Appendix H.15

TERRESTRIAL PLANT ASSESSEMENT

DALMANUTHA WIND ENERGY FARM PROJECT (ALTERNATIVE 1 AND 2) - TERRESTRIAL BIODIVERSITY AND PLANT SPECIES SPECIALIST ASSESSMENT

WSP Group Africa Pty (Ltd)

April 2023

Submitted to:
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Acronyms and Abbreviations

Abbreviation	Explanation
AIS	Alien Invasive Species
AOO	Area of Occupancy
BAP	Biodiversity Action Plan
BI	Biodiversity Importance
CA	Conservation Areas
CBA	Critical Biodiversity Areas
CI	Conservation Importance
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
EOO	Extent of Occurrence
FI	Functional Integrity
Ha	Hectare
MPTA	Mpumalanga Parks and Tourism Agency
NEMA	National Environmental Management Act
NEMBA	National Environmental Management Biodiversity Act
NFEPA	National Freshwater Ecosystem Priority Areas
PA	Protected Areas
QDS	Quarter Degree Square
RR	Receptor Resilience
SANBI	South African National Biodiversity Institute
SAPAD	South African Protected Areas Database
SEI	Site Ecological Importance
SWSA	Strategic Water Source Areas
ToPS	Threatened or Protected Species

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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.

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 Dalmanutha Wind Energy Farm (Alternative 1 and 2) 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

Dalmanutha Wind (Pty) Ltd is proposing to develop the Dalmanutha Wind Energy Facility (WEF) Project (hereafter referred to as the "Project"), near Belfast in Mpumalanga Province, South Africa. Hawkhead Consulting was appointed by WSP Group Africa Pty (Ltd), on behalf of Dalmanutha Wind (Pty) Ltd., to conduct a Terrestrial Biodiversity and a Plant Species (flora) Specialist Assessment for the proposed Project.

1.1. Scope and Purposes of this Report

This specialist study focused on terrestrial ecosystems, vegetation and flora. The primary scope of work included:

- Collating and reviewing information and data on terrestrial ecosystems, vegetation and flora species that occur or potentially occur on-site and in the surrounding landscape;
- Conducting a field programme, comprising one wet season field survey, 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 ecosystems 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).

The purpose of this report is to; 1) present a baseline description of vegetation communities and flora species occurring on-site; 2) present the findings of an impact assessment for the proposed Project; and, 3) recommended applicable biodiversity mitigation and management measures.

This report should be read in conjunction with, *inter alia*, the Terrestrial Animal Species Specialist Assessment report, which presents additional information on fauna populations related to the proposed Project site.

1.2. Project Location and Delimits of the Study Area

The proposed Project complex comprises several conjoined agricultural farms that stretch southward from the N4 freeway in the north, to the KleinKomati River in the south. Collectively, these farms constitute the 'study area' for the proposed Project, and are shown, with the proposed Alternative 1 and Alternative 2 infrastructure layouts in Figure 1 and Figure 2 (Refer to Section 1.3 for a description of the two proposed project alternatives).

The study area forms part of a broad area of land associated with the envisaged Dalmanutha Wind Energy Complex. Apart from the proposed Dalmanutha WEF, the Dalmanutha Wind Energy Complex also includes the proposed Dalmanutha West WEF project and the proposed Dalmanutha Collector Switching Station and Powerline projects. These projects are subject to separate applications for environmental authorisation.

The R33 and R36 arterial roads are located to the west and east of the study area respectively. Several formal gravel roads, as well as numerous internal farming tracks/roads traverse the study area. The nearest major urban centre is Belfast, which is located 6.5 km to the north-west of the

study area's northern boundary. Most of the study area falls within the 2530CC Quarter Degree Square (QDS), with a small portion in the north located in the adjacent 2530CA QDS.

1.3. Project Description

The proposed Project consists of two alternatives, *viz*. Alternative 1 and Alternative 2. A description of each alternative is provided below:

1.3.1. Alternative 1

The proposed Dalmanutha WEF will be developed with a capacity of up to 300 megawatts (MW). The proposed development footprint (buildable area) is approximately 400 ha (subject to finalisation based on technical and environmental requirements), and the extent of the project area is approximately 9 197 ha (Figure 1). The development footprint of Alternative 1 will comprise the following key components:

Wind Turbines

- Up to 70 turbines, each with a foundation of approximately 25 m^2 in diameter (500 m^2 area requiring ~2 500m^3 concrete each) and approximately 3m deep;
- Turbine hub height of up to 200m;
- Rotor diameter of up to 200m; and
- Permanent hard standing area for each wind turbine (approximately 1 ha).

IPP Portion On-Site Substation and Battery Storage Energy System

- IPP portion onsite substation of up to 4 ha; and
- The Battery Energy Storage System (BESS) storage capacity will be up to 300MW/1200 megawatt-hour (MWh) with up to four hours of storage.

Operation and Maintenance Building Infrastructure

- Operations and maintenance (O&M) building infrastructure will be required to support the functioning of the WEF and for services required by operations and maintenance staff. The O&M building infrastructure will be near the onsite substation and will include:
  - Operations building of approximately 200 m^2;
  - Workshop and stores area of approximately 150 m^2 each;
  - Stores area of approximately 150 m^2; and
  - Refuse area for temporary waste and septic/conservancy tanks with portable toilets to service ablution facilities.
- The total combined area of the buildings will not exceed 5 000m^2.

Construction Camp Laydown

- Temporary laydown or staging area - Typical area 220 m x 100 m = 22000 m^2. Laydown area could increase to 30000 m^2 for concrete towers, should they be required;
- Sewage: septic and/or conservancy tanks and portable toilets; and
- Temporary cement batching plant, wind tower factory & yard of approximately 7ha.

Access Roads

- Internal and access roads with a width of between 8 m and 10 m, which can be increased to approximately 12 m on bends. The roads will be positioned within a 20 m wide corridor to accommodate cable trenches, stormwater channels and bypass /circles of up to 20 m during

construction. Length of the internal roads will be approximately 60 km. As a precaution, a fixed road width of 10 m is used during the assessment of potential impacts.

Associated Infrastructure

Other associated infrastructure will include *inter alia*, a medium voltage (up to 33kV) collector system, an over the fence 132kV cable to connect the onsite IPP substation to the Common Collector Switching Station, fencing, lightning protection, telecommunication infrastructure, stormwater channels, offices, operational control centre, maintenance area and workshop, ablution facilities., offices, warehouses, security building and substation building.

1.3.2. Alternative 2

The proposed Dalmanutha WEF will be developed with a capacity of up to 300 megawatts (MW). The proposed development footprint (buildable area) is approximately 400 ha (subject to finalisation based on technical and environmental requirements), and the extent of the project area is approximately 8 000 ha (Figure 2). The development footprint of Alternative 2 will comprise the following key components:

Wind Turbines

- Up to 44 turbines, each with a foundation of approximately 25 m^2 in diameter (500 m^2 area and requiring ~2 500m^3 concrete each) and approximately 3m deep;
- Turbine hub height of up to 200m;
- Rotor diameter of up to 200m; and
- Permanent hard standing area for each wind turbine (approximately 1 ha per turbine).

Solar Fields

- Solar PV array comprising PV modules (solar panels), with a footprint approximately 160 ha; and
- Inverters, transformers and other required associated electrical infrastructure and components.

IPP Portion On-Site Substation and Battery Storage Energy System

- *As per Alternative 1*

Operation and Maintenance Building Infrastructure

- *As per Alternative 1*

Construction Camp Laydown

- *As per Alternative 1*

Access Roads

- *As per Alternative 1,* except 4 m wide internal gravel roads will be constructed between the arrays at the SEF

Associated Infrastructure

- *As per Alternative 1*

1.4. Results of the Environmental Screening Tool

According to the National Web Based Screening Tool, the overall Terrestrial Biodiversity Theme for the study area is rated 'Very High Sensitivity' on account of several factors including, the presence of land designated Critical Biodiversity Area (CBA) Irreplaceable, CBA Optimal, Ecological Support Area (ESA) Landscape Corridor, ESA Local Corridor, FEPA Sub-catchment, Endangered and Vulnerable Ecosystems, and the Protected Area Expansion Strategy. These aspects are addressed in Section 5.2

The overall Plant Species Theme for the study area was rated 'Medium Sensitivity' on account of the potential presence of several threatened flora species. These species are discussed in more detail in Section 5.5.2 of this report.

Figure 1: Map showing the extent of the study area, with the proposed Alternative 1 infrastructure layout.

Figure 2: Map showing the extent of the study area, with the proposed Alternative 2 infrastructure layout.

2. Relevant Legislation and Guidelines

Relevant national and provincial legislation, associated guidelines and policies that are relevant to the environmental and biodiversity, and which were used to guide the Terrestrial Biodiversity and Plant Species Specialist Assessment are listed in **Error! Reference source not found.**.

Table 1: Relevant national and provincial environmental and biodiversity legislation, policies 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 are relevant to this study: • Protocol for the specialist assessment and report content requirements for environmental impacts on terrestrial biodiversity; and • Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial plant species.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	The NEMBA 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. 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); • 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), including the revised list, published on 18 November 2022. 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. The 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 • 2020 Alien and Invasive Species Lists (March 2021).
Mpumalanga Nature Conservation Act (Act No. 10 of 1998)	Amongst other provisions, the Mpumalanga Nature Conservation Act (Act No. 10 of 1998) provides lists of specially protected and protected flora. Of particular relevance to this specialist study are species listed under: • Schedule 11: Protected Plants; and • Schedule 12 Specially Plants.
Other Relevant Policies, Plans and Guidelines	Other relevant policies, plans and guidelines that were considered during this study include: • Mpumalanga Biodiversity Sector Plan; • Draft National Biodiversity Offset Policy (2017); • Species Environmental Assessment Guideline (SANBI, 2020); • National Protected Area Expansion Strategy (2016)

3. Study Methodology

3.1. Desktop Data Collation and Literature Review

The desktop literature review component aimed to collate and review existing ecosystem and botanical information related to the study area and the surrounding landscape. Several data sources were consulted and these represent the most recent data that are available on these platforms.

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);
- The formal conservation context of the study area at a provincial and national level was established based on:
    - The Mpumalanga Biodiversity Sector Plan (2019 spatial layers); and
    - The National List of Threatened Ecosystems (NEMBA Threatened Ecosystems, 2011 and 2021 revision);
- The presence of protected areas (PA) and conservation areas (CA) in the broader region was determined based on the South African Protected Areas Database website (SAPAD, 2021). This database contains a register of all protected areas (legally gazetted) and conservation areas (managed for biodiversity conservation, but not legally declared) in South Africa;
- The National Protected Areas Expansion Strategy (NPAES) was also reviewed to assess the study area's location with respect to identified PA expansion areas; and
- The presence of Strategic Water Source Areas (SWSA), National Freshwater Ecosystem Priority Areas (NFEPA) and Indigenous Forests were also determined with respect to the study area's location based on available online spatial datasets.

3.1.2. Flora Species

- A list of flora species that have previously been recorded in the broader region encompassing the study area and that may be present on-site, was obtained from the SANBI's online Botanical Database of Southern Africa (BODATSA);
- Lists of flora species of conservation concern (SCC) were also sourced from the Mpumalanga Parks and Tourism Agency (MPTA) for the various farms and farm portions that comprise the study area. These were augmented with lists of flora species highlighted for the study area by the online environmental sensitivity screening tool, and existing orchid data previously collected by Mr Geoff Lockwood, who owns a property immediately adjacent to the northern boundary of the study area; and
- The conservation status of flora species that are potentially present based on collated data was determined by cross-referencing the list against both national and provincial lists of threatened and/or protected flora (refer to Section 3.4).

3.2. Field Programme

The flora field programme comprised one wet-season field survey conducted from 24th to 28th October 2022. The field sampling methodologies used during the surveys were aligned with those recommended in SANBI (2020), and included the following:

- Vegetation was sampled using meander search transects at 24 survey sites in the study area, while general habitat notes and photographs were collected at 26 reference points. Data

collected along the transects included flora species identity and estimated cover/abundances (using the Braun-Blanquet scale), general habitat character and condition, presence of alien invasive species and evidence of disturbances. The coordinates of SCC were also recorded;

- Survey and reference sites were selected prior to visiting the field based on a desktop evaluation of general habitat type, location of proposed Project infrastructure, and sampling coverage of the study area. For a map showing the location of survey and reference points, refer to Appendix B;
- Several reference works were used to identify flora species, including
    - Van Wyk and Van Wyk (1997), Coates Palgrave (2002), Schmidt, *et al*., (2002) and Glen and Van Wyk (2016) for woody taxa;
    - Van Oudtshoorn (1999) for grasses;
    - Van Wyk and Malan (1998), Pooley (2005), Manning (2009), Gill and Englebrecht (2012), and Johnson *et al*., (2015) for herbaceous forbs/herb species;
    - Crouch *et al*., (2011) for ferns; and
    - Van Wyk and Smith (2014) for aloes.
- 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 Vegetation Communities

Due to the size and spatial complexity of the study area, a composite approach was used to map vegetation communities. Existing landcover spatial data generated by GeoTerra Imagery was used as the base mapping layer. This was augmented and refined using a combination of 1) data and observations obtained during the flora field survey, 2) the wetland delineations developed by WSP Group Africa (Pty) Ltd for the proposed Project, and 3) a desktop analysis of available satellite imagery (refer to Section 4 for mapping limitations).

3.4. Assessment of Species of Conservation Concern

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

Species of conservation concern were based on the national Red Lists of threatened/near threatened flora species, and the Protected status of species, as per national and provincial legislation. These included:

- Red List of South African Plans (Version 2020), presented by SANBI;
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004) - Threatened or Protected Species List (Notice 389 of 2013) (NEMBA ToPS List, 2007);
- Mpumalanga Nature Conservation Act (Act No. 10 of 1998); and
- Mpumalanga Red List of Threatened Flora.

3.4.2. Habitat Suitability Assessments for Species of Conservation Concern

Based on the lists of SCC potentially present on-site, a 'probability of occurrence' of a species in the study area was determined by conducting habitat suitability assessments. The following parameters were used in the assessments:

- Habitat requirements: Most threatened species have very specific habitat requirements. The presence of these habitats in the study area was evaluated;
- Habitat status: The status or ecological condition of available habitat was assessed. Often a high level of habitat degradation will negate the potential presence of sensitive species; and
- Habitat linkage: Dispersal and movement between natural areas for breeding and feeding 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, or move through the study area (in the case of mobile species), 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 Flora Species

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

3.6. Flora Species of Medicinal Value

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

3.7. Assessment of Site Ecological Importance

The ecological importance (sensitivity) of vegetation communities and habitats 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 A. Table 2 presents a guideline for interpreting the SEI (SANBI, 2020).

Table 2: Guidelines for interpreting SEI in the context of the proposed development activities

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

4. Assumptions, Uncertainties and Gaps in Knowledge

The following assumptions, uncertainties and gaps in knowledge are highlighted for the Terrestrial Biodiversity and a Plant Species Specialist Assessment:

- Field work was conducted over a five-day period from the 24-28th October 2022. This period coincides with the early wet/growing season. Little summer rain had fallen prior to the field visit. Moreover, portions of the study area had also been recently burnt prior to the field survey and displayed little new season regrowth. It is thus possible that certain flora taxa, including *inter alia* short-lived annuals, geophytes, cryptic species or dormant deciduous species, that are most readily visible or distinguishable when in leaf or flower later in the

wet/growing season following sufficient rain, may have been overlooked during field visit; and

- The delineation of vegetation communities for the vegetation map was conducted, in part, using available Google Earth satellite imagery. It was noted during the field survey that large tracts of grassland in the north of the study area had recently been converted to cultivated fields by local farmers, and that some of these changes may not be reflected in the Google Earth satellite imagery available at the time of mapping.

5. Terrestrial Vegetation and Flora Baseline Characteristics

5.1. Regional Ecosystem and Vegetation Characteristics

The study area is located in the grassland biome and according to the regional mapping of South Africa's vegetation, it is characterised by three vegetation types Eastern Highveld Grasslands (Gm 12), Steenkampsberg Montane Grassland (Gm 30) and KaNgwane Montane Grassland (Gm 16). These vegetation types, along with the general characteristics of the grassland biome, are discussed in more detail below. A map showing the distribution of the regional vegetation types in the study area, as per 2018 SANBI spatial data, is shown in Figure *3*:

5.1.1. Grassland Biome

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

South Africa's grassland ecosystems are parsed into five groups, with the study area forming part of the Mesic Highveld Grasslands grouping with possible elements of High-Altitude Grassland (SANBI 2013). Mesic Highveld Grasslands occur at mid-altitudes and experience warm, wet summers (MAP 700-1200 mm) and cold winters. They are typically highly productive sourveld grasslands that are dominated by long-lived perennial grasses (SANBI, 2013). As the name suggests, High-Altitude Grasslands occur at higher altitudes locations and are dominated by slow growing grasses. They experience cold winters, with frequent frost and rainfall ranging between 1200-1500 mm per year. are also sourveld

Fire is common in Mesic Highveld Grasslands, but typically less frequent in High-Altitude Grassland. Coupled with frequent winter frost, fires maintain these ecosystems in a relatively treeless form (SANBI, 2013). Apart from their importance as rich stores of biodiversity, grasslands are critically important water production landscapes, constituting about half of South Africa's Strategic Water Source Areas (SANBI, 2013).

5.1.2. Regional Vegetation Types

5.1.2.1.Eastern Highveld Grassland

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

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

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

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

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

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

5.1.2.2.KaNgwane Montane Grassland

KaNgwane Montane Grassland occurs along the escarpment from the Phongolo Valley in the south to the Usutu- and Lomati Valleys near Carolina. These grasslands are characterised by undulating hills and plains which form a transitional habitat between the highveld and escarpment. Vegetation comprises short closed grassland with diverse forbs and scattered woody shrubs on rocky outcrops.

Graminoides: *Alloteropsis semialata, Brachiaria serrata, Cyperus obtusiflorus, Diheteropogon amplectens, Eragrostis racemosa, Heteropogon contortus, Hyparrhenia hirta, Loudetia simplex, Monocymbium ceresiiforme, Themeda triandra, Rendlia altera, Trachypogon spicatus, Andropogon schirensis, Bewsia biflora, Digitaria diagonalis, Eragrostis chloromelas, Eragrostis plana, Panicum ecklonii, Panicum natalense* and *Paspalum scrobiculatum*.

Herbs: *Ipomoea oblongata, Acalypha peduncularis, Acalypha villicaulis, Aster harveyanus, Berkheya setifera, Corchorus confusus, Cyathula cylindrica, Dicoma zeyheri, Eriosema cordatum, Helichrysum adenocarpum, Helichrysum nudifolium, Mohria caffrorum, Ruellia patula, Sonchus wilmsii, Thunbergia atriplicifolia, Vernonia natalensis* and *Vernonia oligocephala*.

Geophytic Herbs: *Boophone disticha, Cheilanthes deltoidea, Eucomis montana, Gladiolus ecklonii, Habenaria dregeana, Hypoxis iridifolia, Morea pubiflora, Pteridium aquilinum, Watsonia latifolia* and *Zantedeschia albomaculata*.

Shrubs and Trees: *Senegalia caffra, Faurea rochetiana, Pachystigma macrocalyx, Cyathea dregei, Calpurnia glabrata, Cephalanthus natalensis, Diospyros lycioides, Heteromorpha involucrata, Asparagus cooperi, Gymnosporia heterophylla, Myrsine africana, Searsia discolor* and *Schistostephium rotundifolium.*

Endemic Taxa: *Lotononis difformis, Lotononis spicata, Streptocarpus occultis* and *Syncolostemon comptonii.*

5.1.2.3.Steenkampsberg Montane Grassland

Steenkampsberg Montane Grassland extends along the Steenkampsberg escarpment from the mountains north-west of Lydenburg, southwards to Dullstroom and Belfast and then eastwards towards Elandshoogte. This vegetation type occurs on mountain plateaus and slopes and is characterised by short grassland with a high forb/herb diversity.

Tree and Shrubs: *Leucosidea sericea, Searsia discolour, Rubus ludwigii* and *Lopholaena corifolia*.

Graminoides: *Tristachya leucothrix, Harpochloa falx, Andropogon shirensis* and *Monocymbium ceresiiforme.*

Herbs: *Acalypha wilmsii, Argyrolobium tuberosum, Helichrysum adenocarpum* and *Lobelia flaccida.*

Endemic Taxa: *Searsia tumulicola,* var. *meeuseana, Crotalaria monophylla, Indigofera hedyantha* var. *steenkampianus, Kniphofia rigidifolia, Streptocarpus latens, Gladiolus cataractarum, gladiolus malvinus, Graderia linearifolia, Eucomis vandermerwei, Drimiopsis purpurea* and *Aloe challisii*.

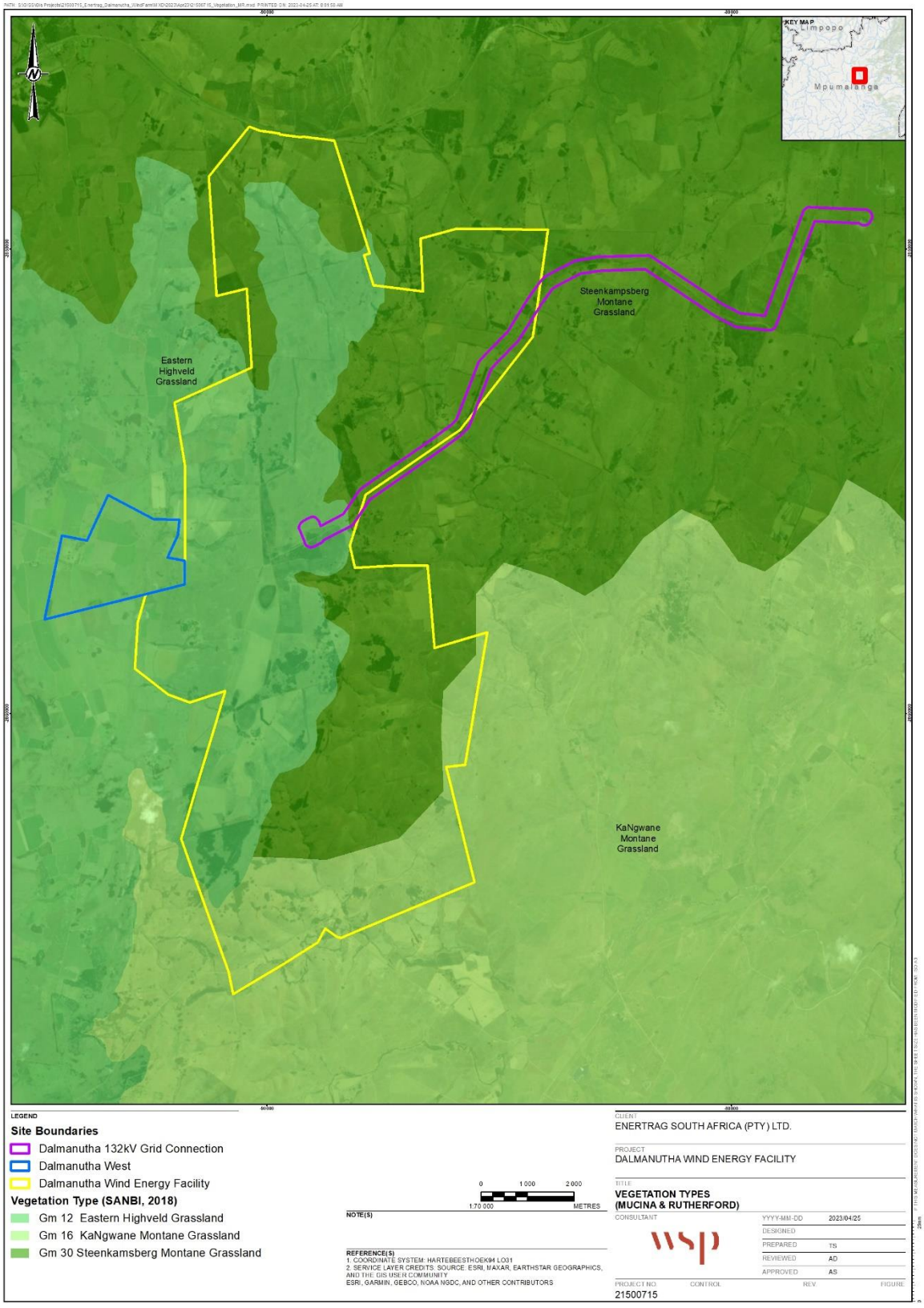

Figure 3: The study area (yellow) in relation to South Africa's regional vegetation types. Note the other sites associated with the Dalmanutha Wind Energy Complex (blue and purple).

