Terrestrial Biodiversity Assessment

prepared in accordance with the
"*Protocol for the Specialist Assessment and minimum report content requirements for environmental impacts on Terrestrial Biodiversity*"

Camden 1 Wind Grid Connection near Ermelo in Mpumalanga Province

David Hoare Consulting (Pty) Ltd

David Hoare
Consulting (Pty) Ltd

Address:
Postnet Suite #116
Private Bag X025
Lynnwood Ridge
0040

41 Soetdoring Avenue
Lynnwood Manor
Pretoria

Cell: 083 284 5111
Fax: 086 550 2053
Email:
david@davidhoareconsulting.co.za

Terrestrial Biodiversity Assessment report for the proposed Camden 1 Wind Grid Connection near Ermelo in Mpumalanga Province.

Location:
South of Ermelo in Mpumalanga Province

for

ENERTRAG South Africa (Pty) Ltd 53 Dudley Road,
Parkwood,
Johannesburg
South Africa

20 November 2022

Report version: Final

TABLE OF CONTENTS

LIST OF FIGURES

SPECIALIST DETAILS & DECLARATION

This report has been prepared in accordance with the "Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species, terrestrial plant species and terrestrial biodiversity", as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), published in GN. No. 320 dated 20 March 2020. It has been prepared independently of influence or prejudice by any parties.

The details of Specialists are as follows:

Specialist	Qualification and accreditation
Dr David Hoare	• PhD Botany • Pr.Sci.Nat. 400221/05 (Ecological Science, Botanical Science)

Declaration of independence:

David Hoare Consulting (Pty) Ltd is an independent consultant and hereby declare that it does not have any financial or other vested interest in the undertaking of the proposed activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998). In addition, remuneration for services provided by David Hoare Consulting (Pty) Ltd is not subjected to or based on approval of the proposed project by the relevant authorities responsible for authorising this proposed project.

Disclosure:

David Hoare Consulting (Pty) Ltd undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) and will provide the competent authority with access to all information at its disposal regarding the application, whether such information is favourable to the applicant or not.

Based on information provided to David Hoare Consulting (Pty) Ltd by the client and in addition to information obtained during the course of this study, David Hoare Consulting (Pty) Ltd present the results and conclusion within the associated document to the best of the author's professional judgement and in accordance with best practice.

_____ 20 November 2022

Dr David Hoare Date

TERMS OF REFERENCE

The specialist study is required to follow the published Protocols, provided in full below for the assessment of impacts on Terrestrial Biodiversity. Note that the Protocols require determination of the level of sensitivity, which then determines the level of assessment required, either a full assessment, or a Compliance Statement.

PROTOCOL FOR THE SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR ENVIRONMENTAL IMPACTS ON TERRESTRIAL BIODIVERSITY

This site sensitivity assessment follows the requirements of The Environmental Impact Assessment Regulations, as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), published in GN. No. 320 dated 20 March 2020.

General information

1.1. An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified on the screening tool as being of "**very high sensitivity**" for terrestrial biodiversity, must submit a Terrestrial Biodiversity Specialist Assessment.

1.2. An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being "**low sensitivity**" for terrestrial biodiversity, must submit a Terrestrial Biodiversity Compliance Statement.

1.3. However, where the information gathered from the site sensitivity verification differs from the designation of "very high" terrestrial biodiversity sensitivity on the screening tool and it is found to be of a "low" sensitivity, then a Terrestrial Biodiversity Compliance Statement must be submitted.

1.4. Similarly, where the information gathered from the site sensitivity verification differs from that identified as having a "low" terrestrial biodiversity sensitivity on the screening tool, a Terrestrial Biodiversity Specialist Assessment must be conducted.

1.5. If any part of the proposed development footprint falls within an area of "very high" sensitivity, the assessment and reporting requirements prescribed for the "very high" sensitivity apply to the entire footprint, ***excluding linear activities*** *for which impacts on terrestrial biodiversity are temporary and the land in the opinion of the terrestrial biodiversity specialist, based on the mitigation and remedial measures, can be returned to the current state within two years of the completion of the construction phase*, in which case a compliance statement applies. Development footprint in the context of this protocol means the area on which the proposed development will take place and includes any area that will be disturbed.

Terrestrial Biodiversity Specialist Assessment

2.1. The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of terrestrial biodiversity.

2.2. The assessment must be undertaken on the preferred site and within the proposed development footprint.

2.3. 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;

2.3.2. ecological functioning and ecological processes (e.g. fire, migration, pollination, etc.) that operate within the preferred site;

2.3.3. the ecological corridors that the proposed development would impede including migration and movement of flora and fauna;

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;

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;

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

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;

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 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;

2.3.7.4. priority areas for protected area expansion, including-

(a) the way in which the proposed development will compromise or contribute to the expansion of the protected area network;

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);

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;

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.

2.4. The findings of the assessment must be written up in a Terrestrial Biodiversity Specialist Assessment Report.

Terrestrial Biodiversity Specialist Assessment Report

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;
3.1.2. a signed statement of independence by the specialist;
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;
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;
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;
3.1.6. a location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);
3.1.7. additional environmental impacts expected from the proposed development;
3.1.8. any direct, indirect and cumulative impacts of the proposed development;
3.1.9. the degree to which impacts and risks can be mitigated;
3.1.10. the degree to which the impacts and risks can be reversed;
3.1.11. the degree to which the impacts and risks can cause loss of irreplaceable resources;
3.1.12. proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);
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;
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
3.1.15. any conditions to which this statement is subjected.

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.

3.3. A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.

LIMITATIONS, ASSUMPTIONS & UNCERTAINTIES

The following assumptions, limitations, uncertainties are listed regarding the ecological assessment of the Camden site:

- The assessment is based on a field survey conducted 3-7 February 2020. The current study is based on an extensive site visit as well as a desktop study of the available information. The time spent on site was adequate for understanding general patterns across affected areas. The seasons in which the fieldwork (peak summer flowering period) was conducted was ideal for assessing the composition and condition of the vegetation.
- The vegetation was in good condition for sampling at the time of the field assessment, and the species lists obtained are considered reliable and relatively comprehensive.
- Compiling the list of species that could potentially occur on site is limited by the paucity of collection records for the area. The list of plant species that could potentially occur on site was therefore taken from a wider area and from literature sources that may include species that do not occur on site and may miss species that do occur on site. In order to compile a comprehensive site-specific list of the biota on site, studies would be required that would include different seasons, be undertaken over a number of years and include extensive sampling. Due to time constraints inherent in the EIA process, this was not possible for this study. However the comprehensive field survey is sufficient for the purposes of this report and towards sufficiently informing the decision making process by the Competent Authority.

INTRODUCTION

Background

ENERTRAG South Africa (Pty) Ltd, a subsidiary of ENERTRAG AG, the German-based renewable energy company is proposing to develop electrical grid infrastructure of up to 132kV related to the Camden I Wind Energy Facility (WEF) of up to 200 MW (the Project) near Camden Power Station in the Mpumalanga Province. This will be part of the Camden Renewable Energy Complex that will include:

1. Camden I Wind Energy Facility (up to 200MW).
2. **Camden I Wind Grid Connection (up to 132kV).**
3. Camden up to 400kV Grid Connection and Collector substation.
4. Camden I Solar (up to 100MW).
5. Camden I Solar up to 132kV Grid Connection.
6. Camden Green Hydrogen and Ammonia Facility, including grid connection infrastructure and water pipeline.
7. Camden II Wind Energy Facility (up to 200MW).
8. Camden II Wind Energy Facility up to 132kV Grid Connection.

Enertrag SA has appointed WSP as the independent Environmental Assessment Practitioner (EAP) to facilitate the Environmental Impact Assessment (EIA) Process.

This report addresses specifically the up to 132kV electrical grid infrastructure application (Basic Assessment) related to the Camden I Wind Energy Facility (which is subject to a separate Scoping and Environmental Impact Assessment process).

Project description

It is proposed that Camden I Wind Energy Facility will connect to the nearby Camden Collector substation (which in turn will connect to the Camden Power Station), through an up to 132kV powerline (either single or double circuit) between the grid connection substation portion (immediately adjacent the Camden I on-site IPP substation portion) and that of the Camden Collector substation. The powerline will be approximately 14km in length, depending on the authorized location of the collector substation. The onsite grid connection substation will consist of high voltage substation yard to allow for multiple (up to) 132kV feeder bays and transformers, control building, telecommunication infrastructure, access roads, etc. The area for the onsite substation will be up to 1.5ha. The up to 132kV powerline and substation will have a 250m assessment corridor (either side of the center line), to allow for technical placement and Micro siting as required, including around the on-site grid connection substation and the terminating works required at the Collector Substation (MTS). This application includes the necessary up to 132kV voltage electrical components required for connection at the Collector Substation.

Portions of the following farms are affected:

Parent Farm	Farm No	Portion No	Owner
Klipbank	295	0	Reyneke Hendrik Jackobus Willem
Adrianople	296	0	Rassie Saaiman Trust
Adrianople	296	1	Lood De Jager Trust
Welgelegen	322	1	Reyneke Hendrik Jackobus Willem
Welgelegen	322	2	Reyneke Hendrik Jackobus Willem
Klipbank	295	3	Reyneke Hendrik Jackobus Willem
Adrianople	296	3	Van Der Meulen Trust

SENSITIVITIES IDENTIFIED FROM DFFE ONLINE SCREENING TOOL

Terrestrial Biodiversity theme

The national web-based Environmental Screening Tool was queried in relation to the following infrastructure:

1. Utilities Infrastructure|Electricity|Distribution and Transmission|Powerline

Separate Screening Tool reports were requested for Alternatives 1/2 and for Alternatives 3/4, but they cover the same areas, except that the second report is for a smaller area near the southern end of the alignments.

The terrestrial biodiversity theme indicates that the site is within one sensitivity class, namely **VERY HIGH** (Figure 1).

Sensitivity features are indicates as follows (Alternative 1 and 2):

Sensitivity	Feature(s)
Very High	Critical biodiversity area 1
Very High	Critical biodiversity area 2
Very High	FEPA Subcatchments
Very High	Protected Areas Expansion Strategy
Very High	Strategic Water Source Areas
Very High	Endangered ecosystem
Very High	Langcarel Private Nature Reserve

Sensitivity features are indicates as follows (Alternative 3 and 4):

Sensitivity	Feature(s)
Very High	FEPA Subcatchments
Very High	Protected Areas Expansion Strategy
Very High	Strategic Water Source Areas
Very High	Endangered ecosystem
Very High	Langcarel Private Nature Reserve

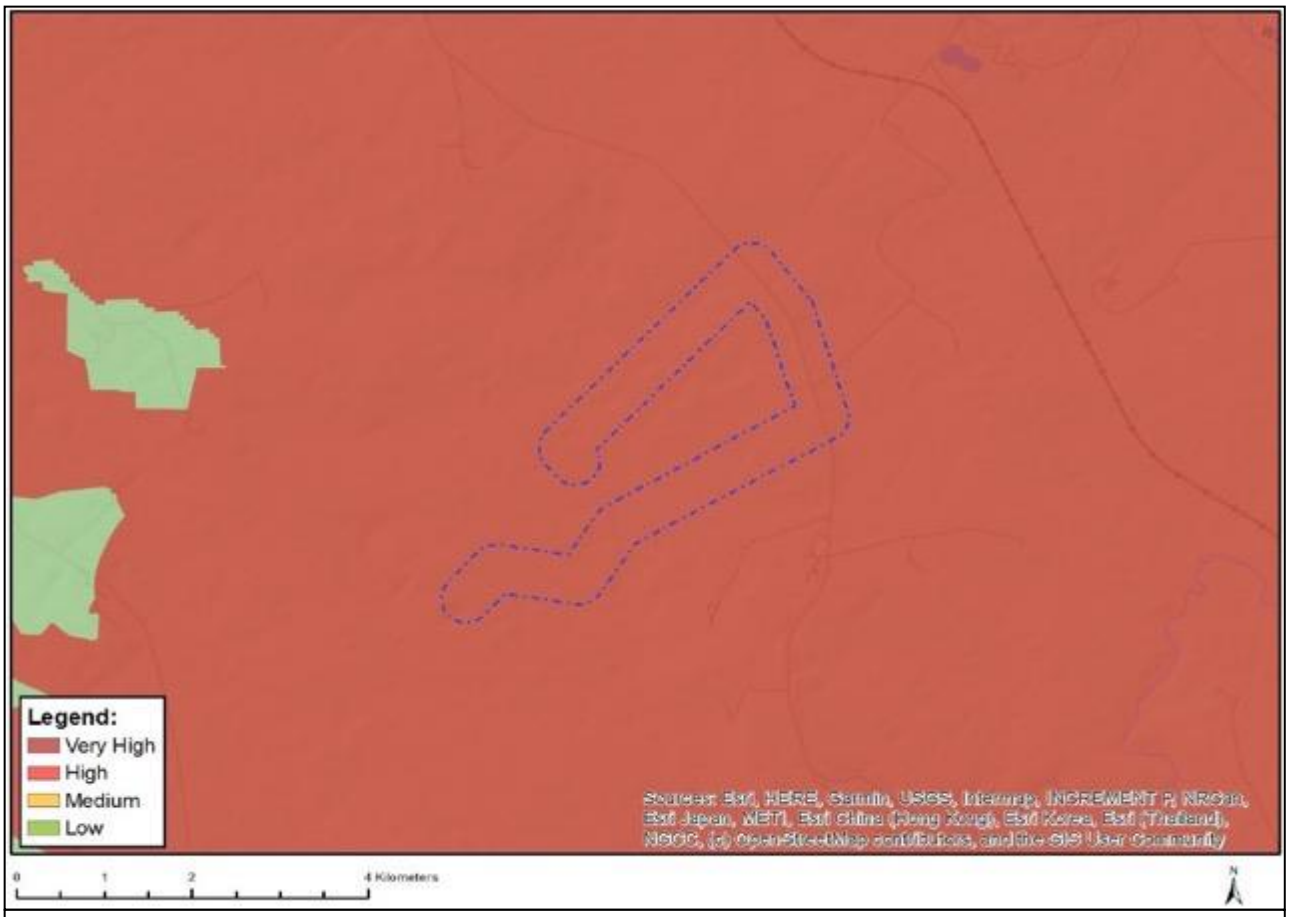

Figure 1: DFFE Screening Tool extract: terrestrial biodiversity theme (Alternative 1 and 2).

METHODOLOGY

The detailed methodology followed as well as the sources of data and information used as part of this assessment is described below.

Approach

The study commenced as a desktop-study followed by a site-specific field study from 3– 7 February 2020. The site is within the grassland biome with a peak rainfall season in summer, which occurs from October to March. There is, however, a delay between rainfall and vegetation growth, which means the peak growing season is from November to May (Figure 2), with most perennial species characteristic of the vegetation being easily identifiable from January to March. The timing of the field survey was therefore ideal in terms of assessing the vegetation condition and flora composition of the site.

Aerial imagery from Google Earth was used to identify and assess habitats on site. Patterns identified from satellite imagery were verified on the ground. From this ground survey, as well as ad hoc observations on site, a checklist of plant species occurring on site was compiled. Digital photographs were taken at locations where features of interest were observed.

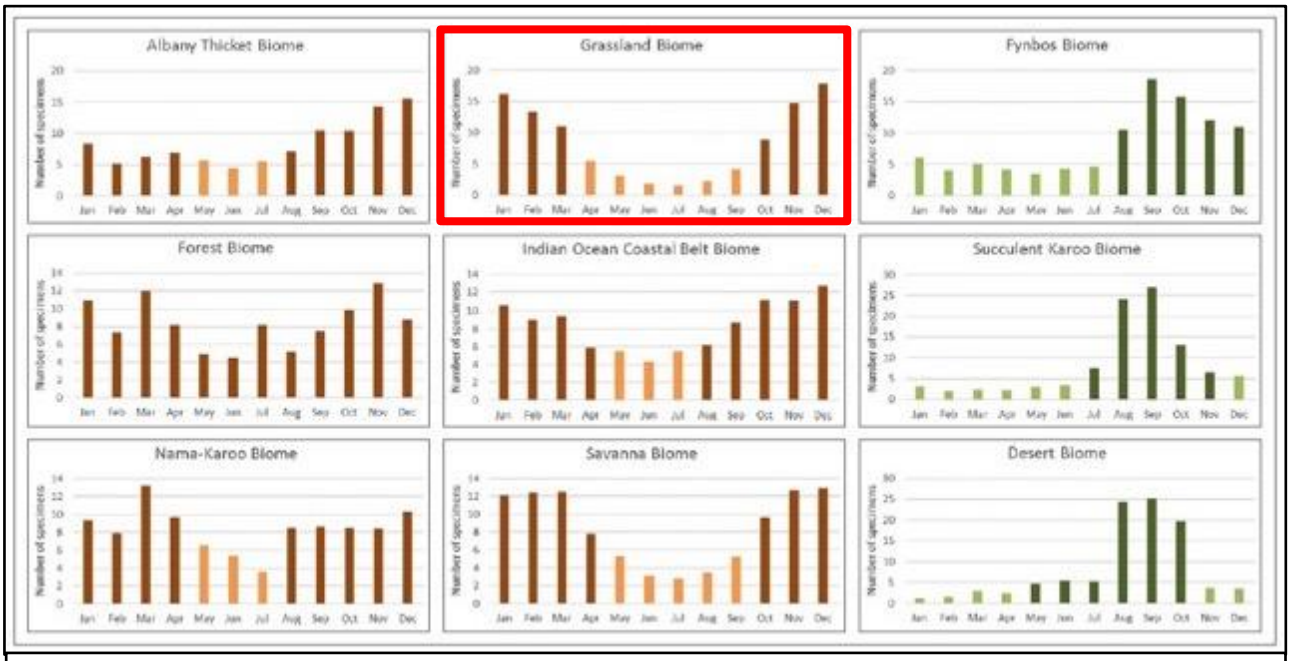

Figure 2: Recommended survey periods for different biomes (Species Environmental Assessment Guidelines).

Sources of information

Regional Vegetation

- Broad vegetation types occurring on site were obtained from Mucina and Rutherford (2006), with updates according to the SANBI BGIS website (http://bgis.sanbi.org), as follows:

- Mucina, L. and Rutherford, M.C. (editors) 2006. Vegetation map of South Africa, Lesotho and Swaziland: an illustrated guide. Strelitzia 19, South African National Biodiversity Institute, Pretoria.
- South African National Biodiversity Institute 2018 Final Vegetation Map of South Africa, Lesotho and Swaziland [Vector] 2018. Available from the Biodiversity GIS website, downloaded on 23 September 2021.

Threatened Ecosystems

- The conservation status of the vegetation types were obtained from Mucina and Rutherford (2006) and the National List of Ecosystems that are Threatened and in need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004).
- The plant species checklist of species that could potentially occur on site was compiled from a plant species checklist extracted from the NewPosa database of the South African National biodiversity Institute (SANBI) for the quarter degree grid 2629BA.
- The IUCN Red List Category for plant species, as well as supplementary information on habitats and distribution, was obtained from the SANBI Threatened Species Programme (Red List of South African Plants, http://redlist.sanbi.org).

Regional plans

- The Mpumalanga Biodiversity Sector Plan (MBSP) retrieved from the SANBI BGIS website (https://bgis.sanbi.org/MBCP). Information on this map is found in Lötter & Ferrar (2006) and Ferrar & Lötter (2007).
- South Africa Protected Areas Database (SAPAD_OR_2021_Q2) retrieved from the Department of Forestry, Fisheries and the Environment website (https://egis.environment.gov.za/data_egis/data_download/current).
- Information from the National Protected Areas Expansion Strategy (NPAES) was consulted for possible inclusion of the site into a protected area in future (available on http://bgis.sanbi.org).

Aerial imagery

- Recent satellite imagery (courtesy of Google Earth Pro). Google Earth Pro also provides historical imagery for a period up to 15 years ago, which aided in the determination of certain vegetation types and land use historically and currently present on site.

Habitat sensitivity

The purpose of producing a habitat sensitivity map is to provide information on the location of potentially sensitive features in the study area. This was compiled by taking the following into consideration:

1. The general status of the vegetation of the study area was derived by compiling a landcover data layer for the study area (*sensu* Fairbanks *et al*., 2000) using available satellite imagery and aerial photography. From this, it can be seen which areas are transformed versus those that are estimated as still being in a natural status.
2. Various provincial, regional or national level conservation planning studies have been undertaken in the area, e.g. the National Spatial Biodiversity Assessment (NSBA). The mapped results from these were taken into consideration in compiling the habitat sensitivity map.
3. Habitats in which various species of plants or animals occur that may be protected or are considered to have high conservation status are considered to be sensitive.

Field surveys

The study area was visited and assessed to confirm patterns identified from the desktop assessment. The site visit was undertaken at the height of the summer growing season. Vegetation was in a good state following good rains over the previous three months. Many plant species could be identified, and habitats were generally in a good condition to assess. The site visit was therefore considered to be successful, as well as representative of the study area.

