Appendix G.4 Terrestrial Biodiversity

TERRESTRIAL BIODIVERSITY SPECIALIST ASSESSMENT FOR THE PROPOSED IGOLIDE WIND ENERGY FACILITY ELECTRICAL GRID INFRASTRUCTURE PROJECT

WSP Group Africa Pty (Ltd)

October 2024

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

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

Executive Summary

Introduction

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

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

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

Study Methodology

The primary scope of work included 1) Reviewing and summarising pertinent biodiversity information presented in relevant ecological, conservation and biodiversity datasets and literature. A key literature source in this regard was the previous specialist study conducted for the Igolide WEF by Ekotrust (2023); 2) Conducting a walkdown of the Project site to collect field data to verify the ecosystem and biodiversity character of the site and surrounding landscape; 3) Identifying and assessing potential negative impacts on terrestrial biodiversity and ecosystems associated with the proposed Project; and 4) Recommending appropriate biodiversity mitigation, management and monitoring measures for inclusion in the proposed Project's Environmental Management Plan (EMP).

The proposed Project's infrastructure footprint was assessed at a desktop level using the National Web-based Environmental Screening Tool. According to the sensitivity report output, the Terrestrial Biodiversity Theme is rated 'Very High' sensitivity due to the presence of Ecological Support Area 1 and Ecological Support Area 2.

Regional Ecological Context and Conservation Setting

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

The Gauteng Conservation Plan (3.3) delineations indicate that a large patch of land in the far south of the study area is designated 'Critical Biodiversity Area (CBA) - Important Areas' and a small patch is designated 'Ecological Support Areas' (ESA). Large patches of land in the north of the N12 Highway are also delineated as Ecological Support Areas (ESA).

The study area is not located within a delineated SWSA, but it is located in the Downstream Vaal Dam Subwater Management Area, as per the FEPA database.

The study area is not located within or in the vicinity of a protected area. But portions of land in the far south of the study area are mapped as Priority Focus Area, as per the National Protected Area Expansion Strategy (2018). These areas will not however, be impacted by proposed Project activities.

According to Gauteng Province's ridge mapping and classification, the ridges in the south of the study area are designated Class 1, while those in the north are designated Class 2.

Habitat units in the Study Area

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

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

Flora of Conservation Importance

In terms of flora species of conservation concern (SCC), several suspected *Adromischus umbraticola* subsp. *umbraticola* (Near Threatened) plants were recorded in an area of *Lopholaena corifolia* Rocky Ridge/Outcrop Grassland in the study area. In addition, five flora species that are listed as Protected at a provincial level, according to the Gauteng Nature Conservation Ordinance (12 of 1983) were also recorded on-site during the 2024 field survey.

Fauna of Conservation Importance

The study area has a potentially rich fauna community. Of mammal species recorded in/adjacent to the study area, two are SCC namely Mountain Reedbuck (*Redunca fulvorufula fulvorufula*) - Endangered and Black Wildebeest (*Connochaetes gnou*) - Protected (NEMBA ToPS List, 2007).

Impact Assessment

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

Impact	Impact Significance	
	Before Mitigation	After Mitigation
Construction Phase		
Direct loss and disturbance of natural habitat	High	Low
Habitat fragmentation impacting habitat connectivity and integrity	Medium	Low
Establishment and spread of alien invasive species	Medium	Low
Increased soil erosion and sedimentation	Medium	Low
Operational Phase		
Establishment and spread of alien invasive species	Medium	Low
Decommissioning Phase		
Establishment and spread of alien invasive species	Medium	Low
Increased soil erosion and sedimentation	Medium	Low
Cumulative Impacts		
Loss, disturbance and fragmentation of natural habitats	High	Low

Mitigation and Monitoring Measures

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

- A pre-construction micro-siting walkdown of the approved development footprints should be conducted during the wet/growing season to identify sensitive biodiversity receptors and inform micro-siting of infrastructure;
- As much of the proposed Project infrastructure as possible should be located in disturbed/modified habitat units, such as *Hyparrhenia hirta – Eragrostis chloromelas* Grassland, Alien Tree Plantations, and Transformed and Degraded;
- As far as practical, access roads should be aligned with existing farm roads and access tracks, and if feasible, no permanent access roads should be constructed in Mixed Rocky Ridge Bushveld and *Lopholaena corifolia* Rocky Ridge/Outcrop Grassland;
- All vegetation clearing for the Project should be restricted to the proposed Project footprints only, with no clearing permitted outside of these areas;
- The footprints to be cleared of vegetation should be clearly demarcated prior to construction to prevent unnecessary clearing outside of these areas;
- A rehabilitation/ landscaping protocol should be developed and implemented to stabilise and revegetate all non-operational sites that have been disturbed by construction activities;
- An AIS control and eradication plan must be developed for the Project that focuses on controlling and eradicating AIS in, and immediately adjacent to, the construction footprints. The plan should also include regular AIS monitoring; and
- Erosion prevention and control measures (e.g., brush-packing, gabions, silt-traps) should be implemented at any sites of erosion.

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

Specialist Opinion

The National Web-based Environmental Screening Tool rated the Terrestrial Biodiversity theme for the study area as 'Very High' sensitivity. The findings of this study confirm the overall Terrestrial Biodiversity sensitivity rating as 'Very High'.

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

Acronyms and Abbreviations

Abbreviation	Explanation
AIS	Alien Invasive Species
AOO	Area of Occupancy
BI	Biodiversity Importance
CA	Conservation Areas
CBA	Critical Biodiversity Areas
CI	Conservation Importance
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
EOO	Extent of Occurrence
ESA	Ecological Support Area
FI	Functional Integrity
Ha	Hectare
GDARD	Gauteng Department of Agriculture and Rural Development
IBA	Important Bird Areas
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
SCC	Species of Conservation Concern
SEI	Site Ecological Importance
SWSA	Strategic Water Source Areas
ToPS	Threatened or Protected Species

Details of the Expertise of the Specialist

Specialist Information	
Name	Andrew D. Zinn Pr.Sci.Nat. - Ecological Science (400687/15)
Designation	Report Author – Terrestrial Ecologist
Cell Phone Number	+27 83 361 0373
Email Address	andrew@hawkhead.co.za
Qualifications	M.Sc. Resource Conservation Biology B.Sc. Hons. Ecology and Conservation Biology B.Sc. Zoology and Grassland Science
Summary of Past Experience	Andrew Zinn is a terrestrial ecologist with Hawkhead Consulting. In this role, he conducts varied specialist ecology studies, including flora and fauna surveys, for baseline ecological assessments and ecological impact assessments. He has over a decade of experience working in the fields of ecology and conservation research, and is registered as a Professional Natural Scientist (*Pr.Sci.Nat.*) – Ecological Science, with the South African Council of Natural Scientific Professions (SACNASP). Andrew has worked on projects in several African countries including Botswana, Democratic Republic of Congo, Ethiopia, Ghana, Mozambique, South Africa, Tanzania and Zambia.

Declaration of Independence by Specialist

I, Andrew Zinn, declare that I –

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

Contents

List of Tables

List of Figures

1. Introduction

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

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

1.1. Scope and Purposes of this Report

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

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

The primary scope of work included:

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

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

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

1.2. Location and Delimits of the Study Areas

The proposed Project is located approximately 6 km northeast of Fochville, within the Merafong City Local Municipality in Gauteng Province (Figure 1). The entire extent of the Project is located within the Central Corridor of the Strategic Transmission Corridors.

The 'study area' defined for this assessment is shown in Error! Reference source not found. and includes 250 m wide corridor along the centreline of the proposed powerline route and a 500 m buffer around the proposed switching station and existing East Drie Five Substation sites (refer to Section Error! Reference source not found. for a description of proposed Project infrastructure and facilities).

1.3. Project Description

The proposed Project infrastructure and activities are presented in Table 1.

Table 1: Project Description – Technical details.

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

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

1.4. Environmental Screening Tool - Project Sensitivities

The proposed Project's infrastructure footprint was assessed at a desktop level using the National Web-based Environmental Screening Tool. According to the sensitivity report output, the Terrestrial Biodiversity Theme is rated 'Very High Sensitivity' due to the presence of the following features:

- Ecological Support Area 1;
- Ecological Support Area 2.

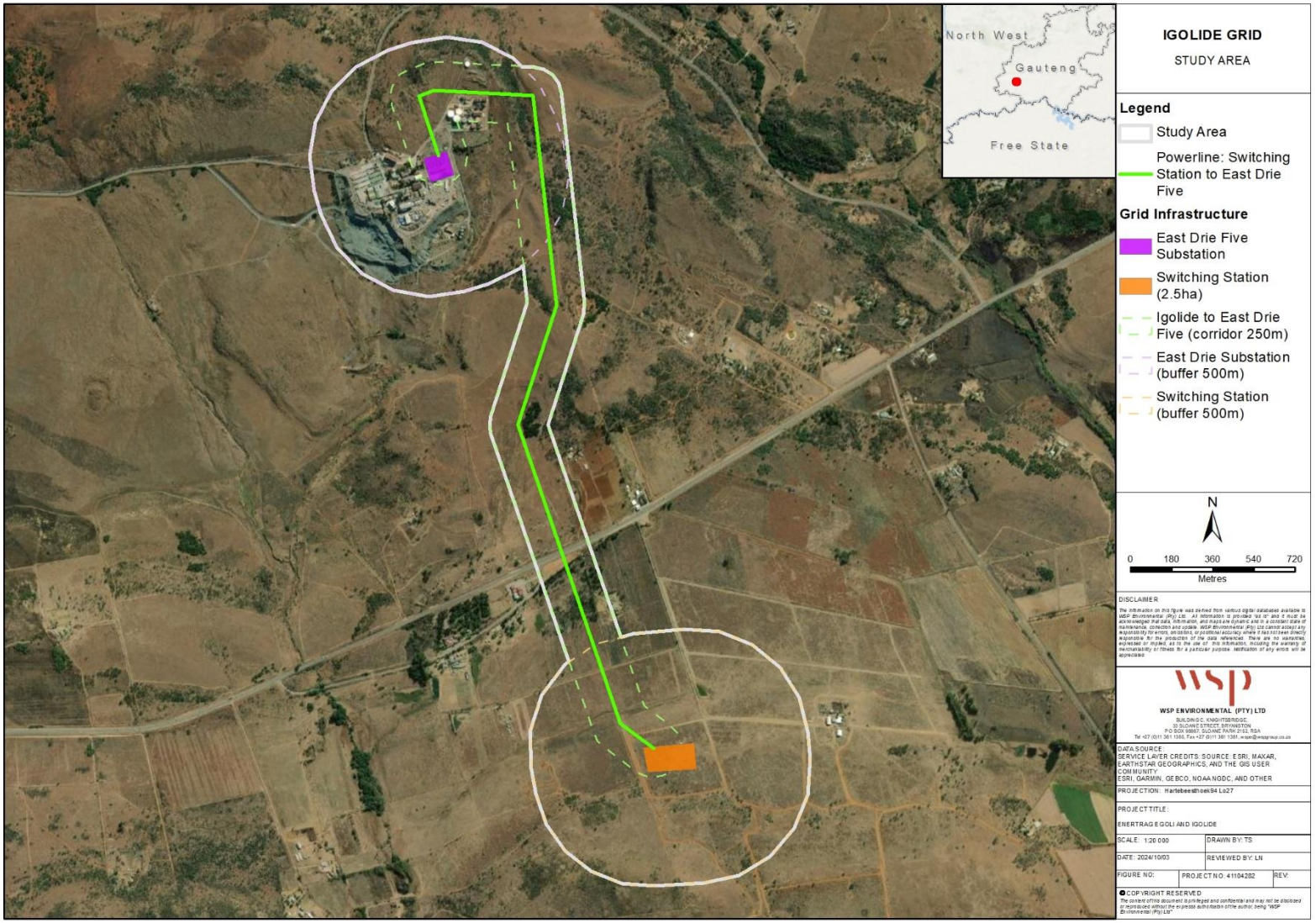


Figure 1 Map showing the regional location of the proposed Project.

2. Relevant Legislation and Guidelines

Relevant national and provincial legislation, associated guidelines and policies that are relevant to the environmental and biodiversity, and which were used to guide the Terrestrial Biodiversity Specialist Assessment are listed in Table 2.

Table 2: Relevant environmental and biodiversity legislation and guidelines.

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

Applicable Legislation and Guideline	Relevance to the Proposed Project
	• National list of threatened terrestrial ecosystems for South Africa (2011, and 2021 revision), published under Section 51(1)(a) of NEMBA. • National Biodiversity Offset Guideline (2023), which provides guidance on the need to develop biodiversity offsets. The purpose of ToPS lists and regulations are to regulate the permit system concerning restricted activities involving specimens of listed threatened or protected species. The primary purpose of listing threatened ecosystems is to reduce the rate of ecosystem and species extinction by identifying 'witness' sites' of exceptionally high conservation value and enabling and facilitating proactive management of these ecosystems. Chapter 5 of NEMBA also provides a list of regulations and guidance concerning alien invasive species, including: • A guideline for Monitoring, Control and Eradication Plans (September 2015); • 2020 Alien and Invasive Species Regulations (September 2020); and • 2016 and 2020 Alien and Invasive Species Lists (March 2021).
Nature Conservation Ordinance 12 of 1983, as amended by Gauteng General Law Amendment Act 4 of 2005.	Amongst other provisions, the Nature Conservation Ordinance provides lists of specially protected and protected flora and fauna. Of particular relevance are Schedule 2, 2A, 4, 7, 11 and 12 concerning Protected and Specially Protected fauna and flora.
Other Relevant national and Provincial Policies, Plans and Guidelines	Other relevant policies, plans and guidelines that were considered during this study include: • Species Environmental Assessment Guideline (SANBI, 2020); • National Protected Area Expansion Strategy (2018); • Standard for the Development and Expansion of Power Lines and Substations within Identified Geographical Areas Revision 2 (DFFE, 2022); • Gauteng Conservation Plan (3.3); • The Ridges Guideline (2019) for Gauteng Province; • The Red List Plant Guideline (2018) for Gauteng Province; and • Gauteng Department of Agriculture and Rural Development Requirements for Biodiversity Assessments Version 3.