5.2. Regional Ecological Sensitivity and Conservation Setting

5.2.1. Nationally Threatened Ecosystems

Both Eastern Highveld Grassland and KaNgwane Montane Grassland were previously listed as Vulnerable (Government notice 1002/2011, in terms of section 52(1)(a) of NEMBA). However, both vegetation types have subsequently been up-listed to Endangered, as a result of high rates of habitat loss (refer to the Revised National List of Threatened Terrestrial Ecosystems, 2022).

Only a very small fraction of Eastern Highveld Grassland is conserved in statutory reserves (Nooitgedacht Dam and Jericho Dam Nature Reserves) and approximately 44% has been transformed, primarily by cultivation, forestry, mines, urbanisation and the building of dams. Similarly, Mucina and Rutherford (2011) indicate that only 0.4% of KaNgwane Montane Grassland is formally is conserved, with forestry and cultivation the main threats to this vegetation type.

It is noted that small portions of the north of the study area also form part of the Dullstroom Plateau Grassland (MP4) ecosystem, which is listed as an Endangered ecosystem under the NEMBA (2011). This ecosystem comprises both the grassland and forest biomes and extends from Die Berg in the north to the town of Belfast in the south. It is delineated based on the presence of breeding and feeding habitat for cranes and Rudd's Lark. Thirty-three threatened and endemic flora and fauna species are known from the ecosystem. Other important ecosystem attributes include escarpment corridors, presence of important caves, pans and wetland and is important for grassland and forest processes.

5.2.2. Critical Biodiversity Areas - Mpumalanga Biodiversity Sector Plan

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

- **Protected Areas**: protected areas recognised in terms of the National Environmental Management Protected Areas Act, No. 57 of 2003, that are currently considered to meet biodiversity targets in the MBSP.
- **Critical Biodiversity Area**: areas (outside of Protected Areas) that are required to meet biodiversity targets for biodiversity pattern (species and ecosystems) and ecological processes. They should remain in a natural state that is maintained in good ecological condition. The MBSP recognises two CBA ranks, *viz*, CBA Irreplaceable and CBA Optimal.
- **Ecological Support Area**: play an important role in supporting the ecological functioning of critical biodiversity areas or for generating or delivering important ecosystem services. They support landscape connectivity and resilience to climate change adaptation. They need to be maintained in at least an ecologically functional state.
- **Other Natural Areas**: often retain much of their natural character and may contribute significantly to maintenance of viable species populations and natural ecosystem functioning, and may provide important ecological infrastructure and ecosystem services. They are not, however, prioritized for immediate conservation action in the MBSP.
- **Modified**: often referred to as transformed, these areas have lost a significant proportion (or all) of their natural biodiversity and in which ecological processes have broken down (in some cases irretrievably), as a result of biodiversity-incompatible land-use practices such as

ploughing, hardening of surfaces, mining, cultivation and the construction of houses or other built infrastructure.

Study Area and Proposed Project Infrastructure in Relation to Mapped Critical Biodiversity Areas

Mapping of the Mpumalanga Biodiversity Sector Plan (2019) indicates that the study area encompasses a large, almost contiguous tract of land running longitudinally down the centre of the study area that is designated as either CBA Irreplaceable and CBA Optimal – shown in Figure 4. These areas will be impacted by proposed Project infrastructure for both Alternative 1 and Alternative 2.

A review of GTI (2020) landcover classification for the study area indicates that certain small land parcels that are mapped as CBA Irreplaceable or CBA Optimal actually comprise modified habitats/sites. It was also noted during the October 2022 field survey, that large areas of grassland in the north of the study area had recently been ploughed and converted to cultivated fields by local farmers. As this land conversion is very recent, it is not reflected in the Mpumalanga Biodiversity Sector Plan and the GTI (2020) spatial datasets.

Figure 5 and Figure 6 present maps showing identified sites where CBA land has been modified. It must be appreciated that the delineation of the recently modified land portions discussed above, was conducted based on field observations and with the satellite imagery available at the time. Notwithstanding the above, it is evident from Figure 5 and Figure 6 that infrastructure associated with both proposed Project's will directly impact land designated as CBA Irreplaceable, as well as CBA optimal. Any impacts to areas designated as CBA are a concern, as these areas are critical to meeting the province's biodiversity conservation targets.

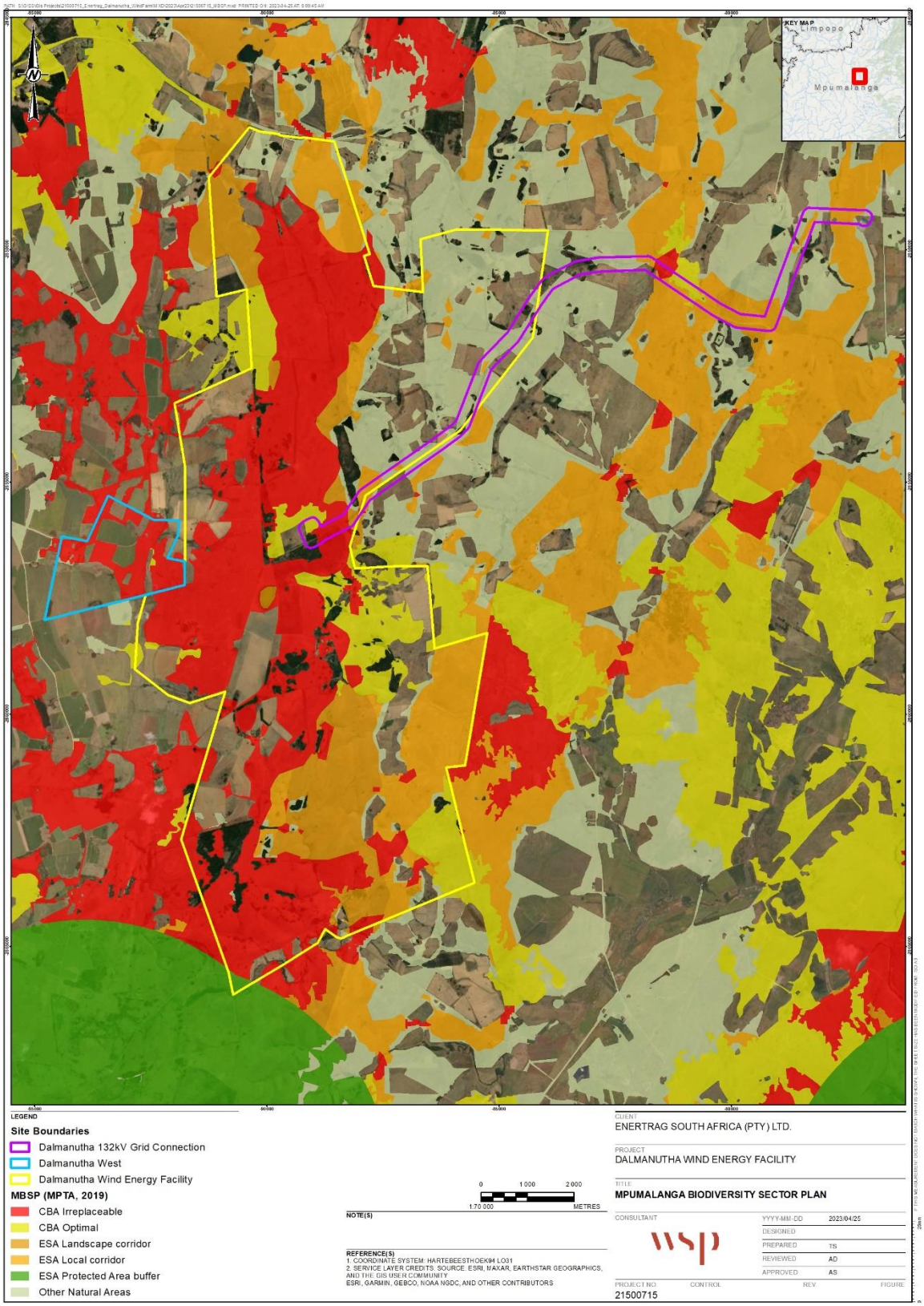

Figure 4: The study area (yellow) in relation to the delineations of the MBSP (2019). Note the other sites associated with the Dalmanutha Wind Energy Complex (blue and purple).

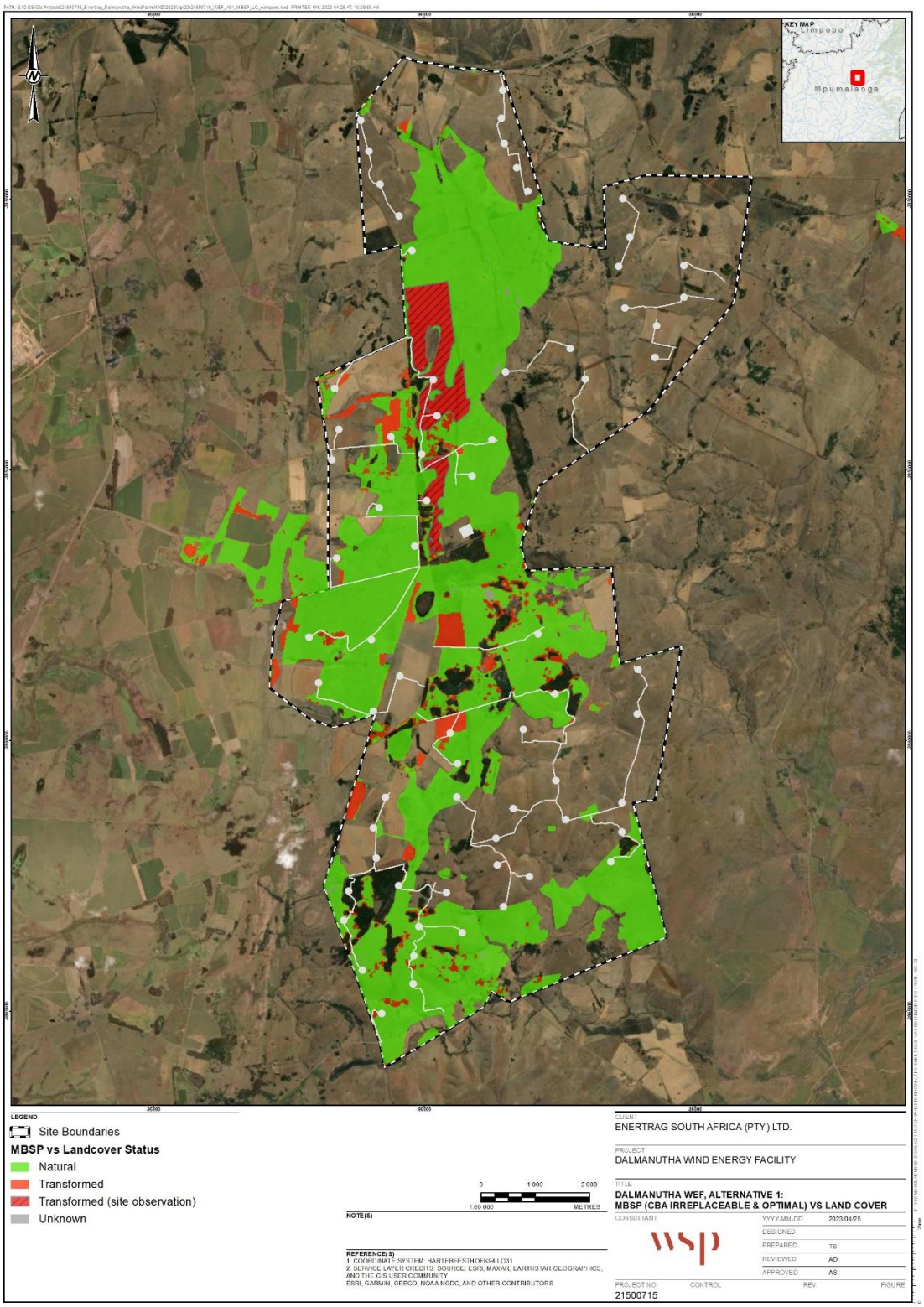

Figure 5: Proposed Alternative 1 infrastructure and areas (red) of land designated CBA Irreplaceable and CBA Optimal designated land that are actually characterised by modified habitat, as determined by a comparison with land cover imagery and/or field observations.

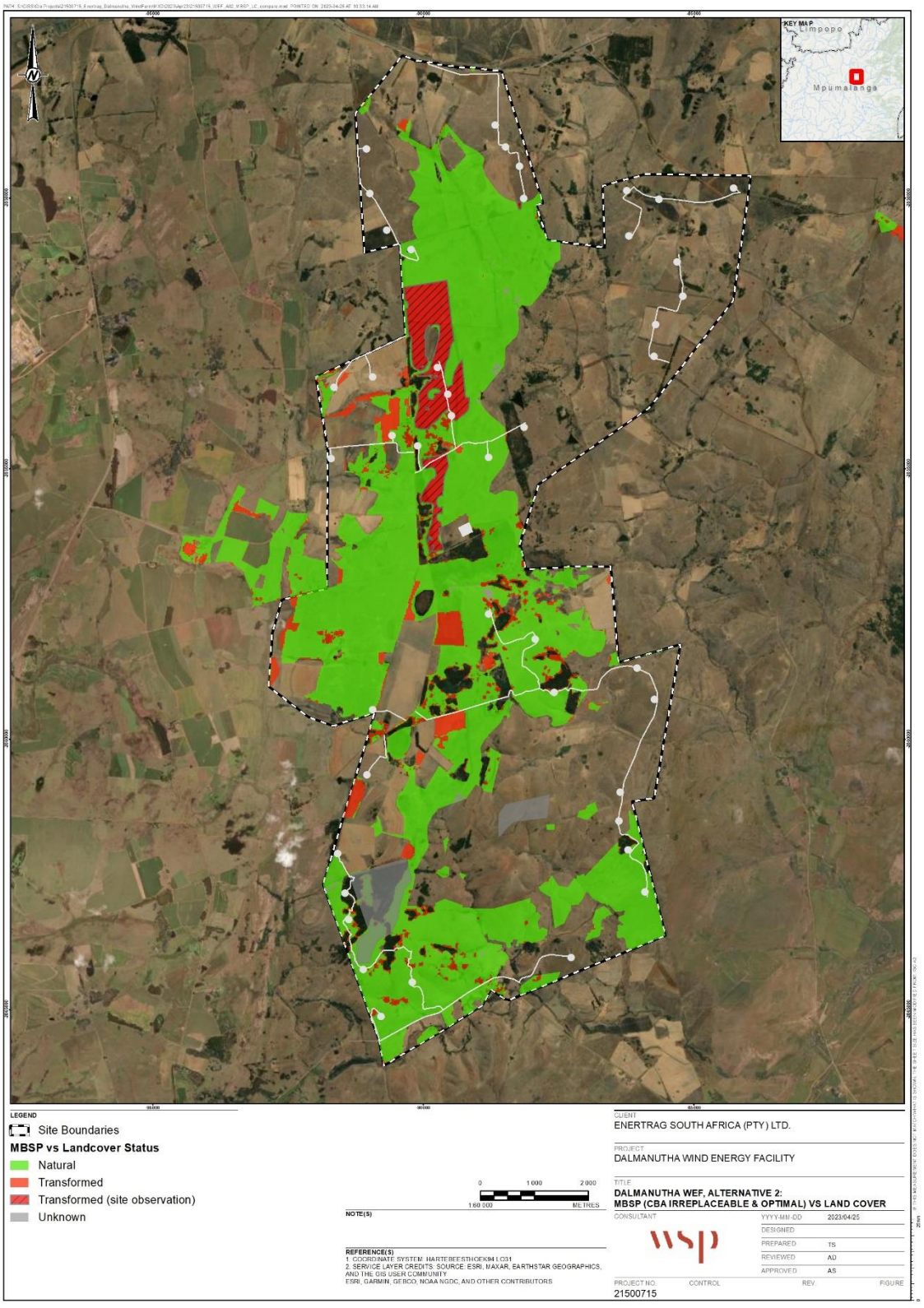

Figure 6: Proposed Alternative 2 infrastructure and areas (red) of land designated CBA Irreplaceable and CBA Optimal designated land that are actually characterised by modified habitat, as determined by a comparison with land cover imagery and/or field observations

5.2.3. Water Management

The study area does not encompass any areas designated as strategic water source areas (SWSA) in South Africa. The study area does however encompass Freshwater Ecosystem Priority Areas (FEPA) sub-catchments, which are shown in Figure 7.

5.2.4. Indigenous Forests

Landcover dataset (GTI, 2020) indicates that no indigenous forest habitat occurs within the study area. According to these data, land comprises mostly secondary and some primary grasslands and hillslope seepage and valley bottom wetlands, interspersed by currently/previously cultivated areas and alien tree plantations/infestations.

5.2.5. Protected Areas and Priority Areas for Protected Area Expansion

The study area does not encompass any nationally protected areas. The nearest protected area is Nooitgedacht Dam Nature Reserve, which is located approximately 11 km south of the study area (Figure 8). Other nearby protected areas include the Greater Lakenvlei Protected Environment and Pauline Van Niekerk Private Nature Reserve (Figure 8).

It is further noted that the study area contains large portions of land that are designated as Priority Focus Areas for protected area expansion, and that the northern extent of the study area overlaps with the Steenkampsberg Important Bird Area (IBA), which consists primarily of rolling high-altitude grassland interspersed with rocky outcrops.

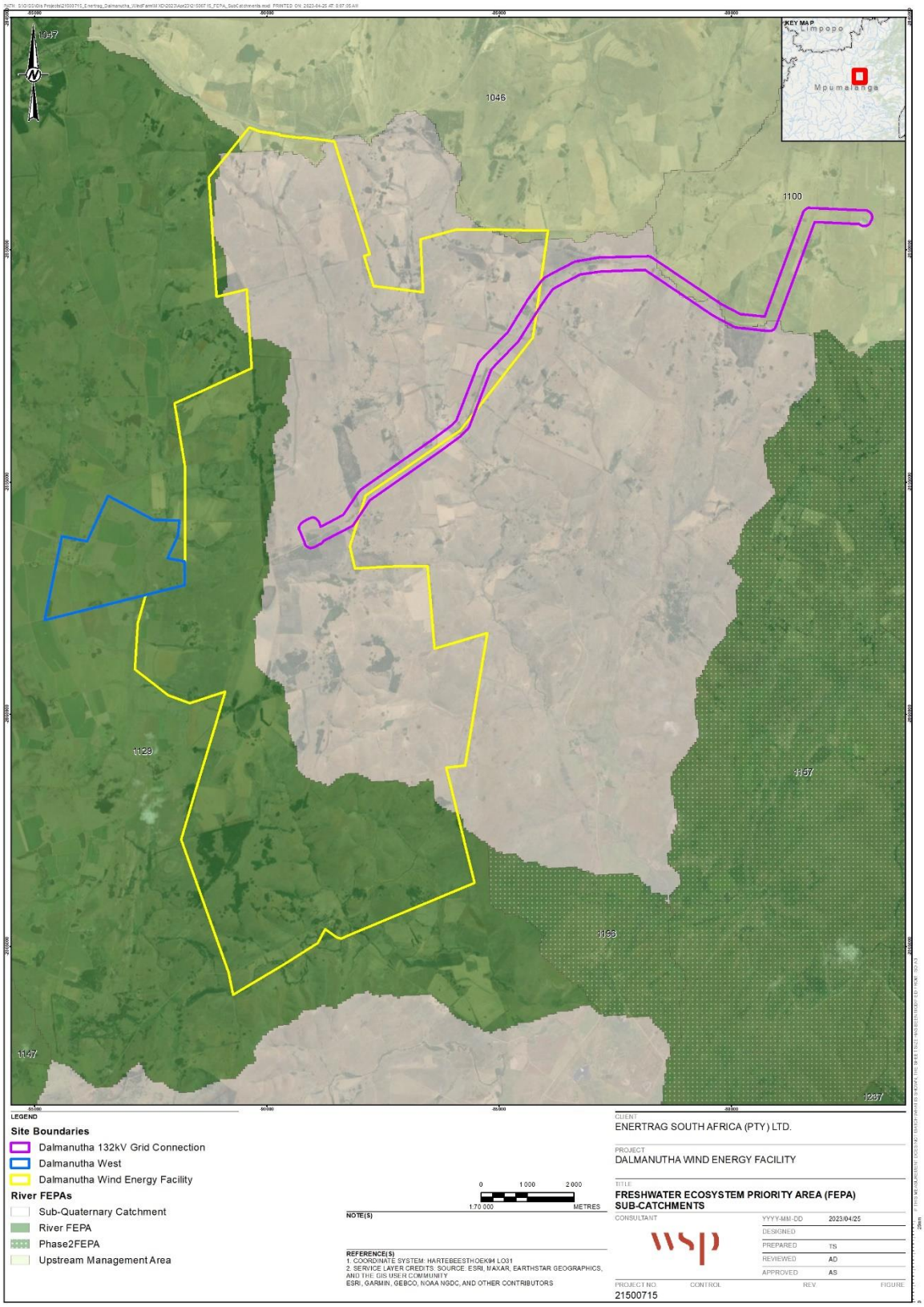

Figure 7: Freshwater Ecosystem Priority Areas and the study area (yellow). Note the other sites associated with the Dalmanutha Wind Energy Complex (blue and purple).

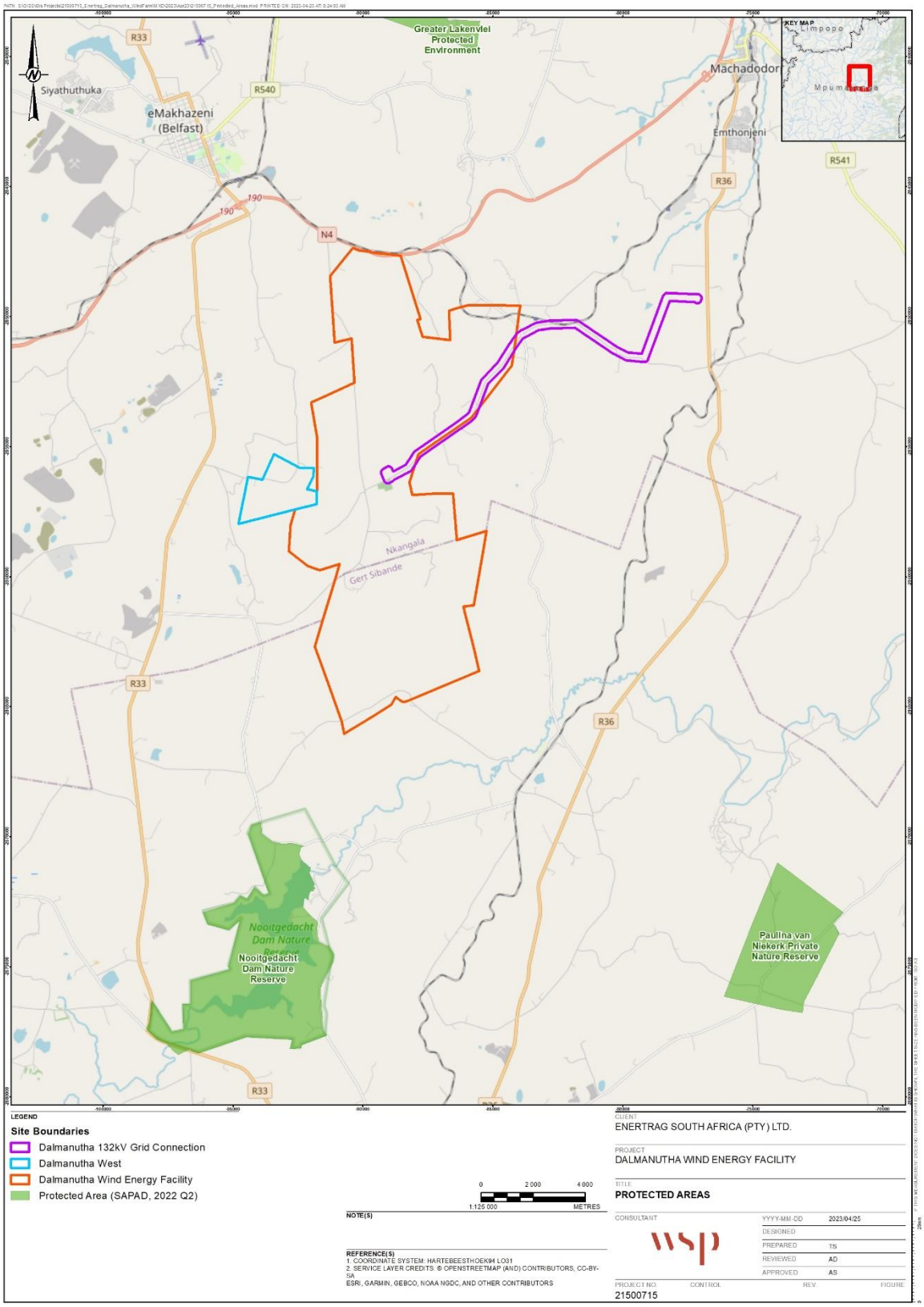

Figure 8: Protected areas in the landscape surrounding the study area (red). Note the other sites associated with the Dalmanutha Wind Energy Complex (blue and purple).