Specific features of potential concern were investigated in the field, including the following:

- General vegetation status, i.e. whether the vegetation was natural, disturbed/secondary or transformed;
- Presence of habitats of conservation concern in terms of high biodiversity, presence of species of conservation concern, specific sensitivities, e.g. wetlands, and any other factors that would indicate an elevated biodiversity or functional value that could not be determined from the desktop assessment;
- Presence of protected trees; and
- Potential presence of species of conservation concern, including observation of individual plants found on site or habitats that are suitable for any of the species identified from the desktop assessment.

During the field survey, all major natural variation on site was assessed and select locations were traversed on foot. A hand-held Garmin GPSMap 64s was used to record a track within which observations were made. Digital photographs were taken of features and habitats on site, as well as of all plant species that were seen. All plant and animal species observed were uploaded to the iNaturalist website.

The survey was of adequate duration and intensity to characterise the flora of the development site as per the regulations.

RELEVANT LEGISLATIVE AND PERMIT REQUIREMENTS

Relevant legislation is provided in this section to provide a description of the key legal considerations of importance to the proposed project. The applicable legislation is listed below.

Convention on Biodiversity (CBD)

South Africa became a signatory to the United Nations Convention on Biological Diversity (CBD) in 1993, which was ratified in 1995. The CBD requires signatory states to implement objectives of the Convention, which are the conservation of biodiversity; the sustainable use of biological resources and the fair and equitable sharing of benefits arising from the use of genetic resources. According to Article 14 (a) of the CBD, each Contracting Party, as far as possible and as appropriate, must introduce appropriate procedures, such as environmental impact assessments of its proposed projects that are likely to have significant adverse effects on biological diversity, to avoid or minimize these effects and, where appropriate, to allow for public participation in such procedures.

National Environmental Management Act, Act No. 107 of 1998 (NEMA)

NEMA is the framework environmental management legislation, enacted as part of the government's mandate to ensure every person's constitutional right to an environment that is not harmful to his or her health or wellbeing. It is administered by the Department of Forestry, Fisheries and the Environment (DFFE) but several functions have been delegated to the provincial environment departments. One of the purposes of NEMA is to provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment. The Act further aims to provide for institutions that will promote cooperative governance and procedures for coordinating environmental functions exercised by organs of state and to provide for the administration and enforcement of other environmental management laws.

NEMA requires, inter alia, that:

- "development must be socially, environmentally, and economically sustainable",
- "disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied",
- "a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions",

NEMA states that "the environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage."

This report considers the Environmental Impact Assessment (EIA) Regulations of 2014 (NEMA, 2014) as amended. According to these Regulations under Listing Notice 1 (GRN No. 983, as amended), Listing Notice 2 (GRN No 984, as amended) and Listing Notice 3 (GRN No 985, as amended), the activities listed are identified as activities that require Environmental Authorisation prior to commencement of that activity and to identify competent authorities in terms of sections 24(2) and 24D of the Act.

National Environmental Management: Biodiversity Act (Act No 10 of 2004) (NEMBA)

As the principal national act regulating biodiversity protection, NEMBA, which is administered by DFFE, is concerned with the management and conservation of biological diversity, as well as the use of indigenous biological resources in a sustainable manner. The term biodiversity according to the Convention on Biodiversity (CBD) refers to the variability among living organisms from all sources including, inter alia terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity in genes, species and ecosystems.

In terms of NEMBA, the developer has a responsibility for:

- The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations).
- Promote the application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all development within the area are in line with ecological sustainable development and protection of biodiversity.
- Limit further loss of biodiversity and conserve endangered ecosystems.

Chapter 4 of the Act relates to threatened or protected ecosystems or species. According to Section 57 of the Act, "Restricted activities involving listed threatened or protected species":

- (1) A person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7.

Such activities include any that are “of a nature that may negatively impact on the survival of a listed threatened or protected species”.

Alien and Invasive Species

Chapter 5 of NEMBA relates to species and organisms posing a potential threat to biodiversity. The Act defines alien species and provides lists of invasive species in regulations. The Alien and Invasive Species (AIS) Regulations, in terms of Section 97(1) of NEMBA, was published in Government Notice R598 in Government Gazette 37885 in 2014 (NEMBA, 2014). The Alien and Invasive Species (AIS) lists were subsequently published in Government Notice R 864 of 29 July 2016 (NEMBA, 2016).

NEMBA regulates all invasive organisms in South Africa, including a wide range of fauna and flora. Chapter 5 of the Act relates to species and organisms posing a potential threat to biodiversity. The purpose of Chapter 5 is:

a) to prevent the unauthorized introduction and spread of alien species and invasive species to ecosystems and habitats where they do not naturally occur;
b) to manage and control alien species and invasive species to prevent or minimize harm to the environment and to biodiversity in particular;
c) to eradicate alien species and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats;

According to Section 65 of the Act, "Restricted activities involving alien species":

1) A person may not carry out a restricted activity involving a specimen of an alien species without a permit issued in terms of Chapter 7. Restricted activities include the following:
    a. Importing into the Republic, including introducing from the sea, any specimen of a listed invasive species.
    b. Having in possession or exercising physical control over any specimen of a listed invasive species.
    c. Growing, breeding or in any other way propagating any specimen of a listed invasive species, or causing it to multiply.
    d. Conveying, moving or otherwise translocating any specimen of a listed invasive species.
    e. Selling or otherwise trading in, buying, receiving, giving, donating or accepting as a gift, or in any other way acquiring or disposing of any specimen of a listed invasive species.
    f. Spreading or allowing the spread of any specimen of a listed invasive species.
    g. Releasing any specimen of a listed invasive species.
    h. Additional activities that apply to aquatic species.
2) A permit referred to in subsection (1) may be issued only after a prescribed assessment of risks and potential impacts on biodiversity is carried out.

An "**alien species**" is defined in the Act as:

a) a species that is not an indigenous species; or
b) an indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by means of migration or dispersal without human intervention.

According to Section 71 of the Act, "Restricted activities involving listed invasive species":

1) A person may not carry out a restricted activity involving a specimen of a listed invasive species without a permit issued in terms of Chapter 7.
2) A permit referred to in subsection (1) may be issued only after a prescribed assessment of risks and potential impacts on biodiversity is carried out.

An "**invasive species**" is defined in the Act as any species whose establishment and spread outside of its natural distribution range:

a) threaten ecosystems, habitats or other species or have demonstrable potential to threaten ecosystems, habitats or other species; and
b) may result in economic or environmental harm or harm to human health.

A "**listed invasive species**" is defined in the Act as any invasive species listed in terms of section 70(1).

According to Section 73 of the Act, "Duty of care relating to listed invasive species":

2) A person who is the owner of land on which a listed invasive species occurs must-
    a) notify any relevant competent authority, in writing, of the listed invasive species occurring on that land;
    b) take steps to control and eradicate the listed invasive species and to prevent it from spreading; and
    c) take all the required steps to prevent or minimize harm to biodiversity.

According to Section 75 of the Act, "Control and eradication of listed invasive species":

- (1) Control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs.
- (2) Any action taken to control and eradicate a listed invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment.
- (3) The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner.

Government Notice No. 1002 of 2011: National List of Ecosystems that are Threatened and in need of protection
This notice, published under Section 52(1)(a) of NEMBA, provides for the listing of threatened or protected ecosystems based on national criteria. The list of threatened terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the National Spatial Biodiversity Assessment (2004).

GNR 151: Critically Endangered, Endangered, Vulnerable and Protected Species List
Published under Section 56(1) of NEMBA.

GNR 1187: Amendment of Critically Endangered, Endangered, Vulnerable and Protected Species List
Published under Section 56(1) of NEMBA.

Government Notice No. 40733 of 2017: Draft National Biodiversity Offset Policy
Published under NEMA. The aim of the Policy is to ensure that significant residual impacts of developments are remedied as required by NEMA, thereby ensuring sustainable development as required by section 24 of the Constitution of the Republic of South Africa, 1996. This policy should be taken into consideration with every development application that still has significant residual impact after the Mitigation Sequence has been followed. The mitigation sequence entails the consecutive application of avoiding or preventing loss, then at minimizing or mitigating what cannot be avoided, rehabilitating where possible and, as a last resort, offsetting the residual impact. The Policy specifies that one impact that has come across consistently as unmitigable is the rapid and consistent transformation of certain ecosystems and vegetation types, leading to the loss of ecosystems and extinction of species. The Policy specifically targets ecosystems where the ability to reach protected area targets is lost or close to being lost. However, the Policy states that "*[w]here ecosystems remain largely untransformed, intact and functional, an offset would not be required for developments that lead to transformation, provided they have not been identified as a biodiversity priority*". Biodiversity offsets should be considered to remedy residual negative impacts on biodiversity of 'medium' to 'high' significance. Residual impacts of 'very high' significance are a fatal flaw for development and residual biodiversity impacts of 'low' significance would usually not require offsets. The Policy indicates that impacts should preferably be

avoided in protected areas, Critical Biodiversity Areas (CBA), verified wetland and river features and areas earmarked for protected area expansion.

National Forests Act (Act no 84 of 1998)

Protected trees
According to this act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that 'no person may cut, damage, disturb, destroy or remove any *protected tree*, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'.

Forests
Prohibits the destruction of indigenous trees in any natural forest without a licence.

National Water Act (Act 36 of 1998)

Wetlands, riparian zones and watercourses are defined in the Water Act as a water resource and any activities that are contemplated that could affect the water resource require authorisation (Section 21 of the National Water Act of 1998). A "watercourse" in terms of the National Water Act (Act 36 of 1998) means:

- River or spring;
- A natural channel in which water flows regularly or intermittently;
- A wetland, lake or dam into which, or from which, water flows; and
- Any collection of water which the Minister may, by notice in the gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

Conservation of Agricultural Resources (Act No. 43 of 1983) as amended in 2001

Declared Weeds and Invaders in South Africa are categorised according to one of the following categories:

- Category 1 plants: are prohibited and must be controlled.
- Category 2 plants: (commercially used plants) may be grown in demarcated areas providing that there is a permit and that steps are taken to prevent their spread.
- Category 3 plants: (ornamentally used plants) may no longer be planted; existing plants may remain, as long as all reasonable steps are taken to prevent the spreading thereof, except within the floodline of watercourses and wetlands.

National Veld and Forest Fire Act (Act No. 101 of 1998)

Provides requirements for veldfire prevention through firebreaks and required measures for fire-fighting. Chapter 4 of the Act places a duty on landowners to prepare and maintain firebreaks. Chapter 5 of the Act places a duty on all landowners to acquire equipment and have available personnel to fight fires.

Mpumalanga Nature Conservation Act, No. 10 of 1998

This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project:

- Various species are protected;
- The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species.

The Act provides lists of protected species for the Province. According to the Mpumalanga Nature Conservation Act, a permit is required for the removal of any species on this list.

National Environmental Management Protected Areas Act, No. 57 of 2003

The National Environmental Management: Protected Areas Act 57 of 2003 has the following objectives:

- to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes;
- to provide for the establishment of a national register of all national, provincial and local protected areas;
- to provide for the management of those areas in accordance with national norms and standards;
- to provide for intergovernmental co-operation and public consultation in matters concerning protected areas; and
- to provide for matters in connection therewith.

It has been amended several times:

- National Environmental Management: Protected Areas Amendment Act 21 of 2014
- National Environmental Management: Protected Areas Amendment Act 15 of 2009
- National Environmental Management: Protected Areas Amendment Act 15 of 2009
- National Environmental Laws Amendment Act 14 of 2009
- National Environmental Management: Protected Areas Amendment Act 31 of 2004

Other Acts

Other Acts that may apply to biodiversity issues, but which are considered to not apply to the current site are as follows:

- Marine Living Resources Act (Act No. 18 of 1998)
- Sea Birds and Seals Protection Act (Act No. 46 of 1973)
- Lake Areas Development Act (Act No. 39 of 1975)
- Mountain Catchment Areas Act (Act No. 63 of 1970)
- Integrated Coastal Zone Management Act (Act No. 24 of 2008)

DESCRIPTION OF STUDY AREA

Location

The project is located about 8 km south to south-east of Ermelo in Mpumalanga Provinces, South Africa (Figure 3). The site is halfway between the N11 (Ermelo to Amersfoort) and the N2 (Ermelo to Piet Retief). Camden Power Station (Eskom) is on the north-eastern border of the site. The roads on site are all gravel farm access roads.

Site conditions

Within the broader study area are significant parts that are either currently or previously cultivated, the exception being drainage valleys and small areas of grassland with shallow soils that are not suitable for cultivation. Natural areas on site are used for animal production, but the primary activity within the study area is crop cultivation. There are various secondary roads leading from the main access roads, and a number of homestead complexes. There are groves of exotic trees scattered throughout the broader study area, but mostly clustered around homesteads and farm infrastructure, where they act as shelter and wind-breaks. The vegetation in the study area is used primarily for livestock grazing and is affected heavily by this use, with as many as 700 heads of cattle (not counting sheep) on Portions 1 and 2 of the Farm Welgelegen 322 by way of example. The long-term grazing capacity of the area is fairly high at 4.5 hectares per large stock unit (DAFF, 2018). Welgelen 1 and 2 comprises ca. 2018 ha. The sustainable grazing on site would then be 448 heads of cattle, whereas the landowner reports it is now around 700 heads of cattle (not counting the sheep), and so is on a long term over-grazing trajectory. With the exception of cultivated areas and infrastructure, the remaining

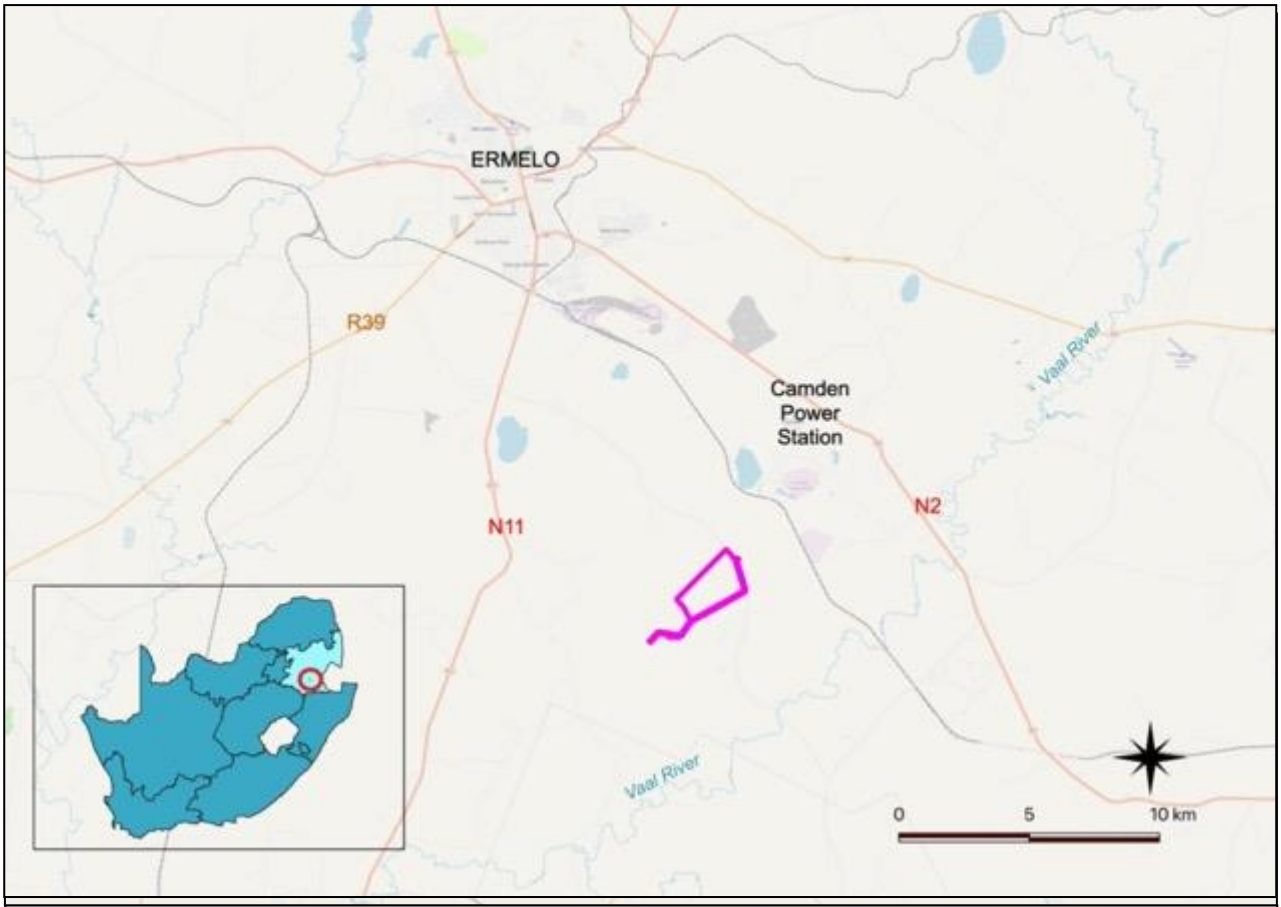

Figure 3**: Location of the study area to the south of Ermelo in Mpumalanga Province.**

vegetation and habitats in the study area is fragmented and moderately to heavily degraded with few areas of intact habitat remaining.

Regional vegetation patterns

There is one regional vegetation type occurring in the study area, namely Eastern Highveld Grassland (Figure 4). Terrestrial vegetation patterns reflect this major vegetation type, which is described below. The description is from Mucina & Rutherford (2006), extracted from the SANBI BGIS website (http://bgis.sanbi.org/vegmap).

Eastern Highveld Grassland

Distribution

Found in Mpumalanga and Gauteng Provinces, on the plains between Belfast in the east and the eastern side of Johannesburg in the west and extending southwards to Bethal, Ermelo and west of Piet Retief. The vegetation type occurs at an altitude of between 1 520–1 780 m.

Vegetation & Landscape Features

The vegetation occurs on slightly to moderately undulating plains, including some low hills and pan depressions. The vegetation is short dense grassland dominated by the usual highveld grass composition (*Aristida*, *Digitaria*, *Eragrostis*, *Themeda*, *Tristachya*, etc.) with small, scattered rocky outcrops with wiry, sour grasses and some woody species (*Acacia caffra*, *Celtis africana*, *Diospyros lycioides* subsp *lycioides*, *Parinari capensis*, *Protea caffra*, *P. welwitschii* and *Searsia magalismontanum*).

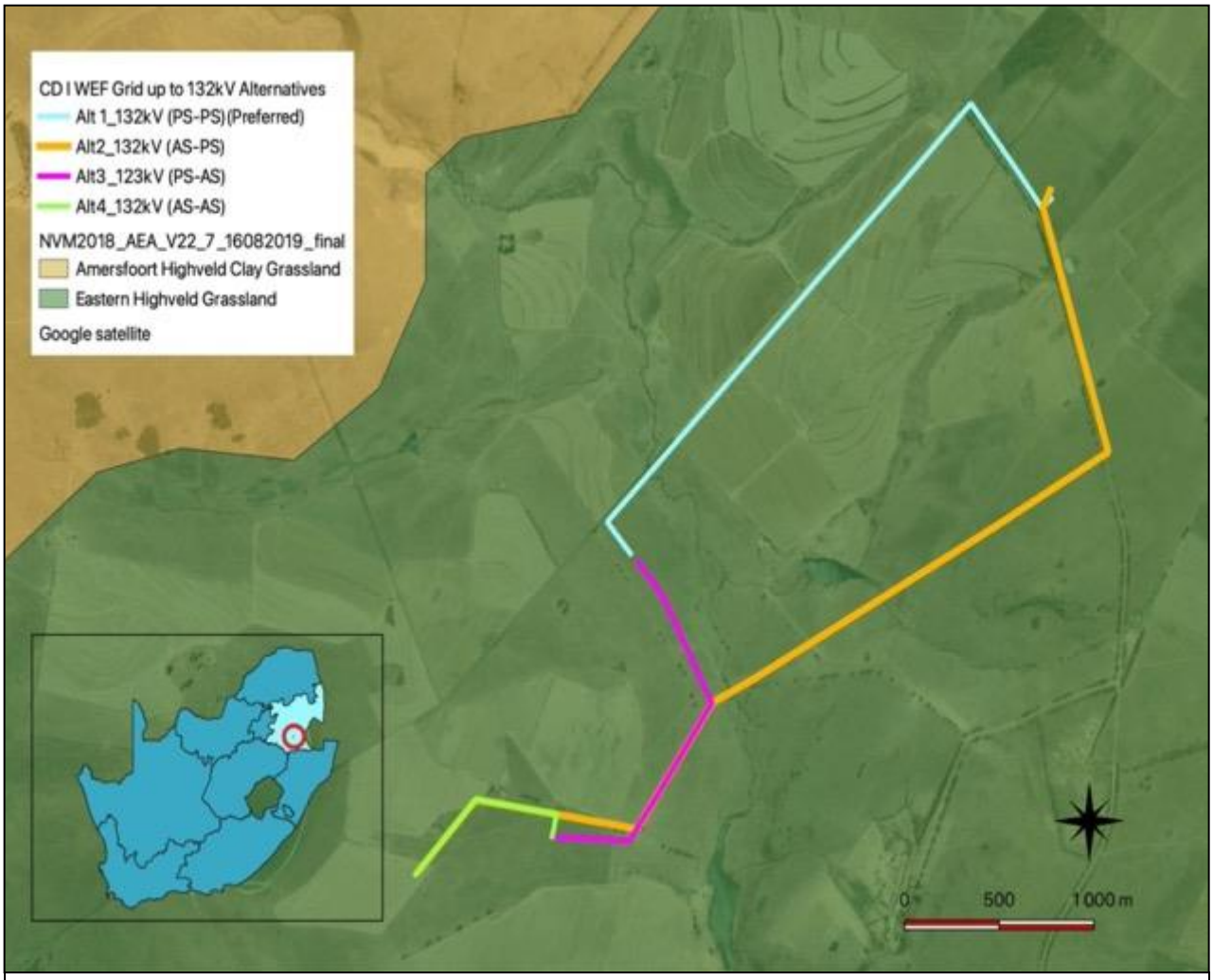

Figure 4: Regional vegetation types of the study area. (Please note: a 250m assessment corridor on either side of the centre lines presented here was assessed).

