*Crassula setulosa*	Succulent	Indigenous	LC	-			x				
Amaryllidaceae	*Crinum graminicola*	Geophytic Herb	Indigenous	LC	Protected				x			
Cucurbitaceae	*Cucumis zeyheri*	Herb	Indigenous	LC	-				x			

Family	Species Name	Growth Form	Origin	Conservation Status		Habitat Units						
				National Red List Status	Gauteng Province Protected Status	*H. hirta – E. chloromelas* Grassland	Moist Grassland	*L. corifolia* Rocky Ridge/Outcrop Grassland	Mixed Rocky Grassland	Mixed Rocky Ridge Bushveld	*V. karroo – S. caffra* Bushveld	Alien Tree Plantations
Araliaceae	*Cussonia paniculata*	Tree	Indigenous	LC	Protected			x				
Poaceae	*Cymbopogon caesius*	Graminoid	Indigenous	LC	-			x	x		x	
Poaceae	*Cymbopogon pospischilii*	Graminoid	Indigenous	LC	-			x	x			
Poaceae	*Cynodon dactylon*	Graminoid	Indigenous	LC	-	x	x		x		x	x
Cyperaceae	*Cyperus congesta*	Graminoid	Indigenous	LC	-		x					
Asteraceae	*Dicoma anomala*	Herb	Indigenous	LC	-			x	x			
Poaceae	*Digitaria eriantha*	Graminoid	Indigenous	LC	-	x			x	x		
Poaceae	*Diheteropogon amplectens*	Graminoid	Indigenous	LC	-				x			
Ebenaceae	*Diospyros lycioides*	Tree	Indigenous	LC	-	x	x		x		x	x
Boraginaceae	*Ehretia rigida*	Tree	Indigenous	LC	-					x	x	
Fabaceae	*Elephantorrhiza elephantina*	Dwarf Tree	Indigenous	LC	-			x	x			
Poaceae	*Elionurus muticus*	Graminoid	Indigenous	LC	-			x	x			
Poaceae	*Eragrostis chloromelas*	Graminoid	Indigenous	LC	-	x		x	x		x	
Poaceae	*Eragrostis curvula*	Graminoid	Indigenous	LC	-	x	x				x	x
Poaceae	*Eragrostis gummiflua*	Graminoid	Indigenous	LC	-	x	x		x			x
Poaceae	*Eragrostis plana*	Graminoid	Indigenous	LC	-	x	x		x			
Poaceae	*Eragrostis nindensis*	Graminoid	Indigenous	LC	-				x			
Poaceae	*Eragrostis racemosa*	Graminoid	Indigenous	LC	-	x			x		x	
Fabaceae	*Eriosema cordatum*	Herb	Indigenous	LC	-				x			
Myrtaceae	*Eucalyptus camaldulensis**	Tree	Alien (NEMBA Category 2)	NE	-							x
Sapotaceae	*Englerophytum magalismontanum*	Tree	Indigenous	LC	-					x		
Ebenaceae	*Euclea crispa*	Tree	Indigenous	LC	-						x	
Asteraceae	*Geigeria burkei*	Herb	Indigenous	LC	-				x			
Iridaceae	*Gladiolus* sp. (no flowers)	Herb	Indigenous	-	-						x	
Apocynaceae	*Gomphocarpus fruticosus*	Herb	Indigenous	LC	-		x					