5.3. Landscape Context and Existing Impacts on Vegetation

The study area is embedded within a rural agricultural landscape, characterised by a complex landcover matrix comprising patches of modified habitat and tracts of natural habitat. The following notes describe the preeminent existing impacts (anthropogenic activities and infrastructure) observed in the study area:

- Farming is the main land use in the study area. Large areas are under dryland crop cultivation, with maize and soy the most prominent crop types. Apart from the more established and old cultivated fields, it was noted during the field programme that local farmers in the north of the study area have recently cleared and ploughed large tracts of natural grassland and are converting these to cultivated fields;
- Livestock farming with cattle, sheep and pigs was also observed in the study area. Cattle are grazed widely throughout grassland and wetland habitat in the study area, while sheep and pigs are more closely managed and restricted to pasture areas;
- Large portions of the study area are characterised by stands of alien invasive trees. These include formal wind-rows and plantations, as well as informal spreading infestations. The latter form is typically dominated by wattle species (*Acacia dealbata* and *Acacia mearnsii*), which are aggressive invaders;
- Felling of alien trees for charcoal production (and possibly building material) was noted to be occurring at several areas in the study area. This is likely to cause shifts in the type (mature vs. young tree stands) and extent of alien tree stands;
- The study area, as well as the surrounding landscape, are fragmented by linear infrastructure including numerous gravel roads and informal vehicle tracks, farm fences, powerline corridors and railway lines; and
- Other anthropogenic activities and infrastructure in the study area that have resulted in habitat loss and disturbance include *inter alia*, farm residences and agriculture structures (barns).

5.4. Vegetation Communities

Seven vegetation communities were identified in the study area during the field survey. These include two communities that are regarded as modified habitats, and five vegetation communities that are classified as natural habitats - albeit with certain areas displaying varying degrees of disturbance from historic and/or current anthropogenic activities:

Modified Habitats

- Cultivated Fields; and
- Alien Tree Plantations.

Natural Habitats

- Dry Mixed Grassland;
- Disturbed Grassland;
- Rocky Grassland;
- Moist Grassland and Wetland; and
- Forested Gorge Habitat.

These vegetation communities are described with accompanying photographs in Sections 5.4.1 to 5.4.7. Vegetation community maps showing the layout of proposed Alternative 1 and Alternative 2 infrastructure are presented in Figure 9 and Figure 10 respectively.

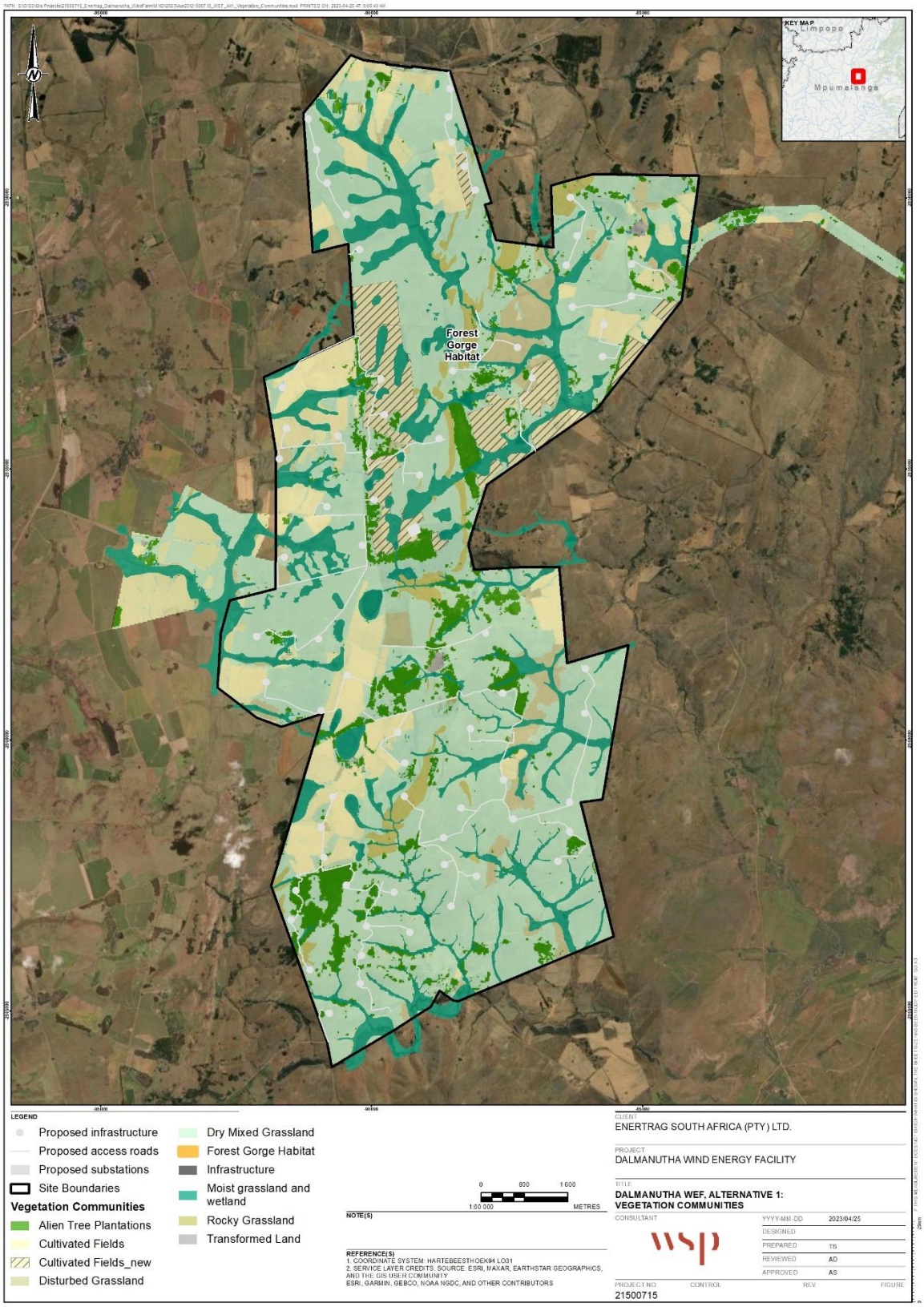

Figure 9: Vegetation community map of the study area and proposed infrastructure for Alternative 1.

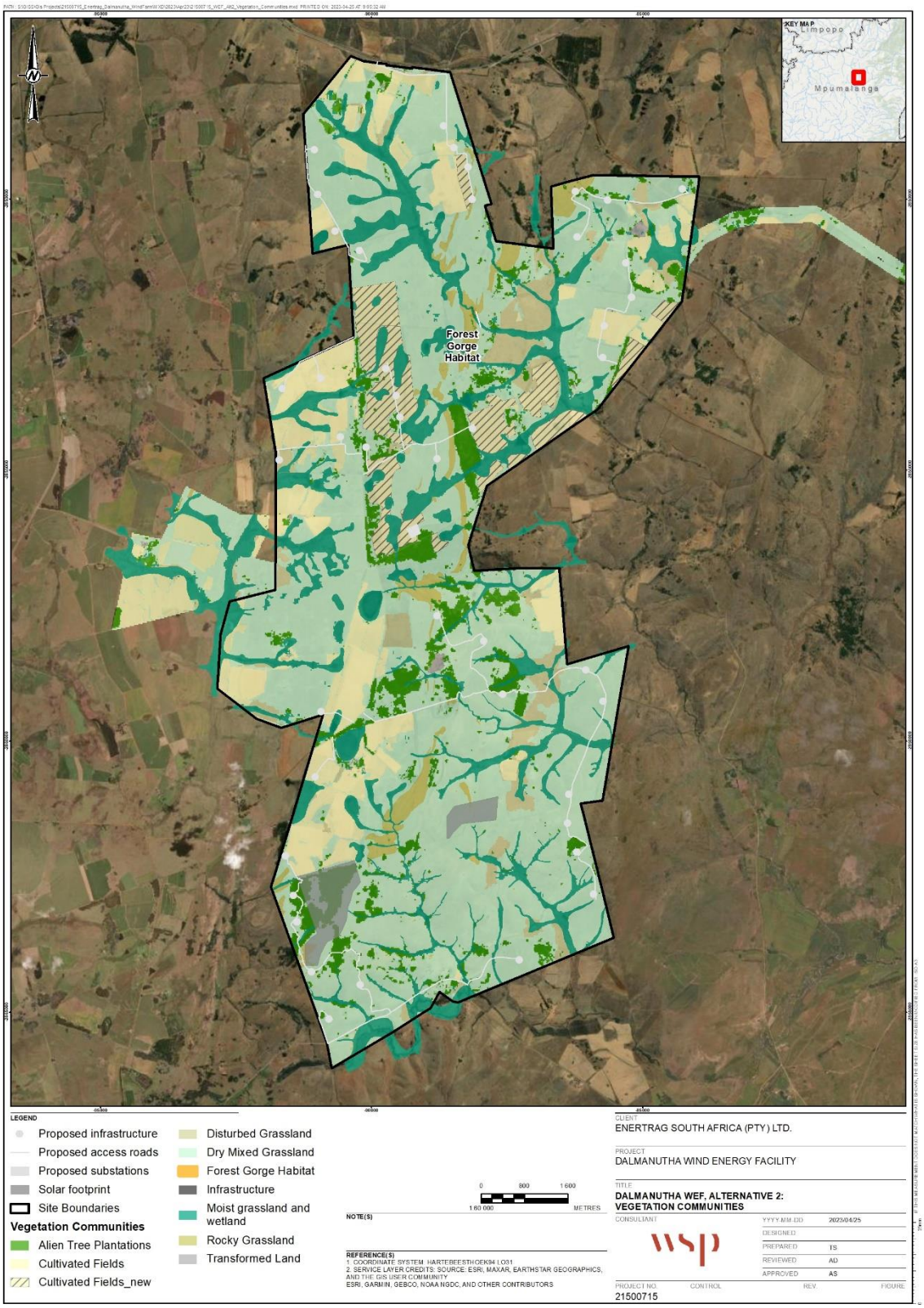

Figure 10: Vegetation community map of the study area and proposed infrastructure for Alternative 2.

5.4.1. Cultivated Fields

Large portions of the study area are characterised by cultivated fields. This community includes actively cultivated agricultural fields that, depending on the time of year and rotational cycles, are lying fallow, have recently been ploughed (shown in Figure 11), or are planted with crops - typically maize or soya. This community also includes cultivated fields that are actively managed as grazing pastures. These fields are dominated by the creeping alien lawn grass *Pennisetum clandestinum* (kikuyu) (Figure 12) and are actively grazed by cattle and sheep.

During the field survey, it was noted that local farmers have recently ploughed over large tracts of grassland in the north of the study area to create new cultivated fields. These areas may not all be reflected in the most recent available Google Earth satellite imagery used to develop the vegetation community map for the study area.

Sensitivity Aspects

Cultivated fields are considered a modified habitat type, that are denuded of indigenous vegetation and are subject to regular anthropogenic disturbance. When not dominated by a monoculture of crop species, these areas are typically colonised by several declared alien invasive species, including *inter alia*; *Argemone ochroleuca, Datura stramonium, Solanum sisymbriifolium* and *Verbena bonariensis*. No flora SCC were recorded in this community and none are considered likely to be present.

Figure 11: Cultivated field, recently ploughed and ready for planting.

Figure 12: A Pennisetum clandestinum dominated cultivated field, managed as a grazing pasture.

5.4.2. Alien Tree Plantations

Stands of alien tree species are common throughout the study area and comprise a closed woodland habitat formation (Figure 13). They range from established wind-rows and timber plantations to informal thickets and infestations. The former category is typically dominated by widely-spaced, large and mature trees comprising alien *Eucalyptus, Pinus* and *Acacia* (wattle) species. Conversely, the latter category is generally characterised by young, densely-spaced *Acacia* (wattle) species – mostly *Acacia dealbata* and *Acacia mearnsii* trees. These infestations are particularly prevalent in valleys in the study area, where they are spreading into adjacent grassland habitats. This vegetation community also includes stands of *Populus x canescens* trees growing in riparian/wetland areas.

Little indigenous vegetation is present in dense, well-established alien tree stands, with herbaceous flora typically supressed or in most cases, largely absent (Figure 14). Where herbaceous vegetation does occur, it is dominated by ruderal grasses and alien weedy taxa, such as *inter alia; Biden pilosa, Solanum sisymbriifolium* and *Tagetes minuta.*

Wood harvesting by local communities for charcoal production was observed throughout the study area, but particularly in the south. This practice is noted to be driving changes in tree size structure, with harvested areas characterised by young emergent saplings and coppice regrowth.

Sensitivity Aspects

Alien tree plantations are a modified habitat type, that are characterised by an almost complete dominance of essentially one or two non-indigenous tree species. No flora SCC were observed in these areas, and the probability of such taxa being present is low.

Figure 13: A large alien tree plantation in the study area.

Figure 14: Alien tree plantation dominated by young Acacia dealbata trees and largely denuded of herbaceous vegetation.

5.4.3. Dry Mixed Grassland

This is a large and variable vegetation community in the study area. Predicated on current and past farming activities, disturbance levels in areas of mixed grassland vary. Upland areas of dry mixed grassland are typically characterised by stony/rocky, shallow soils and less productive herbaceous vegetation, while low lying areas are generally less rocky, have ostensibly deeper soils and higher levels of vegetation productivity. Structurally, this community is characterised by low closed grassland, as per Edwards (1983).

The dry mixed grassland community is characterised by a diverse flora assemblage, comprising a broad mixture of grasses and forb/herb species (Figure 15 and Figure 16). Common grasses recorded in these areas of this community include *inter alia*; *Alloteropsis semialata, Ctenium concinnum, Elionurus muticus, Harpochloa falx, Koeleria capensis, Themeda triandra, Tristachya leucothrix* and various *Eragrostis* species.

Common herbs/forbs recorded in dry mixed grassland include *inter alia*; *Gerbera piloselloides, Haplocarpha scaposa, Hilliardiella aristata,* various *Helichrysum* and *Hypoxis* species*, Pelargonium luridum, Pentanisia angustifolia, Ocimum obovatum* subsp. *obovatum, Lasiosiphon kraussianus, Lasiosiphon capitatus, Senecio coronatus, Syncolostemon pretoriae* and *Tephrosia capensis.*

Woody species generally occur at low abundances in areas of dry mixed grassland and include dwarf shrubs, such as *Parinari capensis* and *Ziziphus zeyheriana,* as well as larger taxa commonly including *Diospyros lycioides, Elephantorrhiza elephantina* and *Seriphium plumosum.* In terms of declared alien invasive species, *Acacia dealbata* and *Acacia mearnsii* were noted to be common invaders throughout this community in the study area, while scattered *Pyracantha angustifolia* trees were also observed to be present in the south of the study area. For a list of flora species recorded during the field survey refer to Appendix C.

Sensitivity Aspects

This is a natural vegetation community that is characterised by a dominance of indigenous flora species. Undisturbed areas of mixed grassland approximate reference conditions. It is noted that areas of dry mixed grassland are susceptible to further colonisation by alien invasive species, particularly wattle trees.

Flora SCC recorded in this community include *Protea parvula* (Near Threatened), *Eucomus autumnalis* (Declining, MP), and several taxa listed as provincially protected, such as *Aloe* species, *Alsophila dregei, Boophone disticha, Cyrtanthus* species, *Gladiolus* species, *Protea caffra* subsp*. caffra* and *Watsonia* species. Based on reviewed literature it is also likely that several additional Red List and/or protected flora species are likely to be present. For further discussion on these taxa and their affinity for this broad vegetation community, refer to Section 5.5.2.

Figure 15: Typical dry mixed grassland in the study area.

Figure 16: Dry mixed grassland, with stands of invasive wattle trees in the background.

5.4.4. Disturbed Grassland

Areas of grassland that have been subject to disturbance – commonly historic cultivation, but also alien species colonisation/clearing - are characterised by secondary grassland vegetation.

Vegetation structure is low closed grassland, as per Edwards (1983). Flora in these areas is less diverse than other vegetation communities, and frequently is characterised by a dominance of *Eragrostis chloromelas* and *Eragrostis curvula* (Figure 17). *Eragrostis* species typically proliferate in grasslands that have been heavily grazed and trampled, or that have elevated soil nitrogen levels resulting from artificial nutrient enrichment from cultivation (read Mentis and Huntley, 1982).

Other grasses recorded in this community include *inter alia; Alloteropsis semialata, Aristida junciformis, Hyparrhenia dregeana, Hyparrhenia hirta* and *Paspalum dilatatum.* Forbs recorded in these areas include indigenous species such as *Helichrysum rugulosum*, *Monopsis decipiens*, as well as several alien taxa, such as *Hypochaeris radicata, Plantago lanceolata, Plantago major, Richardia brasiliensis, Rumex acetosella* and *Solanum sisymbriifolium* (Figure 18). For a list of flora species recorded during the field survey refer to Appendix C.

Sensitivity Aspects

Despite being previously disturbed, this community is considered natural habitat. Flora SCC recorded in this community include *Eucomus autumnalis* (Declining, MP), and it is possible that other SCC are potentially present.

Figure 17: Typical disturbed grassland, dominated by Eragrostis grass species.

Figure 18: Disturbed grassland - recovering from the clearing of alien wattle trees. Note the presence of the invasive weed Solanum sisymbriifolium.

5.4.5. Rocky Grassland

Areas of rocky grassland occur along hillside slopes/ridges in the study area (Figure 19) and are embedded within the broader matrix of dry mixed grassland community. Unlike adjacent areas of dry mixed grassland, this vegetation community is characterised by the prominence of large, protruding rocky outcrops and the relative higher abundance of indigenous woody flora species (Figure 20). In line with Edwards (1983) structural classification, structurally this community is still defined as low open grassland, although certain sites displaying a higher abundance of woody species approximate a more low- to short sparse shrubland structure. Woody vegetation generally occurs however, as scattered individual small trees and shrubs, or clusters of small trees and shrubs.

In terms of composition, *Diospyros lycioides* is the most common woody species, with several other taxa also frequently recorded, including *Lopholaena coriifolia, Phymaspermum athanasioides, Searsia discolor*, *Searsia dentata* and *Searsia tumulicola.* Although not generally abundant, *Aloe arborescens*, *Cussonia paniculata* and *Halleria lucida* were also recorded in this community. Consistent with all are other vegetation communities in the study area, areas of rocky grassland are susceptible to encroachment from alien wattle species, i.e., *Acacia dealbata* and *Acacia mearnsii* (shown in Figure 21).

The herbaceous layer is characterised by various grasses such as *inter alia, Alloteropsis semialata, Aristida aequiglumis, Cymbopogon caesius, Diheteropogon filifolius, Elionurus muticus, Eragrostis chloromelas, Koeleria capensis, Melinis nerviglumis* and *Tristachya leucothrix,* as well as ferns including *Pellaea calomelanos var. calomelanos, Pteridium aquilinum* and *Selaginella dregei*, and various forbs/herbs and shrublets, such as *Hypoxis* species*, Indigofera daleoides, Indigofera melanadenia* and *Syncolostemon eriocephalus.* For a list of flora species recorded during the field survey refer to Appendix C.

Sensitivity Aspects

Rocky grasslands constitute natural habitat. These areas are characterised by a dominance of indigenous flora species, with many recorded flora taxa showing a particular affinity for rocky areas. Disturbance levels are generally low, although localised sites have been colonised by alien wattle trees. Flora SCC recorded in this community include *Merwilla plumbea* (Near Threatened), and several taxa listed as provincially protected, such as various *Aloe* species and *Gladiolus* species.

Based on reviewed literature it is also likely that several additional Red List and/or protected flora species are likely to be present in this vegetation community, including amongst several others, *Riocreuxia aberrans, Aloe reitzii var. reitzii, Streptocarpus denticulatus, Eulophia cooperi* and *Schizochilus cecilii subsp. culveri.* For further discussion on flora SCC and their habitat preferences, refer to Section 5.5.2.

Figure 19: Prominent stretch of rocky grassland occurring along a hillside in the study area.

Figure 20: Large rock outcrops and a higher abundance of woody vegetation characterise the rocky grassland vegetation community.

Figure 21: Rocky outcrop with colonised by alien wattle species. The indigenous Diospyros lycioides is also present.

5.4.6. Moist Grassland and Wetland

This vegetation community is aligned with vegetation associated with the moist soils that characterise wetland systems and drainage areas, as well as around pans and artificial dams in the study area (Figure 22 and Figure 23).

Vegetation structure ranges from low- to tall closed grassland (*sensu*. Edwards 1983). Most areas are grass and sedge dominated, with several grass species common. These include *Agrostis lachnantha, Arundinella nepalensis, Eragrostis gummiflua, Eragrostis plana, Imperata cylindrica, Paspalum dilatatum*.* Other common graminoid taxa recorded in this community include various *Cyperus* species, *Juncus effusus, Juncus lomatophyllus* and *Schoenoplectus brachyceras.* The tall reed *Phragmites australis,* as well as the bulrush *Typha capensis* are also abundant in certain areas.

Common forbs recorded in this community include *inter alia, Berkheya setifera, Centella asiatica*, Haplocarpha scaposa, Helichrysum aureonitens, Hypochaeris radicata*, Senecio inornatus, Senecio isatidioides, Rumex acetosella** and *Trifolium repens*.*

Common woody species recorded in this community include *Seriphium plumosum*, as well as the alien species *Populus x canescens* and *Salix babylonica. Populus x canescens* former species is a

notable invader of wetland habitats and is capable of forming large dense infestations. For a list of flora species recorded in this community during the field survey refer to Appendix C.

Sensitivity Aspects

The moist grassland and wetland vegetation community constitutes natural habitat. Several flora SCC have been recorded in this community. These include several protected orchid species, as well as *Eucomus autumnalis* (Declining, MP) and the provincially protected *Cyrtanthus breviflorus* and *Watsonia* species. Based on reviewed literature it is also likely that several other flora SCC are likely to be present. For further discussion on flora SCC, refer to Section 5.5.2.

Figure 22: Typical area of moist grassland in the study area.