Geology & Soils

Red to yellow sandy soils of the Ba and Bb land types found on shales and sandstones of the Madzaringwe Formation (Karoo Supergroup). Land types Bb (65%) and Ba (30%).

Climate

Strongly seasonal summer rainfall, with very dry winters. MAP 650–900 mm (overall average: 726 mm), MAP relatively uniform across most of this unit, but increases significantly in the extreme southeast. The coefficient of variation in MAP is 25% across most of the unit, but drops to 21% in the east and southeast. Incidence of frost from 13–42 days, but higher at higher elevations.

Important Taxa

Low Shrubs	*Anthospermum rigidum* subsp. *pumilum*, *Stoebe plumosa*..
Herbs	*Berkheya setifera* (d), *Haplocarpha scaposa* (d), *Justicia anagalloides* (d), *Pelargonium luridum* (d), *Acalypha angustata*, *Chamaecrista mimosoides*, *Dicoma anomala*, *Euryops gilfillanii, E. transvaalensis* subsp. *setilobus, Helichrysum aureonitens*, *H. caespititium*, *H. callicomum*, *H. oreophilum*, *H. rugulosum*, *Ipomoea crassipes*, *Pentanisia prunelloides* subsp. *latifolia*, *Selago densiflora*, *Senecio coronatus*, *Vernonia oligocephala*, *Wahlenbergia undulata*.
Geophytic Herbs	*Gladiolus crassifolius*, *Haemanthus humilis* subsp. *hirsutus*, *Hypoxis rigidula* var. *pilosissima*, *Ledebouria ovatifolia*.
Succulent Herbs	*Aloe ecklonis*
Graminoids	*Aristida aequiglumis* (d), *A. congesta* (d), *A. junciformis* subsp. *galpinii* (d), *Brachiaria serrata* (d), *Cynodon dactylon* (d), *Digitaria monodactyla* (d), *D. tricholaenoides* (d), *Elionurus muticus* (d), *Eragrostis chloromelas* (d), *E. curvula* (d), *E. plana* (d), *E. racemosa* (d), *E. sclerantha* (d), *Heteropogon contortus* (d), *Loudetia simplex* (d), *Microchloa caffra* (d), *Monocymbium ceresiiforme* (d), *Setaria sphacelata* (d), *Sporobolus africanus* (d), *S. pectinatus* (d), *Themeda triandra* (d), *Trachypogon spicatus* (d), *Tristachya leucothrix* (d), *T. rehmannii* (d), *Alloteropsis semialata* subsp. *eckloniana*, *Andropogon appendiculatus*, *A. schirensis*, *Bewsia biflora*, *Ctenium concinnum*, *Diheteropogon amplectens*, *Eragrostis capensis*, *E. gummiflua*, *E. patentissima*, *Harpochloa falx*, *Panicum natalense*, *Rendlia altera*, *Schizachyrium sanguineum*, *Setaria nigrirostris*, *Urelytrum agropyroides*.

Conservation status of regional vegetation types

On the basis of a scientific approach used at national level by SANBI (Driver *et al*., 2005), vegetation types can be categorised according to their conservation status which is, in turn, assessed according to the degree of transformation relative to the expected extent of each vegetation type. The status of a habitat or vegetation type is based on how much of its original area still remains intact relative to various thresholds. The original extent of a vegetation type is as presented in the most recent national vegetation map (Mucina, Rutherford & Powrie 2005) and is the extent of the vegetation type in the absence of any historical human impact. On a national scale the thresholds are as depicted in Table 4 below, as determined by best available scientific approaches (Driver *et al*., 2005). The level at which an ecosystem becomes Critically Endangered differs from one ecosystem to another and varies from 16% to 36% (Driver *et al*., 2005).

Determining ecosystem status (Driver *et al*., 2005). *BT = biodiversity target (the minimum conservation requirement).

Habitat remaining (%)			
	80–100	least threatened	LT
	60–80	vulnerable	VU
	*BT–60	endangered	EN
	0–*BT	critically endangered	CR

Conservation status of vegetation types occurring in the study area:

Vegetation Type	Target (%)	Conserved (%)	Transformed (%)	Conservation status	
				Driver *et al*. 2005; Mucina *et al*., 2006	National Ecosystem List (NEMBA)
Eastern Highveld Grassland	24	0.3	44	Endangered	Vulnerable
Chrissiesmeer Panveld				*Not regarded as a vegetation type by Mucina et al.*	Endangered

According to scientific literature (Driver *et al*., 2005; Mucina *et al*., 2006), Eastern Highveld Grassland is listed as Endangered.

The National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), lists national vegetation types, and other ecosystems defined in the Act, that are afforded protection on the basis of rates of transformation. The thresholds for listing in this legislation are higher than in the scientific literature, which means there are fewer ecosystems listed in the National Ecosystem List versus in the scientific literature. Eastern Highveld Grassland is listed as Vulnerable in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011). Eastern Highveld Grassland covers the entire site (Figure 5).

There is an additional listed ecosystem defined under the National Ecosystem List, called Chrissiesmeer Panveld, which is listed as Endangered. This covers the entire site (see Figure 5). It spatially co-incides partially with Eastern Highveld Grassland, but is defined on different criteria.

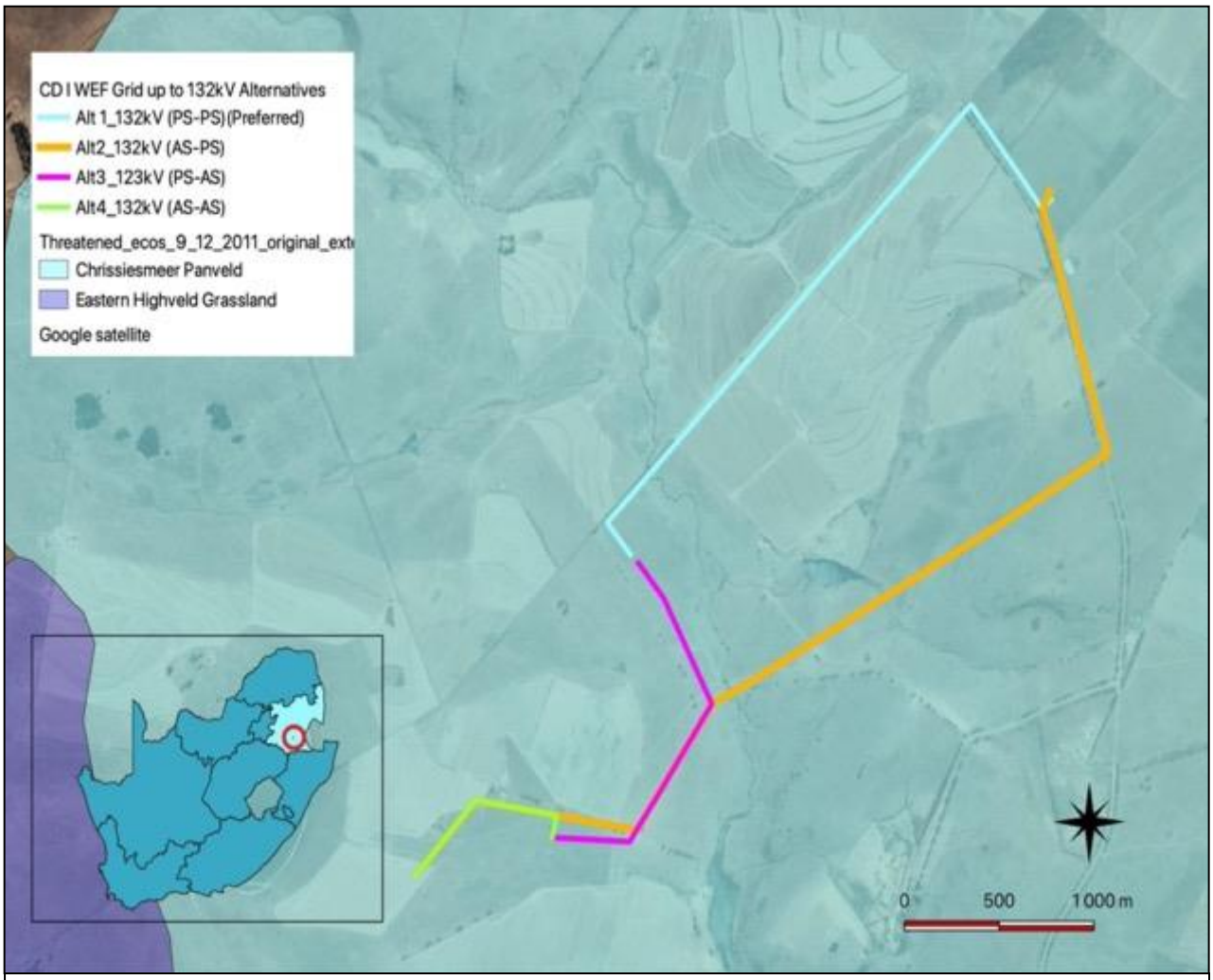

Figure 5: Distribution of listed ecosystems relative to the study area. (Please note: a 250m assessment corridor on either side of the centre lines presented here was assessed).

Biodiversity Conservation Plans

The Mpumalanga Biodiversity Sector Plan (MBSP) (Mpumalanga Parks and Tourism Agency 2014) classifies the natural vegetation of the Province according to the following categories:

1. Protected Areas (sub-divided into three categories);
2. Critical Biodiversity Areas (sub-divided into “Irreplaceable” and “Optimal”);
3. Other natural areas;
4. Ecological Support Area (sub-divided into four categories); and
5. Modified (sub-divided into Heavily or Moderately modified).

Figure 6 shows features within the study area within three of these classes, as follows:

1. Protected Areas: (National Parks and Nature Reserves): The entire site is shown as a protected area. This is, however, in the process of change (see discussion below).
2. Critical Biodiversity Areas (CBA): Irreplaceable: surrounding areas.
3. Critical Biodiversity Areas (CBA): Optimal: a small nearby patch.

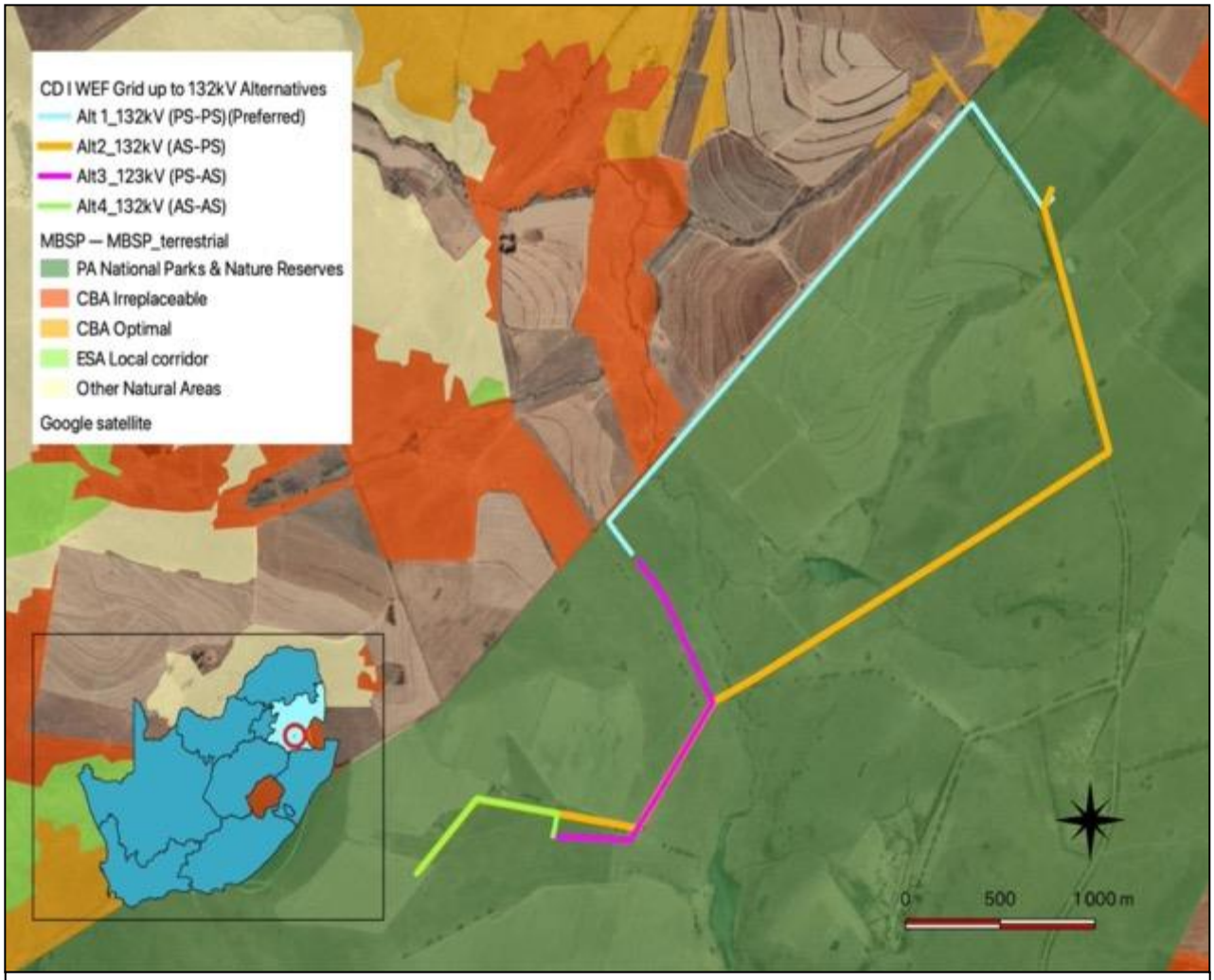

Figure 6: Mpumalanga CBA map for the study area.

According to the description for the MBSP Terrestrial Assessment categories, Critical Biodiversity Areas are areas that are required to meet biodiversity targets (for biodiversity pattern and ecological process features). The MBSP policy is that they should remain in a natural state. CBAs are areas of high biodiversity value which are usually at risk of being lost and usually identified as important in meeting biodiversity targets, except for Critically Endangered Ecosystems or Critical Linkages.

The part of the site shown as a Protected Area occupies the parts of the site on the Farm Welgelegen 322 IT (green area in Figure 6). This is the Langcarel Private Nature Reserve, proclaimed in 1967. This is not being managed as a nature reserve and a separate process is underway to have it (or part thereof) de-proclaimed as part of ongoing province-wide reserve verification efforts by the provincial authorities. No evidence was observed on site of any conservation activities during the field assessment.

Proposed protected areas (NPAES Focus Areas)

According to the National Protected Areas Expansion Strategy 2008 (NPAES2008), there are no areas within the study area that have been identified as priority areas for inclusion in future protected areas. The study area is therefore **outside the NPAES focus area**. A draft National Protected Areas Expansion Strategy was published for public comment in 2018, but is deliberately not available as a spatial dataset. It does, however, reference the Mpumalanga Protected Area Expansion Strategy, in which priority areas are identified in terms of High, Medium and Low priorities. A map

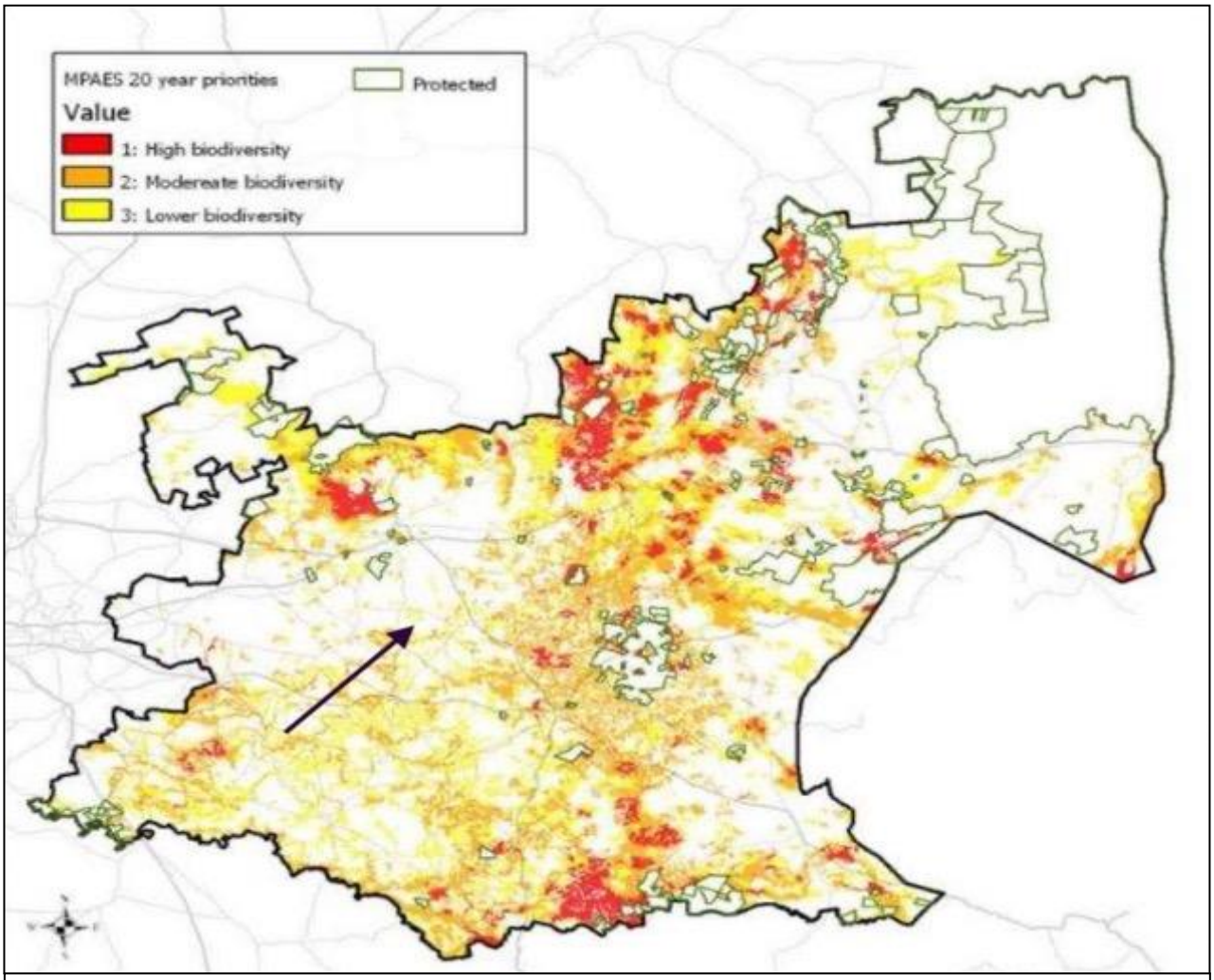

Figure 7: Mpumalanga Protected Area Expansion Strategy (Lotter 2015) arrow points to site.

within this PDF document shows areas around Camden within the Low priority class that may include the site, but a spatial dataset to confirm this could not be sourced at the time of producing this report. On the basis of the Screening Tool output, which identifies "Protected Areas Expansion Strategy" (Figure 7) as a factor within the study area, it is assumed that natural areas within the study area fall within this category (Low Priority - Mpumalanga Protected Area Expansion Strategy).