Family	Species Name	Growth Form	Origin	Conservation Status		Habitat Units						
				National Red List Status	Gauteng Province Protected Status	*H. hirta – E. chloromelas* Grassland	Moist Grassland	*L. corifolia* Rocky Ridge/Outcrop Grassland	Mixed Rocky Grassland	Mixed Rocky Ridge Bushveld	*V. karroo – S. caffra* Bushveld	Alien Tree Plantations
Celastraceae	*Gymnosporia polyacanthus* subsp. *vaccinifolia*	Tree	Indigenous	LC	-					x	x	
Poaceae	*Harpochloa falx*	Graminoid	Indigenous	LC	-				x			
Asteraceae	*Helichrysum acutatum*	Herb	Indigenous	LC	-				x		x	
Asteraceae	*Helichrysum aureonitens*	Herb	Indigenous	LC	-	x	x					
Asteraceae	*Helichrysum aureum*	Herb	Indigenous	LC				x			x	
Asteraceae	*Helichrysum cephaloideum*	Herb	Indigenous	LC	-				x			
Asteraceae	*Helichrysum harveyanum*	Herb	Indigenous	LC	-	x			x			
Asteraceae	*Helichrysum nudifolium* var. *nudifolium*	Herb	Indigenous	LC	-	x			x			
Asteraceae	*Helichrysum rugulosum*	Herb	Indigenous	LC	-	x			x		x	
Asteraceae	*Helichrysum setosum*	Herb	Indigenous	LC	-			x	x			
Asteraceae	*Helichrysum lepidissimum*	Herb	Indigenous	LC	-			x		x		
Asteraceae	*Helichrysum cerastioides*	Herb	Indigenous	LC	-			x		x		
Asteraceae	*Helichrysum callicomum*	Herb	Indigenous	LC	-						x	
Lamiaceae	*Hemizygia canescens*	Herb	Indigenous	LC	-			x		x		
Sterculiaceae	*Hermannia depressa*	Herb	Indigenous	LC	-	x					x	
Apiaceae	*Heteromorpha arborescens*	Succulent	Indigenous	LC	-					x		
Poaceae	*Heteropogon contortus*	Graminoid	Indigenous	LC	-				x			
Malvaceae	*Hibiscus trionum**	Herb	Alien	NE	-						x	
Asteraceae	*Hilliardiella aristata*	Herb	Indigenous	LC	-				x			
Asteraceae	*Hilliardiella oligocephala*	Herb	Indigenous	LC	-				x			
Poaceae	*Hyparrhenia hirta*	Graminoid	Indigenous	LC	-	x	x		x		x	x
Hypoxidaceae	*Hypoxis iridifolia*	Geophytic Herb	Indigenous	LC	-						x	

Family	Species Name	Growth Form	Origin	Conservation Status		Habitat Units						
				National Red List Status	Gauteng Province Protected Status	*H. hirta – E. chloromelas* Grassland	Moist Grassland	*L. corifolia* Rocky Ridge/Outcrop Grassland	Mixed Rocky Grassland	Mixed Rocky Ridge Bushveld	*V. karroo – S. caffra* Bushveld	Alien Tree Plantations
Hypoxidaceae	*Hypoxis rigidula*	Geophytic Herb	Indigenous	LC	-						x	
Fabaceae	*Indigofera hilaris*	Herb	Indigenous	LC	-			x			x	
Fabaceae	*Indigofera melanadenia*	Herb	Indigenous	LC	-			x		x		
Fabaceae	*Indigofera oxytropis*	Herb	Indigenous	LC	-			x	x			
Convolvulaceae	*Ipomoea ommaneyi*	Herb	Indigenous	LC	-	x			x			
Juncaceae	*Juncus effusus*	Graminoid	Indigenous	LC	-		x					
Crassulaceae	*Kalanchoe paniculata*	Succulent	Indigenous	LC	-			x		x		
Crassulaceae	*Kalanchoe thyrsiflora*	Succulent	Indigenous	LC	-						x	
Cyperaceae	*Kyllinga erecta*	Graminoid	Indigenous	LC	-		x					
Flacourtiaceae	*Kiggelaria africana*	Tree	Indigenous	LC	-					x		
Amaranthaceae	*Kyphocarpa angustifolia*	Herb	Indigenous	LC	-						x	
Hyacinthaceae	*Ledebouria revoluta*	Herb	Indigenous	LC	-				x		x	
Lamiaceae	*Leonotis randii*	Herb	Indigenous	LC	-				x			
Asteraceae	*Lopholaena coriifolia*	Shrub	Indigenous	LC	-			x	x			
Poaceae	*Loudetia simplex*	Graminoid	Indigenous	LC	-			x	x			
Malvaceae	*Sida cf. rhombifolia*	Herb	Indigenous	LC	-						x	
Meliaceae	*Melia azedarach**	Tree	Alien (NEMBA Category 1b)	NE	-						x	
Poaceae	*Melinis repens*	Graminoid	Indigenous	LC	-			x	x		x	
Poaceae	*Microchloa caffra*	Graminoid	Indigenous	LC	-			x	x			
Poaceae	*Monocymbium ceresiiforme*	Graminoid	Indigenous	LC	-			x	x			
Fabaceae	*Mundulea sericea*	Tree	Indigenous	LC	-			x				
Myrsinaceae	*Myrsine africana*	Shrub	Indigenous	LC	-			x		x		
Celastraceae	*Mystroxylon aethiopicum*	Tree	Indigenous	LC	-					x		
Asteraceae	*Nidorella anomala*	Herb	Indigenous	LC	-	x			x			
Asteraceae	*Nidorella hottentotica*	Herb	Indigenous	LC	-							