Figure 23: Stream flanked by various reeds, grasses and sedges, as well as scattered alien Salix babylonica trees.

5.4.7. Forested Gorge Habitat

Forested gorge habitat is the smallest vegetation community, and is confined to a short section of a deeply-incised valley bottom along a stream in the centre of the study area – see Figure 24.

Vegetation structure along the stream channel is defined as short- to tall forest or closed woodland, as per Edwards (1983) structural classification. Woody vegetation is characterised by defined lower- and upper strata, while the herbaceous layer is generally poorly developed (Figure 25).

In terms of composition, common tall tree species recorded in the upper woody stratum include *Celtis africana, Ilex mitis* and *Kiggelaria africana,* while common species recorded in the lower woody stratum include, *inter alia; Afrocanthium mundianum, Diospyros whyteana, Myrsine africana* and *Scolopia mundii.* Along the forest fringes, several other woody species were noted including *Buddleja saligna, Buddleja salviifolia, Diospyros lycioides* and *Rhoicissus tridentata*.

Various shrubs, succulents and small trees grow on the steep rocky cliffs of the gorge above the forest patch, including *Aloe arborescens, Alsophila dregei* and *Lopholaena coriifolia.* Large stands of alien *Acacia dealbata* and *Acacia mearnsii* trees are present immediately downstream of the forest patch, and these taxa are present as scattered individual trees in the forest itself. For a list of flora species recorded during the field survey refer to Appendix C.

Sensitivity Aspects

Unlike alien tree plantations, which constitute the only other woodland formation in the study area, this small community is dominated by indigenous woody species and accordingly, it is unique within the context of the grassland dominated study area. The combination of indigenous forest, flanked by tall, vegetated rocky cliffs, contributes significantly to local-scale habitat heterogeneity, as well as the overall botanical diversity of the study area.

Alien wattle trees are present, and are likely to continue to establish and spread into this community. In terms of flora SCC, *Ilex mitis* var. *mitis* (Declining, MP) was recorded and considering the high degree of micro-habitat diversity associated forested gorge habitat, it is also highly likely that other Red List and/or protected flora species are likely to be present. For further discussion on flora SCC, refer to Section 5.5.2

Figure 24: Steep, rocky cliffs covered by various shrubs and succulents.

Figure 25: Well-developed indigenous forest along the valley bottom.

5.5. Floristic Analysis

5.5.1. General Floristics

In total, 254 flora species, representing 75 families, were identified during the field survey. The most represented family is the Asteraceae with 43 species, followed by the Poaceae with 40 species and Fabaceae with 13 species (Appendix C).

The majority of identified species are indigenous taxa (80%), with the remaining 20% alien taxa. Forbs/herbs are the most abundant growth form with 124 species, followed by 59 graminoid species, 32 trees, 27 shrubs/dwarf shrubs, 6 succulents, 5 ferns and 1 climber.

5.5.2. Flora Species of Conservation Concern

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

As they are subject to national and/or provincial environmental legislation and require specific conservation management, flora species listed as 'Protected' or 'Specially Protected' on the on the

NEMBA ToPS List (2007) and Mpumalanga Nature Conservation Act (Act No. 10 of 1998) are also included as flora species of conservation concern and discussed in this section.

Flora SCC Potentially Present in the Study Area

Based on reviewed botanical datasets and data collected in the study area during the field survey, up to 79 flora SCC occur or potentially occur in the study area (Table 4 and Table 5). These include:

- Fifty species that are listed on the national Red List and/or the Mpumalanga provincial Red List. A summary is presented in Table 3, and a full species list, including habitat preferences, and a 'probability of occurrence' (as informed by habitat suitability assessments) is presented in Table 4;
- One species (*Merwilla plumbea*) listed on the NEMBA ToPS List (2007);
- Thirty-six species that are not on the national and provincial Red Lists, but nonetheless are listed as 'Protected' in the province, according to the Mpumalanga Nature Conservation Act (Act No. 10 of 1998) (Table 5).

Table 3: Summary of the number of nationally and provincially Red List flora species occurring/potentially occurring in the study area.

Status	National Red List	Mpumalanga Red List
Critically Endangered (Possibly Extinct)	1	1
Endangered	3	1
Vulnerable	16	15
Near Threatened	7	8
Rare	6	15
Declining	0	6
Data Deficient	1	1

Nationally and provincially Red List taxa represent 20 different families, with the Orchidaceae the most represented with nine species, followed by Iridaceae and Hyacinthaceae with six species, and the Apocynaceae and Asphodelaceae with five species each.

Note: As per the species assessment guidelines, the name 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'.

Flora SCC Recorded in the Study Area

Four national/provincial Red List species were recorded in the study area during the 2022 field survey:

- *Merwilla plumbea* (Figure 26) is listed as Near Threatened on both the national and provincial Red Lists, as well as Vulnerable on the NEMBA ToPS List (2007). This species was recorded along a ridge and at isolated rocky outcrops in the south of the study area (refer to Appendix D). At these locations, it was noted to be growing in fairly large colonies (e.g., at one site an estimated colony of 50 to 100 plants was observed, while aggregations of ± 10 plants were noted three other locations). It is anticipated that this species is also likely to be present at other nearby sites of similar habitat, as well as across the broader study area;

- *Eucomis autumnalis* (Declining, MP) (Figure 27) is fairly abundant in the study area and was recorded at several locations, including at disturbed locations (Appendix D). It was documented at variable abundances ranging from 2 to ±50 plants. *Eucomis autumnalis* is highly sought-after for its medicinal use ();
- *Ilex mitis* var. *mitis* (Declining, MP) was recorded along the stream in the small patch of forest gorge habitat in the centre of the study area (Appendix D). This species is highly unlikely to occur outside of this vegetation community; and
- *Protea parvula* (Near Threatened) (Figure 28) was recorded at two locations dry mixed grassland in the north of the study area (Appendix D). It is likely to occur in grassland habitat throughout the study area.

In addition, four orchid species listed as Rare on the Mpumalanga Red List have been recorded in the north of study area by G. Lockwood. These include *Eulophia cooperi, Habenaria anguiceps, Habenaria humilior* and *Habenaria laevigata* – refer to Table 4.

In terms of flora listed as protected according to the Mpumalanga Nature Conservation Act (Act No. 10 of 1998), 12 protected taxa were recorded in the study area during the field survey, while an additional 28 protected orchid taxa have previously been recorded in the north of the study area by G. Lockwood. These species are listed in Table 5, along with their habitat preferences.

Figure 30 and Figure 31 show the proposed Alternative 1 and Alternative 2 infrastructure layouts in relation to the locations of flora SCC recorded in the study area during the 2022 field survey and based on data received from G. Lockwood. The co-ordinates of these flora SCC are presented in Appendix D.

Considering the extent of natural habitat and relatively high degree of habitat heterogeneity in the study area, it is likely that several additional flora SCC are present and many of these could potentially be impacted by proposed Project activities. Rocky grassland and moist grassland and wetland habitats are favoured by many of the species listed in Table 4 and Table 5, which highlights the botanical importance of these communities.

Figure 26: Merwilla plumbea (Near Threatened)

Figure 27: Eucomis autumnalis (Declining, MP)

Figure 28: Protea parvula (Near Threatened)

Figure 29: Boophone disticha (Protected)

Table 4: List of flora species listed as nationally and provincially threatened or considered of conservation concern recorded and potentially occurring in the study area.

Family	Scientific Name	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
Aizoaceae	*Khadia alticola*	Rare	Rare	-	This species favours high-altitude grasslands in shallow, sandy humus-rich soils in rocky areas (Victor, 2005).	Probable – Suitable habitat present.
Aizoaceae	*Khadia carolinensis*	Vulnerable	Vulnerable	-	Range-restricted species, occurring in Highveld grasslands between 1700m. Favours on well-drained sandy loam soils amongst rock outcrops, or along the edges of sandstone sheets (Lötter, *et al.*, 2007)	Probable – Suitable habitat present.
Amaryllidaceae	*Crinum bulbispermum*	Least Concern	Declining	Protected	Wetland species, occurs along rivers and streams and near pans and depressions (Williams, *et al.*, 2016b)	Probable – Suitable habitat present.
Apocynaceae	*Asclepias dissona*	Critically Endangered (Possibly Extinct	Critically Endangered (Possibly Extinct	-	Species not recorded since 1932. Favours damp grassland. Habitat has been degraded and it is thought extinct (von Staden, 2016).	Unlikely – species is considered 'Possibly Extinct'.
Apocynaceae	*Miraglossum davyi*	Vulnerable	Vulnerable	-	Found on sloping grasslands in heavy black loam soils at high altitudes. Known from only five locations, with an EOO of <15 000km^2.	Probable – Suitable habitat present.
Apocynaceae	*Pachycarpus suaveolens*	Vulnerable	Vulnerable	-	Favours short, annually burnt grassland between 1400-2000 m. Known from eight locations with an EOO of 19 900 km^2.	Probable – Suitable habitat present.
Apocynaceae	*Riocreuxia aberrans*	Near Threatened	Near Threatened	-	Found in the cracks of rocks in exposed quartzite ridges in grassland habitats (Lötter et al. 2012).	Probable – Suitable habitat present.
Aquifoliaceae	*Ilex mitis var. mitis*	Least Concern	Declining	-	Found long rivers and streams in forest and thicket.	Recorded (2022 field survey)
Araceae	*Zantedeschia pentlandii*	Vulnerable	Vulnerable	Protected	Range-restricted species, with a EOO of 12 000 km^2. Favours rocky hillsides in Sekhukhuneland, as well as the Steenkampsberg Montane Grassland (Victor & Siebert, 2006).	Probable – Suitable habitat present.
Asphodelaceae	*Aloe reitzii* var. *reitzii*	Near Threatened	Near Threatened	Protected	Restricted range species (EOO 4952-6488 km^2), known from more than 10 locations. Favours rocky slopes and granite outcrops in montane grassland (Mtshali, *et al.,* 2018).	Probable – Suitable habitat present.
Asphodelaceae	*Kniphofia rigidifolia*	Least Concern	Rare	Protected	Among rocky outcrops on grassy plateaus.	Probable – Suitable habitat present.
Asphodelaceae	*Kniphofia typhoides*	Near Threatened	Near Threatened	Protected	Favours low-lying wetland habitats in *Themeda triandra* grassland on heavy black clay soils (von Staden & Victor, 2005).	Probable – Suitable habitat present.
Asteraceae	*Callilepis leptophylla*	Least Concern	Declining	-	Widespread species (EOO 156 000 km^2) that occurs in rocky outcrops and hillslopes in grassland and savanna (Victor, 2016).	Probable – Suitable habitat present.
Asteraceae	*Cymbopappus piliferus*	Vulnerable	Vulnerable	-	Restricted range species (EOO 1635 km^2), known from six to seven locations. Prefers rocky quartzitic ridges in montane grassland (van Staden and Lötter, 2016)	Probable – Suitable habitat present.
Fabaceae	*Lessertia phillipsiana*	Data Deficient – Insufficient Information	Data Deficient	-	Widespread species, but very poorly known. Habitat preferences unknown, but thought to include rocky hills or plains (Von Staden, 2016).	Possible – Suitable habitat present.

Family	Scientific Name	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
Fabaceae	*Pearsonia hirsuta*	Vulnerable	Vulnerable	-	Known from four locations. Prefers humus-rich sandy soils and grows in patches between rocks (Manyama, 2008)	Probable – Suitable habitat present.
Gesneriaceae	*Streptocarpus denticulatus*	Vulnerable	Vulnerable	-	Range-restricted species, known from less than five locations. Favours damp, shady crevices with rocky overhangs in areas of rocky outcrops in grasslands (Lötter, *et al*., 2005).	Probable – Suitable habitat present.
Gesneriaceae	*Streptocarpus latens*	Rare	Rare	-	Range-restricted species, with a EOO of <150 km^2. Favours moist, moss-covered rock crevices at around 2225 m (Truter & Daniels, 2005).	Probable – Suitable habitat present.
Gunneraceae	*Gunnera perpensa*	Least Concern	Declining	-	Widespread, but threatened species. Favours damp marshy areas and wetlands up to 2400 m.	Probable – Suitable habitat present.
Hyacinthaceae	*Bowiea volubilis*	Vulnerable	Vulnerable	Protected	Found in open woodland and steep rocky hills in shady situations at low- and medium altitudes (Raimondo, *et al*., 2007)	Unlikely. Subpopulation are not recorded around study area.
Hyacinthaceae	*Eucomis autumnalis*	Least Concern	Declining	Protected	Favours damp open places (Williams, *et al.,* 2016c)	Recorded (2022 field survey)
Hyacinthaceae	*Eucomis montana*	Least Concern	Declining	Protected	Widespread species (EOO 30 000km^2) that Favours rocky montane grassland in Mpumalanga and Swaziland (Williams, *et al*., 2016d).	Probable – Suitable habitat present.
Hyacinthaceae	*Eucomis pallidiflora* subsp. *pole-evansii*	Near Threatened	Near Threatened	-	Restricted range species (AOO <1000 km^2), known from 18 locations. Favours wetland habitats, with standing water in grassland ecosystem (Lötter, *et al.,* 2006a).	Probable – Suitable habitat present.
Hyacinthaceae	*Merwilla plumbea*	Near Threatened	Near Threatened	Protected	Favours rocky grassland areas on steep well drained slopes between 300 – 2500 m (Williams, *et al.,* 2008).	Recorded (2022 field survey)
Iridaceae	*Gladiolus calcaratus*	Least Concern	Vulnerable	Protected	Known from 12 subpopulations with a EOO of 11 500 km^2. Prefers grassy slopes in deep soils or around the edges of wetlands (Goldblatt & Naidoo, 2005).	Probable – Suitable habitat present.
Iridaceae	*Hesperantha bulbifera*	Rare	Rare	-	Widespread but rare species that favours wet cliffs in the spray of waterfalls (Von Staden, 2017).	Probable – Suitable habitat present.
Iridaceae	*Moraea robusta*	Least Concern	Rare	-	Favour montane grassland.	Probable – Suitable habitat present.
Iridaceae	*Watsonia occulta*	Least Concern	Rare	-	Favours montane grassland.	Probable – Suitable habitat present.
Orchidaceae	*Centrostigma occultans*	Least Concern	Rare	-	Occurs in wetland and marshy habitats between 1250 and 1700 m in Mpumalanga and Limpopo Province (Zimbabwe Flora website).	Probable – Suitable habitat present.
Orchidaceae	*Eulophia cooperi*	Least Concern	Rare	Protected	Widespread species. Found on rocky quartzite ridges between 1000 and 1800 m.	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Eulophia parvilabris*	Least Concern	Rare	Protected	Favour moist slopes and flats in montane grassland habitat (Johnson *et al.,* 2015).	Probable – suitable habitat present.
Orchidaceae	*Habenaria anguiceps*	Least Concern	Rare	Protected	Little information available on habitat preferences. Presumed to favour montane grassland habitat.	Recorded (pers. comms. G. Lockwood)

Family	Scientific Name	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
Orchidaceae	*Habenaria humilior*	Least Concern	Rare	Protected	Damp grassland habitat from 900-2000 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Habenaria laevigata*	Least Concern	Rare	Protected	Favour well-drained stony grassland habitat from 660 -2200 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Schizochilus cecilii* subsp. *culveri*	Rare	Rare	Protected	Grows on damp rocky ledges on steep grassland slopes. Known from 9-11 scattered subpopulations with an EOO of 1885km^2 (Von Staden, *et al.,* 2009).	Probable – Suitable habitat present.
Proteaceae	*Protea parvula*	Near Threatened	Near Threatened	Protected	Species prefers rocky grassland habitats on acidic soils between 1300 to 2150 m (Rebelo, 2009).	Recorded (2022 field survey)
Rosaceae	*Prunus africana*	Vulnerable	Vulnerable	-	Occurs in mistbelt and afromontane forest up to 2100 m (Williams *et al.,* 2008b).	Possible – Suitable habitat present.
Scrophulariaceae	*Jamesbrittenia macrantha*	Near Threatened	Near Threatened	-	A Sekhukhuneland endemic, known from 11 location and with a EOO of 1800 km^2. Favours grassy slopes with scattered woody plants on norite (Burrows, *et al.,* 2006).	Unlikely – recorded in the Sekhukhuneland.
Thymelaeaceae	*Gnidia variabilis*	Vulnerable	Vulnerable	-	This species is known from only one location in Mpumalanga. It is found in well-drained grassland, between 900 -1800 m (Lötter, *et al.,* 2006b).	Probable – Suitable habitat present.
-	Sensitive species 998	Endangered	-	-	Favours forest margins, drainage lines and islands within wetlands. Also occurs on west and south facing mountain slopes.	Probable – Suitable habitat present.
-	Sensitive species 1219	Vulnerable	Vulnerable	Protected	Occurs in seasonally moist, high-altitude montane grasslands between 1800-2300 m.	Probable – Suitable habitat present.
-	Sensitive species 979	Vulnerable	-	-	Poorly known species. Likely present at four locations. Favours montane grassland in moist areas between 1700-1950 m.	Probable – Suitable habitat present.
-	Sensitive species 313	Endangered	-	Protected	Widespread, but exceptionally rare species. Population estimated at approximately 2500 individuals spread over 20 locations. Favours open grassland between 400 to 1800 m.	Probable – Suitable habitat present.
-	Sensitive Species 1252	Vulnerable	Vulnerable	Protected	Moist bushveld habitats, including wooded mountain kloofs.	Possible – Suitable habitat present.
-	Sensitive species 1086	Endangered	Endangered	Protected	Known from fewer than five locations, with an estimated EOO of 122 km^2. Occurs in wetlands and moist grassland between 1500 to 2000m.	Probable – Suitable habitat present.
-	Sensitive species 1201	Vulnerable	Vulnerable	Protected	Range-restricted species (EOO 400 km^2) known from six locations. Grows along dolerite outcrops in grassland habitats along the Mpumalanga escarpment at around 200 masl.	Possible – Suitable habitat present.
-	Sensitive species 41	Vulnerable	Vulnerable	Protected	Widespread bur rare species, with a EEO of <19 940 km^2 and a AOO of <2000 km^2. Favours high altitude wetlands that remain damp throughout the year.	Possible – Suitable habitat present.
-	Sensitive species 311	Rare	Rare	Protected	Known from ten sites in the Mpumalanga Drakensberg. Favours quartzitic rocky outcrops in montane grassland, between 1200-2200 masl.	Probable – Suitable habitat present.

Family	Scientific Name	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
-	Sensitive species 691	Vulnerable	Near Threatened	-	EOO is between 455 and 11 158 km^2, and though to occur at less than 10 locations. Prefers moist areas in undulating grassland.	Probable – Suitable habitat present.
-	Sensitive species 321	Rare	Rare	Protected	High altitude specialist that is known from fewer than 10 subpopulations. Favours montane and subalpine grassland on grassy, moist and stony slopes between 1600 and 3000 m.	Probable – Suitable habitat present.

Table 5: Flora species listed as Protected in Mpumalanga Province that have been recorded in the study area.

Family	Scientific Name	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
Araceae	*Zantedeschia rehmannii*	Least Concern	-	-	Favours rocky grassland and bush margins (Manning, 2009)	Recorded (2022 field survey)
Amaryllidaceae	*Boophone disticha*	Least Concern	Least Concern	Protected	Widespread species favouring dry grassland and rocky areas (Williams, *et al.,* 2016a).	Recorded (2022 field survey) (Figure 29)
Amaryllidaceae	*Cyrtanthus breviflorus*	Least Concern	-	Protected	Grassland and damp marshy habitats (Van Wyk and Malan, 1998)	Recorded (2022 field survey)
Amaryllidaceae	*Cyrtanthus contractus*	Least Concern	-	Protected	Occurs in areas of grassland (Pooley, 2005).	Recorded (2022 field survey)
Asphodelaceae	*Aloe arborescens*	Least Concern	-	Protected	Common and widespread species, that occurs in dense bush and exposed rocky ridges (van Wyk and Smith, 2014).	Recorded (2022 field survey)
Asphodelaceae	*Aloe ecklonis*	Least Concern	-	Protected	Occurs in areas of grassland of the escarpment (van Wyk and Smith, 2014).	Recorded (2022 field survey)
Asphodelaceae	*Aloe cf. graciliflora*	Least Concern	-	Protected	Favours open grassland, often in rocky areas (van Wyk and Smith, 2014).	Recorded (2022 field survey)
Asphodelaceae	*Aloe verdoorniae*	Data Deficient - Taxonomy	-	Protected	Occurs in areas of grassland of the escarpment (van Wyk and Smith, 2014).	Recorded (2022 field survey)
Cyatheaceae	*Alsophila dregei*	Least Concern	-	Protected	Widespread species, found in thick scrub along mountain streams. (Crouch, *et al.,* 2011)	Recorded (2022 field survey)
Iridaceae	*Gladiolus longicollis subsp. platypetalus*	Least Concern	-	Protected	Common and widespread species in grassland habitats.	Recorded (2022 field survey)
Iridaceae	*Gladiolus woodii*	Least Concern	-	Protected	Common and widespread species in grassland habitats.	Recorded (2022 field survey)
Orchidaceae	*Brownleea parviflora*	Least Concern	-	Protected	Widespread species, favouring damp grassland and rocky sites from sea level to 1300 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Pterygodium dracomontanum*	Least Concern	-	Protected	Widespread species, occurring in grasslands from sea level to 3000 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)

Family	Scientific Name	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
	(=Corycium dracomontanum)					
Orchidaceae	*Disa aconitoides*	Least Concern	-	Protected	Favours damp grasslands from sea level to 2200 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Disa baurii*	Least Concern	-	Protected	Widespread species, occurring in both damp to well-drained grasslands, from 150 to 2000 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Disa chrysostachya*	Least Concern	-	Protected	Damp and marshy areas, from sea level to 2200 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Disa cooperi*	Least Concern	-	Protected	Favours dry to damp grasslands, from 1450 to 2200 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Disa versicolor*	Least Concern	-	Protected	A widespread species that favours dry to damp grasslands, from sea level to 2400 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Disperis anthoceros*	Least Concern	-	Protected	Occurs in forested habitats in rocky areas and along streams, from 600 to 1800 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Disperis micrantha*	Least Concern	-	Protected	Favours moist shaded locations among rocks, from 100 to 1800 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Disperis tysonii*	Least Concern	Least Concern	Protected	Damp grassy slopes on sandstone or quartzite, from 1200 to 2300 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Eulophia hians* var. *hians*	Least Concern	-	Protected	Widespread species. Occurs in grasslands, from sea level to 2200 m (Johnson *et al.,* 2015).	Recorded (2022 field survey & pers. comms. G. Lockwood)
Orchidaceae	*Eulophia hians* var. *nutans*	Least Concern	-	Protected	Widespread species. Occurs in grassland and marshy areas, from sea level to 1800 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Eulophia ovalis*	Least Concern	-	Protected	Widespread species. Occurs in open grassland (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Habenaria dives*	Least Concern	-	Protected	Favours well-drained grassland habitat, between 15 -2300 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Habenaria dregeana*	Least Concern	-	Protected	Widespread species. Favours grassy slopes, between 300 -2000 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Habenaria filicornis*	Least Concern	-	Protected	Common species, occurring in seasonally damp or marshy grasslands, between 400 -2000 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Habenaria galpinii*	Least Concern	-	Protected	Damp grasslands on rocky hillsides and along streams, between 900 -2000 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Habenaria nyikana*	Least Concern	-	Protected	Common species, occurring damp grasslands, between 600 - 1700 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Habenaria pseudociliosa*	Least Concern	-	Protected	Favours damp grasslands, from sea level to 1800 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Habenaria tysonii*	Least Concern	-	Protected	Favours damp rocky slopes in grasslands, from sea level to 2150 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Neobolusia tysonii*	Least Concern	Least Concern	Protected	Common species, found in moist montane grassland, from 350 to 2350 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)