Habitats on site

A map of habitats within the study area is provided in Figure 8. The site is within an area of natural grassland but degraded (from heavily to light). The grassland contains variation due to changes in topography, slope inclination, surface rockiness and the influence of water-flow and water retention in the landscape. A broad classification of the habitat units on site, which also reflects relatively uniform plant species compositional units, is as follows:

Natural habitats:

1. **Natural grassland** (open grassland on undulating plains – the condition is not indicated in the habitat map although there is a gradient from heavily grazed poor condition to moderate condition);
2. **Wetlands** (permanent and seasonal wetlands in drainage valleys, including channels, where they occur);

Transformed and degraded areas:

3. **Old lands** (secondary grasslands on previously cultivated areas);
4. **Exotic trees** (stands of exotic trees);
5. **Degraded areas** (disturbed areas with bare ground, weeds or waste ground).
6. **Current cultivation** (areas currently cultivated and fallow lands);
7. **Transformed** (areas such as roads and buildings where there is no vegetation).

NATURAL VERSUS SECONDARY GRASSLAND	
Natural grassland	Areas of original vegetation in which the soil has not been mechanically disturbed, including areas that are in poor condition due to **overgrazing**, **trampling**, **invasion** by weeds or alien invasive species, **inappropriate fire regimes**, or any other factor that drives natural change in species composition or vegetation structure. The key factor is that the original plants continue to exist, often resprouting after defoliation from sub-surface stems or other storage organs.
Secondary grassland	Areas of vegetation where the original grassland vegetation has been lost through direct **disturbance of the soil** that results in physical removal of the original plants, the most common cause of which is ploughing, but could be other mechanical factors. The vegetation that then develops is as a result of recolonization of the area through propagation.

Figure 8: Main habitats of the study area.

Grassland
The general study area is characterised by an open grassland on the undulating hills and plains. It is generally a short to moderate height tussock grassland with closed canopy cover. The soil depth varies, as does the amount of surface rock cover, but tends to have shallow soil.

The general floristic character of this vegetation on site is fairly uniform across wide areas, often dominated by the same suite of species, including the grasses, *Alloteropsis semialata, Aristida diffusa, Aristida junciformis, Bewsia biflora, Brachiaria serrata, Diheteropogon amplectens, Elionurus muticus, Eragrostis capensis, Eragrostis chloromelas, Eragrostis plana, Eragrostis racemosa, Harpochloa falx, Heteropogon contortus, Microchloa caffra, Panicum natalense, Setaria sphacelata* var. *torta, Themeda triandra,* and *Tristachya leucothrix*, and the forbs, *Acalypha angustata, Anthospermum rigidum subsp. rigidum, Berkheya setifera, Chaetacanthus costatus, Commelina africana, Crabbea acaulis, Cucumis hirsutus, Cucumis zeyheri, Cyanotis speciosa, Gerbera viridifolia, Haplocarpha scaposa, Helichrysum rugulosum, Hemizygia pretoriae, Hermannia transvaalensis, Hibiscus aethiopicus, Hypoxis obtusa, Hypoxis rigidula, Indigofera comosa, Ipomoea ommaneyi, Justicia anagalloides, Kohautia amatymbica, Ledebouria ovatifolia, Monsonia attenuata, Nidorella hottentotta, Pentanisia angustifolia, Pollichia campestris, Scabiosa columbaria, Selago densiflora, Seriphium plumosum, Vernonia galpinii, Vernonia oligocephala,* and *Zornia milneana*. Overall diversity in this unit was high and included a full list of over 100 species. Local species richness was also high at 56 species per 400m^2 sampling area. This rivals the local richness of some of the most species-rich grasslands anywhere in the country.

Wetlands
Wetlands were mapped from Google Earth imagery dated 28/03/2019, a date which shows the wetness signal very well as darker green areas. This also corresponds well to black and white historical aerial photographs from 1955, where wetlands appear as darker areas.

Valley bottom wetlands in this general area around Ermelo, such as this one, are generally dominated by a variety of grasses, sedges and herbaceous plants, including the graminoids, *Kyllinga erecta*, *Leersia hexandra*, *Agrostis lachnantha*, *Andropogon appendiculatus*, *Helictotrichon turgidulum*, *Scirpoides burkei*, *Cyperus teneristolon*, *Cyperus macranthus*, *Typha capensis*, *Agrostis erianthe*, *Hemarthria altissima*, *Panicum schinzii*, *Cyperus rigidifolius* and *Arundinella nepalensis*, the herbs, *Centella asiatica*, *Senecio polyodon*, *Senecio erubescens*, *Haplocarpha scaposa*, *Pelargonium luridum*, *Commelina africana*, *Lobelia flaccida*, *Monopsis decipiens*, and *Helichrysum aureonitens*. The species composition depends entirely on the hydrological characteristics of the site, with a greater number of obligate wetland species occurring in more permanently damp areas, whereas dryer areas more closely resembling terrestrial grassland in species composition.

Current cultivation
These are areas that, according to recent satellite imagery, are currently being cultivated, or were recently cultivated (within the last five years). If not under crops, they would be a ploughed land, or a fallow land with either weeds or a cover crop. From an ecological or biodiversity perspective, these areas have no natural habitat and have no plant or vegetation biodiversity value. The soil profile has been completely disturbed, removing all original vegetation, including geophytic and resprouting plant species. In the Grassland Biome of South Africa, a large proportion of the indigenous biodiversity consists of herbaceous and low shrubby species that re-sprout seasonally, after fire, or after defoliation from grazing animals, and can persist under these conditions. In cultivated areas, it is possible through natural succession, or through active rehabilitation, to restore a perennial cover of grasses, but the original biodiversity is permanently lost. They also have little value for animal biodiversity, except for species that forage in cultivated areas.

Old lands
These are areas that were previously ploughed for cultivation but have been left for an extended period without ploughing. Through natural succession processes, they generally develop a perennial cover of grasses, but these secondary grasslands are species poor and the original diversity of resprouting species is usually entirely absent. Non-grass species diversity usually consists of re-seeding and weedy species, and sometimes animal- and/or bird-dispersed woody species.

On aerial photographs and satellite images with adequate resolution, these areas are often recognisable by the presence of residual plough lines and other structural features often present in cultivated fields.

Exotic trees
There are planted windrows on the roadsides in various parts of the site, as well as within homestead complex areas. These are mostly deliberately planted some decades ago and are not alien invasive species. There are, however, various places on site where alien invasive species have become established in previously disturbed areas. In both cases, the underlying natural grassland is lost.

Degraded areas
Any areas where the original vegetation is lost due to continuous degradation, such as trampling, severe overgrazing, or some other factor, it is mapped as degraded. These areas are unlikely to restore to natural grassland, even with removal of the drivers of the degradation.

Transformed areas
Areas where natural habitat no longer exists due to development of infrastructure, such as roads, buildings, and other hard surfaces. Current cultivation is also transformed, but has not been replaced by built infrastructure, therefore the soil surface can be colonized by plants, if cultivation is stopped.

Habitat sensitivity

To determine ecological sensitivity in the study area, site-specific, local and regional factors were taken into account. There are some habitats in the study area that have been described as sensitive in their own right, irrespective of regional assessments. This includes primarily the stream beds and associated riparian zones and adjacent floodplains. A detailed assessment and delineation of these areas was undertaken by an aquatic specialist and they are only considered here in terms of being important habitat for flora and fauna.

At a regional level, the Critical Biodiversity Area (CBA) map for Mpumalanga indicates various parts of the study area as being important for conservation. However, no parts of the site fall within CBAs (see Figure 6 on page 26).

A summary of sensitivities that occur on site and that may be vulnerable to damage from the proposed project are as follows:

1. Wetlands: These are described here only in terms of being a unique botanical habitat and not in the sense of a formal wetland delineation, which is normally assessed in a separate specialist study. The wetlands must be delineated according to "DWAF, 2003: A Practical Guideline Procedure for the Identification and Delineation of Wetlands and Riparian Zones". **Restrictions in terms of infrastructure within these areas should be according to the National Water Act (Act 36 of 1998).**

2. Listed ecosystems: Chrissiesmeer Panveld is listed as Endangered, and Eastern Highveld Grassland and Eastern Temperate Freshwater Wetlands are both listed as Vulnerable in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011).

3. Grasslands: Grassland vegetation, in a general sense has been identified as threatened nationally as a habitat type. Indications are that loss of any grassland habitat is permanent in an ecological and biodiversity sense, and it is not possible to restore grassland to a natural state after they have been disturbed. They should therefore be treated as sensitive and all efforts made to minimize impacts on any area of grassland. **If possible, the footprint of any proposed infrastructure should be kept to a minimum within any undisturbed, natural grasslands, especially those in a moderate to good condition.**

This information was used in conjunction with methodology to calculate Site Ecological Importance, described below. A map of habitat sensitivity on site is provided in Figure 9.

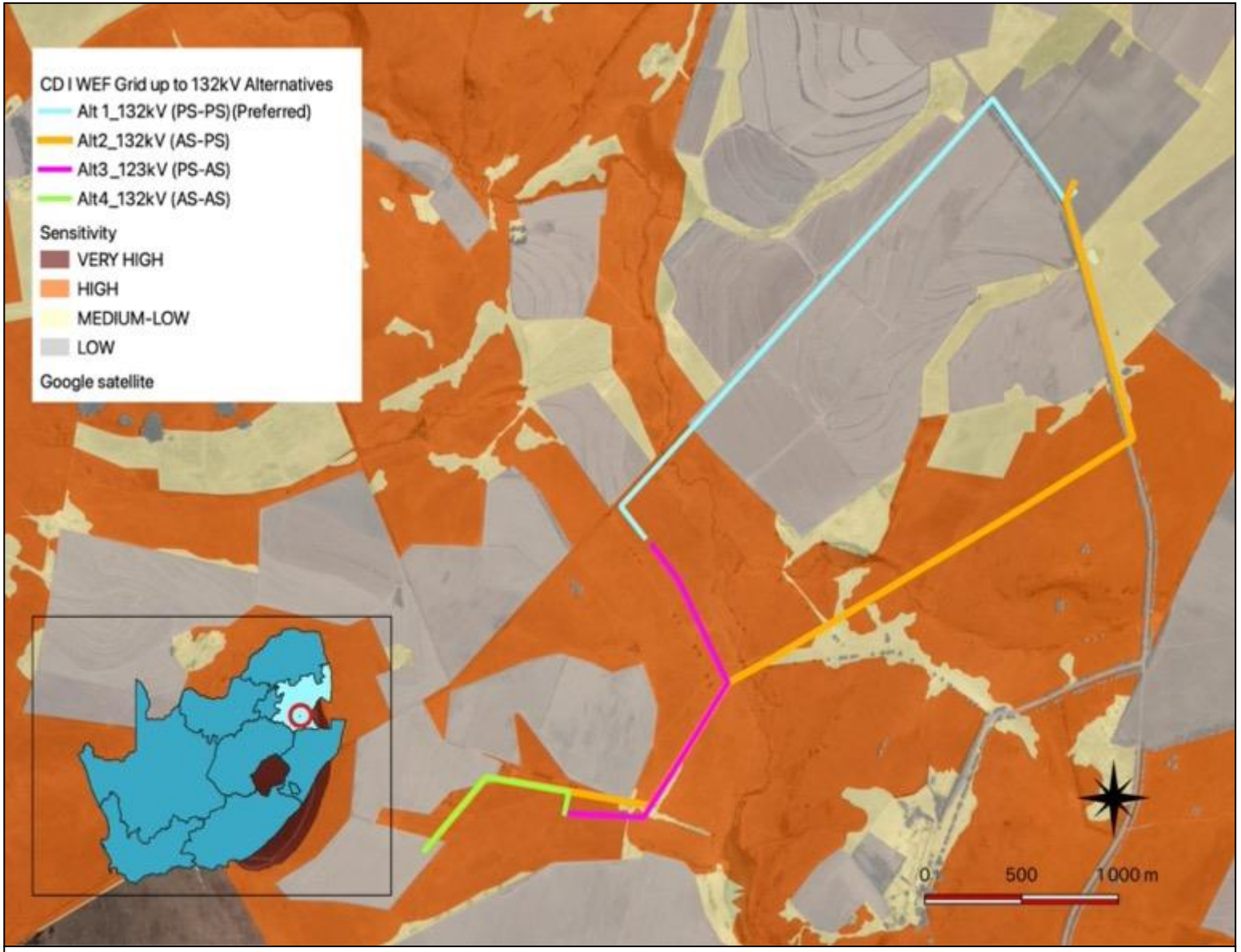

Figure 9: Habitat sensitivity of the study area, including consideration of CBAs.

SITE ECOLOGICAL IMPORTANCE

The Species Environmental Assessment Guidelines (SANBI 2020) require that a Site Ecological Importance is calculated for each habitat on site, and provides methodology for making this calculation.

1. **Natural grassland** (open grassland on undulating plains, including moderately to heavily grazed areas);
2. **Wetlands** (seasonal wetlands in drainage valleys);
3. **Pans** (seasonally inundated areas on the river floodplain);
4. **Old lands** (secondary grasslands on old lands);
5. **Current cultivation** (areas currently cultivated and fallow lands);
6. **Exotic trees** (stands of exotic trees);
7. **Degraded areas** (disturbed areas with weeds or waste ground);
8. **Transformed areas** (no vegetation, due to complete removal and replacement with hard surface or structure).

As per the Species Environmental Assessment Guidelines (SANBI 2020), Site Ecological Importance (SEI) is calculated as a function of the Biodiversity Importance (BI) of the receptor and its resilience to impacts (SEI = BI + RR). The Biodiversity Importance (BI) in turn is a function of Conservation Importance (CI) and Functional Integrity (FI), i.e. BI = CI + FI.

Site ecological importance for habitats found on site:

Habitat	Conservation importance	Functional integrity	Receptor resilience	Site Ecological Importance (BI)
Natural grassland	High 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.	Medium Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types. (Chrissiesmeer Panveld is listed as EN) BUT Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential.	Very low Habitat that is unable to recover from major impacts	High (BI = Medium)
Wetlands	High Any area of natural habitat of threatened ecosystem type with status of VU.	Medium (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types	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	High (BI = Medium)
Old lands	Low No confirmed or highly likely populations of SCC or range-restricted species.	Very low Several major current negative ecological impacts.	High Habitat that can recover relatively quickly (5-10 years) to restore >75% to restore the original	Very low (BI = Very low)

			species composition and functionality	
Current cultivation	Very low No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	Very low Several major current negative ecological impacts.	Very high Habitat that can recover rapidly	Very low (BI = Very low)
Exotic trees	Very low No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	Very low Several major current negative ecological impacts.	Very high Habitat that can recover rapidly	Very low (BI = Very low)
Degraded	Very low No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	Very low Several major current negative ecological impacts.	Very high Habitat that can recover rapidly	Very low (BI = Very low)
Transformed	Very low No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	Very low Several major current negative ecological impacts.	Very high Habitat that can recover rapidly	Very low (BI = Very low)

The calculation of Site Ecological Importance matches the sensitivity classification given in the previous section of this report, but includes an explicit recognition of the ability of each ecosystem to tolerate and recover from disturbance. Guidelines for development activities within different importance levels are given in the Table below.

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 the 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.

POSSIBLE IMPACTS

Proposed infrastructure in relation to sensitivities

Infrastructure locations relative to mapped sensitivities are shown in Figure 8. The proposed infrastructure includes the following:

Powerlines
There are four powerline alternatives, each of which crosses different proportions of land cover types, shown in the table below. Typically, grid powerlines have pylon / tower structures anything from 200 m to 500 m apart, each of which has a small local footprint (possibly as high as 400 m^2, but probably less than this). Assuming a tower every 200 m and a worst-case tower footprint, estimated impact areas are provided in the bottom row of the table. These are clearly negligible relative to the size of the study area associated with the overall cluster of projects. The alternative with the highest proportion of natural habitat is Alternative 2, for which an estimated total impact area of natural habitat is less than 1 ha.

Distance of each type of habitat in the footprint of the grid alternatives:

Habitat	Status	Alternative 1 (Preferred)	Alternative 2	Alternative 3	Alternative 4
Grassland	Natural	440 m	3520 m	1551 m	827 m
Wetland	Natural	274 m	162 m	65 m	
Exotic trees	Degraded	483 m	1038 m		
Degraded areas	Degraded		583 m	324 m	
Old lands	Secondary		92 m		
Current cultivation	Transformed	2363 m	265 m		181 m
Road	Transformed	20 m	20 m		
TOTAL		**3580 m**	**5680 m**	**1940 m**	**1008 m**
Possible footprint		**19 x 400 m^2 = 0.76 ha**	**29 x 400 m^2 = 1.16 ha**	**11 x 400 m^2 = 0.44 ha**	**6 x 400 m^2 = 0.24 ha**

Anticipated impacts

The main impacts associated with construction of the proposed infrastructure are anticipated to be as follows:

1. Direct loss of habitat within the footprint of the proposed infrastructure, and associated impacts on CBAs.
2. Impacts on specific habitats of biodiversity value.
3. Invasion by alien invasive plant species, leading to degradation of habitat. This could occur anywhere on site where disturbance is introduced and alien plants are not specifically controlled. The reason is that they already occur in the area and would opportunistically colonise any area of soil where they are not vigorously controlled.

The main mitigation measures, other than required Management Plans for plant rescue, rehabilitation, and alien plant management, are related to infrastructure location, which is a planning phase measure.

Construction Phase impacts

Direct impacts
Direct impacts include the following:

1. Loss and/or fragmentation of indigenous natural vegetation due to clearing;

Indirect impacts

Indirect impacts during the construction phase include the following:

1. Establishment and spread of alien invasive plants due to the clearing and disturbance of indigenous vegetation;
2. Increased runoff and erosion due to clearing of vegetation, construction of hard surfaces and compaction of surfaces, leading to soil erosion, followed by vegetation loss, in downslope areas.

Operational Phase Impacts

Direct impacts

Ongoing direct impacts will include the following:

1. Sporadic disturbance to natural habitats due to unforeseen events during general operational activities and maintenance (e.g. fires, driving off-road); and

Indirect impacts

These will include the following:

1. Continued establishment and spread of alien invasive plant species due to the presence of disturbance;
2. Continued erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape.

Decommissioning Phase Impacts

Direct impacts

These will include the following:

1. Loss and disturbance of natural vegetation due to the removal of infrastructure and need for working sites;

Indirect impacts

These will occur due to renewed disturbance due to decommissioning activities, as follows:

1. Continued establishment and spread of alien invasive plant species due to the presence of disturbance.

Cumulative impacts

These include the following:

1. Cumulative impacts on indigenous natural vegetation due to clearing;
2. Cumulative impacts on ecological processes;
3. Cumulative impacts due to establishment and spread of alien invasive plant species

ASSESSMENT OF SIGNIFICANCE OF ECOLOGICAL IMPACTS

Detailed discussion of each impact, including justification for assigned scores, is provided below.

Design Phase Impacts

No negative impacts occur during the Design Phase of the project, since no physical construction activities take place. Nevertheless, measures taken during the Design Phase of the project can potentially have a significant positive effect on the nature, extent and intensity of impacts experienced during the Construction Phase. This is usually as a response to identified issues, leading to design modifications to avoid negative impacts where possible.

Construction Phase Impacts

Loss of indigenous natural vegetation due to clearing
The regional vegetation type in the broad study area is Eastern Highveld Grassland, classified in the scientific literature as Endangered (Mucina *et al.*, 2008) and listed as Vulnerable in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011). Any areas of natural habitat (specifically natural grassland, as described above) within this regional vegetation type are therefore considered to have high conservation value.

Vegetation on site is within the Grassland Biome. Mesic grasslands in South Africa have a life-form composition that includes a high number of resprouting sub-terranean species that constitute more than 50% of the species richness at any single location and a higher proportion, if counted across a wider area. Secondary grassland that develops in previously cleared areas (for example, cultivated lands) usually develop a perennial grass cover, but the resprouting component of the flora almost never recovers. This means that any clearing of grassland vegetation, even if temporary, results in permanent loss of the local species composition. Clearing of natural grassland is therefore a permanent impact.

Habitat loss refers to physical disturbance of habitats through clearing, grading and other permanent to semi-permanent loss or degradation. Loss of habitat on site could lead to loss of biodiversity as well as habitat important for the survival of populations of various species.

Impact 1	Loss of indigenous natural vegetation	
Issue	Clearing of natural habitat for construction	
Description of Impact		
Construction activities will require clearing of natural habitat, to be replaced by the infrastructure. This will result in permanent local loss of habitat confined to a small area.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Construction	
Criteria	**Without Mitigation**	**With Mitigation**
Extent	1	1
Duration	5	4
Reversibility	3	3
Magnitude (severity of impact)	1	1

Probability	4	4
Significance	40 (MODERATE)	36 (MODERATE)
Mitigation actions		
The following measures are recommended:	1. Restrict impact to development footprint only and limit disturbance in surrounding areas. 2. Prior to commencement of construction, compile a Rehabilitation Plan including monitoring specifications, to be included into the EMPr during final approval. 3. Prior to commencement of construction, compile an Alien Plant Management Plan, to be included into the EMPr during final approval.	
Monitoring		
The following monitoring is recommended:	As per management plans.	