Family	Species Name	Growth Form	Origin	Conservation Status		Habitat Units						
				National Red List Status	Gauteng Province Protected Status	*H. hirta – E. chloromelas* Grassland	Moist Grassland	*L. corifolia* Rocky Ridge/Outcrop Grassland	Mixed Rocky Grassland	Mixed Rocky Ridge Bushveld	*V. karroo – S. caffra* Bushveld	Alien Tree Plantations
Onagraceae	*Oenothera roseus**	Herb	Alien	NE	-	x						
Cactaceae	*Opuntia ficus-indica**	Tree	Alien (NEMBA Category 1b	NE	-						x	
Poaceae	*Oropetium capense*	Graminoid	Indigenous	LC	-			x				
Santalaceae	*Osyris lanceolata*	Tree	Indigenous	LC	-					x	x	
Oxalidaceae	*Oxalis corniculata**	Herb	Alien	NE	-	x	x					
Poaceae	*Panicum natalense*	Graminoid	Indigenous	LC	-				x			
Poaceae	*Panicum schinzii*	Graminoid	Indigenous	LC	-		x					
Poaceae	*Paspalum dilatatum**	Graminoid	Alien	NE	-		x					
Poaceae	*Paspalum urvillei**	Graminoid	Alien	NE	-		x					
Geraniaceae	*Pelargonium luridum*	Herb	Indigenous	LC	-	x						
Pteridaceae	*Pellaea calomelanos* var. *calomelanos*	Fern	Indigenous	LC	-			x				
Polygonaceae	*Persicaria lapathifolia**	Herb	Alien	NE	-		x					
Poaceae	*Pennisetum clandestinum**	Graminoid	Alien (NEMBA Category 1b)	NE	-		x					
Phytolaccaceae	*Phytolacca dioica**	Tree	Alien (NEMBA Category 1b)	NE	-	x						
Phytolaccaceae	*Phytolacca octandra**	Herb	Alien (NEMBA Category 1b)	NE	-		x					
Poaceae	*Phragmites australis*	Graminoid	Indigenous	LC	-		x					
Lamiaceae	*Plectranthus hereroensis*	Shrub	Indigenous	LC						x	x	
Lamiaceae	*Plectranthus ramosior*	Herb	Indigenous	LC	-			x				
Plantaginaceae	*Plantago major*	Herb	Indigenous	LC							x	
Plantaginaceae	*Plantago lanceolata*	Herb	Alien	NE	-		x					
Poaceae	*Pogonarthria squarrosa*	Graminoid	Indigenous	LC	-	x						x
Caryophyllaceae	*Pollichia campestris*	Herb	Indigenous	LC	-				x			
Asteraceae	*Polydora poskeana*	Herb	Indigenous	LC	-			x				

Family	Species Name	Growth Form	Origin	Conservation Status		Habitat Units						
				National Red List Status	Gauteng Province Protected Status	*H. hirta – E. chloromelas* Grassland	Moist Grassland	*L. corifolia* Rocky Ridge/Outcrop Grassland	Mixed Rocky Grassland	Mixed Rocky Ridge Bushveld	*V. karroo – S. caffra* Bushveld	Alien Tree Plantations
Proteaceae	*Protea caffra*	Tree	Indigenous	LC	Protected					x		
Asteraceae	*Pseudognaphalium luteo-album**	Herb	Alien	NE	-		x					
Rosaceae	*Pyracantha angustifolia**	Tree	Alien (NEMBA Category 1b)	NE	-						x	
Rubiaceae	*Pygmaeothamnus zeyheri*	Dwarf Shrub	Indigenous	LC	-							
Rubiaceae	*Richardia brasiliensis**	Herb	Alien	NE	-	x			x			
Polygonaceae	*Rumex crispus**	Herb	Alien	NE	-		x					
Amaryllidaceae	*Scadoxus puniceus*	Herb	Indigenous	LC	Protected				x		x	
Asteraceae	*Schkuhria pinnata**	Herb	Alien	NE	-	x					x	
Anacardiaceae	*Searsia lancea*	Tree	Indigenous	LC	-						x	
Anacardiaceae	*Searsia leptodictya*	Tree	Indigenous	LC	-				x	x	x	
Anacardiaceae	*Searsia magalismontana* subsp. *magalismontana*	Shrub	Indigenous	LC	-			x		x		
Anacardiaceae	*Searsia pyroides*	Tree	Indigenous	LC	-				x	x	x	
Anacardiaceae	*Searsia rigida var. margaretae*	Shrub	Indigenous	LC	-						x	
Selaginellaceae	*Selaginella dregei*	Fern	Indigenous	LC	-			x				
Scrophulariaceae	*Selago densiflora*	Herb	Indigenous	LC	-	x			x		x	x
Asteraceae	*Senecio coronatus*	Herb	Indigenous	LC	-				x			
Asteraceae	*Senecio venosus*	Herb	Indigenous	LC	-			x	x			
Fabaceae	*Senegalia caffra*	Tree	Indigenous	LC	-				x		x	
Asteraceae	*Seriphium plumosum*	Shrub	Indigenous	LC	-	x	x		x		x	x
Poaceae	*Setaria sphacelata var. sphacelata*	Graminoid	Indigenous	LC	-				x			
Poaceae	*Setaria sphacelata var. torta*	Graminoid	Indigenous	LC	-				x		x	
Solanaceae	*Solanum incanum* *	Shrub	Alien	NE	-						x	