Family	Scientific Name	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
Orchidaceae	*Orthochilus foliosus*	Least Concern	-	Protected	Widespread species, found in sour grassland, from sea level to 2000 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Orthochilus leontoglossus*	Least Concern	-	Protected	Dry to moderately moist grassland, from sea level to 2200 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Orthochilus welwitschii*	Least Concern	-	Protected	Dry to marshy grassland, from 200 to 1800 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Satyrium cristatum var. longilabiatum*	Least Concern	-	Protected	Favours marshy grassland, from 1000 to 1000 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Satyrium longicauda*	Least Concern	-	Protected	Favours moist grassland on peaty soils, from sea level to 2300 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Satyrium trinerve*	Least Concern	-	Protected	Widespread species, occurring in moist black soils, from sea level to 2300 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Schizochilus zeyheri*	Least Concern	-	Protected	Common in moist grassland, from sea level to 2000 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Proteaceae	*Protea caffra*	Least Concern	-	Protected	Widespread species, favouring open wooded grassland.	Recorded (2022 field survey)

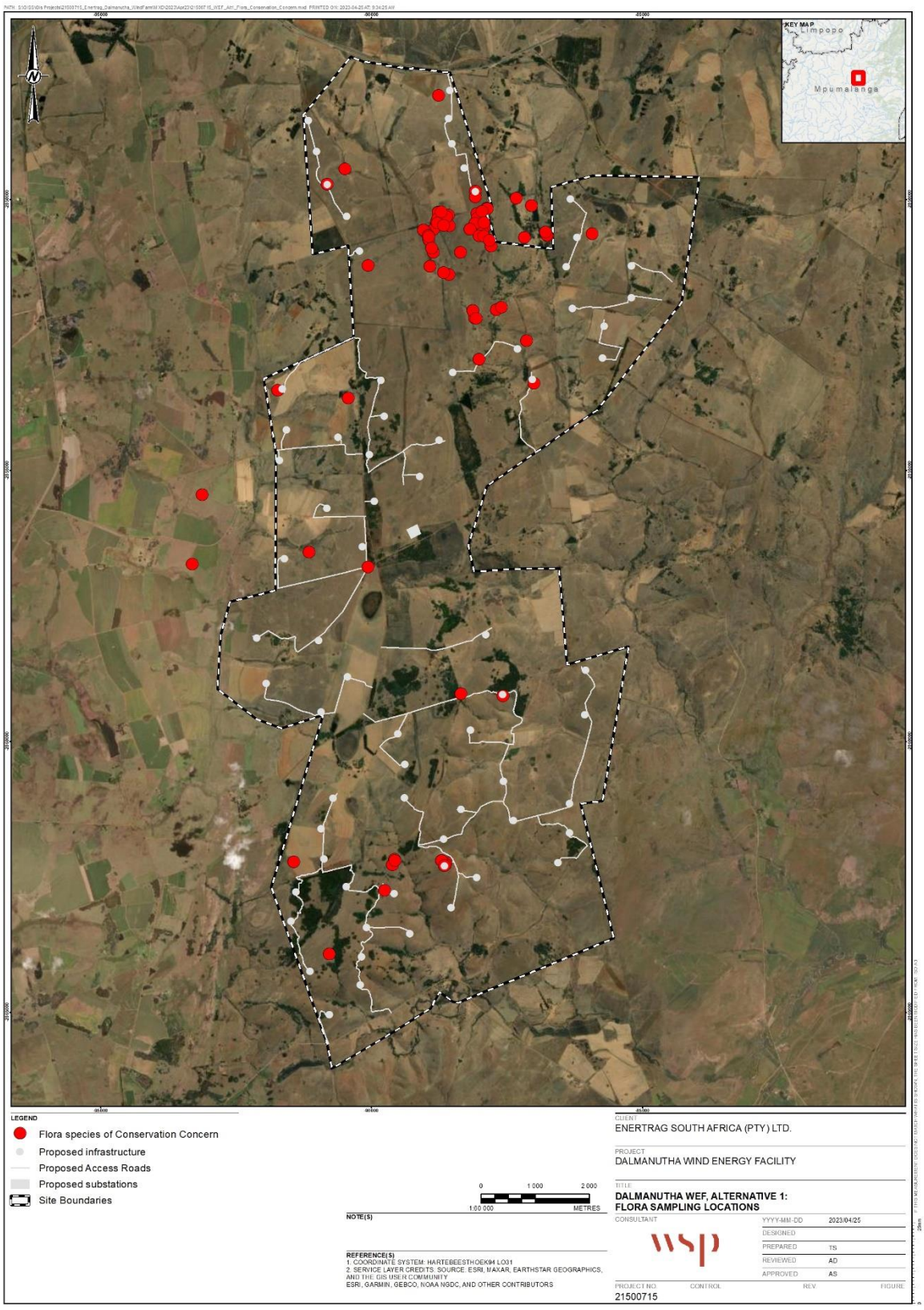

Figure 30: Alterative 1 infrastructure layout and the location of flora species of conservation concern recorded during the field survey and based on data received from G. Lockwood.

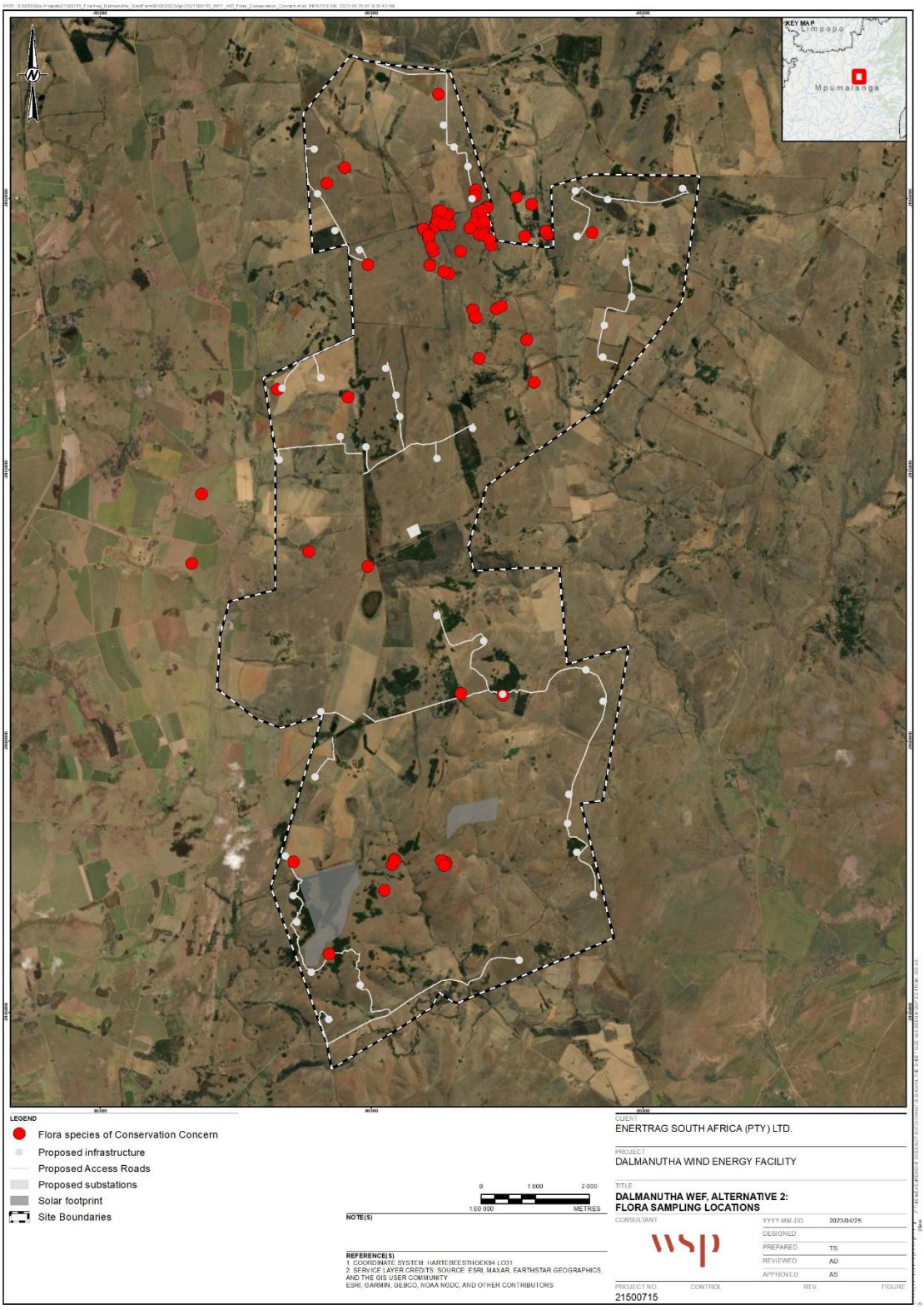

Figure 31: Alterative 2 infrastructure layout and the location of flora species of conservation concern recorded during the field survey and based on data received from G. Lockwood.

5.5.3. Declared Alien Invasive Species

Twenty NEMBA declared alien invasive plant species were recorded in the study area during the field survey - listed in Table 6. For a list of declared alien invasive plant species recorded in the different vegetation communities during the field survey, refer to Appendix C

Twelve species are trees, while the remaining eight taxa are herbaceous forbs. Many of these taxa are confined to disturbed sites, such as roadsides, kraals and farm residences and infrastructure. The most widespread and prominent species that occur beyond disturbed areas are the alien wattle trees *Acacia dealbata and Acacia mearnsii,* and the herbaceous *Solanum sisymbriifolium*.

Acacia dealbata and Acacia mearnsii are a particular concern. These species spread rapidly via seed dispersal, and occur as numerous scattered individuals or on dense stands in all vegetation communities across the study area. These stands will continue to expand into adjacent habitats, where they will compete with and ultimately replace indigenous grass and tree species.

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

Scientific Name	Common Name	Growth Form	NEMBA Category
Acacia dealbata	Silver Wattle	Tree	2
Acacia mearnsii	Black Wattle	Tree	3
Acacia melanoxylon	Blackwood	Tree	2
Acer buergerianum	Chinese Maple	Tree	2
Argemone ochroleuca	White-flowered Mexican Poppy	Herbaceous forb	1b
Casuarina equisetifolia	Horsetail Tree	Tree	2
Cirsium vulgare	Spear Thistle	Herbaceous forb	1b
Datura stramonium	Common Thorn-apple	Herbaceous forb	1b
Eucalyptus spp.	Gum	Tree	1b or 2
Morus alba	Mulberry	Tree	3
Pennisetum clandestinum	Kikuyu	Graminoid	1b
Populus x canescens	Grey Poplar	Tree	2
Phytolacca octandra	Forest Inkberry	Herbaceous plant	1b
Pinus patula	Patula Pine	Tree	2
Pyracantha angustifolia	Yellow Firethorn	Tree	1b
Salix babylonica	Weeping Willow	Tree	-
Solanum sisymbriifolium	Dense-throned Bitter Apple	Herbaceous forb	1b
Solanum mauritianum	Bugweed	Tree	1b
Verbena bonariensis	Verbena	Herbaceous forb	1b
Verbena rigida	Veined Verbena	Herbaceous forb	1b

5.5.4. Flora of Medicinal Value

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

Table 7: Flora species of medicinal value recorded in the study area.

Scientific Name	Medicinal Use*
Aloe arborescens	Leaves are used to treat wounds, burns and various skin irritations.
Asparagus sp.	Used in the treatment of tuberculosis, kidney ailments and rheumatism.
Boophone disticha	Bulbs scales are used to treat boils and septic wounds, as well as alleviate pains.
Centella asiatica	Used to treat leprosy, wounds and cancer.
Datura stramonium	Relieves asthma and acts to reduce pain. Weak infusions are used as an aphrodisiac.
Elephantorrhiza elephantina	Used as a remedy for diarrhoea and dysentery, stomach ailments and haemorrhoids.
Eucomus autumnalis	Bulb decoction used to treat lower back pain. Other treatments include, amongst others, urinary diseases, stomach aches and fevers.
Lasiosiphon kraussiana	Toxic plant that is used to treat snake bites, burns and stomach complaints.
Gomphocarpus fruticosus	Dried leaves are used to treat headaches and tuberculosis. The roots are purported to treat stomach pain and general body ache.
Helichrysum species	Treats a variety of afflictions, including coughs, colds, fever, headaches and infections.
Hypoxis species	Infusions of the corm are used to treat dizziness, bladder disorders and insanity.
Merwilla plumbea	Taken as an enema to treat female infertility and enhance male libido.
Pelargonium luridum	Taken orally to treat diarrhoea and dysentery.
Pellaea calomelanos	Used to treat boils and abscesses and for internal parasites.
Pentanisia prunelloides	Treats a variety of afflictions including vomiting, chest pain, toothache, vomiting and haemorrhoids
Rumex crispus	Used as a remedy for internal parasites, as well as vascular diseases and internal bleeding.
Scabiosa columbaria	Used to treat colic and heartburn.
Typha capensis	Decoctions used to treat venereal disease, as well as diarrhoea, dysentery and enhance male libido.
Vernonia species	Infusions to treat abdominal pain and colic.
Xysmalobium undulata	Roots are sed to treat diarrhoea and colic.
*Medicinal use, as per Van Wyk, *et al*. (2009).	

6. Key Ecological Attributes and Processes

6.1. Habitat Corridors, Resources and Refugia

Despite localised areas of modified and disturbed habitat (mostly associated with cultivation and alien tree plantations), and the presence of linear infrastructure, such as farm roads, powerline servitudes, railways and farm fences, habitat connectivity in the study area and across the broader landscape remains relatively high.

Key habitats associated with the high levels of landscape-scale connectivity include the large areas of grassland and wetland habitats that span the study area (Figure 32). These areas provide a large network of dispersal corridors for flora propagules and diverse habitats for their establishment.

The area of forested gorge habitat is also considered a site of importance in the study area. Considering the overall dominance of grassland habitat and modified habitats, the presence of this small patch of indigenous forest flanked by vegetated rocky cliffs, is unique within the study area and increases local-scale habitat heterogeneity, which reflects in overall flora diversity.

Figure 32: Typical view across the study area, showing a complex mosaic of open grassland and drainage valleys that contribute to maintaining on-site botanical diversity and abundance.

6.2. Ecological Processes and Drivers of Change

The following notes summarise the key 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.

6.2.1. Wildfire – Grassland Burning

Fire is considered a natural, albeit often human initiated disturbance agent in grassland ecosystems. Both Mesic Highveld Grassland and High-altitude Grassland, which characterise Mpumalanga's grassland ecosystems, are considered fire-prone and fire-dependent landscapes, and fire is essential in the maintenance of their biodiversity patterns and ecological processes (SANBI, 2013). Key ecological benefits of fire, with respect to flora communities, include *inter alia*:

- Removal of moribund vegetation, which enhances plant primary productivity, and stimulates germination / flowering of fire-adapted species (e.g., certain orchid species);

- Controls the encroachment of both alien and indigenous woody plant species and weeds; and
- Increases overall habitat heterogeneity by creating a structural mosaic of tall- and short grassland.

Large portions of the study area were burnt prior to the wet-season field visit and it is likely these fires were intentionally set by local farmers (see Figure 33). Fire is therefore considered an important ecological process and driver of change in the study area for flora, including certain SCC.

Figure 33: Recently burnt portion of the study area observed during the wet season field survey.

6.2.2. Herbivory - Grazing by Livestock

Livestock rearing is a common faming activity in the study area, with cattle and sheep farming observed during the field survey (see Figure 34).

High levels of grazing (overgrazing) by domestic livestock is a common cause of dryland degradation (Scholes, 2009). Overgrazing occurs when herbivores (both wildlife and domestic) are kept at excessive stocking rates and/or are able to concentrate their grazing to a limited foraging area, without suitable rest periods. A common degradation syndrome that can be linked to overgrazing, at least in part, is a change in plant species composition. In grassland habitats, this typically manifests as a reduction in palatable grasses and grass productivity (Scholes, 2009). In severe cases, overgrazing coupled with trampling, can result decreases in vegetation cover, increased incidences of erosion, and a reduction in botanical diversity.

Livestock grazing, particularly by cattle, which unlike sheep farming, occurs throughout the study area, is considered an important ecosystem driver in the study area. However, at its current levels it is considered unlikely to impact botanical diversity and flora SCC.

Figure 34: Cattle grazing is common and widespread practice in the study area.

6.2.3. Alien Invasive Species Colonisation

Significant portions of the study area are dominated by stands of alien invasive woody species. The two wattle species (*Acacia dealbata* and *Acacia mearnsii*) are particularly aggressive invaders and have formed dense infestations throughout the study area.

If not actively controlled, wattle trees will continue to spread into adjacent natural habitat, where they will shade-out and competitively exclude many indigenous woody and herbaceous species. This will have several deleterious impacts on the integrity and function of these habitats, such as *inter alia*:

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

The spread of alien invasive vegetation is therefore considered a significant driver of change in the study area and surrounding landscape, and one capable of severely negatively impacting botanical diversity and flora SCC.

7. Combined Assessment of Site Ecological Importance

Table 8 presents summary comment on the ecological importance of identified vegetation communities in the study area, as per the SANBI (2020) protocol. It is informed by the combined findings of both the Terrestrial Plant Species Specialist Assessment (i.e., this report) and the Terrestrial Animal Species Specialist Assessment (excluding avifauna and bats).

A summary matrix is presented in Table 9, while corresponding maps for the Alternative 1 and Alternative 2 infrastructure layout are presented in Figure 35 and Figure 36**Error! Reference source not found.**.

Table 8: Analysis discussion on the ecological importance of vegetation communities identified in the study area.

Vegetation Community	Analysis
Cultivated Fields	A modified vegetation community, that has been heavily impacted by anthropogenic activity. Typically characterised by high-levels of ongoing disturbance and either denuded of vegetation (recently ploughed) and/or dominated by non-indigenous flora species. The ecological importance of this vegetation community is rated very low.
Alien Tree Plantations	A modified vegetation community, that is characterised by an almost complete dominance of alien invasive tree species. Little indigenous flora is present. It is noted that plantations do however, provide refuge habitat for sensitive fauna species. Notwithstanding this functional attribute, the ecological importance of the Alien Tree Plantations vegetation community is rated very low.
Dry Mixed Grassland	This is a large and variable vegetation community, that ranges from undisturbed to localised sites of disturbance and alien wattle colonisation. Dry mixed grassland constitutes important natural habitat for a variety of flora and fauna species, including many SCC. This community also play an important role in maintaining landscape connectivity, and in buffering rocky grassland and moist grassland/wetland habitats. The conservation importance and functional integrity of this vegetation community are both rated high, resulting in a high biodiversity importance score. Receptor resilience is rated high-medium, resulting in an ecological importance rating of medium.
Disturbed Grassland	Disturbed grassland is a subclimax vegetation community that has regenerated following past disturbance. Habitat is stable and essentially retains the functional attributes of undisturbed grassland habitat. This community is rated as having a medium functional integrity, but low conservation importance. The biodiversity importance of disturbed grassland community is thus low. Receptor resilience is rated high, resulting in an ecological importance rating of low.
Rocky Grassland	Rocky grassland is a natural vegetation community, that is confined to ridge areas and localised sites embedded within the broader study area habitat matrix. The prominence of large rock outcrops and the presence of indigenous woody flora species,

Vegetation Community	Analysis
	increases local-scale habitat heterogeneity and flora and fauna diversity. Several flora and fauna SCC have been recorded in this community, or have a high probability of occurrence. The functional integrity and conservation importance of the Rocky grassland are both rated high, resulting in a high biodiversity importance score. Receptor resilience is rated medium, and accordingly ecological importance is rated high.
Moist Grassland and Wetland	The Moist grassland and wetland community maintains several important ecological functions / traits, including its role in local hydrological patterns, providing linear and largely intact movement and dispersal corridors for fauna and flora, and promoting local-scale habitat heterogeneity. Moreover, several flora and fauna SCC have been recorded in this community, or have a high probability of occurrence. The functional integrity and conservation importance of the Moist grassland and wetland are both rated high, resulting in a high biodiversity importance score. Receptor resilience is rated medium, and accordingly ecological importance is rated high
Forested Gorge Habitat	In the context of the study area, this is a small, but unique community, that is characterised by well-developed indigenous forest, flanked by tall vegetated rocky cliffs. The complex topographical template supports numerous microhabitats, which significantly contribute to local-scale habitat heterogeneity and the flora and fauna diversity of the study area. Several flora SCC have a high probability of occurrence in this community. The functional integrity and conservation importance of this community are rated high. The biodiversity importance of disturbed grassland community is thus high. Receptor resilience is rated low, and accordingly ecological importance is rated very high (due to the very small extent of this community in the study area, it is not reflected in Figure 35 and Figure 36).

Table 9: Summary matrix of the Ecological Importance of vegetation communities.

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Ecological Importance
Cultivated Fields	Very Low	Very Low	Very Low	Very High	Very Low
Alien Tree Plantations	Very Low	Low	Very Low	Very High	Very Low
Dry Mixed Grassland	High	High	High	High-medium	Medium
Disturbed Grassland	Low	Medium	Low	High	Low
Rocky Grassland	High	High	High	Medium	High
Moist Grassland and Wetland	High	High	High	Medium	High
Forested Gorge Habitat	High	High	High	Low	Very High

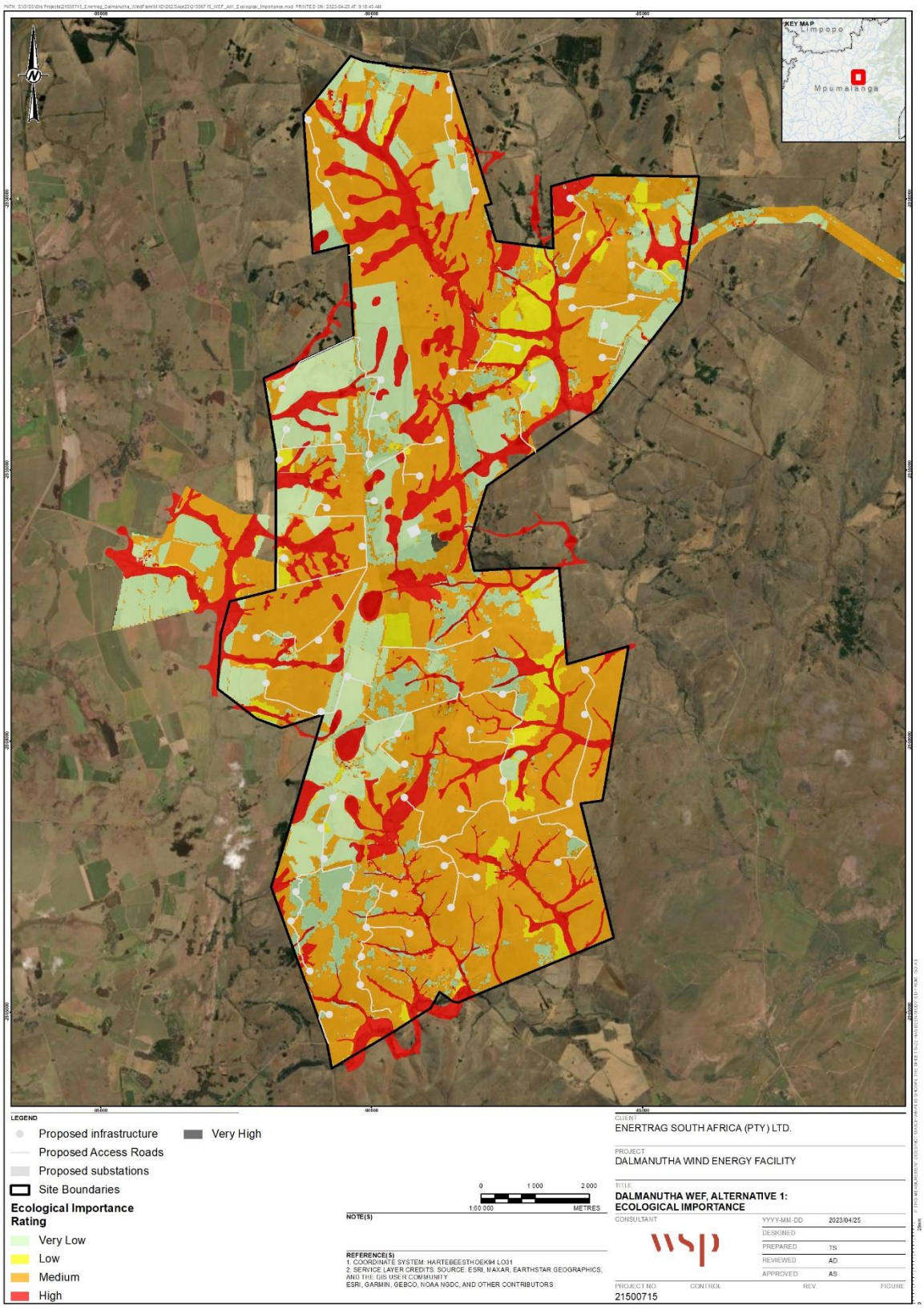

Figure 35: Alternative 1 infrastructure layout and the Ecological Importance of vegetation communities in the study area.