3. Study Methodology

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

3.1. Desktop Literature Review

The aim of the desktop literature review component was to collate and review data and information pertaining to terrestrial biodiversity that may occur in the study area and surrounding landscape, based on historic distribution ranges or recent records.

Literature and data that were reviewed to provide a broader overview of the ecological attributes and conservation context of the study area and surrounding landscape were obtained from a variety of online and literature sources, as discussed below:

- The South African National Biodiversity Institutes (SANBI) Final Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018) was consulted to identify the regional vegetation types relevant to the study area;
- Mucina and Rutherford (2011) was reviewed to obtain full descriptions of the relevant regional vegetation type. SANBI (2013) was also reviewed for a biome-level description;
- The National List of Threatened Ecosystems (NEMBA Threatened Ecosystems, 2011 & 2021) was consulted to determine the conservation status of vegetation types and relevant ecosystems;
- The Gauteng Conservation Plan (3.3) was reviewed to determine the status and distribution of *inter alia*, protected areas, Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA);
- The Strategic Water Source Areas (SWSA) and Freshwater Ecosystem Priority Area (FEPA) databases for information on the hydrological setting of the study area;
- The South African Protected Areas Database website (SAPAD, 2023) was reviewed to identify protected areas (legally gazetted) and conservation areas in the landscape in which the study area is located;
- The Department of Water Affairs and Foresty (DWAF) spatial data of Indigenous Forest Patches was consulted to identify any indigenous forests in or in close proximity to the study area;
- National Protected Area Expansion Strategy (NPAES) (2018) was assessed to identify Priority Focus Areas for protected area expansion;
- Marnewick, *et al*., (2015) was reviewed for descriptions of any Important Bird Areas (IBA) in the region;
- Satellite imagery available on Google Earth Pro was studied to develop an understanding of general landcover, likely habitat types, and historic and current on-site disturbances.
- Ridge spatial data were obtained from the Gauteng Department of Agriculture and Rural Development (GDARD); and
- An additional key literature source that was reviewed for this study was the terrestrial biodiversity assessment report compiled by Ekotrust (2023) for the proposed Igolide WEF. The proposed site for the Igolide WEF encompasses the southern portion of the study area defined for this assessment, and therefore the findings of the Ekotrust (2023) study have relevance.

3.2. Field Programme

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

- Field work focused on both flora and fauna occurring in the study area, and focused on assessing *inter alia*, the general condition and composition of natural and semi-natural habitats, characterising on-site flora and fauna community composition, and verifying the site's overall sensitivity with respects to terrestrial biodiversity (for detailed surveying methods, refer to both the Animal and Plant Species Specialist Assessment reports); and
- Special emphasis was placed on confirming the presence/potential presence of species of conservation concern, habitat connectivity, and sites/habitats of importance and sensitivity.

3.3. Delineation and Mapping of Habitat Units

Mapping of habitat units in the study area was based on on-site observations from the 2024 field survey, an analysis of composite aerial/satellite imagery, and the delineations of Ekotrust (2023).

3.4. Assessment of Site Ecological Importance

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

$$SEI = BI + RR.$$

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

$$BI = CI + FI$$

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

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

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

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

4. Assumptions, Uncertainties and Gaps in Knowledge

The following assumptions, uncertainties and gaps in knowledge are highlighted for this biodiversity assessment:

- Field work was conducted over a one-day period in April 2024. The timing of the field survey coincided with the late wet-season. Sufficient rain had fallen during the preceding wet season to allow for a productive vegetation community. During this period, fauna presence and activity are also generally still high;
- Pursuant to the above, the conditions during which the field work for the current study was conducted are not considered significantly limiting with respects to the findings presented in this report. Notwithstanding this, it is possible that certain small or cryptic flora taxa (e.g., annuals and geophytes) that are most readily visible or distinguishable at other periods during the wet/growing season, may not have been detected during the field survey;
- The absence or non-recording of a specific fauna species, at a particular time, does not necessarily indicate that 1) the species does not occur there; 2) the species does not utilise resources in that area; or 3) the area does not play an ecological support role in the ecology of that species.

5. Regional Vegetation Characteristics

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

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

5.1. Savanna Biome

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

Compositionally, Africa's savannas are distinguished as either fine-leafed savannas or broad-leafed savannas. The distribution of these forms is based primarily on soil fertility (Scholes and Walker, 1993); fine-leafed savannas occur on nutrient rich soils and are dominated by microphyllous woody species of the Fabaceae family (most commonly indigenous Acacia's). These savannas have a productive and diverse herbaceous layer that is dominated by grasses, and can support large populations of mammalian herbivores (Scholes and Walker, 1993). Conversely, broad-leafed savannas usually occur on nutrient poor soils and are dominated by macrophyllous woody species from the Combretaceae family (common genera: Combretum & Terminalia). Compared to fine-leafed savannas, broad-leafed savannas are less productive and support a lower herbivore biomass (Scholes and Walker, 1993).

5.2. Gauteng Shale Mountain Bushveld

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

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

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

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

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

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

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

6. Regional Ecological Sensitivity and Conservation Setting

6.1. Nationally Threatened Ecosystems

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

6.2. Terrestrial Critical Biodiversity Areas and Ecological Support Areas

Figure 4 shows the study area in relation to the spatial delineations of the Gauteng Conservation Plan (C-Plan) 3.3 (2011).

According to the C-Plan, a large patch of land in the far south of the study area is designated 'Critical Biodiversity Area (CBA) - Important Areas' and a small patch is designated 'Ecological Support Areas' (ESA). Large patches of land to the north of the N12 Highway are also delineated as Ecological Support Areas (ESA) (shown in Figure 4).

The CBA and ESA land in the study area forms part of a larger network of CBA and ESA land that stretches along the associated ridges. Triggering criteria include Orange List plant habitat, Red List invertebrate habitat and Primary Vegetation (C-Plan 3.3, 2011). It is noted that the current footprints of the proposed Project infrastructure do not impact the CBA land in the south of the study area. ESA land in the north of the study area will however, be impacted. But anticipated impacts are considered unlikely to impair the functioning of ESA land.

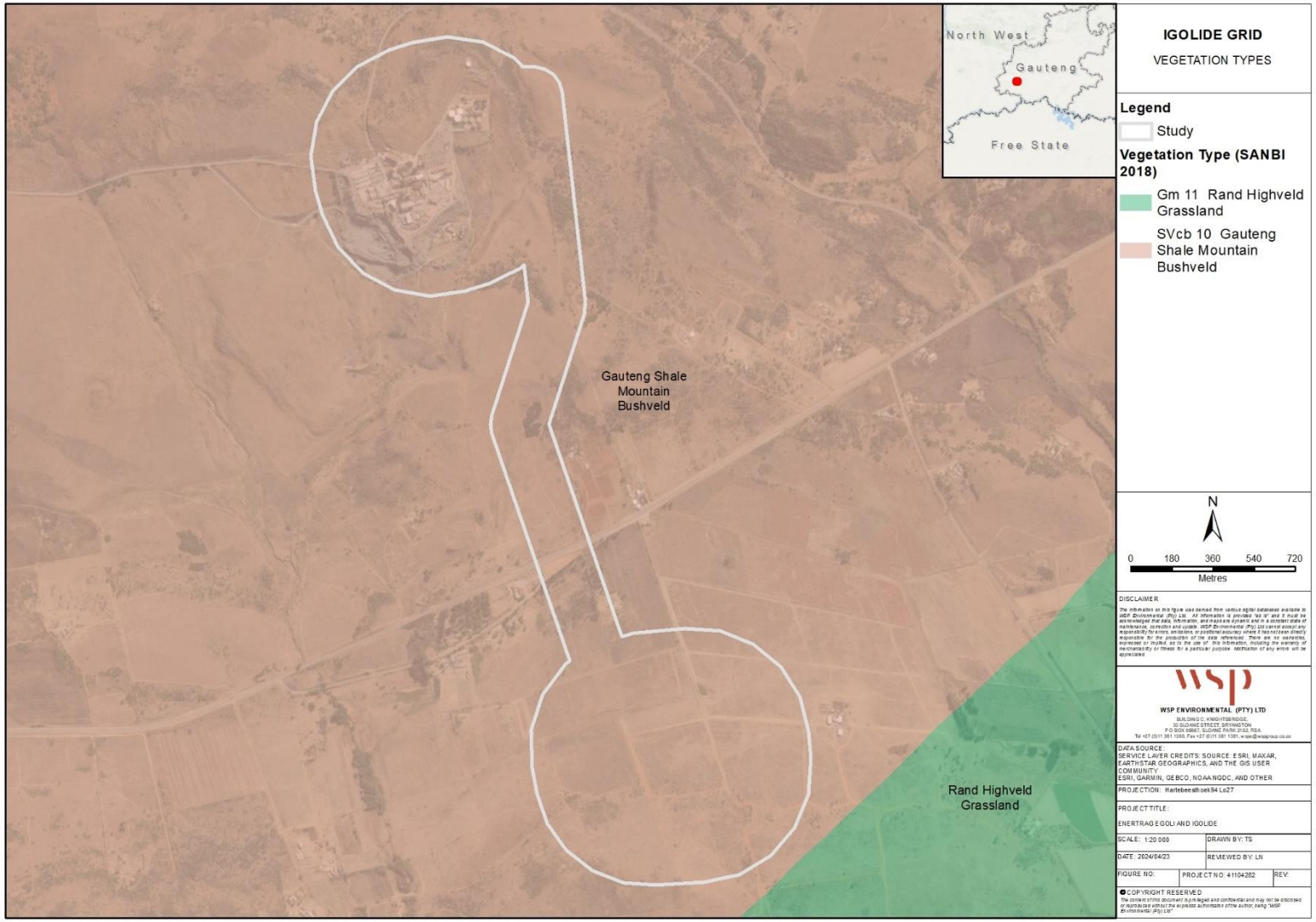


Figure 2: Study area in relation to the SANBI (2018) vegetation types.

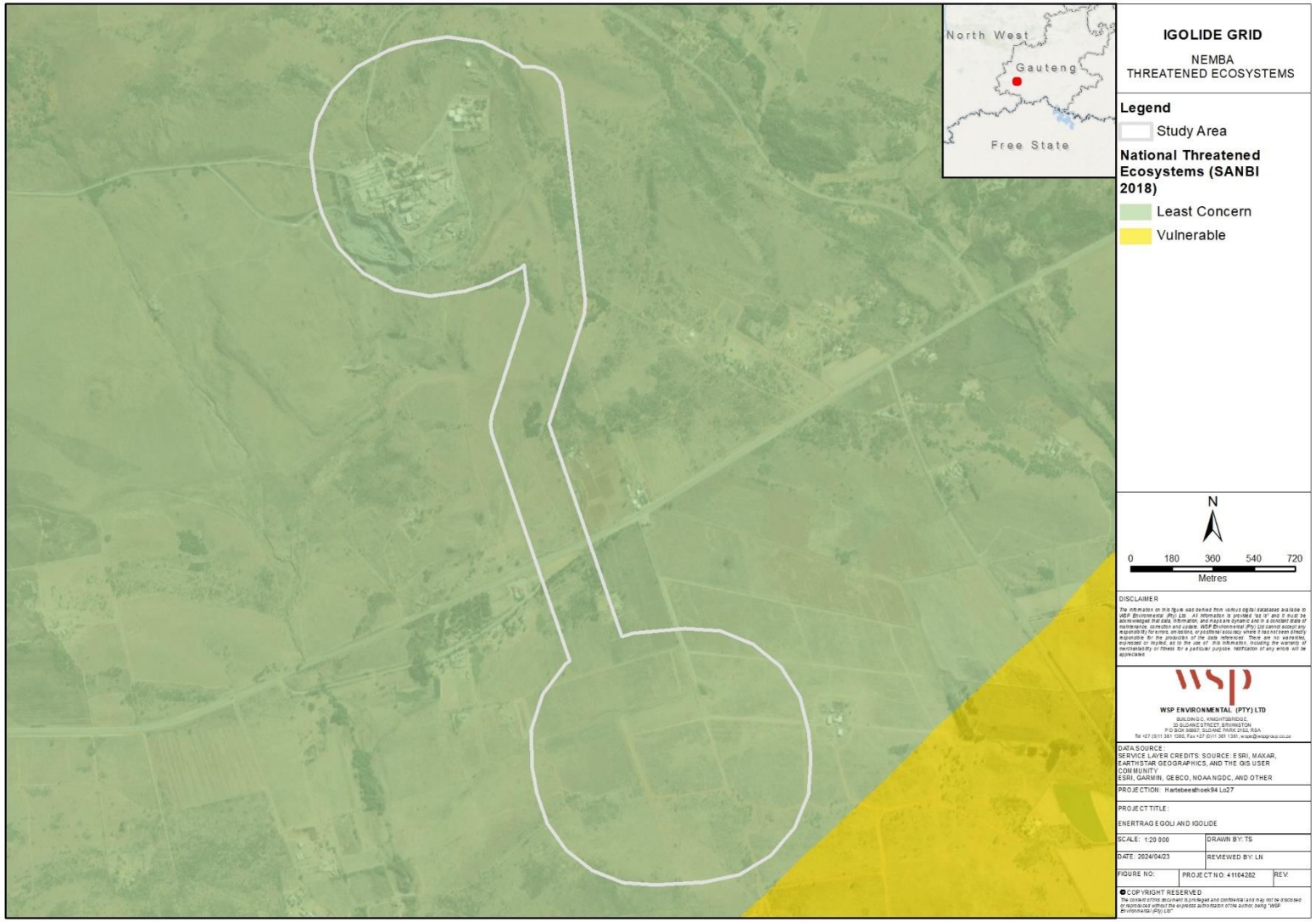


Figure 3: Proposed Project infrastructure in relation to NEMBA Threatened Ecosystems.