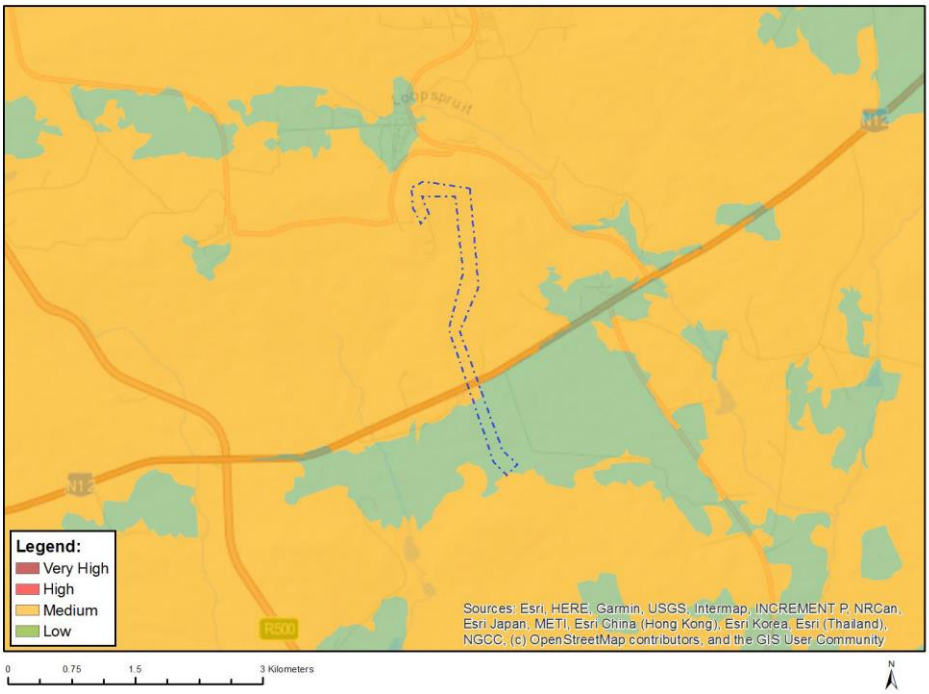
Family	Species Name	Growth Form	Origin	Conservation Status		Habitat Units						
				National Red List Status	Gauteng Province Protected Status	*H. hirta – E. chloromelas* Grassland	Moist Grassland	*L. corifolia* Rocky Ridge/Outcrop Grassland	Mixed Rocky Grassland	Mixed Rocky Ridge Bushveld	*V. karroo – S. caffra* Bushveld	Alien Tree Plantations
Solanaceae	*Solanum mauritianum**	Shrub	Alien (NEMBA Category 1b)	NE	-						x	
Solanaceae	*Solanum pseudocapsicum**	Shrub	Alien (NEMBA Category 1b)	NE	-						x	
Solanaceae	*Solanum sisymbriifolium**	Shrub	Alien (NEMBA Category 1b)	NE	-		x					
Solanaceae	*Solanum violaceum*	Shrub	Alien (NEMBA Category 1b)	NE								
Poaceae	*Sporobolus africanus*	Graminoid	Indigenous	LC	-	x	x		x			
Asteraceae	*Tagetes minuta**	Herb	Alien	NE	-	x					x	
Poaceae	*Themeda triandra*	Graminoid	Indigenous	LC	-				x		x	x
Poaceae	*Trachypogon spicatus*	Graminoid	Indigenous	LC	-						x	
Poaceae	*Triraphis andropogonoides*	Graminoid	Indigenous	LC	-				x	x		
Cactaceae	*Trichocereus spachianus**	Succulent	Alien	NE	-							
Poaceae	*Tristachya rehmannii*	Graminoid	Indigenous	LC	-			x	x			
Poaceae	*Tricholaena monachne*	Graminoid	Indigenous	LC	-							
Typhaceae	*Typha capensis*	Graminoid	Indigenous	LC	-		x					
Poaceae	*Urelytrum agropyroides*	Graminoid	Indigenous	LC	-				x			
Poaceae	*Urochloa panicoides*	Graminoid	Indigenous	LC	-						x	
Fabaceae	*Vachellia karoo*	Tree	Indigenous	LC	-	x	x		x		x	
Fabaceae	*Vachellia robusta*	Tree	Indigenous	LC	-					x		
Rubiaceae	*Vangueria infausta*	Tree	Indigenous	LC	-			x			x	
Verbenaceae	*Verbena bonariensis**	Herb	Alien (NEMBA Category 1b)	NE	-	x	x					
Verbenaceae	*Verbena brasiliensis**	Herb	Alien (NEMBA Category 1b)	NE	-	x	x				x	
Viscaceae	*Viscum rotundifolium*	Herb	Indigenous	LC	-						x	
Rutaceae	*Zanthoxylum capense*	Tree	Indigenous	LC	-					x	x	