Establishment and spread of declared weeds and alien invader plants due to the clearing and disturbance of indigenous vegetation

Major factors contributing to invasion by alien invader plants includes *inter alia* high disturbance (such as clearing for construction activities) and negative grazing practices. Exotic species are often more prominent near infrastructural disturbances than further away. Consequences of this may include:

1. loss of indigenous vegetation;
2. change in vegetation structure leading to change in various habitat characteristics;
3. change in plant species composition;
4. change in soil chemical properties;
5. loss of sensitive habitats;
6. loss or disturbance to individuals of rare, endangered, endemic and/or protected species;
7. fragmentation of sensitive habitats;
8. change in flammability of vegetation, depending on alien species;
9. hydrological impacts due to increased transpiration and runoff; and
10. impairment of wetland function.

Low existing populations of alien plants were see on site, but areas of farm infrastructure were not investigated in detail during the field survey. There is a high possibility that alien plants could be introduced to areas within the footprint of the proposed activities from surrounding areas in the absence of control measures. The potential consequences may be of moderate seriousness for affected natural habitats. Control measures could prevent the impact from occurring. These control measures are relatively standard and well-known. Known alien invasive species recorded in the general geographical area that includes the site are as follows (in order of frequency observed):

- *Campuloclinium macrocephalum*
- *Acacia mearnsii*
- *Verbena bonariensis*
- *Solanum mauritianum*
- *Datura stramonium*
- *Cirsium vulgare*
- *Rumex acetosella*
- *Acacia dealbata*
- *Solanum sisymbriifolium*
- *Cortaderia selloana*
- *Arundo donax*
- *Sesbania punicea*
- *Ipomoea purpurea*
- *Melia azedarach*
- *Nicotiana glauca*
- *Eucalyptus camaldulensis*
- *Solanum elaeagnifolium*

- *Phytolacca octandra*
- *Robinia pseudoacacia*
- *Ailanthus altissima*
- *Xanthium spinosum*
- *Myriophyllum aquaticum*
- *Araujia sericifera*
- *Nasturtium officinale*
- *Verbena rigida*
- *Acacia melanoxylon*
- *Xanthium strumarium*
- *Azolla filiculoides*
- *Pinus taeda*
- *Alisma plantago-aquatica*
- *Rubus niveus*
- *Agave americana*
- *Acacia podalyriifolia*
- *Carduus nutans*
- *Ligustrum lucidum*
- *Ageratum houstonianum*
- *Spathodea campanulata*
- *Verbena brasiliensis*
- *Salvia tiliifolia*
- *Solanum pseudocapsicum*
- *Argemone ochroleuca*
- *Pinus patula*
- *Paspalum quadrifarium*
- *Austrocylindropuntia subulata*
- *Rumex usambarensis*

Impact 2	Establishment and spread of declared weeds and alien invader plants	
Issue	Establishment and spread of declared weeds and alien invader plants	
Description of Impact		
Establishment and spread of declared weeds and alien invader plants		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Construction	
Criteria	**Without Mitigation**	**With Mitigation**
Extent	2	1
Duration	1	1
Reversibility	3	3
Magnitude (severity of impact)	2	1
Probability	3	2
Significance	24 (LOW)	12 (VERY LOW)
Mitigation actions		
The following measures are recommended:	1. Prior to commencement of construction, compile and implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control, including monitoring specifications. 2. Undertake regular monitoring to detect alien invasions early so that	

	they can be controlled. 3. Implement control measures as per the specifications of the alien management plan.
Monitoring	
The following monitoring is recommended:	As per management plans

Operational Phase impacts

Continued disturbance to natural habitats due to general operational activities and maintenance

During the operational phase of the project, there will be continuous activity on site, including normal operational activities, maintenance and monitoring. There may also be minor additional construction. Rehabilitation of various sites, such as the construction camps, will also take place. These activities all have the potential to cause additional direct and/or indirect damage to natural habitat and vegetation.

Impact 3	Continued disturbance to natural habitats due to general operational activities and maintenance	
Issue	Sporadic unforseen disturbance to natural habitats e.g. accidental fires, driving off-road, dumping etc. during general operational activities and maintenance.	
Description of Impact		
Continued disturbance to natural habitats due to general operational activities and maintenance		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Operation	
Criteria	**Without Mitigation**	**With Mitigation**
Extent	1	1
Duration	5	5
Reversibility	3	3
Magnitude (severity of impact)	1	1
Probability	3	2
Significance	30 (LOW)	20 (LOW)
Mitigation actions		
The following measures are recommended:	As per impact 1	
Monitoring		
The following monitoring is recommended:	As per management plans	

Continued establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors

The presence of disturbed surfaces on site creates ecological edges and corridors along which alien species can travel and become established.

Impact 4	Establishment and spread of declared weeds and alien invader plants
Issue	Establishment and spread of declared weeds and alien invader plants
Description of Impact	
Establishment and spread of declared weeds and alien invader plants	

Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Operation	
Criteria	**Without Mitigation**	**With Mitigation**
Extent	2	1
Duration	4	2
Reversibility	3	3
Magnitude (severity of impact)	3	1
Probability	3	2
Significance	36 (MODERATE)	14 (VERY LOW)
Mitigation actions		
The following measures are recommended:	1. Prior to commencement of construction, compile and implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control. 2. Undertake regular monitoring to detect alien invasions early so that they can be controlled. 3. Implement control measures as per the specifications of the alien management plan.	
Monitoring		
The following monitoring is recommended:	As per management plans	

Runoff and erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape

Increased erosion (water and wind) and water run-off will be caused by the clearing of indigenous vegetation, creation of new hard surfaces and compaction of soil. The substation will be the main source of disturbance and erosion if not properly constructed and provided with water run-off structures. The substation site will be levelled and compacted causing run-off that may lead to erosion. Increased run-off and erosion could affect hydrological processes in the area and will change water and silt discharge into drainage lines and streams.

Impact 5	Continued runoff and erosion	
Issue	Continued runoff and erosion	
Description of Impact		
Increased runoff and erosion due to clearing of vegetation, construction of hard surfaces and compaction of surfaces, leading to changes in downslope areas		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Operation	
Criteria	**Without Mitigation**	**With Mitigation**
Extent	1	1
Duration	5	5
Reversibility	3	3
Magnitude (severity of impact)	1	1
Probability	3	2
Significance	30 (LOW)	20 (LOW)
Mitigation actions		
The following measures are recommended:	1. Prior to commencement of construction, compile and implement a stormwater management plan including monitoring specifications.	

	2. Monitor surfaces for erosion, repair and/or upgrade, where necessary.
Monitoring	
The following monitoring is recommended:	As per management plans

Decommissioning Phase impacts

It is expected that the project will operate for a minimum of twenty to twenty-five years (a typical planned lifespan for a project of this nature). Decommissioning will probably require a series of steps resulting in the removal of equipment from the site and rehabilitation of footprint areas. It is possible that the site could be returned to a rural nature, but it is unlikely that natural vegetation would become established at disturbed locations on site for a very long time thereafter. The reality is that it is not possible to determine at this stage whether rehabilitation measures will be implemented or not or what the future plans for the site would be nor is it possible at this stage to determine what surrounding land pressures would be. These uncertainties make it difficult to undertake any assessment to determine possible impacts of decommissioning. It is recommended that a closure and rehabilitation plan be compiled near to the decommissioning stage but in advance of when decommissioning is planned, and that this would be required to be implemented prior to closure of the project. The closure and rehabilitation plan must be in compliance with the regulatory requirements at the time of decommissioning. Possible impacts are described below.

Loss and disturbance of natural vegetation due to the removal of infrastructure and need for working sites
During the decommissioning phase of the project, there will be a flurry of activity on site over a period of time, similar to during the construction phase, including dismantling and removal of equipment and rehabilitation. There may also be minor additional construction. Rehabilitation of various sites will also take place. These activities all have the potential to cause additional direct and/or indirect damage to natural habitat and vegetation.

Impact 6	Loss and/or disturbance of indigenous natural vegetation during removal of infrastructure	
Issue	Disturbance of natural habitat during infrastructure removal	
Description of Impact		
Decommissioning activities may cause disturbance of natural habitat. This may result in permanent local loss of habitat.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Decommissioning	
Criteria	**Without Mitigation**	**With Mitigation**
Extent	1	1
Duration	5	5
Reversibility	3	3
Magnitude (severity of impact)	1	1
Probability	2	2
Significance	20 (LOW)	20 (LOW)
Mitigation actions		
The following measures are recommended:	1. Prior to decommissioning commencing, compile a Rehabilitation Plan in compliance with the regulatory requirements at the time of decommissioning.	
Monitoring		
The following monitoring is recommended:	As per management plans.	

Continued establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors

The presence of disturbed surfaces on site creates ecological edges and corridors along which alien species can travel and become established.

Impact 7	Establishment and spread of declared weeds and alien invader plants	
Issue	Establishment and spread of declared weeds and alien invader plants	
Description of Impact		
Establishment and spread of declared weeds and alien invader plants		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Operation	
Criteria	**Without Mitigation**	**With Mitigation**
Extent	2	1
Duration	4	4
Reversibility	3	3
Magnitude (severity of impact)	2	1
Probability	4	3
Significance	44 (MODERATE)	27 (LOW)
Mitigation actions		
The following measures are recommended:	1. Rehabilitate disturbed areas in accordance with the specifications of a Rehabilitation Plan.	
Monitoring		
The following monitoring is recommended:	As per management plans	

Cumulative impacts

Significance values for these impacts are included in the assessment of impacts in the sections above for Construction, Operation and Decommisioning, under the section for "Cumulative impacts".

According to NEMA a cumulative impact is defined as follows: '*the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities.*'

The intention of the cumulative impact assessment is therefore to understand how a receptor is affected by the proposed project in combination with existing (past) and future anticipated impacts by ALL activities. For example, if a threatened plant species is affected by land-use change, then all activities that have and will cause land-use change should be taken into combined account in assessing the cumulative effect – whether it is a substation, a house, or a ploughed land doesn't make a difference. The objective would be to understand how the current project (the one being assessed) contributes to that overall cumulative effect.

For the current project, a power line is likely to contribute very little to future land-use change, but a development with a larger footprint may cause significant additional land-use change. If they are part of the same assessment area then the overall cumulative impact would be high but the contribution by the powerline would be insignificant.

Cumulative impacts on indigenous natural vegetation

The regional terrestrial vegetation type in the broad study area is listed as Vulnerable and is impacted across its range by historical activities. Loss of habitat will definitely occur for the project, which will be a small area in comparison to the total area of the vegetation type. However, the total loss of habitat due to a number of projects together will be greater than for any single project, so a cumulative effect will occur. The area lost in total will be very small compared to the total area of the vegetation type concerned The cumulative effect will therefore be low for vegetation loss.

Extent	The impact will affect natural vegetation on site and is rated as **site**. For a combination of projects, it affects a wider area and is rated as **regional**.
Probability	Loss and/or disturbance of vegetation is **definite**.
Reversibility	In all projects, loss of vegetation is effectively **irreversible** within the immediate footprint of permanent infrastructure, since construction of roads and other hard surfaces completely removes vegetation and modifies the substrate upon which it grows. For all the grid connection infrastructure projects in other areas the impact is partially reversible in the sense that secondary vegetation in disturbed areas will probably never resemble the original vegetation found on site.
Duration	Within the immediate footprint of the permanent infrastructure (turbine foundations, roads and substation) the impact will be **Permanent** (mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient). In other areas the impact will be of long-term duration. The assessment here is for the permanently affected areas.

Impact 8	Cumulative impacts on indigenous natural vegetation
Issue	Clearing of natural habitat for construction
Description of Impact	
Construction activities will require clearing of natural habitat, to be replaced by the infrastructure. This will result in permanent local loss of habitat, multiplied across multiple projects.	
Type of Impact	Direct
Nature of Impact	Negative
Phases	Construction

Criteria	Current project	Combination of projects
Extent	1	3
Duration	4	5
Reversibility	3	3
Magnitude (severity of impact)	1	2
Probability	4	5
Significance	36 (MODERATE)	65 (HIGH)

Cumulative impacts on ecological processes

There are various ecological processes that may be affected at a landscape level by the presence of multiple projects. This includes population processes, such as migration (movement of species through the landscape), pollination (can be disrupted if insect pollinators are blocked from movement)and dispersal, but also more difficult to interpret factors, such as spatial heterogeneity (the diversity of habitats and their spatial relationship to one another), community composition (the species that occur in the landscape) and environmental gradients, that can become disrupted when landscapes are disturbed at a high level. Disturbance can alter the pattern of variation in the structure or function of ecosystems. Fragmentation is the breaking up of a habitat, ecosystem, or land-use type into smaller parcels. An important consequence of repeated, random clearing is that contiguous cover can break down into isolated patches. This happens when the area cleared exceed a critical level and landscapes start to become disconnected. Spatially heterogenous patterns can be interpreted as individualistic responses to environmental gradients and lead to natural patterns in the landscape. Disrupting gradients and creating disturbance edges across wide areas is very disruptive of natural processes and will lead to fundamental changes in ecosystem function.

The current project has been designed to mostly occupy areas that are already disturbed. Where infrastructure is located in natural areas, it is near to edges or follows existing roads. There are few places where it intrudes significantly into natural areas.

Extent	The extent of the combined projects taken together make this a regional effect.
Probability	Based on the number and the nature of the projects , the impact may possibly happen.
Reversibility	Partly reversible, where disruptions to specific processes can be identified and rectified.
Irreplaceable loss of resources	Significant loss of resources could potentially occur, but it is more likely that marginal loss of resources will happen.
Duration	The impact will be long-term to permanent, depending on the process and the specific impact.
Intensity/magnitude	Based on the nature and number of projects and the ecological process affected, the impact is most likely to be of medium intensity.

Impact 9	Cumulative impacts on ecological processes	
Issue	Disruption of ecological processes at landscape level	
Description of Impact		
Construction activities will require clearing of natural habitat, to be replaced by the infrastructure. This will result in possible regional disruption of ecological processes.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Construction	
Criteria	**Current project**	**Combination of projects**
Extent	1	3
Duration	4	4
Reversibility	3	3

Magnitude (severity of impact)	2	3
Probability	3	4
Significance	30 (LOW)	52 (MODERATE)

Cumulative impacts due to spread of declared weeds and alien invader plants

There is a moderate possibility that alien plants could be introduced to areas within the footprint of the proposed infrastructure from surrounding areas in the absence of control measures. The greater the number of projects, the more likely this effect will happen; therefore, the effect is cumulative. For the current site, the impact is predicted to be low due to the current absence of invasive species on site and the high ability to control any additional impact. The significance will therefore be low, especially if control measures are implemented. However, the increased overall disturbance of the landscape will create opportunities and, if new invasions are not controlled, can create nodes that spread to new locations due to the heightened disturbance levels.

Extent	Habitat in the general area of all RE projects being considered will be affected, rated as **regional**.
Probability	The impact will probably happen in the absence of control measures.
Reversibility	Partly reversible in the absence of control measures. Completely reversible if mitigation measures applied. Preventative measures will stop the impact from occurring.
Irreplaceable loss of resources	Marginal to significant loss of resources will occur. Uncontrolled invasion can affect all nearby natural habitats.
Duration	The impact will be long-term. With no control measures it could effectively be permanent, or alternatively, have impacts of high intensity.
Intensity/magnitude	Medium. Severe invasion can alter the functioning of natural ecosystems.

Impact 10	Cumulative impacts due to establishment and spread of declared weeds and alien invader plants	
Issue	Establishment and spread of declared weeds and alien invader plants	
Description of Impact		
Establishment and spread of declared weeds and alien invader plants		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Operation	
Criteria	**Current project**	**Combination of projects**
Extent	1	3
Duration	2	4
Reversibility	3	3
Magnitude (severity of impact)	1	3
Probability	2	4
Significance	14 (VERY LOW)	52 (MODERATE)

Assessment of No-Go alternative

If the project does not proceed then the current *status quo* will continue. This will involve continued use of the land for cultivation and livestock production, as well as the possibility of future mining. Historical aerial imagery shows that cultivation patterns have not changed much in recent history. This is probably due to the fact that most areas that were

viable for crop production were already cultivated in the early 1900s and that there is no benefit to cultivating any new areas, usually due to soil depth limitations. In terms of livestock production, the agricultural specialist report indicated that the long-term grazing capacity of the general area is fairly high at 4.5 hectares per large stock unit (DAFF, 2018). To illustrate general stocking rates in the area, Welgelen 1 and 2 comprises ca. 2018ha, which implies a sustainable grazing numbers on site of ca. 448 head of cattle. These two properties currently occupy ca. 700 head of cattle (not counting the sheep), and therefore the land is heavily overstocked, which is reflected in the condition of the grasslands on site. These are obviously overgrazed and the site is on a long term over-grazing trajectory. This implies that stocking rates, and therefore profitability, will need to be reduced to avert land degradation, putting financial strain on producers. An alternative income stream associated with financial benefits from hosting renewable energy projects is likely to improve the financial viability of any land manager, which in turn reduces the pressure to carry unsustainable stock numbers. This reduces pressure on the land, which reduces the likelihood of grazing-induced degradation. In summary, the No-Go option will increase the rate of land degradation due to over-grazing, especially under adverse future climate scenarios, whereas there is a possibility of this effect being lessened in the case of the project promoting local economic diversity. There is also a moderate to high risk of loss of natural areas due to expansion of coal mining.

Summary of mitigation measures

The following mitigation measures are recommended to address known potential impacts:

- Restrict impact to development footprint only and limit disturbance in surrounding areas.
- Prior to commencement of construction, compile a Rehabilitation Plan including monitoring specifications, to be included into the EMPr during final approval.
- Prior to commencement of construction, compile an Alien Plant Management Plan, to be included into the EMPr during final approval.
- Prior to commencement of construction, compile and implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control, including monitoring specifications.
- Undertake regular monitoring to detect alien invasions early so that they can be controlled.
- Prior to commencement of construction, compile and implement a stormwater management plan including monitoring specifications.
- Monitor surfaces for erosion, repair and/or upgrade, where necessary.
- Prior to decommissioning commencing, compile a Rehabilitation Plan in compliance with the regulatory requirements at the time of decommissioning.

Summary of monitoring recommendations

Specific monitoring recommendations should be provided in the Alien Invasive Management Plan, and the Rehabilitation Plan. The following are broad recommendations:

Alien Invasive Species:

- Monitor for early detection, to find species when they first appear on site. This should be as per the frequency specified in the management plan and should be conducted by an experienced botanist. Early detection should provide a list of species and locations where they have been detected. Summer (vegetation maximum growth period) is usually the most appropriate time, but monitoring can be adaptable, depending on local conditions – this must be specified in the management plan.
- Monitor for the effect of management actions on target species, which provides information on the effectiveness of management actions. Such monitoring depends on the management actions taking place. It should take place after each management action.
- Monitor for the effect of management actions on non-target species and habitats.

Rehabilitated areas:

- Rehabilitation Plan must be compiled by an approved ecologist prior to achieving COD and prior to the start of decommissioning.
- All management actions associated with rehabilitation must be recorded after each management action has taken place.
- All rehabilitated areas should be monitored to assess vegetation recovery. This should be for a minimum of three years after post-construction rehabilitation, but depends on the assessed trajectory of rehabilitation (whether it is following a favourable progression of vegetation establishment or not – this depends on the total vegetation cover present, and the proportion that consists of perennial growth of desired species). For each monitoring site, an equivalent comparative site in adjacent undisturbed vegetation should be similarly monitored. Monitoring data collection should include the following:
    - total vegetation cover and height, as well as for each major growth form;
    - species composition, including relative dominance;
    - soil stability and/or development of erosion features;
    - representative photographs should be taken at each monitoring period.
- Monitoring of rehabilitated areas should take place at the frequency and for the duration determined in the rehabilitation plan, or until vegetation stability has been achieved.

DISCUSSION

The study area for the proposed project consists of a combination of natural vegetation and cultivated areas. The grassland in the general study area is degraded to various degrees from long-term over-grazing. The regional vegetation type that occurs on site, Eastern Highveld Grassland, is listed as Vulnerable in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004). The remaining natural habitat on site, therefore has to be considered to have high biodiversity value.

The DFFE online screening tool identifies Terrestrial Biodiversity as a theme of very high sensitivity. This is due to presence on site of areas included within Endangered Ecosystem, Vulnerable Ecosystem, Langcarel Nature reserve, FEPA sub-catchment, Strategic Water Source Area, and/or Protected Areas Expansion Strategy. The theme indicates almost the entire study area as being in the Very High sensitivity category, but there are significant areas that have been cultivated and impacted by heavy grazing that do not support this classification.