Figure 4: Proposed Project infrastructure in relation to mapped Critical Biodiversity Areas and Ecological Support Areas.

6.3. Water Management

6.3.1. Strategic Water Source Areas

The study area is not located in a strategic water source area (SWSA) (Figure 5). The nearest SWSA (Far West Karst Region) is located to the north of the study area. SWSA's were not included as receptor for the impact assessment, or considered further in this report.

6.3.2. Freshwater Ecosystem Priority Area Sub-Catchment

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

The study area is located in the Downstream Vaal Dam Subwater Management Area - shown in Figure 6. According to Driver, *et al*., (2012), FEPA's should be maintained in a natural/near natural condition, and anthropogenic activities in Upstream Management Areas should be carefully managed to prevent degradation of downstream FEPA's.

6.4. Indigenous Forests

No indigenous forests occur in the study area. Indigenous forests were therefore not included as receptor for the impact assessment, or considered further in this report.

6.5. Protected Areas and Conservation Areas

The study area is not located within or in the vicinity of a protected area (SAPAD, 2023) (Figure 7). Protected areas were therefore not included as receptors for the impact assessment, or considered further in this report.

6.6. Priority Focus Areas for Protected Area Expansion

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

According to the National Protected Area Expansion Strategy (2018) mapping, portions of land in the far south of the study area are mapped as Priority Focus Area, as shown in Figure 8. These areas will not however, be impacted by proposed Project activities.

6.7. Important Bird Areas

The study area is not located within an Important Bird Area (IBA), as per Marnewick *et al*., (2015). IBA's were not included as receptor for the impact assessment, or considered further in this report.

6.8. Gauteng Ridges

Ridge ecosystems are recognised as important biodiversity features, harbouring diverse flora and fauna communities, including several species of conservation concern. They also play an important role in many ecological (dispersal) and hydrological (water recharge) processes (refer to Section 10.1 for additional discussion on the ecological importance of ridges).

Most of Gauteng Province's ridges have been mapped and classified based on their degree of transformation (refer to Table 4 for ridges classes).

Figure 9 shows the classification of ridges associated with the study area. The ridges in the south of the study area are designated Class 1, while those in the north are designated Class 2. According to the Gauteng Ridge Guidelines, electricity network infrastructure, such as the proposed Project, is considered a low impact activity (GDARD Biodiversity, 2019). With respects to Class 1 ridges, the guidelines indicate that low impact activities will be supported, provided <5% of the ridge buffer zone is affected. With respects to Class 2 ridges, the guidelines indicate that low impact activities will be supported, provided <5% of the property is affected (GDARD Biodiversity, 2019).

Table 4: Gauteng Ridge Classification

Class	Description
Class 1 Ridges	5% or less of the area has been transformed by human activity. Comprises approximately 58% of Gauteng's ridges.
Class 2 Ridges	More than 5% but less than 35% of the ridge has been transformed by human activity. Comprises approximately 23% of Gauteng's ridges.
Class 3 Ridges	Ridges that have been transformed by 35% or more, but less than 65% as a result of human activity. Comprises approximately 8% of Gauteng's ridges.
Class 4 Ridges	Ridges that have been transformed by 65% or more as a result of human activity. Comprises approximately 11% of Gauteng's ridges.
From: GDARD Biodiversity (2019)	

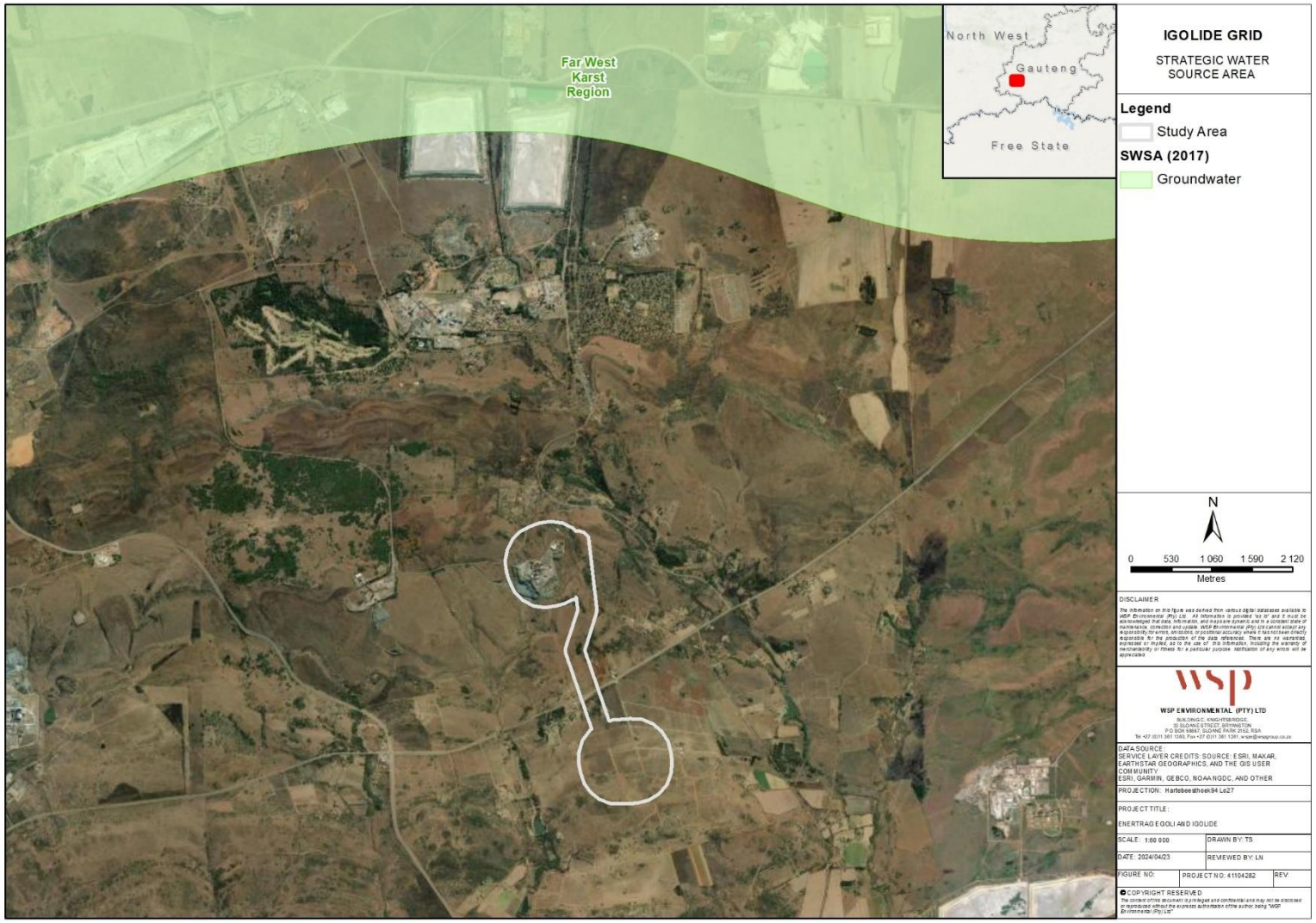


Figure 5: Study area in relation to recognised Strategic Water Source Areas

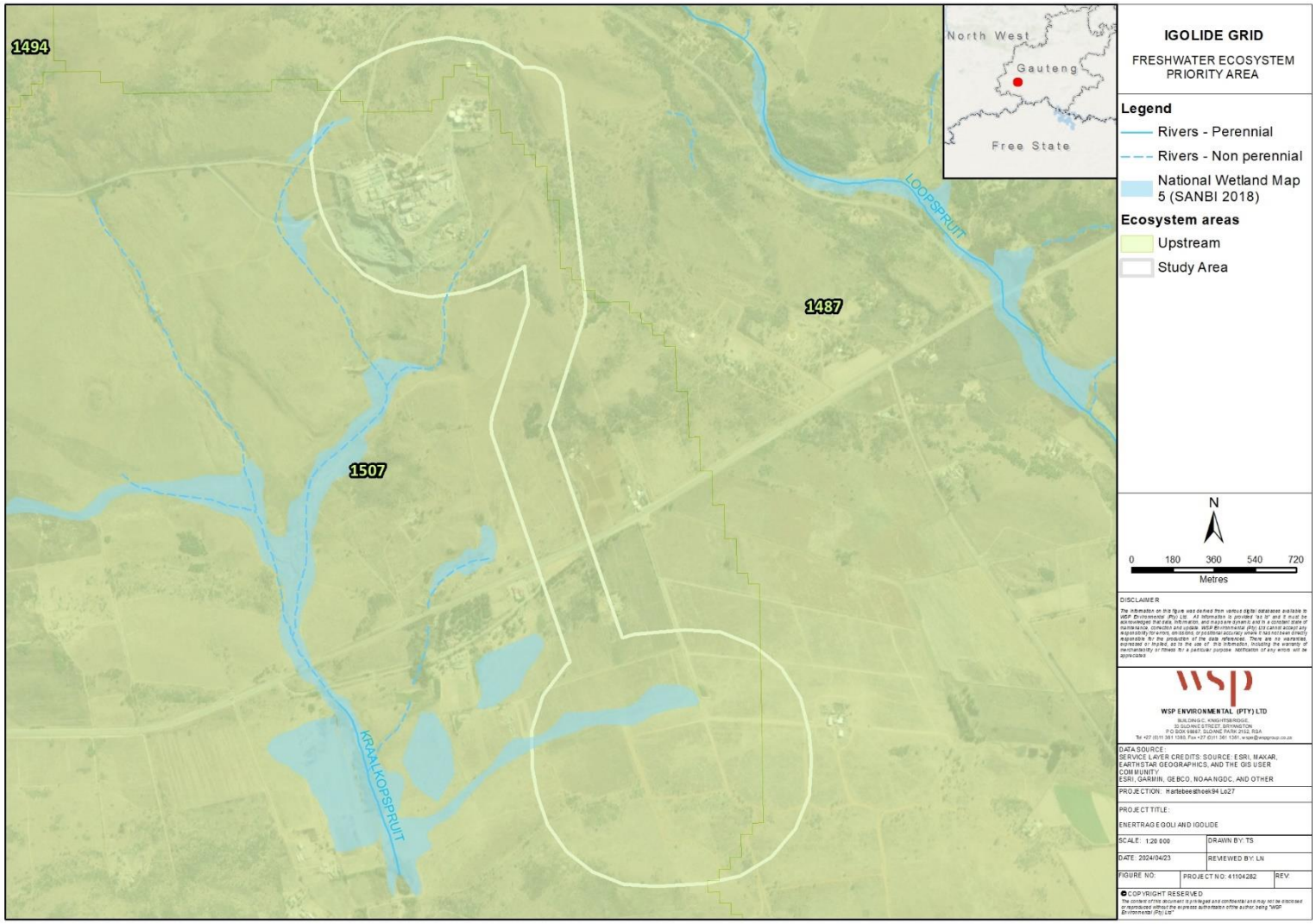


Figure 6: Study area in relation to recognised Freshwater Ecosystem Priority Area.