Family	Species Name	Growth Form	Origin	Conservation Status		Habitat Units						
				National Red List Status	Gauteng Province Protected Status	*H. hirta – E. chloromelas* Grassland	Moist Grassland	*L. corifolia* Rocky Ridge/Outcrop Grassland	Mixed Rocky Grassland	Mixed Rocky Ridge Bushveld	*V. karroo – S. caffra* Bushveld	Alien Tree Plantations
Asteraceae	*Zinnia peruviana**	Herb	Alien	NE	-						x	
Rhamnaceae	*Ziziphus mucronata*	Tree	Indigenous	LC	-	x		x	x	x	x	
Red List Categories NE = Not Evaluated LC = Least Concern NT = Near Threatened												

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.



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Medium	Khadia beswickii
Medium	Sensitive species 1248

Appraisal of the Sensitivity Rating

Neither *Khadia beswickii* or Sensitive species 1248 were recorded in the study area. However, habitat suitability assessments indicate that there is suitable habitat available for both species; *Khadia beswickii* favours open shallow soils, over rocks in grassland, and Sensitive species 1248 occurs in open woodland and steep rocky hills in shady situations. These habitats occur in the study area, and it is therefore possible that both *Khadia beswickii* and Sensitive species 1248 are present. Suspected *Adromischus umbraticola* subsp*. umbraticola* (Near Threatened) were recorded in the study area during the field survey.

Based on the findings of this study, the Plant Species Theme sensitivity rating for the Rocky Ridge/Outcrop Grassland and Mixed Rocky Ridge Bushveld units in the study area are rated as having 'High' sensitivity, with the remainder of the study area is regarded as 'Medium' 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, viability and provide a detailed description of population size of the SCC, identified within the study area;	Section 7.2.1
2.2.4 identify the nature and the extent of the potential impact of the proposed development on the population of the SCC located within the study area;	Section 10.3
2.2.5 determine the importance of the conservation of the population of the SCC identified within the study area, based on information available in national and international databases, including the IUCN Red List of Threatened Species, South African Red List of Species, and/or other relevant databases;	Section 7.2.1
2.2.6 determine the potential impact of the proposed development on the habitat of the SCC located within the study area;	Section 10.3
2.2.7 include a review of relevant literature on the population size of the SCC, the conservation interventions as well as any national or provincial species management plans for the SCC. This review must provide information on the need to conserve the SCC and indicate whether the development is compliant with the applicable species management plans and if not, include a motivation for the deviation;	Section 7.2.1
2.2.8 identify any dynamic ecological processes occurring within the broader landscape that might be disrupted by the development and result in negative impact on the identified SCC, for example, fires in fire-prone systems;	Section 8
2.2.9 identify any potential impact of ecological connectivity in relation to the broader landscape, resulting in impacts on the identified SCC and its long-term viability;	Section 8 & Section 10.3
2.2.10 determine buffer distances as per the Species Environmental Assessment Guidelines used for the population of each SCC;	Section 7.2.1
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;	Red List flora data submitted to GDARD & iNaturalist account for A Zinn
3.1.9 the location of areas not suitable for development and to be avoided during construction where relevant;	Section 9
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