The Langcarel Nature Reserve is shown as occurring on site. This area is not being managed as a protected area and has undergone similar levels of degradation as surrounding areas, due primarily to overgrazing, but also partially due to alien invasive plants. In addition, no conservation management or activities were evident on site during the field assessment. This pattern of over-utilization affects all grasslands on site, resulting in them being in moderate to poor condition. In addition, a separate process is underway to have it (or part thereof) de-proclaimed as part of ongoing province-wide reserve verification efforts by the provincial authorities.

The proposed project consists of a substation station, powerline connecting the energy project to the collector substation, as well as minor collector substation connection infrastructure (as required). There are four possible alternatives for the powerline routing. It has been calculated here that if the longest option is chosen, that also has the greatest distance across natural habitats, then the total footprint area of the powerline towers is less than 1.2 ha. The powerline therefore potentially has a negligible footprint area.

An impact assessment using WSP methodology identified a small number of potential impacts, none of which are of major concern, with all rated Moderate to Very Low before and after mitigation. Some impacts related to loss of vegetation remain Moderate significance after mitigation because they are permanent and are considered unavoidable. However, as discussed above, the amount of habitat potentially affected is insignificant.

Any of the four powerline alternatives is acceptable.

CONCLUSIONS

1. The vegetation type that occurs on site is Eastern Highveld Grassland, is listed as Vulnerable. All areas on site within Eastern Highveld Grassland also fall within another listed ecosystem, Chrissiesmeer Panveld, listed as Vulnerable, and defined independently to the vegetation types. The site is therefore within two listed ecosystems that overlap.
2. There is a proclaimed conservation area on site, the Langcarel Private Nature Reserve. This area has not been managed as a protected area and has undergone similar levels of degradation as surrounding areas due primarily to overgrazing, but also partially due to alien invasive plants. In addition, no conservation management activities were evident on site during the field assessment. This pattern of over-utilization affects all grasslands on site, resulting in them being in moderate to poor condition. A separate process is underway to have it (or part thereof) de-proclaimed as part of ongoing province-wide reserve verification efforts by the provincial authorities. The habitat has been used for livestock production and is impacted by this land-use. It is therefore the authors' opinion on the basis of the current land use and levels of modification, that the private nature reserve does not align with the objective and purpose of the protected area status.
3. Natural grassland on site is in moderate to poor condition, primarily due to heavy overgrazing. There are significant areas of low grass cover and bare areas, and plant species composition has been degraded by grazing effects.
4. The tower structures of the proposed powerline will occupy a maximum of 1.2 ha footprint area, based on the longest powerline option that crosses the most amount of natural habitat. Assuming a worst-case scenario, the proposed project will have a barely detectable impact on surface areas of natural habitat.
5. Assessed impact with moderate significance after mitigation is "Loss of indigenous natural vegetation". However, these are only moderate because they are permanent and will definitely happen – the extent of the impact is negligible. On this basis, the project is therefore deemed acceptable from a terrestrial biodiversity perspective and it is recommended the Environmental Authorisation be granted. The author is of the opinion that the impacts associated with the project can be mitigated to acceptable levels provided the recommended mitigation measures identified are implemented.

BIBLIOGRAPHY AND REFERENCES:

ALEXANDER, G. & MARAIS, J. 2007. A guide to the reptiles of southern Africa. Struik, Cape Town.

BARNES, K.N. (ed.) (2000) The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. Birdlife South Africa, Johannesburg.

BATES, M.F., BRANCH, W.R., BAUER, A.M., BURGER, M., MARAIS, J., ALEXANDER, G.J. & DE VILLIERS, M.S. 2014. Atlas and Red List of the Reptiles of South Africa. Suricata 1, South African National Biodiversity Institute. ISBN 978-1-919976-84-6.

BRANCH, W.R. (1988) South African Red Data Book—Reptiles and Amphibians. South African National Scientific Programmes Report No. 151.

CHILD MF, ROXBURGH L, DO LINH SAN E, RAIMONDO D, DAVIES-MOSTERT HT, editors. The 2016 Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

DRIVER, A., MAZE, K., ROUGET, M., LOMBARD, A.T., NEL, J., TURPIE, J.K., COWLING, R.M., DESMET, P., GOODMAN, P., HARRIS, J., JONAS, Z., REYERS, B., SINK, K. & STRAUSS, T. 2005. National Spatial Biodiversity Assessment 2004: priorities for biodiversity conservation in South Africa. Strelitzia 17. South African National Biodiversity Institute, Pretoria.

DU PREEZ, L. & CARRUTHERS, V. 2009. A complete guide to the frogs of southern Africa. Random House Struik, Cape Town.

FAIRBANKS, D.H.K., THOMPSON, M.W., VINK, D.E., NEWBY, T.S., VAN DEN BERG, H.M & EVERARD, D.A. 2000. The South African Land-Cover Characteristics Database: a synopsis of the landscape. *S.Afr.J.Science* 96: 69-82.

FEY, M. 2010. With contributions by Jeff Hughes, Jan Lambrechts, Theo Dohse, Anton Milewski and Anthony Mills. *Soils of South Africa: their distribution, properties, classification, genesis, use and environmental significance.* Cambridge University Press, Cape Town.

FRIEDMANN, Y. & DALY, B. (eds.) 2004. The Red Data Book of the Mammals of South Africa: A Conservation Assessment: CBSG Southern Africa, Conservation Breeding Specialist Group (SSC/IUCN), Endangered Wildlife Trust, South Africa.

GROOMBRIDGE, B. (ed.) 1994. *1994 IUCN Red List of Threatened Animals*. IUCN, Gland, Switzerland.

IUCN (2001). *IUCN Red Data List categories and criteria: Version 3.1*. IUCN Species Survival Commission: Gland, Switzerland.

LOTTER, M. (2015) Spatial Assessment informing the Mpumalanga Protected Area Expansion Strategy - 20 and 5 year spatial priorities. Mpumalanga Tourism & Parks Agency, Mbombela (Nelspruit).

MARAIS, J. 2004. A complete guide to the snakes of southern Africa. Struik Publishers, Cape Town.

MILLS, G. & HES, L. 1997. The complete book of southern African mammals. Struik Publishers, Cape Town.

MINTER, L.R., BURGER, M., HARRISON, J.A., BRAACK, H.H., BISHOP, P.J. and KLOEPFER, D. (eds.) 2004. Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland. SI/MAB Series #9. Smithsonian Institution, Washington, DC.

MONADJEM, A., TAYLOR, P.J., COTTERILL, E.P.D. & SCHOEMAN, M.C. 2010. Bats of southern and central Africa. Wits University Press, Johannesburg.

MOUTON, P. LE FRAS, N. (2014). Ouroborus cataphractus (Boie, 1828). In BATES, M.F., BRANCH, W.R., BAUER, A.M., BURGER, M., MARAIS, J., ALEXANDER, G.J. & DE VILLIERS, M.S. 2014. Atlas and Red List of the Reptiles of South Africa. Suricata 1, South African National Biodiversity Institute.

MUCINA, L. AND RUTHERFORD, M.C. (editors) 2006. Vegetation map of South Africa, Lesotho and Swaziland: an illustrated guide. *Strelitzia* 19, South African National Biodiversity Institute, Pretoria.

MUCINA, L., RUTHERFORD, M.C. AND POWRIE, I.W. (editors) 2005. Vegetation map of South Africa, Lesotho and Swaziland, 1:1 000 000 SCALE SHEET MAPS South African National Biodiversity Institute, Pretoria.

PASSMORE, N.I. & CARRUTHERS, V.C. (1995) South African Frogs; a complete guide. Southern Book Publishers and Witwatersrand University Press. Johannesburg.

PAVÓN, N.P., HERNÁNDEZ-TREJO, H. AND RICO-GRAY, V. 2000. Distribution of plant life forms along an altitudinal gradient in the semi-arid valley of Zapotitlán, Mexico. Journal of Vegetation Science 11, 39-42.

RAUNKIAER, C. 1934. The life forms of plants and statistical plant geography. Oxford University Press, Oxford.

RUTHERFORD, M.C. AND WESTFALL., R.H. 1994. Biomes of Southern Africa. An objective characterisation. Memoirs of the Botanical Survey of South Africa 63, 1-94.

RUTHERFORD, M.C., MUCINA, L. AND POWRIE, L.W. 2006. Biomes and Bioregions of Southern Africa. In: L. Mucina and M.C. Rutherford (Eds). The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19, pp. 30-51. South African National Biodiversity Institute, Pretoria.

SKELTON, P. 2001. A complete guide to the freshwater fishes of southern Africa. Struik Publishers, Cape Town.

TOLLEY, K. & BURGER, M. 2007. Chameleons of southern Africa. Struik Publishers, Cape Town.

LÖTTER, M.C. & FERRAR, A.A. 2006. Mpumalanga Biodiversity Conservation Plan Map. Mpumalanga Tourism & Parks Agency, Nelspruit

FERRAR, A.A. & LÖTTER, M.C. 2007. Mpumalanga Biodiversity Conservation Plan Handbook. Mpumalanga Tourism & Parks Agency, Nelspruit

SOUTH AFRICAN NATIONAL BIODIVERSITY INSTITUTE (SANBI). 2020. Species Environmental Assessment Guideline. Guidelines 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.

APPENDICES:

Appendix 1: Curriculum vitae: Dr David Hoare

Education
Matric - Graeme College, Grahamstown, 1984
BSc (majors: Botany, Zoology) - Rhodes University, 1991-1993
BSc (Hons) (Botany) - Rhodes University, 1994 with distinction
MSc (Botany) - University of Pretoria, 1995-1997 with distinction
PhD (Botany) – Nelson Mandela Metropolitan University, Port Elizabeth

Main areas of specialisation

- Vegetation ecology, primarily in grasslands, thicket, coastal systems, wetlands.
- Plant biodiversity and threatened plant species specialist.
- Alien plant identification and control / management plans.
- Remote sensing, analysis and mapping of vegetation.
- Specialist consultant for environmental management projects.

Membership
Professional Natural Scientist, South African Council for Natural Scientific Professions, 16 August 2005 – present. Reg. no. 400221/05 (Ecology, Botany)
Member, International Association of Vegetation Scientists (IAVS)
Member, Ecological Society of America (ESA)
Member, International Association for Impact Assessment (IAIA)
Member, Herpetological Association of Africa (HAA)

Employment history
1 December 2004 – present, Director, David Hoare Consulting (Pty) Ltd. Consultant, specialist consultant contracted to various companies and organisations.
1 January 2009 – 30 June 2009, Lecturer, University of Pretoria, Botany Dept.
1 January 2013 – 30 June 2013, Lecturer, University of Pretoria, Botany Dept.
1 February 1998 – 30 November 2004, Researcher, Agricultural Research Council, Range and Forage Institute, Private Bag X05, Lynn East, 0039. Duties: project management, general vegetation ecology, remote sensing image processing.

Experience as consultant
Ecological consultant since 1995. Author of over 380 specialist ecological consulting reports. Wide experience in ecological studies within grassland, savanna and fynbos, as well as riparian, coastal and wetland vegetation.

Publication record:

Refereed scientific articles (in chronological order):

Journal articles:

HOARE, D.B. & BREDENKAMP, G.J. 1999. Grassland communities of the Amatola / Winterberg mountain region of the Eastern Cape, South Africa. *South African Journal of Botany* 64: 44-61.

HOARE, D.B., VICTOR, J.E., LUBKE, R.A. & MUCINA, L., 2000. Vegetation of the coastal fynbos and rocky headlands south of George, South Africa. *Bothalia* 30: 87-96.

VICTOR, J.E., **HOARE, D.B.** & LUBKE, R.A., 2000. Checklist of plant species of the coastal fynbos and rocky headlands south of George, South Africa. *Bothalia* 30: 97-101.

MUCINA, L, BREDENKAMP, G.J., **HOARE, D.B** & MCDONALD, D.J. 2000. A National Vegetation Database for South Africa *South African Journal of Science* 96: 1-2.

HOARE, D.B. & BREDENKAMP, G.J. 2001. Syntaxonomy and environmental gradients of the grasslands of the Stormberg / Drakensberg mountain region of the Eastern Cape, South Africa.. *South African Journal of Botany* 67: 595 – 608.

LUBKE, R.A., **HOARE, D.B.**, VICTOR, J.E. & KETELAAR, R. 2003. The vegetation of the habitat of the Brenton blue butterfly, Orachrysops niobe (Trimen), in the Western Cape, South Africa. *South African Journal of Science* 99: 201–206.

HOARE, D.B & FROST, P. 2004. Phenological classification of natural vegetation in southern Africa using AVHRR vegetation index data. *Applied Vegetation Science* 7: 19-28.

FOX, S.C., HOFFMANN, M.T. and HOARE, D. 2005. The phenological pattern of vegetation in Namaqualand, South Africa and its climatic correlates using NOAA-AVHRR NDVI data. South African Geographic Journal, 87: 85–94.

Pfab, M.F., Compaan, P.C., Whittington-Jones, C.A., Engelbrecht, I., Dumalisile, L., Mills, L., West, S.D., Muller, P., Masterson, G.P.R., Nevhutalu, L.S., Holness, S.D., **Hoare, D.B.** 2017. The Gauteng Conservation Plan: Planning for biodiversity in a rapidly urbanising province. Bothalia, Vol. 47:1. a2182. https://doi.org/10.4102/abc.v47i1.2182.

Book chapters and conference proceedings:

HOARE, D.B. 2002. Biodiversity and performance of grassland ecosystems in communal and commercial farming systems in South Africa. Proceedings of the FAO's Biodiversity and Ecosystem Approach in Agriculture, Forestry and Fisheries Event: 12–13 October, 2002. Food and Agriculture Organisation of the United Nations, Viale delle Terme di Caracalla, Rome, Italy. pp. 10 - 27.

STEENKAMP, Y., VAN WYK, A.E., VICTOR, J.E., **HOARE, D.B.**, DOLD, A.P., SMITH, G.F. & COWLING, R.M. 2005. Maputaland-Pondoland-Albany Hotspot. In: Mittermeier, R.A., Gil, P.R., Hoffmann, M., Pilgrim, J., Brooks, T., Mittermeier, C.G., Lamoreux, J. & Fonseca, G.A.B. da (eds.) *Hotspots revisited.* CEMEX, pp.218–229. ISBN 968-6397-77-9

STEENKAMP, Y., VAN WYK, A.E., VICTOR, J.E., **HOARE, D.B.**, DOLD, A.P., SMITH, G.F. & COWLING, R.M. 2005. Maputaland-Pondoland-Albany Hotspot. http://www.biodiversityhotspots.org/xp/hotspots/maputaland/.

HOARE, D.B., MUCINA, L., RUTHERFORD, M.C., VLOK, J., EUSTON-BROWN, D., PALMER, A.R., POWRIE, L.W., LECHMERE-OERTEL, R.G., PROCHES, S.M., DOLD, T. and WARD, R.A. *Albany Thickets.* in Mucina, L. and Rutherford, M.C. (eds.) 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19, South African National Biodiversity Institute, Pretoria.

MUCINA, L., **HOARE, D.B.**, LÖTTER, M.C., DU PREEZ, P.J., RUTHERFORD, M.C., SCOTT-SHAW, C.R., BREDENKAMP, G.J., POWRIE, L.W., SCOTT, L., CAMP, K.G.T., CILLIERS, S.S., BEZUIDENHOUT, H., MOSTERT, T.H., SIEBERT, S.J., WINTER, P.J.D., BURROWS, J.E., DOBSON, L., WARD, R.A., STALMANS, M., OLIVER, E.G.H., SIEBERT, F., SCHMIDT, E., KOBISI, K., KOSE, L. 2006. *Grassland Biome.* In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

RUTHERFORD, M.C., MUCINA, L., LÖTTER, M.C., BREDENKAMP, G.J., SMIT, J.H.L., SCOTT-SHAW, C.R., **HOARE, D.B.**, GOODMAN, P.S., BEZUIDENHOUT, H., SCOTT, L. & ELLIS, F., POWRIE, L.W., SIEBERT, F., MOSTERT, T.H., HENNING, B.J., VENTER, C.E., CAMP, K.G.T., SIEBERT, S.J., MATTHEWS, W.S., BURROWS, J.E., DOBSON, L., VAN ROOYEN, N., SCHMIDT, E., WINTER, P.J.D., DU PREEZ, P.J., WARD, R.A., WILLIAMSON, S. and HURTER, P.J.H. 2006. *Savanna Biome.* In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

MUCINA, L., RUTHERFORD, M.C., PALMER, A.R., MILTON, S.J., SCOTT, L., VAN DER MERWE, B., **HOARE, D.B.**, BEZUIDENHOUT, H., VLOK, J.H.J., EUSTON-BROWN, D.I.W., POWRIE, L.W. & DOLD, A.P. 2006. *Nama-Karoo Biome.* In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

MUCINA, L., SCOTT-SHAW, C.R., RUTHERFORD, M.C., CAMP, K.G.T., MATTHEWS, W.S., POWRIE, L.W. and **HOARE, D.B.** 2006. *Indian Ocean Coastal Belt.* In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

Conference Presentations:

HOARE, D.B. & LUBKE, R.A. *Management effects on diversity at Goukamma Nature Reserve, Southern Cape*; Paper presentation, Fynbos Forum, Bienne Donne, July 1994

HOARE, D.B., VICTOR, J.E. & LUBKE, R.A. *Description of the coastal fynbos south of George, southern Cape*; Paper presentation, Fynbos Forum, Bienne Donne, July 1994

HOARE, D.B. & LUBKE, R.A. *Management effects on fynbos diversity at Goukamma Nature Reserve, Southern Cape*; Paper presentation, South African Association of Botanists Annual Congress, Bloemfontein, January 1995

HOARE, D.B. & BOTHA, C.E.J. *Anatomy and ecophysiology of the dunegrass Ehrharta villosa var. maxima*; Poster presentation, South African Association of Botanists Annual Congress, Bloemfontein, January 1995

HOARE, D.B., PALMER, A.R. & BREDENKAMP, G.J. 1996. *Modelling grassland community distributions in the Eastern Cape using annual rainfall and elevation*; Poster presentation, South African Association of Botanists Annual Congress, Stellenbosch, January 1996

HOARE, D.B. Modelling vegetation on a past climate as a test for palaeonological hypotheses on vegetation distributions; Paper presentation, Randse Afriakaanse Universiteit postgraduate symposium, 1997

HOARE, D.B., VICTOR, J.E. & BREDENKAMP, G.J. *Historical and ecological links between grassy fynbos and afromontane fynbos in the Eastern Cape*; Paper presentation, South African Association of Botanists Annual Congress, Cape Town, January 1998

LUBKE, R.A., HOARE, D.B., VICTOR, J.E. & KETELAAR, R. *The habitat of the Brenton Blue Butterfly*. Paper presentation, South African Association of Botanists Annual Congress, Cape Town, January 1998

HOARE, D.B. & PANAGOS, M.D. Satellite stratification of vegetation – structure or floristic composition? Poster presentation at the 34th Annual Congress of the Grassland Society of South Africa, Warmbaths, 1-4 February 1999.

HOARE, D.B. & WESSELS, K. Conservation status and threats to grasslands of the northern regions of South Africa, Poster presentation at the South African Association of Botanists Annual Congress, Potchefstroom, January 2000.

HOARE, D.B. Phenological dynamics of Eastern Cape vegetation. Oral paper presentation at the South African Association of Botanists Annual Congress, Grahamstown, January 2002.

HOARE, D.B., MUCINA, L., VAN DER MERWE, J.P.H. & PALMER, A.R. Classification and digital mapping of grasslands of the Eastern Cape Poster presentation at the South African Association of Botanists Annual Congress, Grahamstown, January 2002.

HOARE, D.B. Deriving phenological variables for Eastern Cape vegetation using satellite data Poster presentation at the South African Association of Botanists Annual Congress, Grahamstown, January 2002.

MUCINA, L., RUTHERFORD, M.C., HOARE, D.B. & POWRIE, L.W. 2003. VegMap: The new vegetation map of South Africa, Lesotho and Swaziland. In: Pedrotti, F. (ed.) Abstracts: Water Resources and Vegetation, 46th Symposium of the International Association for Vegetation Science, June 8 to 14 – Napoli, Italy.

HOARE, D.B. 2003. Species diversity patterns in moist temperate grasslands of South Africa. Proceedings of the VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa. African Journal of Range and Forage Science. 20: 84.

Unpublished technical reports:

PALMER, A.R., HOARE, D.B. & HINTSA, M.D., 1999. Using satellite imagery to map veld condition in Mpumalanga: A preliminary report. Report to the National Department of Agriculture (Directorate Resource Conservation). ARC Range and Forage Institute, Grahamstown.

HOARE, D.B. 1999. The classification and mapping of the savanna biome of South Africa: methodology for mapping the vegetation communities of the South African savanna at a scale of 1:250 000. Report to the National Department of Agriculture (Directorate Resource Conservation). ARC Range and Forage Institute, Pretoria.