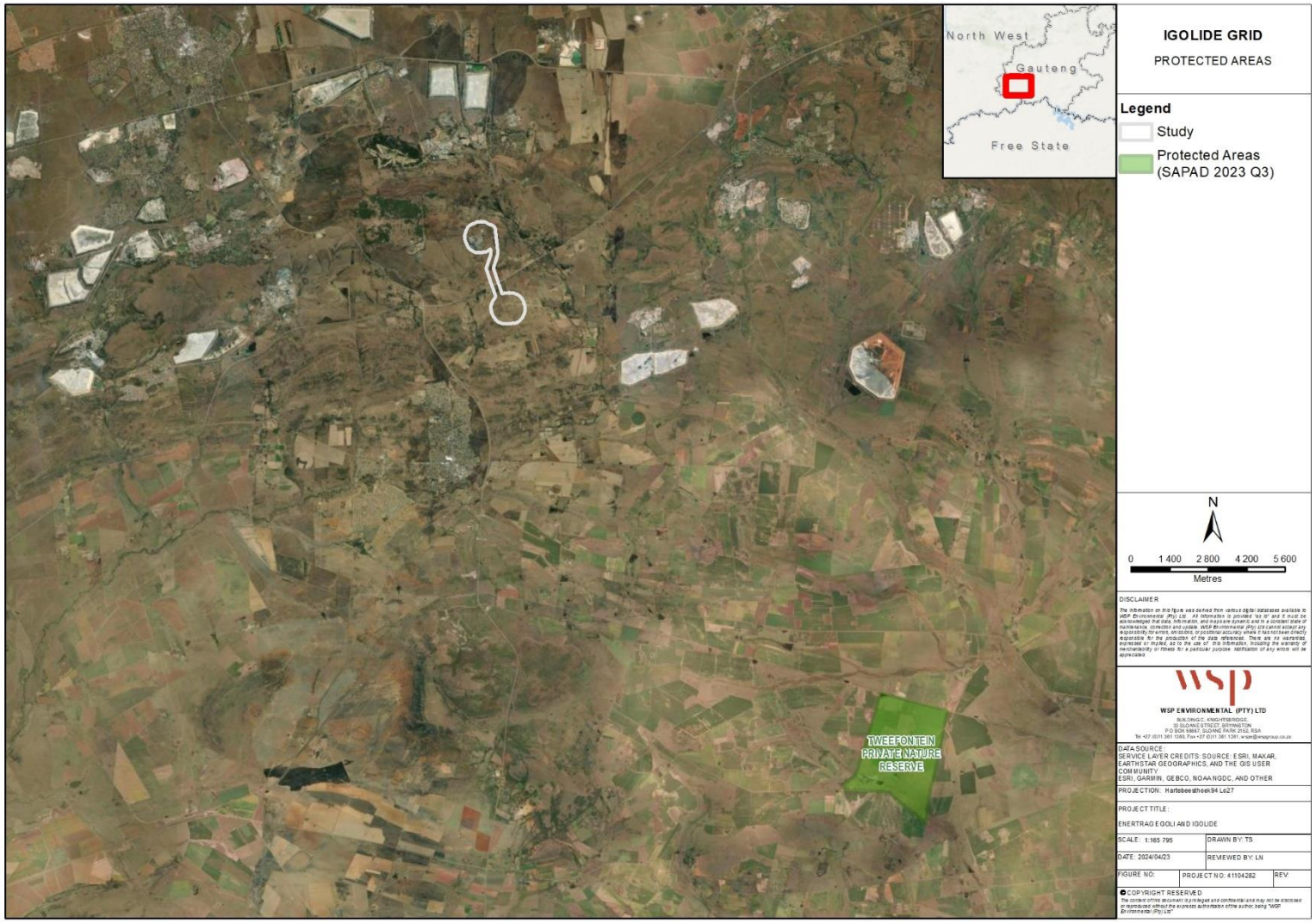


Figure 7: Protected areas in the landscape surrounding the study area.

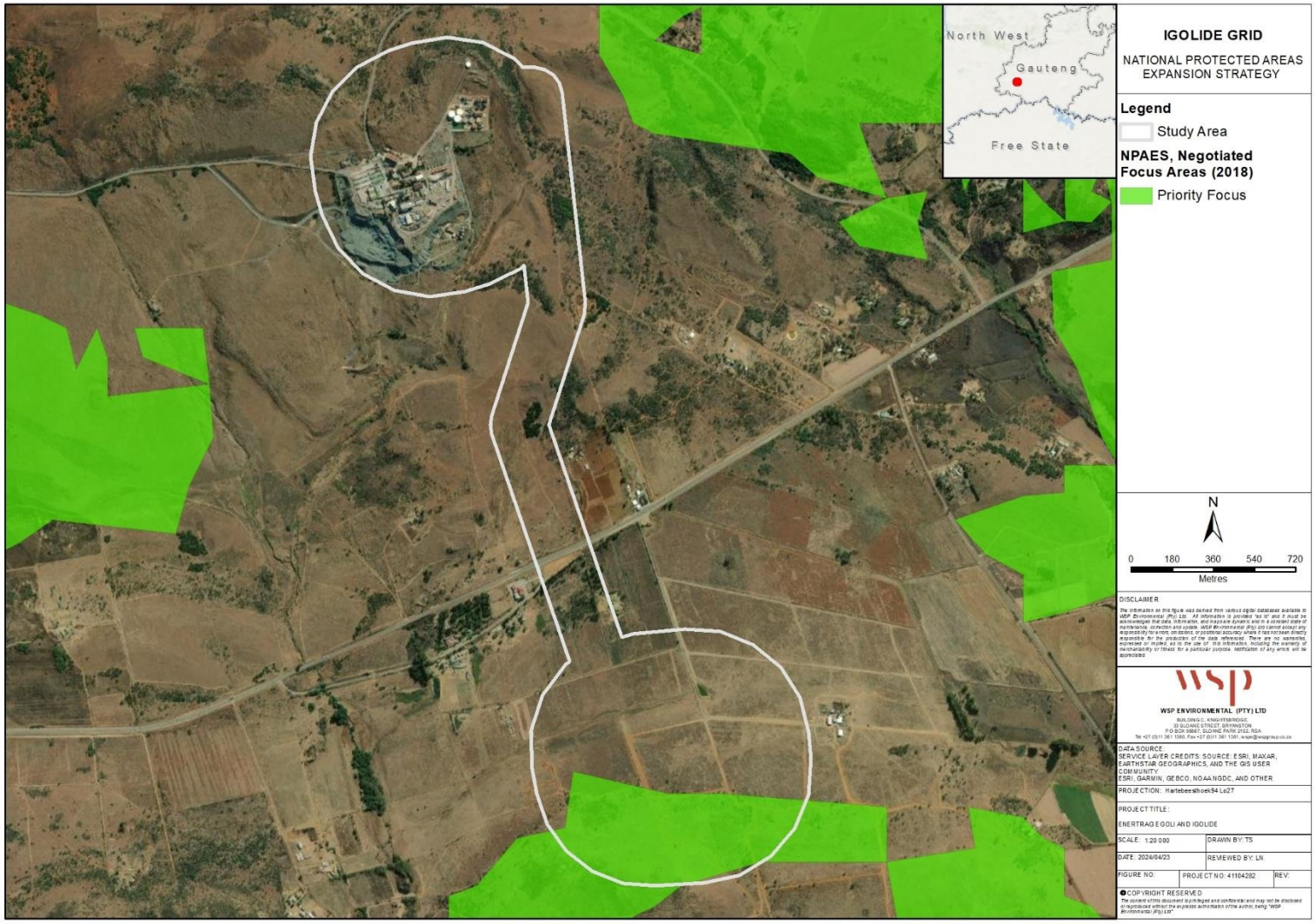


Figure 8: Study area in relation to national Priority Focus Area, as per the National Protected Areas Expansion Strategy (2018).

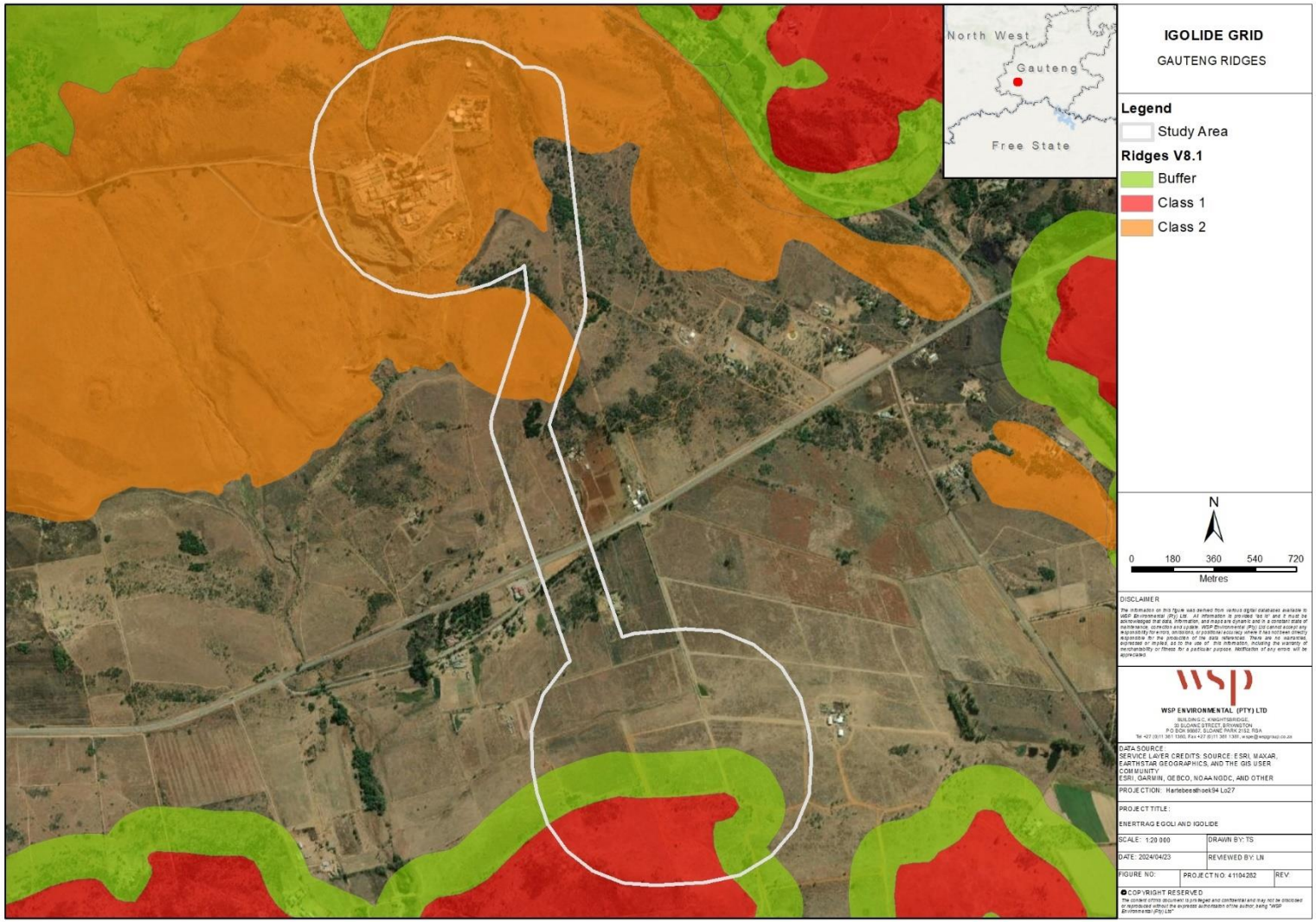


Figure 9: Ridges mapped in the landscape surrounding the study area.

7. Habitat Units in the Study Area

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

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

Descriptions of each unit, with accompanying photographs, are presented in Section 7.1 to Section 7.8. A habitat unit map for the study area is shown in Figure 10Error! Reference source not found.:

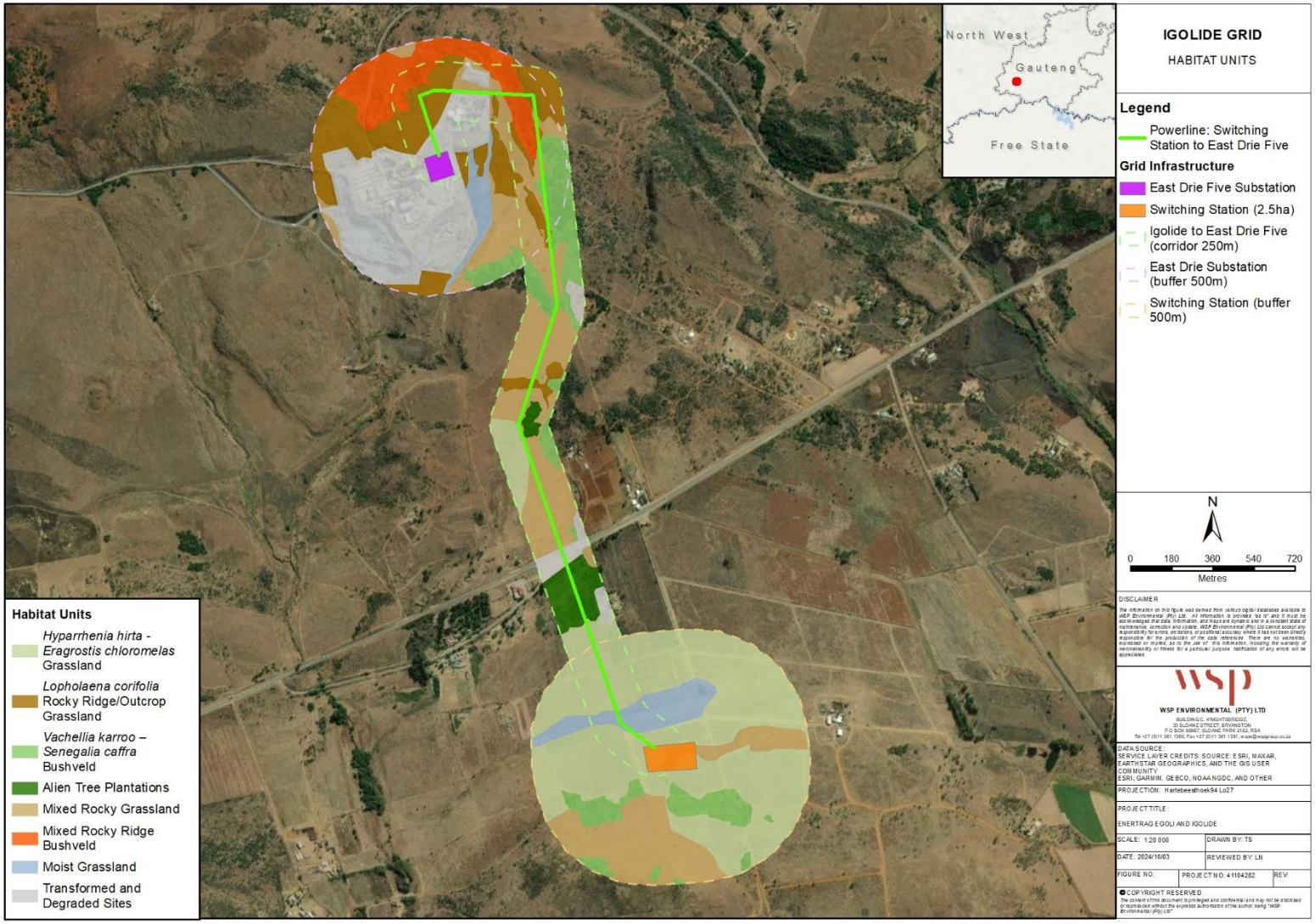


Figure 10: Habitat unit map of the study area.