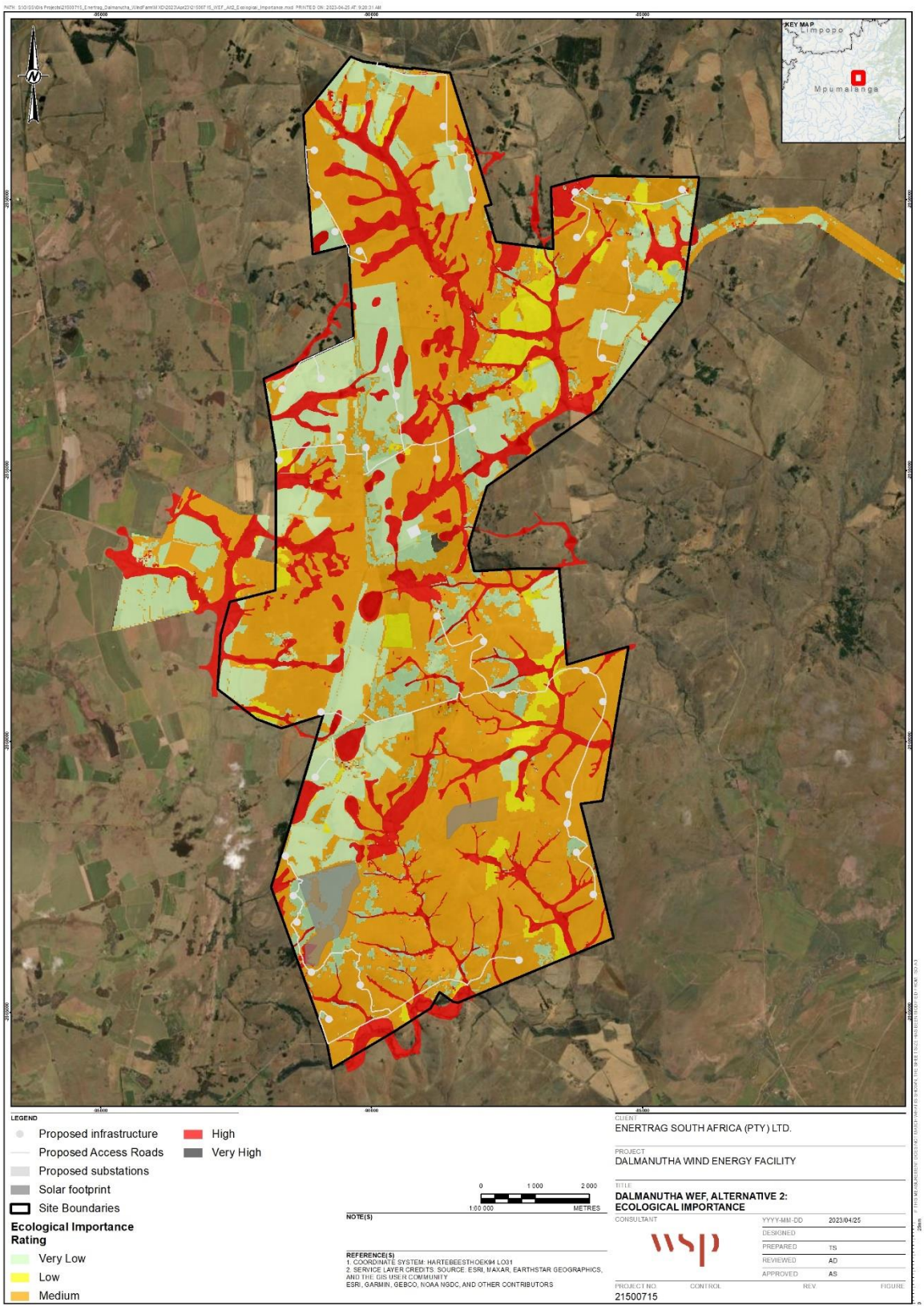

Figure 36: Alternative 2 infrastructure layout and the Ecological Importance of vegetation communities in the study area.

8. Impact Assessment

8.1. 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**

8.2. 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 37 below.

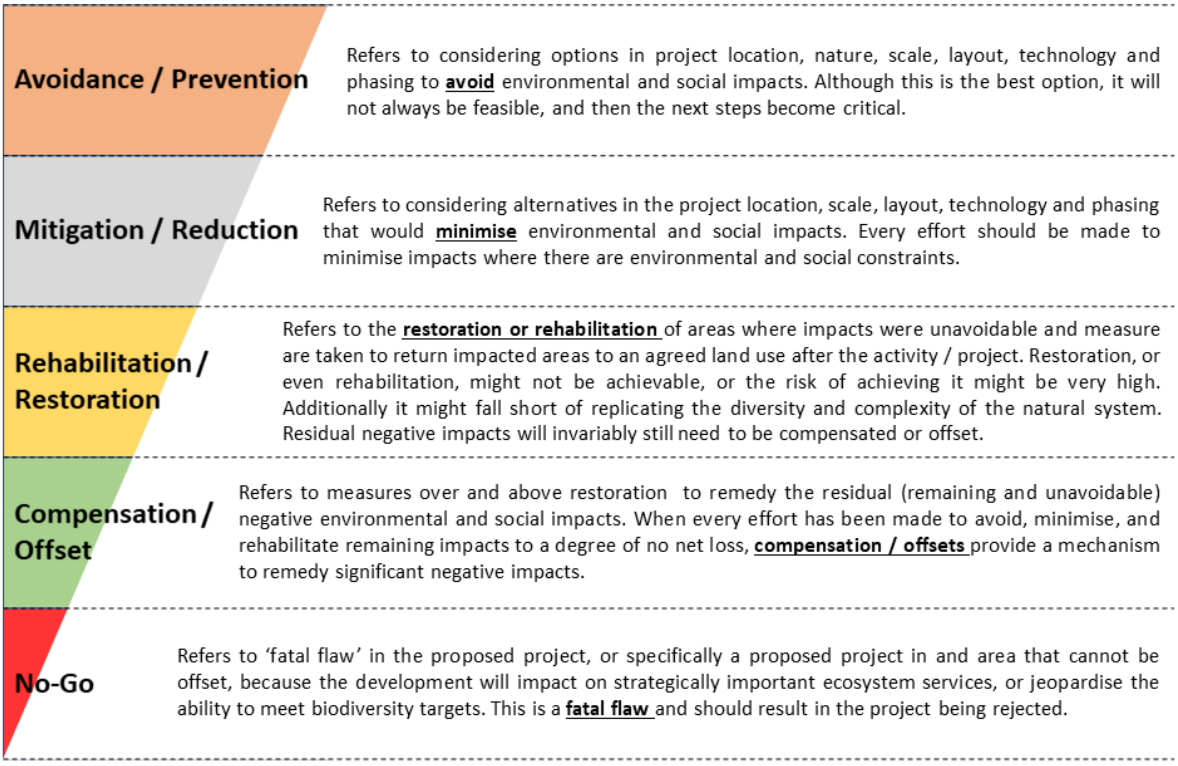

Figure 37: Mitigation Sequence/Hierarchy

A discussion on assessed impacts for each phase (i.e., Construction Operational and Decommissioning) of the proposed Project is provided in Section 8.3, with a summary table presented in Table 12.

8.3. Assessment of Impacts on Terrestrial Flora

8.3.1. Construction Phase

8.3.1.1. Loss and Disturbance of Flora Habitat

Habitat loss and disturbance refers to the direct removal or disturbance of natural habitat that results from vegetation clearing and earth works. The development of the proposed Project infrastructure will require vegetation clearing and earth works within the planned development footprint. This will directly impact individual flora species, as well as flora habitat integrity.

Based on the available infrastructure layout plans for the proposed Project alternatives, a breakdown of the approximate extent of direct habitat loss and disturbance of each vegetation community per alternative is presented in Table 11.

Alternative 1 will result in approximately 66.37 ha of natural habitat loss, whereas Alternative 2 will result in approximately 142.06 ha of natural habitat. For Alternative 1, this incorporates about 31 ha of CBA Irreplaceable and 16 ha of CBA Optimal land. For Alternative 2, this incorporates about 84 ha of CBA Irreplaceable and 18 ha of CBA Optimal land.

Table 11: Approximate extent of direct habitat loss associated with the proposed Project alternatives.

Habitat Type	Vegetation Community	Approximate Extent of Loss (ha)	
		Alternative 1	Alternative 2
Modified Habitats	Cultivated Fields	24.82	29.56
	Alien Tree Plantations	5.67	66.43
	Sub-Total	30.56	95.99
Natural Habitat	Dry Mixed Grassland	58.51	132.26
	Disturbed Grassland	4.21	1.77
	Rocky Grassland	1.33	6.19
	Moist Grassland and Wetland	2.32	1.84
	Forested Gorge Habitat	0.0	0.0
	Subtotal	66.37	142.06

Alternative 1: The impact prior to mitigation is considered to be of high magnitude, permanently affecting vegetation within and potentially adjacent to the development footprints (local). It is also considered to have a definite probability, resulting in an impact of "high" significance (Score 70). Considering the development nature of the proposed Project, this impact is difficult to avoid, however measures can be taken to minimise the significance. With mitigation, the magnitude of the impact can be lowered to medium, and it can be confined to the site scale. Duration can be reduced to the long-term, and probability to high. This results in an after-mitigation impact of "medium" significance (Score 44).

Alternative 2: As substantial more natural habitat will be lost compared to Alternative 1, the impact prior to mitigation is considered to be of very high magnitude, permanently affecting vegetation within and potentially adjacent to the development footprints (local). It is also considered to have a definite probability, resulting in an impact of "high" significance (Score 75). With mitigation, the magnitude of the impact can be lowered to high, and it can be confined to the site scale. Duration can be reduced to the long-term, and probability to high. This results in an after-mitigation impact of "medium" significance (Score 48).

8.3.1.2.Disruption of Ecosystem Processes due to Project Infrastructure

The presence of proposed Project infrastructure, particularly linear infrastructure (e.g., the access roads), may cause alterations in important ecosystem processes, such as wildfire patterns (through habitat fragmentation) and water flow/seepage patterns (through soil compaction). This may result in changes in flora composition driving a potential loss of species richness.

Alternative 1: The impact prior to mitigation is considered to be of high magnitude, with a long-term duration. The extent of the impact will be local and it is also considered to have a high probability, resulting in an impact of "medium" significance (Score 44). With mitigation, the magnitude and probability of the impact can be reduced to low. Extent will remain local, but the duration is reduced to the short-term. This results in an after-mitigation impact of "low" significance (Score 16).

Alternative 2: The impact prior to mitigation is considered to be of medium magnitude, with a long-term duration. The extent of the impact will be local and it is also considered to have a medium probability, resulting in an impact of "medium" significance (Score 30). With mitigation, the magnitude and probability of the impact can be reduced to low. Extent will remain local, but the duration is reduced to the short-term. This results in an after-mitigation impact of "low" significance (Score 14).

8.3.1.3.Establishment and Spread of Alien Invasive Species

Disturbances caused by vegetation clearing and earth works during construction will facilitate the establishment and spread of alien invasive vegetation. Alien plant infestations can spread exponentially, suppressing or replacing indigenous vegetation. This may result in the impairment of ecosystem functioning and a loss of biodiversity.

Several highly invasive alien species were recorded on-site during the field visit, including *inter alia*; woody taxa such as *Acacia dealbata* and *Acacia mearnsii,* and herbaceous species such as *Cirsium vulgare, Datura stramonium* and *Verbena bonariensis*. It is possible that additional disturbances caused by construction activities may result in the further spread of alien vegetation into grassland and wetland habitats.

This impact is likely to be the same for both alternatives. Impact character is considered to be the same for both project alternatives. Before mitigation, impact magnitude is high, while duration is long term and it has a high probability. 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 (Score 52). With the implementation of active control 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 (Score 16).

8.3.1.4.Loss of Flora Species of Conservation Concern

Several flora SCC were recorded on-site or are likely to be present, based on known distribution ranges, and it is possible that individual plants will be cleared during construction.

As SCC are likely to be distributed throughout the study area, this impact is likely to be similar for both alternatives. Before mitigation, impact magnitude is very high, while duration is immediate. It has a definite probability of occurrence. The spatial extent of the impact is at the local scale. Prior to mitigation, this impact is rated of "high" significance (Score 65). With mitigation, this impact can be reduced to a low magnitude, while duration will remain of immediate. Spatial extent will be reduced to the site only, but probability will be reduced to low. After mitigation, this impact is rated to be of "low" significance (Score 14).

8.3.1.5.Increased Incidences of Soil Erosion

Construction activities, such as the removal of vegetation and earth works, are likely to increase the potential for soil erosion, which can spread beyond the development footprint and can cause broader-scale habitat degradation

This impact is likely to be the same for both alternatives. Before mitigation, the magnitude of soil erosion is medium, while duration is long term and it has a high probability. The spatial extent of soil

erosion is local. Prior to mitigation, this impact is rated an impact of “medium” significance (Score 48). With the implementation of active control, 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 (Score 12).

8.3.2. Operational Phase

8.3.2.1.Establishment and Spread of Alien Invasive Species

The potential establishment of alien invasive species will continue to be an impact of concern during the operational phase.

This impact is likely to be the same for both alternatives. Before mitigation, impact magnitude is high, while duration is long term and the impact has a medium probability of occurring. The spatial extent of alien invasive species spread is local. This results in an impact significance before mitigation of “medium” (Score 39). With the continued implementation of active control 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 the probability of the impact occurring as predicted would be reduced to low. After mitigation, this impact is rated to be of “low” significance (Score 16).

8.3.3. Decommissioning Phase

8.3.3.1.Establishment and Spread of Alien Invasive Species

Decommissioning activities, such as the dismantling and clearing away of infrastructure are likely to disturb vegetation and soils, which may facilitate the establishment and spread of alien invasive species.

This impact is likely to be the same for both alternatives. Before mitigation, impact magnitude is high, while duration is long term and it has a high probability. 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 (Score 52). With the implementation of active control during the decommissioning phase, this impact can be reduced to a low magnitude, with a short-term duration. Spatial extent will be reduced to the site only and the probability of the impact occurring as predicted would be reduced to low. After mitigation, this impact is rated to be of “low” significance (Score 16).

8.3.3.2.Increased Incidences of Soil Erosion

Decommissioning activities, such as the dismantling and clearing away of infrastructure are likely to disturb vegetation and soils, which may increase the potential for soil erosion, which can cause broader-scale habitat degradation

This impact is likely to be the same for both alternatives. Before mitigation, the magnitude of soil erosion is medium, while duration is long term and it has a high probability. The spatial extent of soil erosion is local. Prior to mitigation, this impact is rated an impact of “medium” significance (Score 48). With the implementation of active control, 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 (Score 12).

Table 12: Impact rating table for the Construction, Operational, and Decommissioning Phases.

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 1.1:	Flora habitat	Loss and disturbance of flora habitat - **Alternative 1**	Construction	Negative	Low	4	2	3	5	5	**70**	**N3**	3	1	3	4	4	**44**	**N2**
	Significance					**N3 - High**							**N2 - Medium**						
Impact 1.2:	Flora habitat	Loss and disturbance of flora habitat - **Alternative 2**	Construction	Negative	Low	5	2	3	5	5	**75**	**N3**	4	1	3	4	4	**48**	**N2**
	Significance					**N3 - High**							**N2 - Medium**						
Impact 2.1:	Flora habitat	Disruption of ecosystem processes due to Project infrastructure - **Alternative 1**	Construction	Negative	Moderate	4	2	1	4	4	**44**	**N2**	3	2	1	2	2	**16**	**N1**
	Significance					**N2 - Medium**							**N1 - Low**						
Impact 2.2:	Flora habitat	Disruption of ecosystem processes due to Project infrastructure - **Alternative 2**	Construction	Negative	Moderate	3	2	1	4	3	**30**	**N2**	2	2	1	2	2	**14**	**N1**
	Significance					**N2 - Medium**							**N1 - Low**						
Impact 3:	Flora habitat	Establishment and spread of alien invasive species	Construction	Negative	High	4	2	3	4	4	**52**	**N2**	2	1	3	2	2	**16**	**N1**
	Significance					**N2 - Medium**							**N1 - Low**						
Impact 4.1:	Flora SCC	Loss of flora of conservation concern	Construction	Negative	High	5	2	5	1	5	**65**	**N3**	2	1	3	1	2	**14**	**N1**
						N3 - High							**N1 - Low**						
Impact 5:	Flora habitat	Increased incidences of soil erosion	Construction	Negative	High	3	2	3	4	4	**48**	**N2**	2	1	1	2	2	**12**	**N1**
	Significance					**N2 - Medium**							**N1 - Low**						

OPERATIONAL																		
Impact number	**Receptor**	**Description**	**Stage**	**Character**	**Ease of Mitigation**	**Pre-Mitigation**							**Post-Mitigation**						
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**		**(M+**	**E+**	**R+**	**D)x**	**P=**	**S**	
Impact 1:	Flora habitat	Establishment and spread of alien invasive species	Operational	Negative	High	4	2	3	4	3	**39**	**N2**	2	1	3	2	2	**16**	**N1**
	Significance					**N2 - Medium**							**N1 - Low**						

DECOMISSIONING																		
Impact number	**Receptor**	**Description**	**Stage**	**Character**	**Ease of Mitigation**	**Pre-Mitigation**							**Post-Mitigation**						
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**		**(M+**	**E+**	**R+**	**D)x**	**P=**	**S**	
Impact 1:	Flora habitat	Establishment and spread of alien invasive species	Decommissioning	Negative	High	4	2	3	4	4	**52**	**N2**	2	1	3	2	2	**16**	**N1**
	Significance					**N2 - Medium**							**N1 - Low**						
Impact 2:	Flora habitat	Increased incidences of soil erosion	Decommissioning	Negative	High	3	2	3	4	4	**48**	**N2**	2	1	1	2	2	**12**	**N1**
	Significance					**N2 - Medium**							**N1 - Low**						

9. 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 Section Assessment of Impacts8.3.

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

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

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

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

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

Table 13: Recommended mitigation and management measures for terrestrial flora

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 - Habitats	Loss and disturbance of flora habitat	Avoidance Where practically possible areas of natural habitat should be avoided: • All temporary construction footprints, including, but not limited to, laydown areas, portable toilets, cement batching plants, wind tower factory etc., should only be located in areas of modified habitat (e.g., cultivated fields and alien tree plantations); • Where feasible, permanent proposed Project infrastructure should be located on land that is already modified/disturbed. This should be guided by a micro-siting exercise, prior to construction; and • Proposed Project access roads should be aligned with existing district and farm roads and tracks.	N/A	Avoidance	Prior to Construction Phase (i.e., during Pre-construction)	Project Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
2. Construction phase							
2.1	Terrestrial Flora – Habitats	Loss and disturbance of flora habitat	<u>Minimisation</u> • Vegetation clearing should be restricted to the proposed Project footprints only, with no clearing permitted outside of these areas; • The footprints to be cleared should be clearly demarcated prior to construction to prevent unnecessary clearing outside of these areas; and • No heavy vehicles should travel beyond the marked works zone. <u>Rehabilitation</u> A rehabilitation/landscaping protocol should be developed and implemented on-site. The protocol should include, *inter alia*, the following provisions: • Stockpiling of topsoil from development footprints during site preparation; • Post-construction, the land form should be correctly contoured to limit potential	N/A	Minimisation, Rehabilitation and Offsetting	During and after Construction Phase	Project Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			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 • Locally occurring indigenous grasses species should be used to revegetate all areas disturbed during construction. <u>Offsetting</u> To offset the loss of land designated as CBA Irreplaceable and CBA Optimal, a biodiversity offsetting strategy should be developed, under consultation with the local conservation authority (i.e., Mpumalanga Parks and Tourism Agency). On completion of the micro-siting exercise and finalisation of the infrastructure layout, the offsetting strategy should be revised to account for any changes.				

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
2.2	Terrestrial Flora - Habitats	Disruption of ecosystem processes due to Project infrastructure	Minimisation • To promote grassland health, local farmers should be approached in order to investigate the potential of developing a co-ordinated grassland burning (wildfire) programme for the study area; and • To prevent wetland desiccation, the wetland management and protection measures outlined in the wetland impact assessment for the proposed Project should be strictly implemented on-site.	N/A	Minimisation	During Construction Phase	Project Manager
2.3	Terrestrial Flora - Habitats	Establishment and spread of alien invasive species	Minimisation An Alien Invasive Species (AIS) Control and Eradication Plan must be developed for the Project. It is recommended that the plan include: • A combined approach using both chemical and mechanical control methods;	Guidelines for Monitoring, Control and Eradication of AIS (DEA, 2015)	Minimisation	During Construction Phase	Project Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person

			• Periodic follow-up treatments, informed by regular monitoring;
			• A specific focus on:
			  ○ All sites disturbed by construction; and
			  ○ Areas of wetland/stream vegetation.				

2.4	Terrestrial Flora - SCC	Loss of flora of conservation concern	<u>Avoidance and Minimisation</u> • Prior to any vegetation clearing, the proposed construction footprints should be clearly marked in the field; • A wet/growing season field survey for flora SCC should be conducted by a botanist within the planned development footprints to determine the identify and number of potentially impacted flora SCC; • Informed by the findings of the survey: ○ Wherever possible, infrastructure footprints should be re-aligned/re-positioned to avoid SCC locations;	N/A	Avoidance and Minimisation	During Construction Phase	Project Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			○ Where re-alignment/re-positioning is not possible, permits should be obtained from the relevant authority to rescue and relocate impacted plants; and • A Flora SCC Rescue and Relocation Plan should be developed for the proposed Project to provide guidance on all aspects of SCC rescue and relocation.				
2.5	Terrestrial Flora - Habitats	Increased incidences of soil erosion	<u>Avoidance and Minimisation</u> • All sites disturbed during the construction phase should be stabilised and rehabilitated, as per the rehabilitation / landscaping protocol discussed in Construction Phase impacts; • The location of sites requiring erosion prevention and rehabilitation should be identified through regular field inspections.	N/A	Avoidance and Minimisation	During Construction Phase	Project Manager
3. Operational phase							

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
3.1	Terrestrial Flora - Habitats	Establishment and spread of alien invasive species	Minimisation Active alien invasive species control should continue throughout the operational phase, as per the Project's AIS Control and Eradication Plan.	Guidelines for Monitoring, Control and Eradication of AIS (DEA, 2015)	Minimisation	During Operational Phase	Facility Manager
4. Decommissioning Phase							
4.1	Terrestrial Flora - Habitats	Establishment and spread of alien invasive species	Minimisation Active alien invasive species control, as per the AIS Control and Eradication Plan, should continue during the decommissioning phase and follow up control should be carried out annually for a five- year period following decommissioning. Rehabilitation • All project infrastructure should be dismantled and removed from site; • All sites disturbed during the decommissioning phase should be stabilised and rehabilitated, as per the rehabilitation/landscaping protocol.	Guidelines for Monitoring, Control and Eradication of AIS (DEA, 2015)	Minimisation and Rehabilitation	During Decommissioning phase, and annually for a five-year period after decommissioning.	Facility Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
4.2	Terrestrial Flora - Habitats	Increased incidences of soil erosion	<u>Minimisation</u> • All sites disturbed during the decommissioning phase should be stabilised and rehabilitated, as per the rehabilitation/landscaping protocol. • The location of sites requiring erosion prevention and rehabilitation should be identified through regular field inspections.	N/A	Minimisation and Rehabilitation	During Decommissioning Phase and annually for a five-year period after decommissioning	Facility Manager

10. 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 9.