HOARE, D.B. 1999. The classification and mapping of the savanna biome of South Africa: size and coverage of field data that exists on the database of vegetation data for South African savanna. Report to the National Department of Agriculture (Directorate Resource Conservation). ARC Range and Forage Institute, Pretoria.

THOMPSON, M.W., VAN DEN BERG, H.M., NEWBY, T.S. & HOARE, D.B. 2001. Guideline procedures for national land-cover mapping and change monitoring. Report no. ENV/P/C 2001-006 produced for Department of Water Affairs and Forestry, National Department of Agriculture and Department of Environment Affairs and Tourism. Copyright: Council for Scientific and Industrial Research (CSIR) and Agricultural Research Council (ARC).

HOARE, D.B. 2003. Natural resource survey of node O R Tambo, using remote sensing techniques, Unpublished report and database of field data for ARC Institute for Soil, Climate & Water, ARC Range and Forage Institute, Grahamstown.

HOARE, D.B. 2003. Short-term changes in vegetation of Suikerbosrand Nature Reserve, South Africa, on the basis of resampled vegetation sites. Gauteng Department of Agriculture, Conservation, Environment and Land Affairs, Conservation Division.

BRITTON, D., SILBERBAUER, L., ROBERTSON, H., LUBKE, R., HOARE, D., VICTOR, J., EDGE, D. & BALL, J. 1997. The Life-history, ecology and conservation of the Brenton Blue Butterfly (*Orachrysops niobe*) (Trimen)(*Lycaenidea*) at Brenton-on-Sea. Unpublished report for the Endangered Wildlife Trust of Southern Africa, Johannesburg. 38pp.

HOARE, D.B., VICTOR, J.E. & MARNEWIC, G. 2005. Vegetation and flora of the wetlands of Nylsvley River catchment as component of a project to develop a framework for the sustainable management of wetlands in Limpopo Province.

Consulting reports:

Total of over 380 specialist consulting reports for various environmental projects from 1995 – present.

Workshops / symposia attended:

International Association for Impact Assessment Annual Congress, Durban, 16 – 19 May 2018.

Workshop on remote sensing of rangelands presented by Paul Tueller, University of Nevada Reno, USA, VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa.

VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa.

BioMap workshop, Stellenbosch, March 2002 to develop strategies for studying vegetation dynamics of Namaqualand using remote sensing techniques

South African Association of Botanists Annual Congress, Grahamstown, January 2002.

28th International Symposium on Remote Sensing of Environment, Somerset West, 27-31 March 2000.

Workshop on Vegetation Structural Characterisation: Tree Cover, Height and Biomass, 28th International Symposium on Remote Sensing of Environment, Strand, 26 March 2000.

South African Association of Botanists Annual Congress, Potchefstroom, January 2000

National Botanical Institute Vegmap Workshop, Kirstenbosch, Cape Town, 30 September-1 October 1999.

Sustainable Land Management – Guidelines for Impact Monitoring, Orientation Workshop: Sharing Impact Monitoring Experience, Zithabiseni, 27-29 September 1999.

WWF Macro Economic Reforms and Sustainable Development in Southern Africa, Environmental Economic Training Workshop, development Bank, Midrand, 13-14 September 1999.

34th Annual Congress of the Grassland Society of South Africa, Warmbaths, 1-4 February 1999

Expert Workshop on National Indicators of Environmental Sustainable Development, Dept. of Environmental Affairs and Tourism, Roodevallei Country Lodge, Roodeplaat Dam, Pretoria, 20-21 October 1998.

South African Association of Botanists Annual Congress, Cape Town, January 1998

Randse Afrikaanse Universiteit postgraduate symposium, 1997.

South African Association of Botanists Annual Congress, Bloemfontein, January 1995.

Terrestrial Animal Species Assessment

prepared in accordance with the
"*Protocol for the Specialist Assessment and minimum report content requirements for environmental impacts on Terrestrial Animal Species*"

Camden 1 Wind Grid Connection near Ermelo in Mpumalanga Province

David Hoare Consulting (Pty) Ltd

David Hoare
Consulting (Pty) Ltd

Address:
Postnet Suite #116
Private Bag X025
Lynnwood Ridge
0040

41 Soetdoring Avenue
Lynnwood Manor
Pretoria

Cell: 083 284 5111
Email:
david@davidhoareconsulting.co.za

Terrestrial Animal Species Assessment

prepared in accordance with the
"Protocol for the Specialist Assessment and minimum report content requirements for environmental impacts on Terrestrial Animal Species"

Camden 1 Wind Grid Connection near Ermelo in Mpumalanga Province

Prepared by: Dr David Hoare
Pr.Sci.Nat. (Botany, Ecology) 400221/05

For: ENERTRAG South Africa (Pty) Ltd
53 Dudley Road,
Parkwood,
Johannesburg
South Africa

20 November 2022

TABLE OF CONTENTS

SPECIALIST DETAILS & DECLARATION

This report has been prepared in accordance with the "Protocol for the specialist assessment and minimum report content requirements for environmental impacts on **terrestrial animal species**", as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), published in GN. No. 320 dated 20 March 2020. It has been prepared independently of influence or prejudice by any parties.

The details of Specialists are as follows:

Specialist	Qualification and accreditation
Dr David Hoare	PhD Botany SACNASP (Pr.Sc.Nat.) Reg. no. 400221/05 (Ecology, Botany)

Declaration of independence:

David Hoare Consulting (Pty) Ltd in an independent consultant and hereby declares that it does not have any financial or other vested interest in the undertaking of the proposed activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998). In addition, remuneration for services provided by David Hoare Consulting (Pty) Ltd is not subject to or based on approval of the proposed project by the relevant authorities responsible for authorising this proposed project.

Disclosure:

David Hoare Consulting (Pty) Ltd undertakes to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) and will provide the competent authority with access to all information at its disposal regarding the application, whether such information is favourable to the applicant or not.

Based on information provided to David Hoare Consulting (Pty) Ltd by the client and in addition to information obtained during the course of this study, David Hoare Consulting (Pty) Ltd presents the results and conclusion within the associated document to the best of the author's professional judgement and in accordance with best practice.

_____ 20 November 2022

Dr David Hoare Date

TERMS OF REFERENCE

The specialist study is required to follow the published Protocols, provided in full below for the assessment of impacts on Terrestrial Animal Species. Note that the Protocols require determination of the level of sensitivity, which then determines the level of assessment required, either a full assessment, or a Compliance Statement.

PROTOCOL FOR THE SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR ENVIRONMENTAL IMPACTS ON TERRESTRIAL ANIMAL SPECIES

This site sensitivity assessment follows the requirements of The Environmental Impact Assessment Regulations, as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), published in GN. No. 320 dated 20 March 2020.

General information

1.1 An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of "**very high**" or "**high**" sensitivity for terrestrial animal species, must submit a **Terrestrial Animal Species Specialist Assessment Report**.

1.2 An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of "**medium** sensitivity" for terrestrial animal species, must submit either a **Terrestrial Animal Species Specialist Assessment Report** or a **Terrestrial Animal Species Compliance Statement**, depending on the outcome of a site inspection undertaken in accordance with paragraph 4.

1.3 An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of "**low**" sensitivity for terrestrial animal species, must submit a **Terrestrial Animal Species Compliance Statement**.

1.4 Where the information gathered from the site sensitivity verification differs from the screening tool designation of "very high" or "high" for terrestrial animal species sensitivity on the screening tool, and it is found to be of a "low" sensitivity, then a **Terrestrial Animal Species Compliance Statement** must be submitted.

1.5 Where the information gathered from the site sensitivity verification differs from the screening tool designation of "low" terrestrial animal species sensitivity and it is found to be of a "very high" or "high" terrestrial animal species sensitivity, a **Terrestrial Animal Species Specialist Assessment** must be conducted.

1.6 If any part of the development falls within an area of confirmed "very high" or "high" sensitivity, the assessment and reporting requirements prescribed for the "very high" or "high" sensitivity, apply to the entire development footprint. Development footprint in the context of this protocol, means the area on which the proposed development will take place and includes the area that will be disturbed or impacted.

1.7 The **Terrestrial Animal Species Specialist Assessment** and the **Terrestrial Animal Species Compliance Statement** must be undertaken within the study area.

1.8 Where the nature of the activity is not expected to have an impact on species of conservation concern (SCC) beyond the boundary of the preferred site, the study area means the proposed development footprint within the preferred site.

1.9 Where the nature of the activity is expected to have an impact on SCC beyond boundary of the preferred site, the project areas of influence (PAOI) must be determined by the specialist in accordance with Species Environmental Assessment Guideline, and the study area must include the PAOI, as determined.

Terrestrial Animal Species Specialist Assessment

2.1 The assessment must be undertaken by a specialist registered with the South African Council for Natural Scientific Professions (SACNASP), within a field of practice relevant to the taxonomic groups ("taxa") for which the assessment is being undertaken.

2.2 The assessment must be undertaken in accordance with the Species Environmental Assessment Guideline and must:

2.2.1 Identify the SCC which were found, observed or are likely to occur within the study area;

2.2.2 provide evidence (photographs) of each SCC found or observed within the study area, which must be disseminated by the specialist to a recognized online database facility immediately after the site inspection has been performed (prior to preparing the report contemplated in paragraph 3);

2.2.3 identify the distribution, location, viability and detailed description of population size of the SCC identified within the study area;

2.2.4 identify the nature and the extent of the potential impact of the proposed development to the population of the SCC located within the study area;

2.2.5 determine the importance of the conservation of the population of the SCC identified within the study area, based on information available in national and international databases including the IUCN Red List of Threatened Species, South African Red List of Species, and/or other relevant databases;

2.2.6 determine the potential impact of the proposed development on the habitat of the SCC located within the study area;

2.2.7 include a review of relevant literature on the population size of the SCC, the conservation interventions as well as any national or provincial species management plans for the SCC. This review must provide information on the need to conserve the SCC and indicate whether the development is compliant with the applicable species management plans and if not, a motivation for the deviation;

2.2.8 identify any dynamic ecological processes occurring within the broader landscape, that might be disrupted by the development and result in negative impact on the identified SCC, for example, fires in fire-prone systems;

2.2.9 identify any potential impact on ecological connectivity in relation to the broader landscape, resulting in impacts on the identified SCC and its long term viability;

2.2.10 determine buffer distances as per the Species Environmental Assessment Guidelines used for the population of each SCC;

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

2.2.12 identify any alternative development footprints within the preferred development site which would be of "low" or "medium" sensitivity as identified by the screening tool and verified through the site sensitivity verification.

2.3 The findings of the assessment must be written up in a **Terrestrial Animal Species Specialist Assessment Report**.

Terrestrial Animal Species Specialist Assessment Report

3.1 This report must include as a minimum the following information:

3.1.1 contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the assessment including a curriculum vitae;

3.1.2 a signed statement of independence by the specialist;

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;

3.1.4 a description of the methodology used to undertake the site sensitivity verification and impact assessment and site inspection, including equipment and modelling used where relevant;

3.1.5 a description of the mean density of observations/number of samples sites per unit area of site inspection observations;

3.1.6 a description of the assumptions made and any uncertainties or gaps in knowledge or data;

3.1.7 details of all SCC found or suspected to occur on site, ensuring sensitive species are appropriately reported;

3.1.8 the online database name, hyperlink and record accession numbers for disseminated evidence of SCC found within the study area;

3.1.9 the location of areas not suitable for development and to be avoided during construction where relevant;

3.1.10 a discussion on the cumulative impacts;

3.1.11 impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);

3.1.12 a reasoned opinion, based on the findings of the specialist assessment, regarding the acceptability or not, of the development related to the specific theme considered, and if the development should receive approval or not, related to the specific theme being considered, and any conditions to which the opinion is subjected if relevant; and

3.1.13 a motivation must be provided if there were any development footprints identified as per paragraph 2.2.12 above that were identified as having “low” or “medium” terrestrial animal species sensitivity and were not considered appropriate.

3.2 A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.

Terrestrial Animal Species Compliance Statement

5.1 The compliance statement must be prepared by a SACNASP registered specialist under one of the two fields of practice (Zoological Science or Ecological Science).

5.2 The compliance statement must:

5.2.1 be applicable within the study area;

5.2.2 confirm that the study area is of "low" sensitivity for terrestrial animal species; and

5.2.3 indicate whether or not the proposed development will have any impact on SCC.

5.3 The compliance statement must contain, as a minimum, the following information:

5.3.1 contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the compliance statement including a curriculum vitae;

5.3.2 a signed statement of independence by the specialist;

5.3.3 a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;

5.3.4 a description of the methodology used to undertake the site survey and prepare the compliance statement, including equipment and modelling used where relevant;

5.3.5 the mean density of observations/ number of samples sites per unit area;

5.3.6 where required, proposed impact management actions and outcomes or any monitoring requirements for inclusion in the EMPr;

5.3.7 a description of the assumptions made and any uncertainties or gaps in knowledge or data;

5.3.8 any conditions to which the compliance statement is subjected.

A signed copy of the Terrestrial Animal Species Compliance Statement must be appended to the Basic Assessment Report or the Environmental Impact Assessment Report.

INTRODUCTION

Project Background

ENERTRAG South Africa (Pty) Ltd, a subsidiary of ENERTRAG AG, the German-based renewable energy company is proposing to develop electrical grid infrastructure of up to 132kV related to the Camden I Wind Energy Facility (WEF) of up to 200 MW (the Project) near Camden Power Station in the Mpumalanga Province. This will be part of the Camden Renewable Energy Complex that will include:

1. Camden I Wind Energy Facility (up to 200MW).
2. **Camden I Wind Grid Connection (up to 132kV).**
3. Camden up to 400kV Grid Connection and Collector substation.
4. Camden I Solar up to 100MW.
5. Camden I Solar up to 132kV Grid Connection.
6. Camden Green Hydrogen and Ammonia Facility, including grid connection infrastructure.
7. Camden II Wind Energy Facility (up to 200MW).
8. Camden II Wind Energy Facility up to 132kV Grid Connection.

Enertrag SA has appointed WSP as the independent Environmental Assessment Practitioner (EAP) to facilitate the Environmental Impact Assessment (EIA) Process.

This report addresses specifically the up to 132kV electrical grid infrastructure application (Basic Assessment) related to the Camden I Wind Energy Facility (which is subject to a separate Scoping and Environmental Impact Assessment process).

Project description

It is proposed that Camden I Wind Energy Facility will connect to the nearby Camden Collector substation (which in turn will connect to the Camden Power Station), through an up to 132kV powerline (either single or double circuit) between the grid connection substation portion (immediately adjacent the Camden I on-site IPP substation portion) and that of the Camden Collector substation. The powerline will be approximately 5km in length, depending on the authorized location of the collector substation. The onsite grid connection substation will consist of high voltage substation yard to allow for multiple (up to) 132kV feeder bays and transformers, control building, telecommunication infrastructure, access roads, etc. The area for the onsite substation will be up to 1.5ha. The up to 132kV powerline and substation will have a 250m assessment corridor (either side of the centre line), to allow for technical placement and micro-siting as required, including around the on-site grid connection substation and the terminating works required at the Collector Substation (MTS). This application includes the necessary up to 132kV voltage electrical components required for connection at the Collector Substation.

Portions of the following farms are affected:

Parent Farm	Farm No	Portion No	Owner
Klipbank	295	0	Reyneke Hendrik Jackobus Willem
Adrianople	296	0	Rassie Saaiman Trust
Adrianople	296	1	Lood De Jager Trust
Welgelegen	322	1	Reyneke Hendrik Jackobus Willem
Welgelegen	322	2	Reyneke Hendrik Jackobus Willem

Parent Farm	Farm No	Portion No	Owner
Klipbank	295	3	Reyneke Hendrik Jackobus Willem
Adrianople	296	3	Van Der Meulen Trust

The project is located about 8 km south to south-east of Ermelo in Mpumalanga Provinces, South Africa (Figure 1). The site is halfway between the N11 (Ermelo to Amersfoort) and the N2 (Ermelo to Piet Retief). Camden Power Station (Eskom) is on the north-eastern border of the site. The roads on site are all gravel farm access roads.

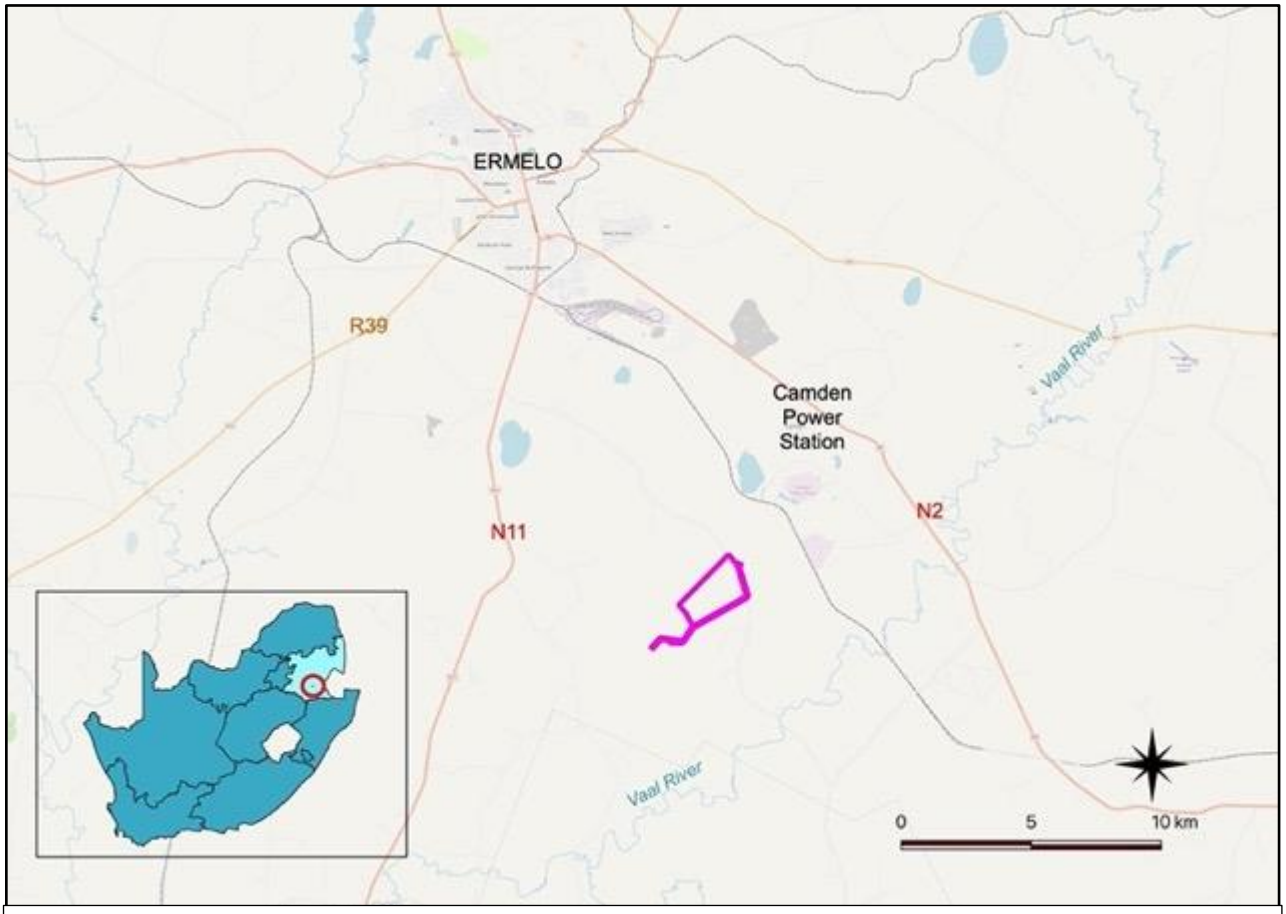

Figure 1: Location of the proposed Project.