7.1. *Hyparrhenia hirta - Eragrostis chloromelas* Grassland

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

In line with Edwards (1983) structural classification, structurally this community is defined as low open grassland. In terms of composition, these grasslands are generally species poor and dominated by dense stands of the tall thatching grass *Hyparrhenia hirta* (see Figure 11). Other recorded grasses include *Aristida congesta* subsp. *congesta, Cynodon dactylon, Digitaria eriantha, Eragrostis curvula, Eragrostis chloromelas* and *Eragrostis gummiflua.* Common forbs recorded in this habitat unit include *inter alia; Bidens bipinnata*, Cirsium vulgare*, Helichrysum rugulosum, Hermannia depressa, Ipomoea ommaneyi, Nidorella anomala, Richardia brasiliensis*, Verbena bonariensis** and *Verbena brasiliensis** (*indicates alien taxa).

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

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

No flora SCC were recorded in this habitat unit, and it is considered unlikely that such species are present.

Figure 11: Hyparrhenia hirta – Eragrostis chloromelas Grassland

7.2. Moist Grassland

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

Vegetation structure ranges from low- to tall closed grassland (*sensu*. Edwards 1983) (Figure 12). Compositionally, shorter grasses tend to dominate most temporarily and seasonally wet areas, while the taller rush *Typha capensis* and the reed *Phragmites australis* dominate more permanently wet locations (Figure 13).

Common grass species recorded in this unit include *Agrostis lachnantha, Andropogon eucomus, Cynodon dactylon, Eragrostis curvula, Eragrostis gummiflua, Eragrostis plana, Hyparrhenia hirta, Panicum schinzii, Paspalum dilatatum*, Pennisetum clandestinum** and *Sporobolus africanus.* Other taxa noted include *Conyza* species*, *Juncus effusus, Helichrysum aureonitens, Persicaria lapathifolia*, Plantago lanceolata, Pseudognaphalium luteo-album** and *Rumex crispus*.*

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

Figure 12: Moist grassland habitat in the south of the study area.

Figure 13: Moist grassland habitat associated with water discharge from the Sibanye Driefontein Gold 5 Shaft complex.

7.3. *Lopholaena corifolia* Rocky Ridge/Outcrop Grassland

This habitat unit occurs on small rocky outcrops and along larger south-facing ridge/hillsides in the north of the study area, and is characterised by the visible prevalence of large protruding rocks. In line with Edwards (1983), structurally, vegetation is defined as low open grassland, with woody vegetation occurring only as scattered individual small trees and shrubs (see Figure 14 and Figure 15).

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

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

Woody species recorded include the often-abundant small shrubs *Lopholaena coriifolia and Searsia magalismontana* subsp*. magalismontana*, as well as scattered larger trees, such as *Senegalia caffra, Brachylaena rotundata, Mundulea sericea, Vangueria infausta* and the dwarf shrub *Elephantorrhiza elephantina.* Several succulents were noted to occur in this community including *Aloe davyana, Aloe verecunda, Cotyledon orbiculata, Crassula setulosa, Kalanchoe paniculata* and *Kalanchoe thyrsiflora.*

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

Figure 14: Lopholaena coriifolia Rocky Ridge/Outcrop Grassland in the north of the study area.

Figure 15: Lopholaena coriifolia is a prominent woody species in this habitat unit.

7.4. Mixed Rocky Grassland

Mixed Rocky Grassland is a variable habitat unit, and an expansion of the *Cymbopogon caesius - Elionurus muticus* rocky grasslands described by Ekotrust (2023). This unit occurs on shallow rocky soils to the north- and south of the N12 highway. Structurally, mixed rocky grasslands are characterised by low closed grassland (Figure 16), as per Edwards (1983).

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

Woody species generally occur at low abundances and as scattered small trees and shrubs in this habitat unit. The following indigenous species were noted; *Diospyros lycioides, Lopholaena coriifolia, Pollichia campestris, Seriphium plumosum* and *Vachellia karroo*. The dwarf tree *Elephantorrhiza elephantina* was also noted to grow in localised aggregations in this unit. *Seriphium plumosum* is a common encroacher species in areas of this unit that have been disturbed (Figure 17).

In terms of NEMBA declared alien invasive species, scattered alien wattle species (*Acacia dealbata* and *Acacia mearnsii*) were noted in this habitat unit. Provincially protected plant species recorded in this unit include *Crinum graminicola.*

Figure 16: Mixed Rocky Grassland.

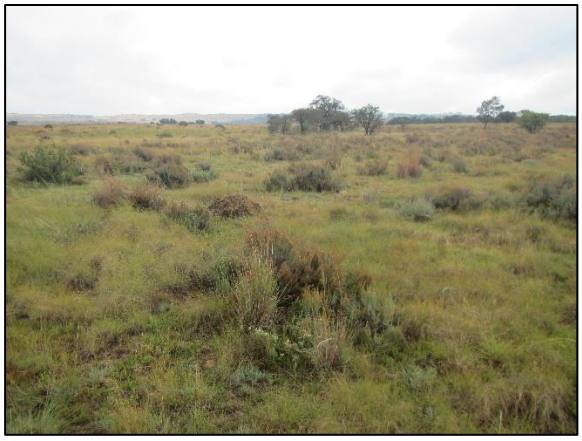


Figure 17: Abundance of Seriphium plumosum

7.5. *Vachellia karroo – Senegalia caffra* Bushveld

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

Vegetation structure ranges from low open woodland to short closed woodland, as per Edwards (1983) structural classification (Figure 18 and Figure 19).

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

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

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

In terms of flora SCC, two provincially protected plant species were recorded in this unit, namely *Protea caffra* and *Scadoxus puniceus*.

Figure 18: Vachellia karroo – Senegalia caffra Bushveld in the south of the study area.

Figure 19: Vachellia karroo – Senegalia caffra Bushveld in the north of the study area.

7.6. Mixed Rocky Ridge Bushveld

This habitat unit occurs on the north- and east-facing ridge/hillsides in the north of the study area, and like the *Lopholaena corifolia* Rocky Ridge/Outcrop Grassland unit, is characterised by the abundance of large protruding rocks. It is noticeably dissimilar to the grassland unit by the abundance of larger woody taxa (shown in Figure 20 and Figure 21).

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

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

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

One provincially protected plant species was recorded in this unit, namely *Scadoxus puniceus,* and it is considered probable that other SCC are present in this unit.

Figure 20: Mixed Rocky Ridge Bushveld in the far north of the study area.

Figure 21: Densely wooded ridge.

7.7. Alien Tree Plantations

In the study area, two small patches are dominated by alien tree species. A small stand of *Acacia mearnsii* trees is located to the north of the N12. This stand is characterised by an almost complete absence of herbaceous vegetation growing beneath the trees (Figure 22).

A large stand dominated by *Eucalyptus camaldulensis* is located immediately south of the N12 in the study area. Unlike the *Acacia mearnsii* stands, herbaceous vegetation is present beneath the *Eucalyptus* trees (Figure 23) and includes grass species such as *Aristida congesta* subsp. *congesta, Cynodon dactylon, Eragrostis curvula, Eragrostis gummiflua, Hyparrhenia hirta, Pogonarthria squarrosa* and *Themeda triandra*. Indigenous woody species recorded include *Asparagus laricinus, Diospyros lycioides* and *Seriphium plumosum.*

Alien tree plantations are a modified habitat type. No flora SCC were observed in these areas, and the probability of such taxa being present is unlikely to negligible.

Figure 22: Stand of Acacia mearnsii trees. Note: absence of undergrowth vegetation.

Figure 23: Stand of Eucalyptus camaldulensis trees.

7.8. Transformed and Degraded Sites

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

Driefontein) infrastructure and associated facilities, residential dwellings and infrastructure, and the N12 Highway.

8. Flora species of Conservation Concern

Several suspected *Adromischus umbraticola* subsp*. umbraticola* plants were recorded in an area of *Lopholaena corifolia* Rocky Ridge/Outcrop Grassland in the study area. This species is listed as Near Threatened on the national Red List (Helme and Raimondo, 2006) and is in priority group A2 in Gauteng Province (GDARD, 2014). The required buffer for a species listed in priority group A2 is 500 m (GDARD Biodiversity, 2018). Refer to the Plant Species Assessment report (Hawkhead, 2024a) for more detail on the *Adromischus umbraticola* subsp*. umbraticola* plants, their location, the assessed impacts on this species, and the recommended mitigation measures.

Five flora species that are listed as Protected at a provincial level, according to the Gauteng Nature Conservation Ordinance (12 of 1983) were recorded during the 2024 field survey, including *Aloe verecunda*, *Cussonia paniculata*, *Crinum graminicola, Protea caffra* and *Scadoxus puniceus.* During their field work, Ekotrust (2023) recorded one additional provincially Protected taxon *viz., Gladiolus permeabilis.*Error! Reference source not found.

For additional information on other flora SCC potentially occurring in the study area, including habitat preferences and a 'probability of occurrence' based on findings of habitat suitability assessments, refer to the Plant Species Specialist Assessment Report (Hawkhead, 2024a).

9. Fauna Attributes of the Study Area

The study area has a potentially rich fauna community. In terms of mammals, 29 species were documented for the landscape. These include several game farmed/managed taxa, but also many free-roaming species. Of documented mammals, two are SCC namely:

- Mountain Reedbuck (*Redunca fulvorufula fulvorufula*) - Endangered; and
- Black Wildebeest (*Connochaetes gnou*) - Protected (NEMBA ToPS List, 2007).

The variety and extent of available natural habitats also suggests that many species of bird, reptile, amphibian and invertebrate are likely to occur on-site. Indeed, data retrieved from SABAP 2 for the pentads encompassing the study area indicates that 315 bird species have previously been documented locally, while Virtual Museum records indicate that four amphibian, 21 reptile, 80 butterfly, 12 dragonfly, one scorpion and one spider species, have been recorded in the 2627BC QDS.

Habitat suitability assessments also indicate that several SCC potentially occur in the study area and therefore potentially will be impacted by proposed Project activities.

For additional information on fauna SCC occurring and potentially occurring in the study area, refer to the Animal Species Specialist Assessment Report (Hawkhead, 2024b).

10. Key Ecological Attributes and Processes

10.1. Habitat Corridors, Resources and Refugia

Rocky outcrops and ridges are recognised for their high biodiversity importance, and for their role as landscape corridors, refugia and as critical hydrological features (Pfab, 2001). The combination and

interaction of several factors including altitude, aspect, slope, geology, soils, light and hydrological patterns create highly diverse and unique micro-habitats that significantly increase local- and landscape-scale habitat heterogeneity. This in turn, promotes a high degree of both flora and fauna diversity (Pfab, 2001).

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

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

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

10.2. Ecological Processes and Drivers of Change

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

10.2.1. Alien Invasive Species Colonisation

In total, 31 declared NEMBA AIS have been recorded in or adjacent to the study area during the current study or by Ekotrust (2023). AIS have the capacity to spread into areas of natural habitat, where they can potentially shade-out and competitively exclude indigenous flora species, including flora SCC. Both *Acacia dealbata* and *Acacia mearnsii* were observed in the study area and are noted to be particularly aggressive invaders, capable of spreading into adjacent areas of undisturbed habitat.

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

10.2.2. Wildfire – Grassland Burning

Fire is a natural, albeit often human initiated, disturbance agent in grassland ecosystems. Mesic Highveld Grasslands are considered fire-prone and fire-dependent landscapes, and fire is essential to the maintenance of biodiversity patterns and ecological processes (SANBI, 2013).

Wildfires have several key ecological effects, including:

- Removal of moribund vegetation and increasing plant productivity and palatability, which improves grazing for wild herbivores, and stimulates germination/flowering of fire-adapted flora species (e.g., certain orchid species);
- Controls the encroachment of both alien and indigenous woody plant species and weeds; and

- Increases overall habitat heterogeneity by creating a structural mosaic of tall- and short grassland.

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

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

10.2.3. Herbivory - Livestock Grazing and Trampling

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

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

11. Site Ecological Importance

The site ecological importance (SEI) of identified habitat units in the study area were assessed using the SANBI (2020) protocol (refer to Section 3.4 and Appendix B for the methodology). The results of the assessment are presented in Table 5, and shown in Figure 24.