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 phase						

1.1	Alien Invasive Species Monitoring	• Annual on-site alien invasive species monitoring should be conducted. Monitoring should focus on:
		  ○ All sites disturbed during the construction phase;
		  ○ Riparian/wetland areas adjacent to construction sites; and
		• Monitoring should assess species type and density, and these data should inform the scope of ongoing alien invasive species control.
			Wet/growing season	Annual	Annual Monitoring Report	Facility Manager

1.2	Rehabilitation Monitoring	• Monitoring of rehabilitated and revegetated sites should be conducted annually until such as time as rehabilitation of disturbed sites has proved successful;
		• Key aspects that should be monitored include:
		  ○ Successful establishment and coverage of vegetation;
		  ○ Sites of erosion;
			Wet/growing season	Annual	Annual Monitoring Report	Facility Manager

Ref. No.	Category	Method for monitoring	Time period	Frequency of monitoring	Mechanism for monitoring compliance	Responsible person
		• The findings of monitoring should be used to inform the need for additional rehabilitation and/ or corrective actions.				
2. Operational phase						
2.1	Alien Invasive Species Monitoring	• Annual on-site alien invasive species monitoring should be conducted. Monitoring should focus on: o All sites disturbed during the construction phase; o Riparian/wetland areas adjacent to construction sites; and • Monitoring should assess species type and density, and these data should inform the scope of ongoing alien invasive species control.	Wet/growing season	Annual	Annual Monitoring Report	Facility Manager
3. Decommissioning phase						
3.1	Alien Invasive Species Monitoring	• Alien invasive species monitoring should be conducted on an annual basis during decommissioning and annually for a five-	Wet/growing season	Annually during decommissioning & annually for a five-year period	Annual Monitoring Report(s)	Facility Manager

Ref. No.	Category	Method for monitoring	Time period	Frequency of monitoring	Mechanism for monitoring compliance	Responsible person
		year period following decommissioning. Monitoring should focus on: ○ All sites disturbed during decommissioning; ○ Riparian/wetland areas adjacent to former development sites; and • Monitoring should assess species type and density, and these data should inform the scope of ongoing alien invasive species control.		after decommissioning		
3.2	Rehabilitation Monitoring	• Monitoring of rehabilitated and revegetated sites should be conducted annually during decommissioning and for a two-year period after decommissioning; • Key aspects that should be monitored include: ○ Successful establishment and coverage of vegetation; ○ Sites of erosion; ○ The findings of monitoring should be used to inform the need for	Wet/growing season	Annually during decommissioning & for a two-year period after decommissioning	Annual Monitoring Reports	Facility / Closure Manager

Ref. No.	Category	Method for monitoring	Time period	Frequency of monitoring	Mechanism for monitoring compliance	Responsible person
		additional rehabilitation and/ or corrective actions.				

11. Cumulative Impacts

Large portions of the study area and the surrounding landscape are modified and fragmented as a consequence of various anthropogenic land uses, most notably agriculture. Moreover, coal mining, although not present in the study area itself, is prevalent across the surrounding landscape. These anthropogenic activities, amongst others, have caused and continue to cause ongoing habitat loss, disturbance and fragmentation, and this is placing additional pressure on the functioning and integrity of remaining patches of natural and semi-natural habitat in the landscape.

The proposed Project will have a direct negative impact on terrestrial flora in the study area through habitat loss, disturbance and fragmentation. The cumulative loss of flora habitat, particularly areas designated CBA Irreplaceable and CBA Optimal under the MBSP, is a concern with respect to meeting biodiversity conservation targets and the preservation of individual flora SCC.

In comparison to other anthropogenic land uses in the landscape (such as mining), the impacts associated with the proposed Project are limited in extent and can be effectively mitigated through correct on-site management. Prior to any form of mitigation, the cumulative impacts on terrestrial flora linked to the proposed Project are rated High. However, provided the management and mitigation measures presented in this report are implemented, the cumulative impacts on terrestrial flora can be reduced to Low significance.

12. Biodiversity Action Plan

All recommended mitigation and monitoring measures related to terrestrial vegetation and flora, as well as all additional measures relating to biodiversity as stipulated in the respective specialist study reports, should be collated and presented in a Biodiversity Action Plan (BAP) for the proposed Project. This should be compiled upon completion of micro-siting and finalisation of the Project layout.

The plan should provide an integrated and practical framework that encompasses, aligns and guides all aspects of biodiversity management throughout the various life-cycle phases of the Project.

13. Environmental Impact Statement

13.1. Summary of Main Findings

The following section presents a summary of the key findings of the terrestrial flora specialist assessment:

The study area comprises three regional vegetation types, *viz.* Eastern Highveld Grasslands, Steenkampsberg Montane Grassland and KaNgwane Montane Grassland. Both Eastern Highveld Grassland and KaNgwane Montane Grassland are listed as Endangered ecosystems (NEMBA, 2021).

Notwithstanding, localised sites of disturbance, the study area is characterised by a large network of natural grassland and wetland habitat that supports a rich botanical community. A large proportion of this habitat in the centre of the study area is designated as CBA Irreplaceable, with smaller areas designated CBA Optimal and ESA Local Corridors. Based on floristic data collected during the field survey and data obtained from a local land owner, several flora SCC (Red List and/or protected) are

confirmed to be present in the study area, and habitat suitability assessments suggest that a high number of other flora SCC are also likely to be present.

The development of proposed Project infrastructure in areas of natural habitat, will have negative impacts on terrestrial flora. Several mitigation measures have been recommended to avoid and minimise identified impacts (presented in Section 9).

The loss and disturbance of natural habitat, particularly CBA Irreplaceable and CBA Optimal land, remains a residual impact of concern with an overall after-mitigation rating of 'medium' significance for both proposed Project alternatives. Pursuant to this, considering the greater extent (hectares) of direct natural habitat loss and disturbance associated with Alternative 2 (which includes the large solar facilities) relative to Alternative 1, Alternative 1 is rated as having a lower impact significance score for this impact and is therefore the preferred option from a terrestrial flora perspective.

Notwithstanding which Project alternative is ultimately selected for implementation, a biodiversity offset will be required for the loss of CBA Irreplaceable and CBA Optimal land. It is recommended that this takes the form of a combined biodiversity offset programme that accounts for and integrates all elements of the Dalmanutha Wind Energy Complex initiative.

13.2. Conditions to be Included in the Environmental Authorisation

In addition to the individual mitigation and monitoring measures presented in Section 9 and Section 10 of this report, it is recommended that a biodiversity offset programme should be identified and implement under agreement with Mpumalanga Parks and Tourism Agency, in line with NEMBA's Draft National Biodiversity Offset Policy (2017) to offset the loss of natural habitat designated CBA Irreplaceable and CBA Optimal.

13.3. Specialist Opinion

In accordance with the outcomes of the impact assessment (Section 8) and taking cognisance of the baseline conditions as presented in Section 5 through to Section 7, as well as the impact management measures (Section 9 and Section 10), the proposed Project, is not deemed to present significant negative environmental issues or impacts, and it should thus be authorised.

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Appendix A: Curricula vitae for Andrew Zinn

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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**

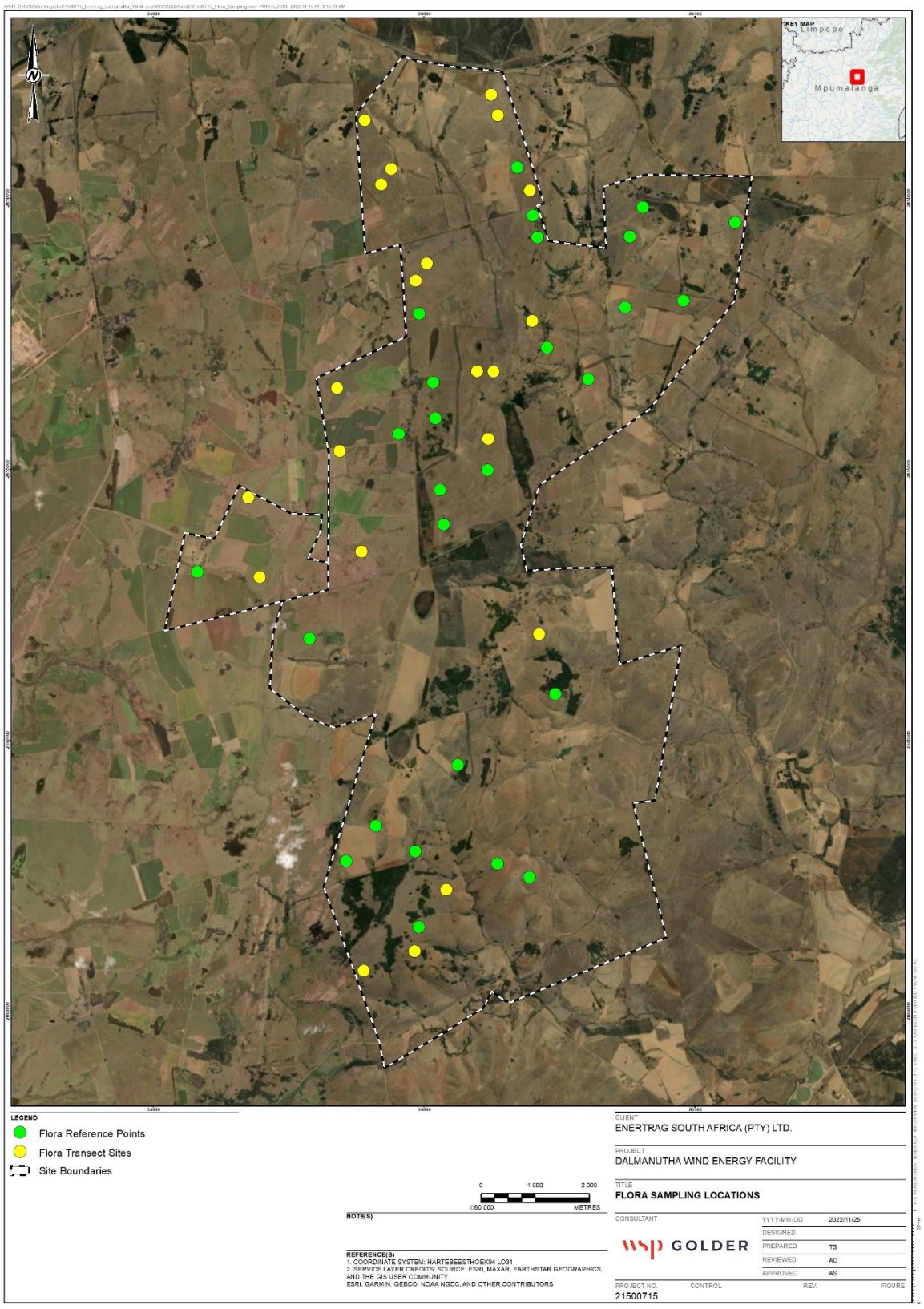
Yale University, Kruger National Park, South Africa
October 2007 – May 2008
Research technician on the Savanna Convergence Experiment (SCE). The SCE project was a long-term cross-continental study that investigated the role of mega-herbivores in fire-grazing interactions and their influence on vegetation 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.
- Burkepile, D.E., C.E. Burns, E. Amendola, G.M. Buis, N. Govender, V. Nelson, C.J. Tambling, D.I. Thompson, A.D. Zinn and M.D. Smith (2013). Habitat selection by large herbivores in a southern African savanna: the relative roles of bottom-up and top-down forces. Ecosphere, 4(11):139.
- Knapp, A.K., D.L. Hoover, J.M. Blair, G. Buis, D.E. Burkepile, A. Chamberlain, S.L. Collins, R.W.S Fynn, K.P. Kirkman, M.D. Smith, D. Blake, N. Govender, P. O'Neal, T. Schreck and A. Zinn (2012). A test of two mechanisms proposed to optimize grassland aboveground primary productivity in response to grazing. Journal of Plant Ecology, 5, 357-365.
- Zinn, A.D., D. Ward and K. Kirkman (2007). Inducible defences in *Acacia sieberiana* in response to giraffe browsing. African Journal of Range and Forage Science, 24, 123-129.
- Zinn, A.D. (2007). Exploitation vs. Conservation: A Burgeoning Fifth Column. African Wildlife, 61, 9-11.
- Andrew Zinn (2006). Conflict Resolution. Africa Birds and Birding. Vol. 11, No. 5, 12-13.

Appendix B: Methodology Supplement:

Appendix B (1) Location of flora transect and reference point locations



Appendix B(2): 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 Field Survey.

Family	Species Name	Growth Form	Origin	Conservation Status			Disturbed Sites (e.g., road sides, cultivated fields)	Vegetation Communities				
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status		Dry Mixed Grassland	Disturbed Grassland	Rocky Grassland	Moist Grassland and Wetland	Forested Gorge Habitat
Acanthaceae	*Justicia anagalloides*	Herb	Indigenous	LC	-	-		X				
Acanthaceae	*Thunbergia atriplicifolia*	Herb	Indigenous	LC	-	-		X				
Aceraceae	*Acer buergerianum**	Tree	Alien (NEMBA Category 3)	NE	-	-	X					
Achariaceae	*Kiggelaria africana*	Tree	Indigenous	LC	-	-						X
Agavaceae	*Agave americana**	Succulent	Alien	NE	-	-	X					
Agavaceae	*Chlorophytum cooperi*	Herb	Indigenous	LC	-	-		X		X		
Alliaceae	*Tulbaghia acutiloba*	Herb	Indigenous	LC	-	-					X	
Amaryllidaceae	*Boophone disticha*	Herb	Indigenous	LC	-	Protected		X				
Amaryllidaceae	*Cyrtanthus breviflorus*	Herb	Indigenous	LC	-	Protected		X			X	
Amaryllidaceae	*Cyrtanthus contractus*	Herb	Indigenous	LC	-	Protected		X				
Anacardiaceae	*Searsia cf. rigida var. dentata*	Tree	Indigenous	LC	-	-				X		
Anacardiaceae	*Searsia dentata*	Dwarf Shrub	Indigenous	LC	-	-				X		X
Anacardiaceae	*Searsia discolor*	Dwarf Shrub	Indigenous	LC	-	-		X		X		
Anacardiaceae	*Searsia pyroides var. gracilis*	Tree	Indigenous	LC	-	-						X
Anacardiaceae	*Searsia tumulicola*	Tree	Indigenous	LC	-	-		X				
Apiaceae	*Afrosciadium magalismontanum (=Peucedanum magalismontanum)*	Herb	Indigenous	LC	-	-		X				
Apiaceae	*Berula erecta*	Herb	Indigenous	LC	-	-					X	
Apiaceae	*Centella asiatica**	Herb	Alien	NE	-	-					X	
Apocynaceae	*Asclepias aurea*	Herb	Indigenous	LC	-	-			X			
Apocynaceae	*Asclepias cf. stellifera*	Herb	Indigenous	LC	-	-		X				
Apocynaceae	*Aspidoglossum ovalifolium*	Herb	Indigenous	LC	-	-		X				
Apocynaceae	*Gomphocarpus fruticosus*	Shrub	Indigenous	LC	-	-	X	X	X			
Apocynaceae	*Xysmalobium undulatum*	Herb	Indigenous	LC	-	-	X					

Family	Species Name	Growth Form	Origin	Conservation Status			Disturbed Sites (e.g., road sides, cultivated fields)	Vegetation Communities				
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status		Dry Mixed Grassland	Disturbed Grassland	Rocky Grassland	Moist Grassland and Wetland	Forested Gorge Habitat
Aquifoliaceae	*Ilex mitis var. mitis*	Tree	Indigenous	LC	Declining	-						X
Araceae	*Zantedeschia rehmannii*	Herb	Indigenous	-	-	Protected		X				
Araliaceae	*Cussonia paniculata*	Tree	Indigenous		-	-				X		
Asparagaceae	*Asparagus cf. virgatus*	Shrub	Indigenous	LC	-	-						X
Asparagus laricinum	*Asparagus laricinus*	Shrub	Indigenous	LC	-	-		X	X	X		
Asphodelaceae	*Aloe arborescens*	Succulent	Indigenous	LC	-	Protected						X
Asphodelaceae	*Aloe cf. graciliflora*	Succulent	Indigenous	LC	-	Protected		X		X		
Asphodelaceae	*Aloe ecklonis*	Succulent	Indigenous	LC	-	Protected		X				
Asphodelaceae	*Aloe verdoorniae*	Succulent	Indigenous	DDT	-	Protected				X		
Aspleniaceae	*Asplenium sp.*	Fern	Indigenous	-	-	-						X
Asteraceae	*Aster harveyanus*	Herb	Indigenous	LC	-	-		X				
Asteraceae	*Berkheya setifera*	Herb	Indigenous	LC	-	-		X			X	
Asteraceae	*Bidens pilosa**	Herb	Alien	NE	-	-		X				
Asteraceae	*Callilepis cf. laureola*	Herb	Indigenous	LC	-	-		X		X		
Asteraceae	*Cirsium vulgare**	Herb	Alien (NEMBA Category 1b)	NE	-	-		X			X	
Asteraceae	*Conyza bonariensis**	Herb	Alien	NE	-	-	X	X			X	
Asteraceae	*Conyza canadensis**	Herb	Alien	NE	-	-	X	X			X	
Asteraceae	*Cosmos bipinnatus**	Herb	Alien	NE	-	-	X					
Asteraceae	*Denekia capensis*	Herb	Indigenous	LC	-	-		X				
Asteraceae	*Dimorphotheca jucunda*	Herb	Indigenous	LC	-	-		X				
Asteraceae	*Felicia filifolia*	Shrub	Indigenous	LC	-	-		X				
Asteraceae	*Gerbera piloselloides*	Herb	Indigenous	LC	-	-		X	X		X	
Asteraceae	*Haplocarpha scaposa*	Herb	Indigenous	LC	-	-		X	X			
Asteraceae	*Helichrysum acutatum*	Herb	Indigenous	LC	-	-				X		
Asteraceae	*Helichrysum aureonitens*	Herb	Indigenous	LC	-	-		X			X	
Asteraceae	*Helichrysum callicomum*	Herb	Indigenous	LC	-	-		X				
Asteraceae	*Helichrysum cephaloideum*	Herb	Indigenous	LC	-	-		X				
Asteraceae	*Helichrysum nudifolium var. pilosellum*	Herb	Indigenous	LC	-	-		X			X	

Family	Species Name	Growth Form	Origin	Conservation Status			Disturbed Sites (e.g., road sides, cultivated fields)	Vegetation Communities				
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status		Dry Mixed Grassland	Disturbed Grassland	Rocky Grassland	Moist Grassland and Wetland	Forested Gorge Habitat
Asteraceae	*Helichrysum oreophilum*	Herb	Indigenous	LC	-	-		X				
Asteraceae	*Helichrysum rugulosum*	Herb	Indigenous	LC	-	-		X				
Asteraceae	*Hilliardiella aristata*	Herb	Indigenous	LC	-	-		X	X			
Asteraceae	*Hypochaeris radicata**	Herb	Alien	NE	-	-	X	X	X		X	
Asteraceae	*Lopholaena coriifolia*	Shrub	Indigenous	LC	-	-				X		
Asteraceae	*Lopholaena segmentata*	Shrub	Indigenous	LC	-	-		X				
Asteraceae	*Nidorella sp.*	Herb	Indigenous	LC	-	-				X		
Asteraceae	*Phymaspermum athanasioides*	Shrub	Indigenous	LC	-	-		X		X		
Asteraceae	*Pseudognaphalium luteo-album**	Herb	Alien	NE	-	-	X	X			X	
Asteraceae	*Senecio consanguineus*	Herb	Indigenous	LC	-			X				
Asteraceae	*Senecio coronatus*	Herb	Indigenous	LC	-	-		X		X		
Asteraceae	*Senecio inornatus*	Herb	Indigenous	LC	-	-		X			X	
Asteraceae	*Senecio isatidioides*	Herb	Indigenous	LC	-	-					X	
Asteraceae	*Senecio panduriformis*	Herb	Indigenous	LC	-	-		X				
Asteraceae	*Senecio scitus*	Herb	Indigenous	LC	-	-		X				
Asteraceae	*Senecio venosus*	Herb	Indigenous	LC	-	-						
Asteraceae	*Senecio sp.*	Herb	Indigenous	-	-	-		X				
Asteraceae	*Seriphium plumosum*	Shrub	Indigenous	LC	-	-		X			X	
Asteraceae	*Sonchus cf. oleraceus**	Herb	Alien	NE	-	-		X				
Asteraceae	*Tagetes minuta**	Herb	Alien	NE	-	-	X	X				
Asteraceae	*Taraxacum officinale**	Herb	Alien	NE	-	-					X	
Asteraceae	*Tolpis capensis*	Herb	Indigenous	LC	-					X		
Asteraceae	*Tragopogon dubius**	Herb	Alien	NE	-	-		X	X			
Asteraceae	*Vernonia cf. hirsuta*	Herb	Indigenous	LC	-	-						X
Asteraceae	*Vernonia galpinii*	Herb	Indigenous	LC	-	-		X		X		
Brassicaceae	*Heliophila rigidiuscula*	Herb	Indigenous	LC	-	-					X	
Caryophyllaceae	*Dianthus mooiensis*	Herb	Indigenous	LC	-	-		X				
Celastraceae	*Gymnosporia heterophylla*	Tree	Indigenous	LC	-	-						X
Chrysobalanaceae	*Parinari capensis*	Dwarf Tree	Indigenous	LC	-	-		X				
Commelinaceae	*Cyanotis speciosa*	Herb	Indigenous	LC	-	-		X		X	X	

Family	Species Name	Growth Form	Origin	Conservation Status			Disturbed Sites (e.g., road sides, cultivated fields)	Vegetation Communities				
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status		Dry Mixed Grassland	Disturbed Grassland	Rocky Grassland	Moist Grassland and Wetland	Forested Gorge Habitat
Convolvulaceae	*Ipomoea transvaalensis*	Herb	Indigenous	LC	-	-		X				
Cucurbitaceae	*Cucumis hirsutus*	Herb	Indigenous	LC	-	-		X				
Cucurbitaceae	*Cucumis zeyheri*	Herb	Indigenous		-	-		x				
Cupressaceae	*Casuarina equisetifolia**	Tree	Alien (NEMBA Category 2)	NE	-	-	X					
Cyatheaceae	*Alsophila dregei (=Cyathea dregei)*	Fern	Indigenous	LC	-	Protected		X				X
Cyperaceae	*Ascolepis capensis*	Graminoid	Indigenous	LC	-	-					X	
Cyperaceae	*Cyperus cf. denudatus*	Graminoid	Indigenous	LC	-	-					X	
Cyperaceae	*Cyperus esculentus**	Graminoid	Alien	NE	-	-	X					
Cyperaceae	*Cyperus obtusiflorus var. flavissimus*	Graminoid	Indigenous	LC	-	-		X				
Cyperaceae	*Cyperus sp.*	Graminoid	Indigenous	-	-	-					X	
Cyperaceae	*Eleocharis cf. limosa*	Graminoid	Indigenous	LC	-	-					X	
Cyperaceae	*Fuirena pubescens*	Herb	Indigenous	LC	-	-					X	
Cyperaceae	*Kyllinga erecta*	Graminoid	Indigenous	LC	-	-					X	
Cyperaceae	*Schoenoplectus brachyceras*	Graminoid	Indigenous	LC	-	-					X	
Dennstaedtiaceae	*Pteridium aquilinum*	Herb	Indigenous	LC	-	-		X		X		
Dipsacaceae	*Scabiosa columbaria*	Herb	Indigenous	LC	-	-		X			X	
Ebenaceae	*Diospyros lycioides*	Tree	Indigenous	LC	-	-		X	X	X		
Ebenaceae	*Diospyros whyteana*	Tree	Indigenous	LC	-	-						X
Ericaceae	*Erica drakensbergensis*	Shrub	Indigenous	LC	-	-		X				
Euphorbiaceae	*Acalypha angustata*	Herb	Indigenous	LC	-	-		X	X			
Euphorbiaceae	*Euphorbia clavarioides*	Succulent	Indigenous	LC	-	-		X				
Fabaceae	*Acacia dealbata**	Tree	Alien (NEMBA Category 2)	NE	-	-	X	X	X	X	X	X
Fabaceae	*Acacia mearnsii**	Tree	Alien (NEMBA Category 2)	NE	-	-	X	X	X	X	X	X
Fabaceae	*Acacia melanoxylon**	Tree	Alien (NEMBA	NE	-	-	X					