Table 5: Site Ecological Importance of habitat unit in the study area

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

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

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
		Only minor current negative ecological impacts with limited signs of major past disturbance and good rehabilitation potential.			
Alien Tree Plantations	VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remains.	VERY LOW: Several major current negative ecological impacts.	VERY LOW	VERY HIGH: Habitat that can recover rapidly to restore >75% of the original species composition and functionality.	VERY LOW
Transformed and Degraded Sites	VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remains.	VERY LOW: Several major current negative ecological impacts.	VERY LOW	VERY HIGH: Habitat that can recover rapidly (~less than 5 years) to restore >75% of the original species composition and functionality	VERY LOW

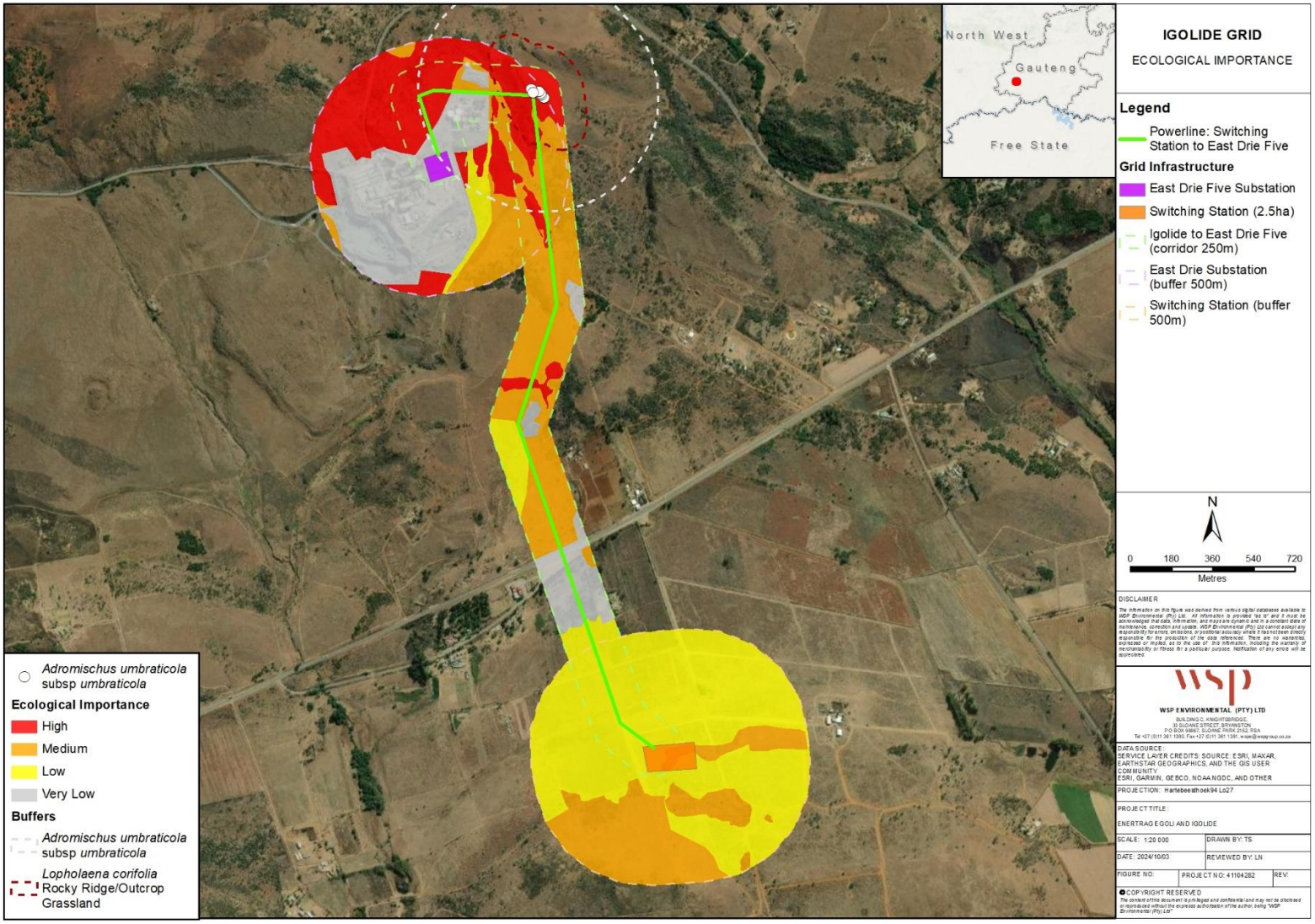


Figure 24: Site Ecological Importance of the study area, showing current proposed layout of the Project infrastructure and location of flora SCC.

12. Terrestrial Biodiversity Impact Assessment

12.1. 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 6.

Table 6: Impact Assessment Criteria and Scoring System

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

[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

12.2. 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 25 below.

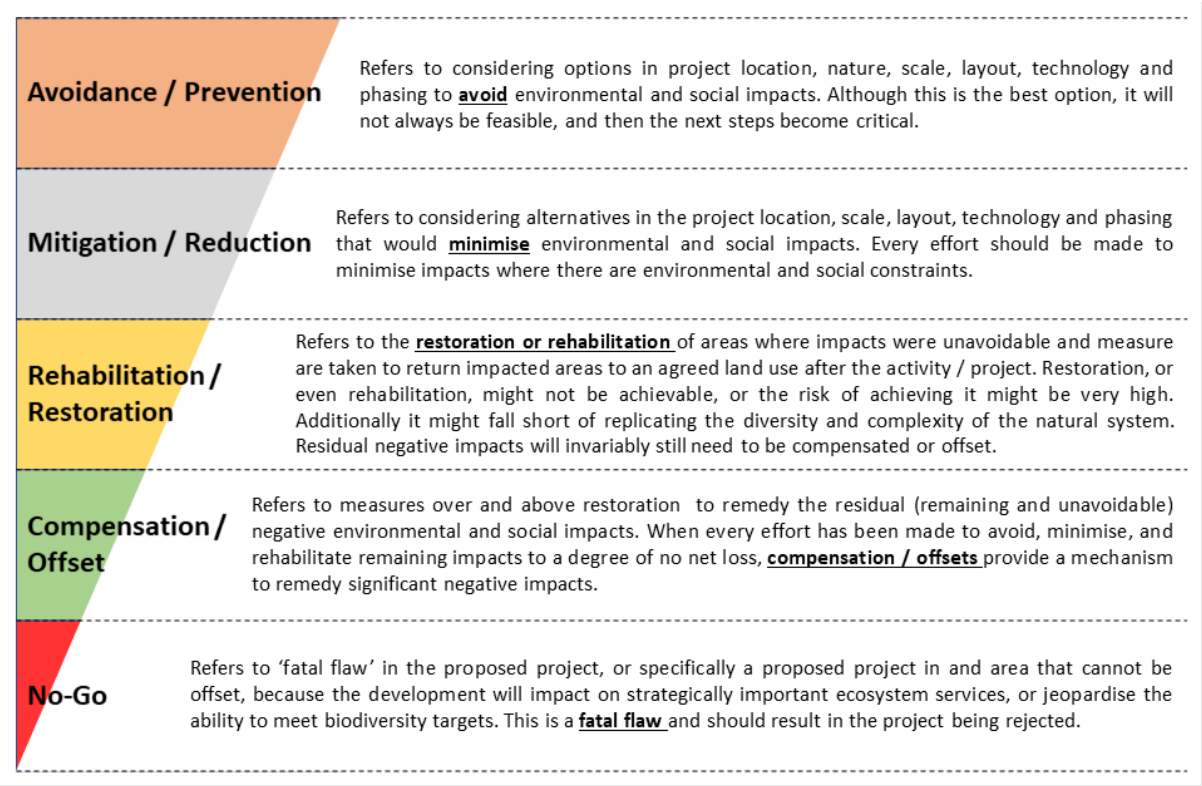


Figure 25: Mitigation Sequence/Hierarchy

A discussion on assessed impacts for each phase (i.e., Construction Operational and Decommissioning) of the proposed Project is provided in sections below, along with an analysis of anticipated cumulative impacts in Section 12.3.4. A summary table is presented in Table 9.

12.3. Assessment of Impacts on Terrestrial Biodiversity

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

12.3.1. Construction Phase

12.3.1.1. Direct loss and disturbance of natural habitat

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

The proposed Project will result in the clearing of approximately 4.63 ha of natural habitat for the construction of planned infrastructure (shown in Figure 26 and presented in Table 7):

- For the proposed powerline pylon/towers, based on an estimated pylon/tower footprint of 80 m^2 and an approximate pylon/tower placement of about every 250 m, the approximate extent of permanent natural habitat loss is 0.11 ha, with the loss per habitat unit presented in Table 7;
- The proposed switching station has a proposed footprint of 2.5 ha and will result in the loss of approximately 1.68 ha of *Hyparrhenia hirta – Eragrostis chloromelas* Grassland and 0.81 ha of Mixed Rocky Grassland; and
- A layout of the proposed access road is not available at this time. However, it is understood that the proposed access road will run the length (4 km) of the powerline corridor and will be up to 6 m wide. Based on these metrics and the current alignment of the powerline, the extrapolated/indicative extent of habitat loss is about 2.03 ha (Table 7);

With respects to the delineations of Gauteng C-Plan (3.3), no CBA land will be impacted, but in total approximately 0.97 ha of ESA land may be impacted as a result of the proposed Project, with Table 8Table 8 presenting the potential impact footprint, per proposed infrastructure component.

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

Several measures can be taken to minimise impact significance, including *inter alia*, micro-siting infrastructure to already disturbed footprints, minimising disturbance footprints to the absolute necessary for construction and operational, and rehabilitating all disturbed areas after construction. With the application of these, and other recommended mitigation measures, impact magnitude can be reduced to medium, and it can be confined to the site scale. Duration can be reduced to the long-term, and probability to low. This results in an after-mitigation impact of “Low” significance.

Table 7: Extent of habitat loss associated with proposed Project infrastructure

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

Table 8: Approximate extent of loss of Ecological Support Areas.

Gauteng C-Plan (3.3) Category	Approximate Extent of Direct Loss (Ha)		
	Powerline	Switching Station	Access Road
Ecological Support Areas	0.05	0.00	0.92

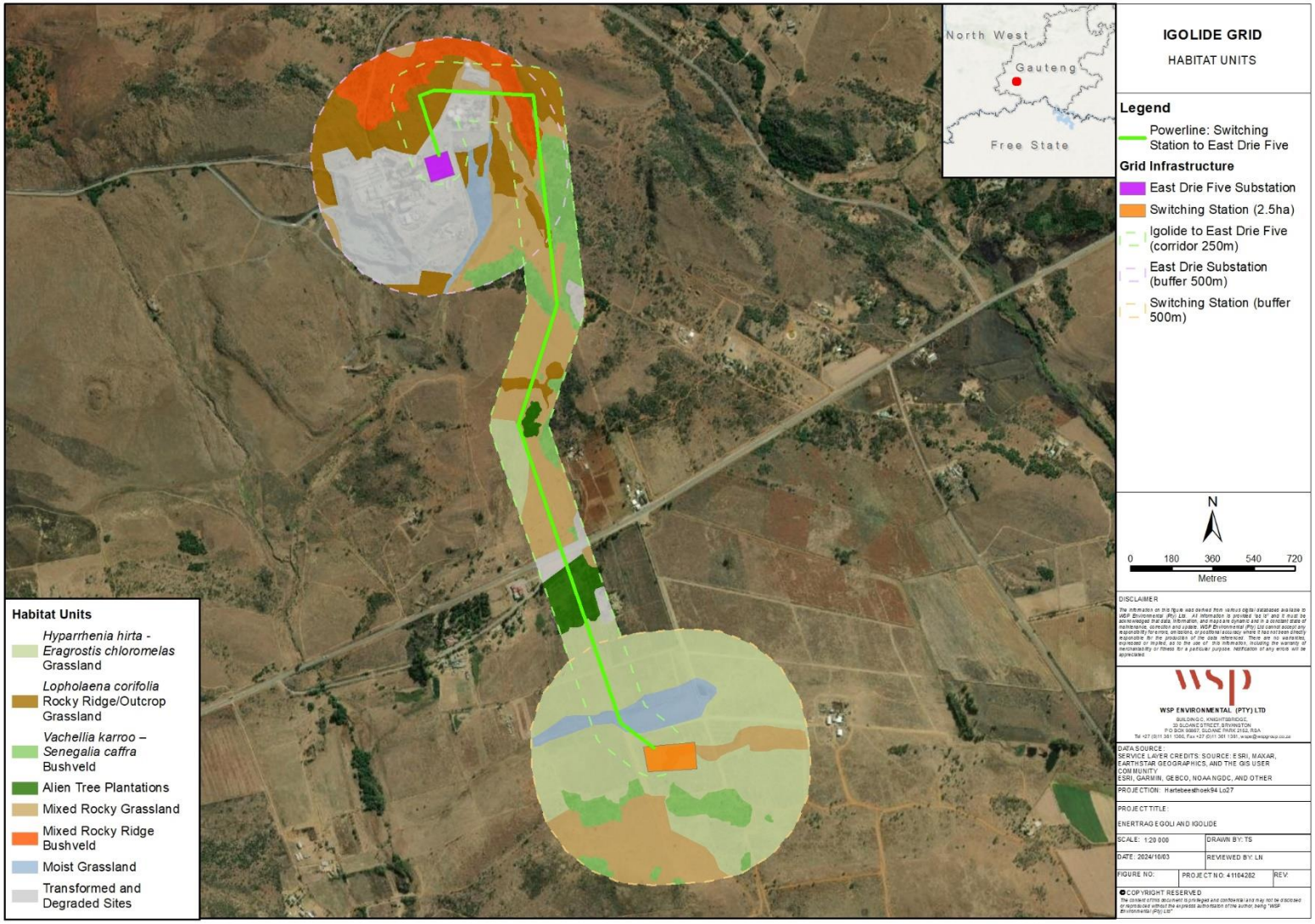


Figure 26: Habitat units and the currently proposed infrastructure layout.

12.3.1.2. Habitat fragmentation impacting habitat connectivity and integrity.

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

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

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

12.3.1.3. Establishment and spread of alien invasive species

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

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

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

This impact is relatively easy to mitigate though the implementation of an AIS control programme during the construction phase. This impact can be reduced to a low magnitude, with a short-term duration. Spatial extent will be reduced to the site only and the probability of the impact occurring as predicted would be reduced to low. After mitigation, this impact is rated to be of "Low" significance.

12.3.1.4. Increased soil erosion and sedimentation

Vegetation clearance and earth works are likely to increase potential incidences of soil erosion, which may lead to the mobilisation and transportation of sediment into drainage features. High levels of sedimentation could have a smothering effect and impact the integrity and functioning of affected habitats, and reduce terrestrial biodiversity.

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

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

12.3.2. Operational Phase

12.3.2.1. Establishment and spread of alien invasive species

The potential spread of AIS in the study area will continue to be an impact of concern during the operational phase.

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

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

12.3.3. Decommissioning Phase

12.3.3.1. Establishment and spread of alien invasive species

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

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

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

12.3.3.2. Increased soil erosion and sedimentation

Earth works during decommissioning may increase potential incidences of soil erosion, which may lead to the mobilisation and transportation of sediment into drainage features in the study area.

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

This impact is relatively easy to mitigate with active interventions, such as *inter alia*, rehabilitation and the erection of silt traps. With the implementation of the required mitigation measures during

the decommissioning, this impact can be reduced to a low magnitude, with a short-term duration. Spatial extent will be reduced to the site only and the probability of the impact occurring as predicted would be reduced to low. After mitigation, this impact is rated to be of "Low" significance.

Table 9: Impact assessment scoring for terrestrial biodiversity

CONSTRUCTION																		
Impact number	Receptor	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation					
						(M+	E+	R+	D)x	P=	S	Rating	(M+	E+	R+	D)x	P=	S	Rating
Impact 1:	Terrestrial habitat	Direct loss and disturbance of natural habitat	Construction	Negative	Low	5	2	3	5	5	75	N3	3	1	3	4	2	22	N1
					Significance	N3 - High							N1 - Low						
Impact 2:	Terrestrial habitat	Habitat fragmentation impacting habitat connectivity and integrity.	Construction	Negative	Medium	5	2	3	5	4	60	N2	3	2	3	4	2	24	N1
					Significance	N2 - Medium							N1 - Low						
Impact 3:	Terrestrial habitat	Establishment and spread of alien invasive species	Construction	Negative	High	4	2	3	4	4	52	N2	2	1	3	2	2	16	N1
						N2 - Medium							N1 - Low						
Impact 5:	Terrestrial habitat	Increased soil erosion and sedimentation	Construction	Negative	High	3	2	3	4	4	48	N2	2	1	3	2	2	16	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:	Terrestrial habitat	Establishment and spread of alien invasive species	Operational	Negative	High	4	2	3	4	3	39	N2	2	1	3	2	2	16	N1
					Significance	N2 - Medium							N1 - Low						
DECOMISSIONING																		
Impact number	Receptor	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation					
						(M+	E+	R+	D)x	P=	S		(M+	E+	R+	D)x	P=	S	
Impact 1:	Terrestrial habitat	Establishment and spread of alien invasive species	Decommissioning	Negative	High	4	2	3	4	4	52	N2	2	1	3	2	2	16	N1
					Significance	N2 - Medium							N1 - Low						
Impact 2:	Terrestrial habitat	Increased soil erosion and sedimentation		Negative	High	3	2	3	4	4	48	N2	2	1	3	2	2	16	N1
					Significance	N2 - Medium							N1 - Low						
CUMULATIVE																		
Impact number	Receptor	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation					
						(M+	E+	R+	D)x	P=	S		(M+	E+	R+	D)x	P=	S	
Impact 1:	Terrestrial habitat	Loss, disturbance and fragmentation of natural habitat	Construction	Negative	Moderate	4	3	3	5	5	75	N3	3	3	3	4	2	26	N1
					Significance	N3 - High							N1 - Low						

12.3.4. Cumulative Impacts

12.3.4.1. Cumulative impact of natural habitat loss, disturbance and fragmentation.

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

The approved Igolide WEF, which is associated with this proposed Electrical Grid Infrastructure Project, but is part of a separate authorisation process, is also located within the immediate landscape surrounding the study area.

Collectively, the development of both the Igolide WEF and the proposed Igolide Electrical Grid Infrastructure, will cause direct habitat loss, disturbance and fragmentation through vegetation clearing that is greater in extent than that of a single constituent project, and this is a cumulative impact of concern with respects to terrestrial biodiversity.

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

13. Assessment of the No Go Alternative

If the proposed Project does not proceed, it is anticipated that the current land use status quo will continue into the future. The tracts of grassland and savanna habitat in the study area will continue to be used for livestock and game farming, which may lead to incidences of overgrazing, which may drive the homogenisation of habitats and reduce both fauna and flora diversity.

It is also likely that overtime, AIS growing in the study area (such as *Acacia mearnsii* and *Solanum mauritianum*) will continue to expand their current distribution. This may compromise habitat integrity and negatively impact both fauna and flora diversity, and potentially the persistence of SCC.

14. Mitigation Measures

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

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

- Construction;
- Operational; and
- Decommissioning

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

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

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

Table 10Error! 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 10: Summary of proposed impact mitigation actions.

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
1. Pre-Construction Phase							
1.1	Terrestrial Habitat	Direct loss and disturbance of natural habitat	• A pre-construction micro-siting walkdown of the approved development footprints should be conducted during the wet/growing season to identify sensitive biodiversity receptors and inform micro-siting of infrastructure.	N/A	Avoidance & Minimisation	Pre-Construction Phase	Project Manager
2. Construction Phase							
2.1	Terrestrial Habitat	Direct loss and disturbance of natural habitat	<u>Avoidance</u> • As much of the proposed Project infrastructure as possible should be located in disturbed/modified habitat units, such as *Hyparrhenia hirta – Eragrostis chloromelas* Grassland, Alien Tree Plantations, and Transformed and Degraded Areas) and localised disturbed sites; • As far as practical, access roads should be aligned with existing farm	N/A	Avoidance, Minimisation & Rehabilitation	During Construction Phase	Project Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			roads and access tracks, and if feasible, no permanent access roads should be constructed in Mixed Rocky Ridge Bushveld and *Lopholaena corifolia* Rocky Ridge/Outcrop Grassland; <u>Minimisation</u> • All vegetation clearing for the Project should be restricted to the proposed Project footprints only, with no clearing permitted outside of these areas; • The footprints to be cleared of vegetation should be clearly demarcated prior to construction to prevent unnecessary clearing outside of these areas; • No heavy vehicles should travel beyond the marked works zone; • Temporary facilities associated with construction, such as portable toilets, storage and laydown areas,				

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			should be located on land that is modified. <u>Rehabilitation</u> A rehabilitation/ landscaping protocol should be developed and implemented to stabilise and revegetate all non-operational sites that have been disturbed by construction. The protocol should include: • Stockpiling of topsoil from development footprints during site preparation; • Post-construction, the land form should be correctly contoured to limit potential erosion and compacted soils should be ripped and loosened to facilitate vegetation establishment; • Topsoil removed during construction should be applied to all non-operational sites that were disturbed during construction and require revegetation; and				

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			• Grass species used during rehabilitation should be indigenous and locally-occurring perennial species, and include a mixture of pioneer, sub-climax and climax species.				
2.2	Terrestrial Habitat	Habitat fragmentation impacting habitat connectivity and integrity	<u>Avoidance and Minimisation</u> See mitigation measures for: *Direct loss and disturbance of natural habitat*	N/A	Avoidance and Minimisation	During Construction Phase	Project Manager
2.3	Terrestrial Habitat	Establish and spread of alien invasive species	An AIS control and eradication plan must be developed for the Project that focuses on controlling and eradicating AIS in, and immediately adjacent to, the construction footprints. The plan must include: • Identification of AIS management units • Prioritisation of sites and species requiring control; • Targets and indicators of success; • Scheduling of AIS control;	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
			• Species-specific control methods, using a combined approach of both chemical and mechanical control methods; and • Provision for follow-up treatments, as informed by regular AIS monitoring.				
2.4	Terrestrial Habitat	Increased soil erosion and sedimentation	• All sites disturbed by construction activities should be stabilised and actively revegetated, as per the rehabilitation/ landscaping protocol; and • Erosion prevention and control measures (e.g., brush-packing, gabions, silt-traps) should be implemented at any sites of erosion.	N/A	Minimisation & Rehabilitation	During Construction Phase	Project Manager
3. Operational phase							
3.1	Terrestrial Habitat	Establish and spread of alien invasive species	Active alien invasive species control should continue throughout the operational phase, as per the approved AIS control and eradication programme.	Guidelines for Monitoring, Control and Eradication of AIS (DEA, 2015)	Minimisation	During Operational Phase	Facility Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
4. Decommissioning phase							
4.1	Terrestrial Habitat	Establish and spread of alien invasive species	Active alien invasive species control should continue during the decommissioning phase and annual follow up control should be carried out for a five- year period following decommissioning.	Guidelines for Monitoring, Control and Eradication of AIS (DEA, 2015)	Minimisation	Annually during decommissioning and annually for a five-year period after decommissioning	Facility Manager
4.2	Terrestrial Habitat	Increased soil erosion and sedimentation	To limit the potential for AIS encroachment, soil erosion and dust generation, all Project footprints and sites that were disturbed during decommissioning, should be actively rehabilitated using local occurring indigenous flora species.	N/A	Rehabilitation	During the Decommissioning Phase	Facility Manager

15. Monitoring Measures

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

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

For each monitoring action, the following information is provided:

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

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

- Construction;
- Operational; and
- Decommissioning.

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

Table 11: Summary of monitoring measures

Ref. No.	Category	Method for monitoring	Time period	Frequency of monitoring	Mechanism for monitoring compliance	Responsible person
1. Construction and Operational phase						
1.1	Alien invasive species	• Annual on-site alien invasive species monitoring should be conducted. Monitoring should focus on all sites disturbed during the construction phase; and • Monitoring should assess species type and density, and these data should inform the scope of ongoing alien invasive species control.	Wet/growing season	Annual	Annual Monitoring Report	Project Manager
2. Decommissioning phase						
2.1	Alien invasive species	• Alien invasive species monitoring should be conducted on an annual basis during decommissioning and annually for a five-year period following decommissioning. Monitoring should focus on all sites disturbed during decommissioning; and • Monitoring should assess species type and density, and these data should inform the scope of ongoing alien invasive species control.	Wet/growing season	Annually during decommissioning for a five-year period after decommissioning	Annual Monitoring Report	Facility Manager

16. Reasoned Opinion and Environmental Impact Statement

16.1. Summary of Main Findings

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

The Gauteng C-Plan (3.3) delineations indicate that a large patch of land in the far south of the study area is designated 'Critical Biodiversity Area (CBA) - Important Areas' and a small patch is designated 'Ecological Support Areas' (ESA). Large patches of land in the north of the N12 Highway are also delineated as Ecological Support Areas (ESA). It is noted that the current footprints of proposed Project infrastructure do not impact the CBA land in the south, but they do impact the ESA land to the north of the N12. This notwithstanding, considering the generally limited nature of habitat loss/disturbance anticipated for the proposed Project, coupled with the implementation of the recommended mitigation measures, any impacts are not expected to significantly impair the functionality of the designated ESA.

The study area is not located within a delineated SWSA, but it is located in the Downstream Vaal Dam Subwater Management Area, as per the FEPA database.

Portions of land in the far south of the study area are mapped as Priority Focus Area. These areas will not however, be impacted by proposed Project activities.

During the field survey, eight habitat units were identified in the study area, including both natural (and seminatural) grassland and savanna habitats, as well as highly modified habitats (i.e., Alien Tree Plantations and Transformed and Degraded Sites). The latter are of little conservation value and have Site Ecological Importance ratings of 'Very Low'. The natural/semi-natural habitats have Site Ecological Importance ratings ranging from "Low' to 'High'. These areas provide important habitat for flora and fauna. They also form part of a larger network of natural habitat and thus contribute to broader-scale habitat connectivity, which is an important component of maintaining landscape ecological processes and terrestrial biodiversity.

The National Web-based Environmental Screening Tool rates the Terrestrial Biodiversity Theme for the proposed Project as 'Very High' sensitivity on account of the presence of ESA 1 and ESA 2. It is noted that the tracts of natural grassland and bushveld habitat in the study area are of biodiversity importance with respect to their roles as ecological support areas. The 'Very High' sensitivity rating of the screening tool is therefore confirmed.