Family	Species Name	Growth Form	Origin	Conservation Status			Disturbed Sites (e.g., road sides, cultivated fields)	Vegetation Communities				
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status		Dry Mixed Grassland	Disturbed Grassland	Rocky Grassland	Moist Grassland and Wetland	Forested Gorge Habitat
			Category 2)									
Fabaceae	*Argyrolobium sp.*	Herb	Indigenous	LC	-	-		X				
Fabaceae	*Chamaecrista mimosoides*	Herb	Indigenous	LC	-	-		X		X		
Fabaceae	*Elephantorrhiza elephantina*	Tree	Indigenous	LC	-	-	X	X				
Fabaceae	*Erythrina zeyheri*	Tree	Indigenous	LC	-	-		X				
Fabaceae	*Indigofera melanadenia*	Shrub	Indigenous	LC	-	-				X		
Fabaceae	*Indigofera setiflora*	Herb	Indigenous	LC	-			X				
Fabaceae	*Indigofera daleoides*	Herb	Indigenous	LC	-	-		X		X		
Fabaceae	*Lotononis calycina*	Herb	Indigenous	LC	-	-		X		X		
Fabaceae	*Tephrosia capensis*	Herb	Indigenous	LC	-	-		X				
Fabaceae	*Trifolium repens**	Herb	Alien	NE	-	-					X	
Fagaceae	*Quercus sp.*	Tree	Alien	NE	-	-	X					
Geraniaceae	*Geranium incanum*	Herb	Indigenous	LC	-	-		X				
Geraniaceae	*Pelargonium luridum*	Herb	Indigenous	LC	-	-		X			X	
Hyacinthaceae	*Eucomus autumnalis*	Herb	Indigenous	LC	Declining	Protected		X			X	
Hyacinthaceae	*Ledebouria cooperi*	Herb	Indigenous	LC	-	-		X			X	
Hyacinthaceae	*Merwilla plumbea*	Herb	Indigenous	NT	NT	Protected				X		
Hyacinthaceae	*Ornithogalum sp.*	Herb	Indigenous	-				X				
Hypoxidaceae	*Hypoxis acuminata*	Herb	Indigenous	LC	-	-		X		X		
Hypoxidaceae	*Hypoxis argentea*	Herb	Indigenous	LC	-	-		X		X		
Hypoxidaceae	*Hypoxis rigidula*	Herb	Indigenous	LC	-	-		X		X		
Iridaceae	*Aristea torulosa (=Aristea woodii)*	Herb	Indigenous	LC	-	-		X				
Iridaceae	*Dierama mossii*	Herb	Indigenous	LC	-	-				X	X	
Iridaceae	*Gladiolus longicollis subsp. platypetalus*	Herb	Indigenous	LC	-	Protected				X		
Iridaceae	*Gladiolus woodii*	Herb	Indigenous	LC	-	Protected		X				
Iridaceae	*Watsonia sp. (no flowers)*	Herb	Indigenous	-	-	Protected		X			X	
Juncaceae	*Juncus effusus*	Graminoid	Indigenous	LC	-	-					X	
Juncaceae	*Juncus lomatophyllus*	Graminoid	Indigenous	LC	-	-					X	
Juncaceae	*Juncus oxycarpus*	Graminoid	Indigenous	LC	-	-					X	
Lamiaceae	*Ocimum obovatum subsp. obovatum*	Herb	Indigenous	LC	-	-		X		X		
Lamiaceae	*Rotheca hirsuta*	Herb	Indigenous	LC	-	-		X				

Family	Species Name	Growth Form	Origin	Conservation Status			Disturbed Sites (e.g., road sides, cultivated fields)	Vegetation Communities				
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status		Dry Mixed Grassland	Disturbed Grassland	Rocky Grassland	Moist Grassland and Wetland	Forested Gorge Habitat
Lamiaceae	*Syncolostemon eriocephalus*	Shrub	Indigenous	LC	-	-		X		X		
Lamiaceae	*Syncolostemon pretoriae (=Hemizygia pretoriae)*	Herb	Indigenous	LC	-	-		X	X		X	
Lobeliaceae	*Lobelia flaccida*	Herb	Indigenous	LC	-	-		X			X	
Lobeliaceae	*Monopsis decipiens*	Herb	Indigenous	LC	-	-		X	X		X	
Malvaceae	*Hermannia cristata*	Herb	Indigenous	LC	-	-		X	X			
Malvaceae	*Hermannia lancifolia*	Herb	Indigenous	LC	-	-		X				
Malvaceae	*Hermannia transvaalensis*	Herb	Indigenous	LC	-			X		X		
Malvaceae	*Hibiscus aethiopicus*	Herb	Indigenous	LC	-	-		X				
Malvaceae	*Malvastrum coromandelianum*	Herb	Alien	NE	-	-			X			
Menyanthaceae	*Nymphoides cf. thunbergiana*	Herb	Indigenous	LC	-	-					X	
Molluginaceae	*Psammotropha myriantha*	Herb	Indigenous	LC	-	-		X				
Moraceae	*Morus alba**	Tree	Alien (NEMBA Category 3)	NE	-	-						X
Myrsinaceae	*Myrsine africana*	Tree	Indigenous	LC	-	-						X
Myrtaceae	*Eucalyptus sp.**	Tree	Alien (NEMBA Category 2 or not listed)	NE	-	-	X	X				
Onagraceae	*Oenothera rosea**	Herb	Alien	NE	-	-					X	
Orchidaceae	*Eulophia hians*	Herb	Indigenous	LC	-	Protected		X				
Orobanchaceae	*Cycnium adonense*	Herb	Indigenous	LC	-	-						
Oxalidaceae	*Oxalis corniculata**	Herb	Alien	NE	-	-		X	X			
Papaveraceae	*Argemone ochroleuca**	Herb	Alien (NEMBA Category 1b)	NE	-	-	X					
Papaveraceae	*Papaver aculeatum**	Herb	Alien	NE	-	-						
Phytolaccaceae	*Phytolacca octandra**	Shrub	Alien (NEMBA	NE	-	-	X	X				

Family	Species Name	Growth Form	Origin	Conservation Status			Disturbed Sites (e.g., road sides, cultivated fields)	Vegetation Communities				
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status		Dry Mixed Grassland	Disturbed Grassland	Rocky Grassland	Moist Grassland and Wetland	Forested Gorge Habitat
			Category 3)									
Pinaceae	*Pinus patula**	Tree	Alien (NEMBA Category 2)	NE	-	-	X					X
Plantaginaceae	*Plantago lanceolata**	Herb	Alien	NE	-	-		X	X		X	
Plantaginaceae	*Plantago major**	Herb	Alien	NE	-	-		X	X		X	
Poaceae	*Agrostis lachnantha*	Graminoid	Indigenous	LC	-	-					X	
Poaceae	*Alloteropsis semialata*	Graminoid	Indigenous	LC	-	-		X	X	X		
Poaceae	*Andropogon appendiculatus*	Graminoid	Indigenous	LC	-	-					X	
Poaceae	*Andropogon cf. schirensis*	Graminoid	Indigenous	LC	-	-				X		
Poaceae	*Aristida aequiglumis*	Graminoid	Indigenous	LC	-	-		X		X		
Poaceae	*Aristida junciformis*	Graminoid	Indigenous	LC	-	-		X				
Poaceae	*Arundinella nepalensis*	Graminoid	Indigenous	LC	-	-					X	
Poaceae	*Brachiaria serrata*	Graminoid	Indigenous	LC	-	-		X	X			
Poaceae	*Ctenium concinnum*	Graminoid	Indigenous	LC	-	-		X		X		
Poaceae	*Cymbopogon caesius*	Graminoid	Indigenous	LC	-	-		X		X		
Poaceae	*Cymbopogon pospischilii*	Graminoid	Indigenous	LC	-	-		X				
Poaceae	*Cynodon dactylon*	Graminoid	Indigenous	LC	-	-		X			X	
Poaceae	*Diheteropogon filifolius*	Graminoid	Indigenous	LC	-	-		X		X		
Poaceae	*Elionurus muticus*	Graminoid	Indigenous	LC	-	-		X				
Poaceae	*Eragrostis capensis*	Graminoid	Indigenous	LC	-	-		X				
Poaceae	*Eragrostis chloromelas*	Graminoid	Indigenous	LC	-	-		X		X		
Poaceae	*Eragrostis curvula*	Graminoid	Indigenous	LC	-	-	X	X	X			
Poaceae	*Eragrostis gummiflua*	Graminoid	Indigenous	LC	-	-		X				
Poaceae	*Eragrostis plana*	Graminoid	Indigenous	LC	-	-			X		X	
Poaceae	*Eragrostis pseudosclerantha*	Graminoid	Indigenous	LC	-	-		X				
Poaceae	*Eragrostis racemosa*	Graminoid	Indigenous	LC	-	-		X				
Poaceae	*Eragrostis sp.*	Graminoid	Indigenous	LC	-	-		X				
Poaceae	*Harpochloa falx*	Graminoid	Indigenous	LC	-	-		X			X	
Poaceae	*Helictotrichon turgidulum*	Graminoid	Indigenous	LC	-	-		X				

Family	Species Name	Growth Form	Origin	Conservation Status			Disturbed Sites (e.g., road sides, cultivated fields)	Vegetation Communities				
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status		Dry Mixed Grassland	Disturbed Grassland	Rocky Grassland	Moist Grassland and Wetland	Forested Gorge Habitat
Poaceae	*Heteropogon contortus*	Graminoid	Indigenous	LC	-	-		X		X		
Poaceae	*Hyparrhenia dregeana*	Graminoid	Indigenous	LC	-	-	X	X	X			
Poaceae	*Hyparrhenia hirta*	Graminoid	Indigenous	LC	-	-	X	X			X	
Poaceae	*Imperata cylindrica*	Graminoid	Indigenous	LC	-	-					X	
Poaceae	*Koeleria capensis*	Graminoid	Indigenous	LC	-	-		X			X	
Poaceae	*Lolium cf. multiflorum*	Graminoid	Alien	NE	-	-					X	
Poaceae	*Loudetia cf. simplex*	Graminoid	Indigenous	LC	-	-		X				
Poaceae	*Melinis nerviglumis*	Graminoid	Indigenous	LC	-	-		X		X		
Poaceae	*Melinis repens*	Graminoid	Indigenous	LC	-	-	X					
Poaceae	*Microchloa caffra*	Graminoid	Indigenous	LC	-	-		X		X		
Poaceae	*Monocymbium ceresiiforme*	Graminoid	Indigenous	LC	-	-		X		X		
Poaceae	*Panicum ecklonii*	Graminoid	Indigenous	LC	-	-		X		X		
Poaceae	*Panicum natalense*	Graminoid	Indigenous	LC	-	-		X				
Poaceae	*Paspalum dilatatum**	Graminoid	Alien	NE	-	-			X		X	
Poaceae	*Pennisetum clandestinum**	Graminoid	Alien (NEMBA Category 1b)	NE	-	-	X				X	
Poaceae	*Pennisetum sphacelatum*	Graminoid	Indigenous	LC	-						X	
Poaceae	*Phragmites australis*	Graminoid	Indigenous		-	-					X	
Poaceae	*Setaria sp.*	Graminoid	Indigenous	LC	-	-		X				
Poaceae	*Setaria pallide-fusca*	Graminoid	Indigenous	LC	-	-					X	
Poaceae	*Stiburus alopecuroides*	Graminoid	Indigenous	LC	-	-					X	
Poaceae	*Themeda triandra*	Graminoid	Indigenous	LC	-	-		X			X	
Poaceae	*Tristachya leucothrix*	Graminoid	Indigenous	LC	-	-		X		X		
Poaceae	*Typha capensis*	Graminoid	Indigenous	LC	-	-					X	
Polygalaceae	*Polygala hottentotta*	Herb	Indigenous	LC	-	-		X				
Polygonaceae	*Emex australis**	Herb	Alien	NE	-	-						
Polygonaceae	*Rumex acetosella**	Herb	Alien	NE	-	-		X	X	X	X	
Polygonaceae	*Rumex crispus**	Herb	Alien	NE	-	-					X	
Proteaceae	*Protea caffra subsp. caffra*	Tree	Indigenous	LC	-	Protected		X			X	
Proteaceae	*Protea parvula*	Suffrutex	Indigenous	NT	NT	Protected		X				
Pteridaceae	*Cheilanthes viridis*	Fern	Indigenous	LC	-	-						X

Family	Species Name	Growth Form	Origin	Conservation Status			Disturbed Sites (e.g., road sides, cultivated fields)	Vegetation Communities				
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status		Dry Mixed Grassland	Disturbed Grassland	Rocky Grassland	Moist Grassland and Wetland	Forested Gorge Habitat
Pteridaceae	*Pellaea calomelanos var. calomelanos*	Fern	Indigenous	LC	-	-		X		X		
Ranunculaceae	*Ranunculus multifidus*	Herb	Indigenous	LC	-	-					X	
Rhamnaceae	*Ziziphus zeyheriana*	Dwarf Tree	Indigenous	LC	-	-		X				
Rosaceae	*Prunus persica**	Tree	Alien	NE	-	-	X					
Rosaceae	*Pyracantha angustifolia**	Tree	Alien (NEMBA Category 1b)	NE	-	-		X				
Rosaceae	*Rubus ludwigii*	Shrub	Indigenous	LC	-	-		X				
Rubiaceae	*Afrocanthium mundianum*	Tree	Indigenous	LC	-	-						X
Rubiaceae	*Kohautia amatymbica*	Herb	Indigenous	LC	-	-	X	X				
Rubiaceae	*Pentanisia angustifolia*	Dwarf Shrub	Indigenous	LC	-	-		X				
Rubiaceae	*Pentanisia prunelloides*	Herb	Indigenous	LC	-	-		X		X		
Rubiaceae	*Pygmaeothamnus zeyheri var. zeyheri*	Dwarf Shrub	Indigenous	LC	-	-		X				
Rubiaceae	*Richardia brasiliensis**	Herb	Alien	NE	-	-		X	X			
Salicaceae	*Populus x canescens**	Tree	Alien (NEMBA Category 2)	NE	-	-	X					
Salicaceae	*Salix babylonica**	Tree	Alien	NE	-	-					X	
Salicaceae	*Scolopia mundii*	Tree	Indigenous	LC	-	-						X
Scrophulariaceae	*Buddleja saligna*	Tree	Indigenous	LC	-	-						X
Scrophulariaceae	*Buddleja salviifolia*	Tree	Indigenous	LC	-	-						X
Scrophulariaceae	*Limosella major*	Herb	Indigenous	LC	-	-					X	
Scrophulariaceae	*Nemesia fruticans*	Herb	Indigenous	LC	-	-		X				
Scrophulariaceae	*Selago sp.*	Herb	Indigenous	-	-	-					X	
Selaginellaceae	*Selaginella dregei*	Fern	Indigenous	LC	-	-				X		
Solanaceae	*Datura stramonium**	Herb	Alien (NEMBA Category 1b)	NE	-	-	X				X	
Solanaceae	*Solanum elaeagnifolium**	Herb	Alien (NEMBA	NE	-	-		X				

Family	Species Name	Growth Form	Origin	Conservation Status			Disturbed Sites (e.g., road sides, cultivated fields)	Vegetation Communities				
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status		Dry Mixed Grassland	Disturbed Grassland	Rocky Grassland	Moist Grassland and Wetland	Forested Gorge Habitat
			Category 1b)									
Solanaceae	*Solanum mauritianum**	Shrub	Alien (NEMBA Category 1b)	NE	-	-	X					
Solanaceae	*Solanum panduriforme*	Shrub	Indigenous	LC	-			x				
Solanaceae	*Solanum pseudocapsicum**	Shrub	Alien	NE	-	-						X
Solanaceae	*Solanum sisymbriifolium**	Herb	Alien (NEMBA Category 1b)	NE	-	-		X	X	X	X	
Stilbaceae	*Halleria lucida*	Tree	Indigenous	LC	-	-				X		
Thymelaeaceae	*Lasiosiphon caffer*	Shrub	Indigenous	LC	-			X				
Thymelaeaceae	*Lasiosiphon capitatus (=Gnidia capitata)*	Shrub	Indigenous	LC	-	-		X		X		
Thymelaeaceae	*Lasiosiphon kraussianus (=Gnidia kraussiana)*	Shrub	Indigenous	LC	-	-		X		X		
Thymelaeaceae	*Lasiosiphon caffer (=Gnidia caffer)*	Shrub	Indigenous	LC								
Ulmaceae	*Celtis africana*	Tree	Indigenous	LC	-	-						X
Verbenaceae	*Verbena bonariensis**	Herb	Alien (NEMBA Category 1b)	NE	-	-	X	X	X			
Verbenaceae	*Verbena rigida**	Herb	Alien (NEMBA Category 1b)	NE	-	-			X			
Vitaceae	*Rhoicissus tridentata*	Climber	Indigenous	LC	-	-				X		X
Xyridaceae	*Xyris capensis*	Graminoid	Indigenous	LC	-	-					X	
	Unidentified Geophyte A (no flowers)	Herb	Indigenous	-	-	-		X				
	Unidentified Geophyte A (no flowers)	Herb	Indigenous	-	-	-				X		
	Orchid Sp. A (no flowers)	Herb	Indigenous	-	-	Protected				X		

Family	Species Name	Growth Form	Origin	Conservation Status			Disturbed Sites (e.g., road sides, cultivated fields)	Vegetation Communities				
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status		Dry Mixed Grassland	Disturbed Grassland	Rocky Grassland	Moist Grassland and Wetland	Forested Gorge Habitat
Red List Categories *NE = Not Evaluated* *LC = Least Concern* *NT = Near Threatened*												
**Indicates alien species*												

Appendix D: List and Co-ordinates of Flora Species of Conservation Concern Recorded in the Study Area

Table 1: Flora species of conservation concern recorded in the study area during the 2022 field survey.

Species Name	Location Co-ordinates	Approximate Number of Plants
Merwilla plumbea (Near Threatened, Nat & MP and VU NEMBA ToPS)	Along ridge between S25 51.899 E30 06.379 and S25 51.951 E30 06.354	50 to 100
	S25 51.914 E30 06.900	± 10
	S25 51.954 E30 06.942	± 10
	S25 51.933 E30 06.949	± 10
Boophone disticha (Protected, MP)	S25 45.144 E30 05.686	2
	S25 46.724 E30 07.876	1
	S25 47.285 E30 05.901	1
	S25 48.974 E30 06.110	2
	S25 45.588 E30 07.417	1
	S25 50.272 E30 07.591	1
	S25 51.915 E30 05.267	1
	S25 52.208 E30 06.267	1
Aloe verdoorniae (Protected, MP)	S25 46.905 E30 07.349	± 20
Watsonia (no flowers) (Protected, MP)	S25 45.961 E30 06.131	1
Eucomus autumnalis (Declining, MP)	S25 47.285 E30 05.901	2
	S25 47.200 E30 05.125	5
	S25 48.824 E30 05.456	6
	S25 48.974 E30 06.110	± 20
	S25 47.149 E30 07.956	± 10
	S25 48.979 E30 06.113	± 50
Aloe ecklonis (Protected, MP)	S25 47.200 E30 05.125	1
	S25 48.240 E30 04.279	3
Cyrtanthus contractus (Protected, MP)	S25 48.935 E30 04.167	1
Unidentified geophyte (no flowers)	S25 44.265 E30 06.923	1
Unidentified geophyte (no flowers)	S25 51.915 E30 06.899	6
Gladiolus longicollis subsp. *platypetalus*	S25 45.225 E30 07.321	
Ilex mitis var. mitis (Declining, MP)	S25 46.491 E30 07.302	1
Protea parvula (Near Threatened)	S25 46.410 E30 07.547	1
	S25 46.389 E30 07.602	1
Eulophia hians (Protected, MP)	S25 52.838 E30 05.650	1
Aloe cf. graciliflora (Protected)	S25 51.912 E30 06.381	± 10
Orchid sp. A (no flowers) (Protected, MP)	S25 51.965 E30 06.930	1
Gladiolus woodii (Protected, MP)	S25 50.250 E30 07.123	±5

Cyrtanthus breviflorus (Protected, MP)	S25 44.993 E30 05.884	4

Table 2 Location of Orchids recorded in the study area by G. Lockwood.

Species Name	Location Co-ordinates
Brownleea parviflora	-25.761059° 30.135056°
Corycium dracomontanum	-25.754961° 30.129575°
	-25.759347° 30.114761°
	-25.760133° 30.114203°
Disa aconitoides	-25.76296° 30.12483°
Disa baurii	-25.757507° 30.122313°
Disa chrysostachya	-25.757694° 30.116050°
	-25.767636° 30.117045°
Disa cooperi	-25.758248° 30.122409°
	-25.759149° 30.123448°
	-25.760599° 30.123344°
	25.763926° 30.119220°
Disa versicolor	-25.760312° 30.112702°
	-25,761817° 30.113578°
	-25.763864° 30.114192°
Disperis anthoceros	-25.773622° 30.121442°
Disperis micrantha	-25.773622° 30.121442°
Disperis tysonii	-25.761270° 30.135261°
Eulophia cooperi (Rare, MP)	-25.757250° 30.115202°
Eulophia hians var. hians	-25.761549° 30.130977°
Eulophia hians var. nutans	-25.757250° 30.115202°
Eulophia ovalis	-25.760967° 30.1434816°
Habenaria anguiceps (Rare, MP)	-25.75911° 30.12192°
Habenaria dives	-25.759492° 30.117237°
Habenaria dregeana	-25.760201° 30.112399°
	-25.761037° 30.113308°
	-25.761740° 30.113413°
Habenaria filicornis	-25.754729° 30.132352°
	-25.774939° 30.122059°
Habenaria galpinii	-25.761264° 30.113376°
Habenaria humilior (Rare, MP)	-25.758787° 30.114862°
	-25.756593° 30.124101°
Habenaria laevigata (Rare, MP)	-25.756662° 30.124203°
	-25.757130° 30.123199°
	-25.758993° 30.123625°
	-25.760064° 30.120997°
Habenaria nyikana	-25.756247° 30.132377°
Habenaria pseudociliosa	-25.761160° 30.135119°

Habenaria tysonii	-25.761160° 30.135119°
Neobolusia tysonii	-25.758258° 30.115108°
Orthochilus foliosus	-25.758010° 30.116646°
	-25.761219° 30.122688°
Orthochilus leontoglossa	-25.757154° 30.115693°
Orthochilus welwitschii	-25.761290° 30.123500°
Satyrium cristatum var. logilabiatum	-25.760638° 30.134862°
Satyrium longicauda	-25.763235° 30.113890°
	-25.759000° 30.115032°
Satyrium trinerve	-25.767301° 30.116105°
Schizochilus zeyheri	-25.759435° 30.116129°
	-25.761941° 30.124547°
Data source: Courtesy of G. Lockwood.	