The loss, disturbance and fragmentation of natural habitat from vegetation clearing during construction is the primary impact of concern. Vegetation clearing coupled with earth works are also likely to be accompanied by other indirect impacts, such as AIS colonisation and erosion.

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

16.2. Conditions to be Included in the Environmental Authorisation

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

16.3. Specialist Opinion

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

17. References

DEA (Department of Environmental Affairs) (2018). National Protected Areas Expansion Strategy for South Africa. Department of Environmental Affairs, Pretoria, South Africa.

DFEE (Department of Forestry, Fisheries and the Environment) (2022). Standard for the Development and Expansion of Power Lines and Substations within Identified Geographical Areas Revision 2. Prepared by the CSIR and SANBI for the Strategic Environmental Assessment for the Expansion of Electricity Grid Infrastructure Corridors in South Africa.

Driver, A., Sink, K.J., Nel, J.N., Holness, S., Van Niekerk, L., Daniel, F., Jonas, Z., Majiedt, P.A., Harris, L. and Maze, K. (2012). National Biodiversity Assessment 2011: An assessment of South Africa's biodiversity and ecosystems. Synthesis Report. South African National Biodiversity Institute and Department of Environmental Affairs. Pretoria.

Ekotrust (2023). Environmental Impact Assessment for the Proposed Development of the Igolide Wind Energy Facility Located Near Fochville, Gauteng: Terrestrial Biodiversity and Species Specialist Assessment.

GDARD (2014). Technical Report for the Gauteng Conservation Plan (Gauteng C-Plan, V3.3). Gauteng Department of Agriculture and Rural Development: Nature Conservation Directorate.

GDARD Biodiversity (2018). The Red Listed Plant Guideline. Gauteng Province of Agriculture and Rural Development.

GDARD Biodiversity (2019). The Ridges Guideline. Gauteng Province of Agriculture and Rural Development.

GPEMF (2014). Environmental Management Framework Report. Gauteng Provincial Environmental Management Framework.

Hawkhead (2024a). Plant Species Specialist Assessment for the Proposed Igolide Wind Energy Facility Electrical Grid Infrastructure Project.

Hawkhead (2024b). Animal Species Specialist Assessment for the Proposed Igolide Wind Energy Facility Electrical Grid Infrastructure Project.

Marnewick, M.D., Retief, E.F., Theron, N.T., Wright, D.R. and Anderson, T.A (2015). Important Bird and Biodiversity Areas of South Africa. Johannesburg: Birdlife South Africa.

Mucina, L. and Rutherford, M.C. (eds) (Reprint 2011) The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19, South African National Biodiversity Institute (SANBI), Pretoria.

National Environmental Management: Biodiversity Act (NEMBA) (Act No. 10 of 2004) - National list of threatened terrestrial ecosystems for South Africa (NEMBA Threatened Ecosystems, 2011 and 2021). South Africa.

National Environmental Management: Biodiversity Act (NEMBA) (Act No. 10 of 2004). Alien and Invasive Species Lists, 2016 and 2020.

National Environmental Management: Protected Areas Act (NEMPA) (Act No. 57of 2003).

National Environmental Management Act (NEMA) (Act No. 107 of 1998) The National Biodiversity Offset Guideline. 2023

NFEPA (National Freshwater Ecosystem Priority Areas) (2023). South African National Biodiversity Institute. Accessed at http://bgisviewer.sanbi.org. [Accessed 25 March 2024]

Pfab, M.F. (2001a). Development Guidelines for Ridges. Department of Agriculture, Conservation, Environment and Land Affairs – Directorate of Nature Conservation.

Pfab, M.F. (2001b). Red Data Policy for Environmental Impact Evaluations. Department of Agriculture, Conservation, Environment and Land Affairs – Directorate of Nature Conservation.

SANBI (2018). 2018 National Vegetation Map. South African National Biodiversity Institute, Pretoria.

SANBI (2020). Species Environmental Assessment Guideline. Guideline for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa. South African National Biodiversity Institute, Pretoria. Version 1. 2020.

SAPAD (South African Protected Area Database) (2024). Protected Area Register Interactive Mapservice. Department of Forestry, Fisheries and the Environmental. Accessed at https://dffeportal.environment.gov.za/portal/apps/webappviewer [Accessed 25 March 2024]

Scholes, R.J. (2009). Syndromes of dryland degradation in southern Africa. African Journal of Range and Forage Science. 26(3): 113-215.

SWSA (Strategic Water Source Areas) (2017). South African National Biodiversity Institute. Accessed at http://bgisviewer.sanbi.org. [Accessed 25 March 2024]

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

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

Terrestrial Ecologist
Hawkhead Consulting

Appendix A: Curriculum Vitae – Andrew Zinn

Hawkhead Consulting

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

Details

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

Email: andrew@hawkhead.com
Mobile: +27 83 361 0373
Address: 58 Central Rd, Linden Ext., Johannesburg, 2195
South Africa
Date of birth: 14 July 1982
Nationality: South African

Profile

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

Education and Qualifications

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

Affiliations

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

Work Experience

1. Independent Ecologist

Hawkhead Consulting, South Africa
September 2020 – Present

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

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

2. Ecologist

Golder Associates Africa, South Africa
June 2011 – September 2020
Ecologist responsible for the management and implementation of baseline biodiversity studies and ecological impact assessments for development projects in the mining, power generation, transport, land development and industrial development sectors throughout sub-Saharan Africa. Role responsibilities included project management, technical review, biodiversity study design and implementation, flora and fauna surveys, biodiversity baseline and impact assessment reporting, development of biodiversity management plans, rehabilitation plans and alien invasive species control and eradication plans. These studies were conducted to satisfy national environmental regulations and/or international financing requirements, including the International Finance Corporation's (IFC) Performance Standard 6 (PS6)

3. Independent Ecologist

Subcontracted to KPMG, United Arab Emirates
March – April 2011
Subcontracted to KPMG as a subject matter expert (ecology) on the internal audit of Sir Bani Yas Island's Conservation Department (United Arab Emirates). The audit focused on evaluating the efficacy of the island's various conservation practices, including game management, feed provisioning, carnivore breeding and monitoring, veterinary care and vegetation maintenance.

4. Environmental Consultant

WSP Environment and Energy, South Africa
August 2008 – March 2011
Environmental consultant, responsible for a range of environmental projects and services including managing environmental authorisation processes (BAs and EIAs), facilitating stakeholder engagement processes,
conducting compliance audits, developing environmental management programmes and conducting specialist ecological studies.

5. Research Technician

Yale University, Kruger National Park, South Africa
October 2007 – May 2008
Research technician on the Savanna Convergence Experiment (SCE). The SCE project was a long-term cross-continental study that investigated the role of mega-herbivores in fire-grazing interactions and their influence on vegetation dynamics. Responsible for collecting and analysing vegetation composition and productivity data, as well as herbivore distribution data.

Publications

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

Appendix B: Methodology Supplement

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

The ecological sensitivity of habitats in the 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

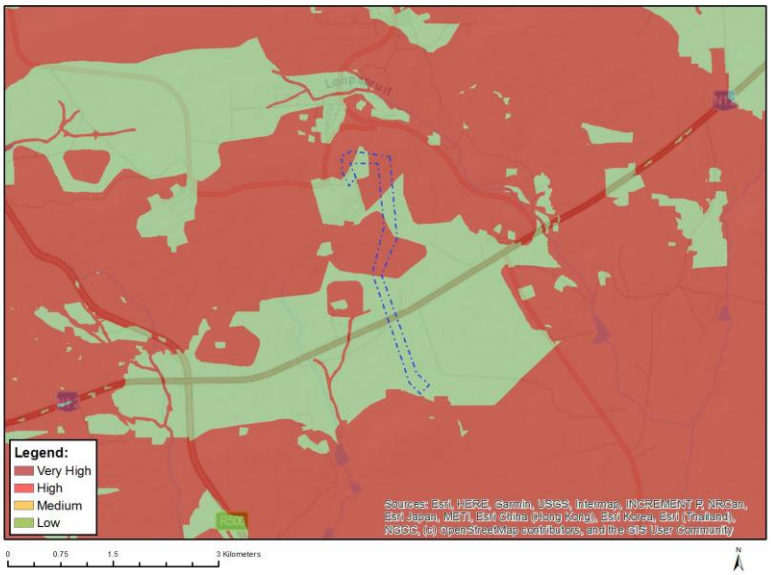
Table 4: Guidelines for interpreting SEI in the context of the proposed development activities.

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

Sensitivity Rating of the National Web Based Screening Tool

The National Web-based Environmental Screening Tool rates the Terrestrial Biodiversity Theme for the proposed Project as 'Very High' sensitivity on account of designated Ecological Support Areas 1 and 2, as per the Gauteng C-Plan (3.3). Refer to the maps showing the spatial sensitivity. It must be noted that the screening tool only allows for sensitivity ratings of 'Very High' or 'Low' for terrestrial biodiversity.



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Very High	ESA 1
Very High	ESA 2

Appraisal of the Sensitivity Rating

The study area comprises patches of modified habitat, and fairly large areas of natural habitat. Based on field work conducted for this study, it is noted that the character and condition of the habitat patches that are delineated as ESA 1 and ESA 2 is commensurate with the assigned C-Plan designation, and accordingly, the findings of this study support the 'Very High' sensitivity rating of the screening tool.

Appendix D: Compliance with Terrestrial Biodiversity Protocol.

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity	Relevant Section in Report
The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects:	
2.3.1. a description of the ecological drivers or processes of the system and how the proposed development will impact these	Section 10
2.3.2. ecological functioning and ecological processes (e.g., fire, migration, pollination, etc.) that operate within the preferred site;	Section 10
2.3.3. the ecological corridors that the proposed development would impede including migration and movement of flora and fauna;	Section 10
2.3.4. the description of any significant terrestrial landscape features (including rare or important flora- faunal associations, presence of strategic water source areas (SWSAs) or freshwater ecosystem priority area (FEPA) sub catchments;	Section 5, Section 6 & Section 7
2.3.5. a description of terrestrial biodiversity and ecosystems on the preferred site, including: a) main vegetation types; b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified; c) ecological connectivity, habitat fragmentation, ecological processes and fine scale habitats; and d) species, distribution, important habitats (e.g., feeding grounds, nesting sites, etc.) and movement patterns identified.	Section 5 to Section 10
2.3.6. the assessment must identify any alternative development footprints within the preferred site which would be of a “low" sensitivity as identified by the screening tool and verified through the site sensitivity verification; and	Section 11 & 14
2.3.7. the assessment must be based on the results of a site inspection undertaken on the preferred site and must identify: 2.3.7.1. terrestrial critical biodiversity areas (CBAs), including: a) the reasons why an area has been identified as a CBA; b) an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation; c) the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s); d) the impact on ecosystem threat status; e) the impact on explicit subtypes in the vegetation; f) the impact on overall species and ecosystem diversity of the site; and g) the impact on any changes to threat status of populations of species of conservation concern in the CBA	Section 6.2 & Section 12.3
2.3.7.2. terrestrial ecological support areas (ESAs), including: a) the impact on the ecological processes that operate within or across the site; b) the extent the proposed development will impact on the functionality of the ESA; and c) loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridors or	Section 6.2, Section 10 & Section 12.3

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity	Relevant Section in Report
introducing barriers that impede migration and movement of flora and fauna	
2.3.7.3. protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including – a) an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan;	Section 6.5
2.3.7.4. priority areas for protected area expansion, including- a) the way in which in which the proposed development will compromise or contribute to the expansion of the protected area network;	Section 6.6
2.3.7.5. SWSAs including: a) the impact(s) on the terrestrial habitat of a SWSA; and b) the impacts of the proposed development on the SWSA water quality and quantity (e.g., describing potential increased runoff leading to increased sediment load in water courses);	Section 6.3.1
2.3.7.6. FEPA sub-catchments, including a) the impacts of the proposed development on habitat condition and species in the FEPA sub catchment;	Section 6.3.2
2.3.7.7. indigenous forests, including: a) impact on the ecological integrity of the forest; and b) percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.	Section 6.4
3.1. The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:	
3.1.1. contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	Page 3 & Appendix A
3.1.2. a signed statement of independence by the specialist;	Page 3
3.1.3. a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment	Section 3.1 & Section 3.2
3.1.4. a description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant;	Section 3.1 & Section 3.2
3.1.5. a description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;	Section 4
3.1.6 a location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);	Section 6.2 & Section 11
3.1.7. additional environmental impacts expected from the proposed development;	Section 12.3
3.1.8. any direct, indirect and cumulative impacts of the proposed development;	Section 12.3
3.1.9. the degree to which impacts and risks can be mitigated;	Section 12.3
3.1.10. the degree to which the impacts and risks can be reversed;	Section 12.3
3.1.11. the degree to which the impacts and risks can cause loss of irreplaceable resources;	Section 12.3

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity	Relevant Section in Report
3.1.12. proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	Section 14 & Section 15
3.1.13. a motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a "low" terrestrial biodiversity sensitivity and that were not considered appropriate;	Section 11 & Section 16.2
3.1.14. a substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not; and	Section 16
3.1.15. any conditions to which this statement is subjected.	Section 16.2
3.2. The findings of the Terrestrial Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report including the mitigation and monitoring measures as identified, which must be incorporated into the EMPr, where relevant.	EAP to incorporate
3.2.1. A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	EAP to incorporate