SENSITIVITIES IDENTIFIED FROM DFFE ONLINE SCREENING TOOL

Animal Species Theme

A sensitivity screening report from the DFFE Online Screening Tool was requested in the application category: Utilities Infrastructure|Electricity|Distribution and Transmission|Powerline (Figure 2). The DFFE Screening Tool report for the area indicates the following ecological sensitivities:

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Animal Species Theme		X		

The animal species theme was highlighted as being of High sensitivity due the potential presence of the following species:

Sensitivity	Feature(s)
High	Sensitive species 2
High	Aves-Geronticus calvus
Medium	Aves-Tyto capensis
Medium	Sensitive species 2
Medium	Aves-Geronticus calvus
Medium	Aves-Sagittarius serpentarius
Medium	Mammalia-Crocidura maquassiensis
Medium	Mammalia-Ourebia ourebi ourebi

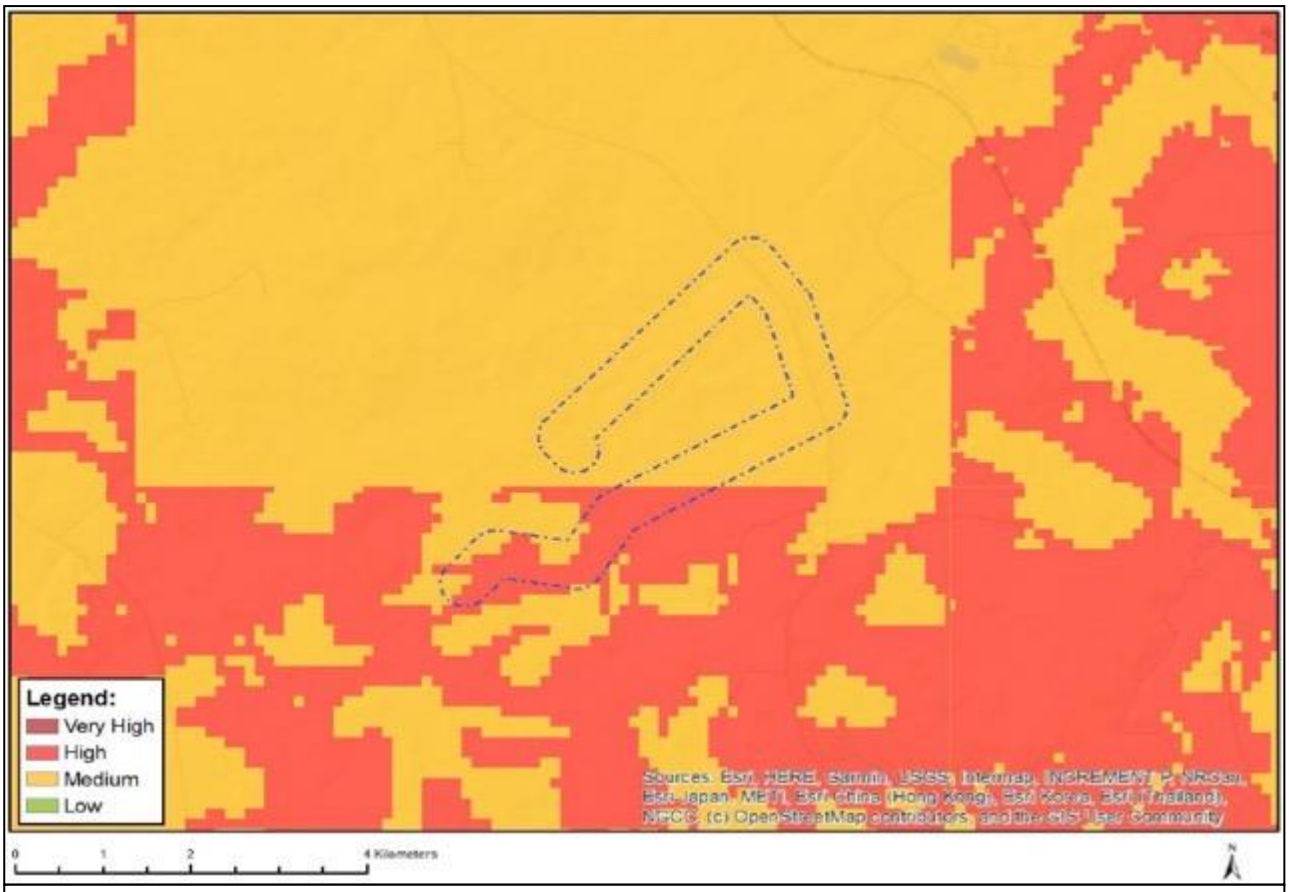

Figure 2: DFFE Screening Tool extract: animal theme.

METHODOLOGY

The detailed methodology followed as well as the sources of data and information used as part of this assessment is described below.

Survey timing

The study commenced as a desktop-study followed by a site-specific field study on 3–7 February 2020. The site is within the Grassland Biome with a peak rainfall season in summer, which occurs from October to March (Figure 3). There is, however, a delay between rainfall and vegetation growth, which means the peak growing season is from November to April, with most perennial species characteristic of the vegetation being easily identifiable from January to March. The timing of the survey was therefore ideal in terms of assessing the vegetation condition in terms of suitable animal habitat on the site.

Field survey approach

During the field survey, all major natural variation on site was assessed and select locations were traversed on foot.

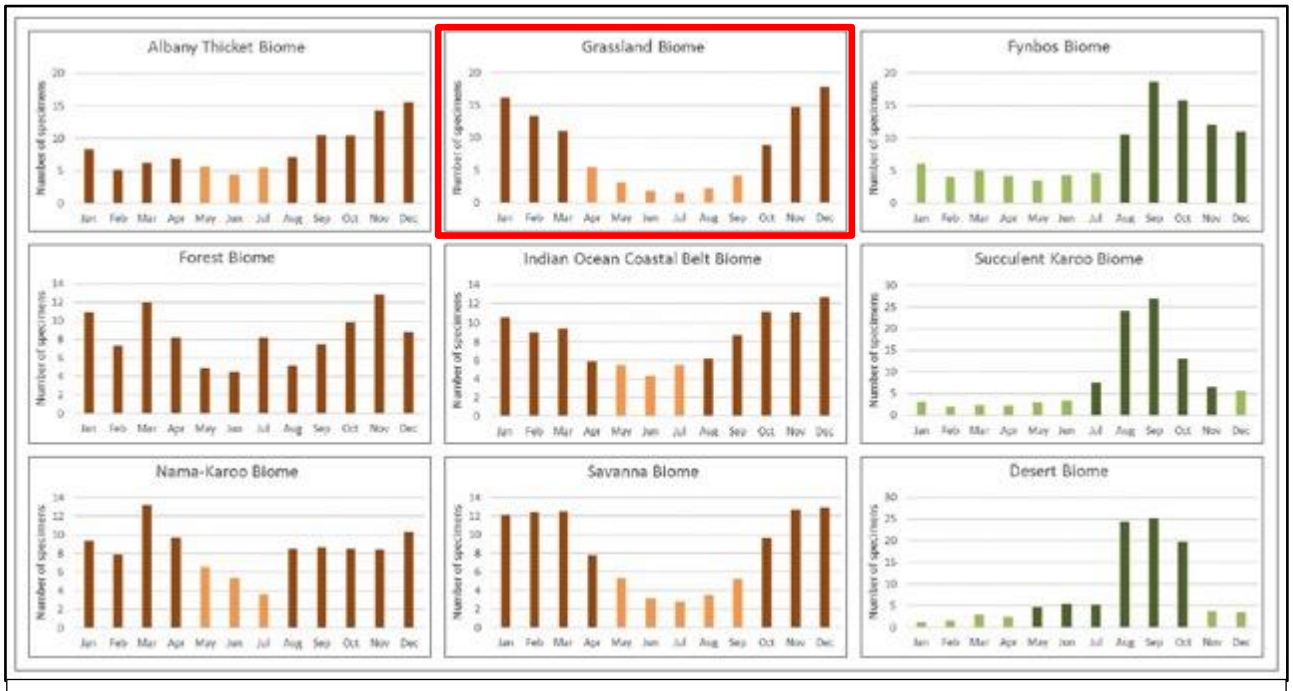

Figure 3: Recommended survey periods for different biomes (Species Environmental Assessment Guidelines).

Aerial imagery from Google Earth was used to identify and assess habitats suitable for animal species that could occur on site. Patterns identified from satellite imagery were verified on the ground. During the field survey, particular attention was paid to ensuring that all habitat variability was covered physically on the ground.

Sources of information

Lists of animal species that have a geographical range that includes the study area were obtained from literature sources (Bates et al., 2014 for reptiles, du Preez & Carruthers 2009 for frogs, Mills & Hes 1997 and Friedmann and Daly, 2004 for mammals). This was supplemented with information from the Animal Demography Unit website (adu.uct.ac.za) and literature searches for specific animals, where necessary.

Limitations, Assumptions & Uncertainties

The following assumptions, limitations, uncertainties are listed regarding the assessment of the Hendrina site:

- Inventory surveys of animal species occurring on a site are difficult to achieve within the timeframes associated with an EIA. To compile a comprehensive site-specific list of the biota on site, studies would be required that would include different seasons and be undertaken a much longer timeframe including extensive sampling. It is more important to know of fauna of value, as well as ecological processes. Therefore, the assessment attempts to identify threatened and other significant species, important habitats, and ecological processes.
- Compiling the list of species that could potentially occur on site is limited by the density of collection records for the area. The list of animal species that could potentially occur on site was therefore taken from a wider area and from literature sources that may include species that do not occur on site and may miss species that do occur on site.
- The assessment is based on a field survey conducted 3-7 February 2020. The current study is based on an extensive site visit as well as a desktop study of the available information. The time spent on site was adequate for understanding general patterns across affected areas. The seasons in which the fieldwork (peak summer flowering period) was conducted was ideal for assessing the composition and condition of the vegetation, which is also suitable for assessing habitat condition and suitability for animals.

ASSESSMENT OUTCOMES

Habitats on site

A map of habitats within the study area is provided in Figure 4. The site is within an area of natural grassland but degraded (from heavily to light). The grassland contains variation due to changes in topography, slope inclination, surface rockiness and the influence of water-flow and water retention in the landscape. A broad classification of the habitat units on site, which also reflects relatively uniform plant species compositional units, is as follows:

Natural habitats:

1. **Natural grassland** (open grassland on undulating plains – the condition is not indicated in the habitat map although there is a gradient from heavily grazed poor condition to moderate condition).
2. **Wetlands** (permanent and seasonal wetlands in drainage valleys, including channels, where they occur).

Transformed and degraded areas:

3. **Old lands** (secondary grasslands on previously cultivated areas).
4. **Exotic trees** (stands of exotic trees).
5. **Degraded areas** (disturbed areas with bare ground, weeds, or waste ground).
6. **Current cultivation** (areas currently cultivated and fallow lands).
7. **Transformed** (areas such as roads and buildings where there is no vegetation).

NATURAL VERSUS SECONDARY GRASSLAND	
Natural grassland	Areas of original vegetation in which the soil has not been mechanically disturbed, including areas that are in poor condition due to **overgrazing**, **trampling**, **invasion** by weeds or alien invasive species, **inappropriate fire regimes**, or any other factor that drives natural change in species composition or vegetation structure. The key factor is that the original plants continue to exist, often resprouting after defoliation from sub-surface stems or other storage organs.
Secondary grassland	Areas of vegetation where the original grassland vegetation has been lost through direct **disturbance of the soil** that results in physical removal of the original plants, the most common cause of which is ploughing, but could be other mechanical factors. The vegetation that then develops is as a result of recolonization of the area through propagation.

Figure 4: Main habitats of the study area (Please note: a 250m assessment corridor on either side of the centre lines presented here was assessed).

Grassland
The general study area is characterised by an open grassland on the undulating hills and plains. It is generally a short to moderate height tussock grassland with closed canopy cover. The soil depth varies, as does the amount of surface rock cover, but tends to have shallow soil.

The general floristic character of this vegetation on site is fairly uniform across wide areas, often dominated by the same suite of species, including the grasses, *Alloteropsis semialata, Aristida diffusa, Aristida junciformis, Bewsia biflora, Brachiaria serrata, Diheteropogon amplectens, Elionurus muticus, Eragrostis capensis, Eragrostis chloromelas, Eragrostis plana, Eragrostis racemosa, Harpochloa falx, Heteropogon contortus, Microchloa caffra, Panicum natalense, Setaria sphacelata var. torta, Themeda triandra,* and *Tristachya leucothrix*, and the forbs, *Acalypha angustata, Anthospermum rigidum subsp. rigidum, Berkheya setifera, Chaetacanthus costatus, Commelina africana, Crabbea acaulis, Cucumis hirsutus, Cucumis zeyheri, Cyanotis speciosa, Gerbera viridifolia, Haplocarpha scaposa, Helichrysum rugulosum, Hemizygia pretoriae, Hermannia transvaalensis, Hibiscus aethiopicus, Hypoxis obtusa, Hypoxis rigidula, Indigofera comosa, Ipomoea ommaneyi, Justicia anagalloides, Kohautia amatymbica, Ledebouria ovatifolia, Monsonia attenuata, Nidorella hottentotta, Pentanisia angustifolia, Pollichia campestris, Scabiosa columbaria, Selago densiflora, Seriphium plumosum, Vernonia galpinii, Vernonia oligocephala,* and *Zornia milneana*. Overall diversity in this unit was high and included a full list of over 100 species. Local species richness was also high at 56 species per 400m^2 sampling area. This rivals the local richness of some of the most species-rich grasslands anywhere in the country.

Wetlands

Wetlands were mapped from Google Earth imagery dated 28/03/2019, a date which shows the wetness signal very well as darker green areas. This also corresponds well to black and white historical aerial photographs from 1955, where wetlands appear as darker areas.

Valley bottom wetlands in this general area around Ermelo, such as this one, are generally dominated by a variety of grasses, sedges and herbaceous plants, including the graminoids, *Kyllinga erecta*, *Leersia hexandra*, *Agrostis lachnantha*, *Andropogon appendiculatus*, *Helictotrichon turgidulum*, *Scirpoides burkei*, *Cyperus teneristolon*, *Cyperus macranthus*, *Typha capensis*, *Agrostis erianthe*, *Hemarthria altissima*, *Panicum schinzii*, *Cyperus rigidifolius* and *Arundinella nepalensis*, the herbs, *Centella asiatica*, *Senecio polyodon*, *Senecio erubescens*, *Haplocarpha scaposa*, *Pelargonium luridum*, *Commelina africana*, *Lobelia flaccida*, *Monopsis decipiens*, and *Helichrysum aureonitens*. The species composition depends entirely on the hydrological characteristics of the site, with a greater number of obligate wetland species occurring in more permanently damp areas, whereas dryer areas more closely resembling terrestrial grassland in species composition.

Current cultivation
These are areas that, according to recent satellite imagery, are currently being cultivated, or were recently cultivated (within the last five years). If not under crops, they would be a ploughed land, or a fallow land with either weeds or a cover crop. From an ecological or biodiversity perspective, these areas have no natural habitat and have no plant or vegetation biodiversity value. The soil profile has been completely disturbed, removing all original vegetation, including geophytic and resprouting plant species. In the Grassland Biome of South Africa, a large proportion of the indigenous biodiversity consists of herbaceous and low shrubby species that re-sprout seasonally, after fire, or after defoliation from grazing animals, and can persist under these conditions. In cultivated areas, it is possible through natural succession, or through active rehabilitation, to restore a perennial cover of grasses, but the original biodiversity is permanently lost. They also have little value for animal biodiversity, except for species that forage in cultivated areas.

Old lands
These are areas that were previously ploughed for cultivation but have been left for an extended period without ploughing. Through natural succession processes, they generally develop a perennial cover of grasses, but these secondary grasslands are species poor and the original diversity of resprouting species is usually entirely absent. Non-grass species diversity usually consists of re-seeding and weedy species, and sometimes animal- and/or bird-dispersed woody species.

On aerial photographs and satellite images with adequate resolution, these areas are often recognisable by the presence of residual plough lines and other structural features often present in cultivated fields.

Exotic trees
There are planted windrows on the roadsides in various parts of the site, as well as within homestead complex areas. These are mostly deliberately planted some decades ago and are not alien invasive species. There are, however, various places on site where alien invasive species have become established in previously disturbed areas. In both cases, the underlying natural grassland is lost.

Degraded areas
Any areas where the original vegetation is lost due to continuous degradation, such as trampling, severe overgrazing, or some other factor, it is mapped as degraded. These areas are unlikely to restore to natural grassland, even with removal of the drivers of the degradation.

Transformed areas
Areas where natural habitat no longer exists due to development of infrastructure, such as roads, buildings, and other hard surfaces. Current cultivation is also transformed, but has not been replaced by built infrastructure, therefore the soil surface can be colonized by plants if cultivation is stopped.

Listed species that could occur on site

Animal species flagged for the study area

The following species have been flagged for the site in the DFFE Screening Report:

Sensitive species 2
This is a large bird listed as Vulnerable. They are usually found in grasslands close to bodies of water or vleis. They prefer to nest near bodies of water that provide cover, but often feed in open savannas and grasslands. They can also be found in agricultural lands such as pastures, cropland, or fallow fields. They also often select habitats that include some trees, as they can roost in trees. A detailed avifaunal assessment has been undertaken for this project where additional information can be obtained regarding this species.

Geronticus calvus
The Southern Bald Ibis, listed as Vulnerable, is restricted to Lesotho, north-east South Africa and west Eswatini. The core range lies in the north-eastern Free State, Mpumalanga and the KwaZulu-Natal Drakensberg. The site is therefore near to the centre of its relatively restricted global distribution. It prefers high rainfall (>700 mm p.a.), sour and alpine grasslands, characterised by an absence of trees and a short, dense grass sward. It also occurs in lightly wooded and relatively arid country. It forages preferentially on recently burned ground, also using unburnt natural grassland, cultivated pastures, reaped maize fields, and ploughed areas (Birdlife International 2022). A detailed avifaunal assessment has been undertaken for this project where additional information can be obtained regarding this species.

Tyto capensis
The African Grass Owl is listed as Vulnerable. It is confined to the higher rainfall areas in the eastern half of South Africa, where it typically roosts and breeds in tall, rank grass or sedges associated with damp substrates, such as permanent and non-perennial wetlands and streams. The Olifants River is an important corridor for the species. A detailed avifaunal assessment has been undertaken for this project where additional information can be obtained regarding this species.

Sagittarius serpentarius
The Secretarybird, listed as Endangered, inhabits open landscapes, ranging from open plains and grasslands to lightly wooded savanna, but is also found in agricultural areas and sub-desert. It is nomadic, but birds living in the moist grassland biome are less likely to be nomadic, although they will travel on average 20-30 km per day while foraging. There are various threats to this species, one of which is that overgrazing degrades favourable habitat. A detailed avifaunal assessment has been undertaken for this project where additional information can be obtained regarding this species.

Crocidura maquassiensis
The Maquassie Musk Shrew (*Crocidura maquassiensis*), listed as Vulnerable, is endemic to South Africa, Eswatini and Zimbabwe, where it is found in moist grassland habitats in Savannah and Grassland Biomes. It appears to tolerate a wide range of habitats, although threats to the species have been inferred as being related to loss or degradation of moist, productive areas, such as rank grassland and wetlands. It depends on moist habitats and the calculation of extent of occurrence uses wetland habitats as a proxy for suitable habitat. The species is patchily distributed within the north-eastern part of South Africa. The study area is within the known distribution of this species in the sense that there are records in quarter degree grids throughout the Highveld, although not from the current grid or any nearby grids. It is, however, flagged in the DFFE Online Screening Tool as potentially occurring on site. It is therefore considered possible that it could occur on site and individuals could therefore possibly be be affected by construction activities. Due to it being rare, the likelihood of detecting this species during a short field survey, even with suitable trapping methods, is relatively low.

Ourebia ourebi ourebi
The Oribi (*Ourebia ourebi*), listed as Endangered in South Africa and Least Concern globally, has a geographical distribution that includes the study area. It is widely distributed in Africa, but the subspecies found in South Africa has a more limited distribution that includes South Africa and Mozambique. The species inhabits savanna woodlands, floodplains and other open grasslands from sea level to 2200 m asl (in Mpumalanga). They reach their highest density

on floodplains and moist tropical grasslands. They prefer open grassland in good condition containing a mosaic of short grass for feeding and tall grass for feeding and shelter. It has not been recorded in the grid in which the site is located, which is one of a group of grids in south-western Mpumalanga where the species does not appear to occur. Nevertheless, the area is within the overall distribution range of the species. Based on the gap in the distribution of the species, there is a low likelihood that it could occur on site within any suitable habitat, although it is flagged for the project in the Screening Tool.

Since a separate Avifaunal Specialist Assessment is undertaken for this project, the assessment here is a more general one in which favourable habitat for mostly terrestrial species is considered, primarily Oribi and Maquassie Musk Shrew, as well as the additional species listed below.

Other listed species for the study area

Vertebrate species (mammals, reptiles, amphibians) with a geographical distribution that includes the study area are listed in Appendix 1. All threatened (Critically Endangered, Endangered or Vulnerable) or near threatened vertebrate animals that could occur in the study area and have habitat preference that includes habitats available in the study area are discussed further.

Grey Rhebok

The Grey Rhebok (*Pelea capreolus*), listed as Near Threatened, is endemic to South Africa, Lesotho and parts of Eswatini. They are predominantly browsers, feeding on ground-hugging forbs, and largely water independent, obtaining most of their water requirements from their food. Local declines in their population have been attributed to increased densities of natural predators, such as Black-backed Jackal, Caracals and Leopards. It has not been recorded in the grid in which the site is located but has been recorded in grids to the north-east and many grids further to the south, so the site is within the overall distribution range of the species. There is therefore a moderate likelihood that it could occur on site within any suitable habitat. However, it is a relatively mobile species and not necessarily dependent on any habitat. It is likely to move away from the path of any construction and development of parts of the study area.

Black-footed Cat

The Black-footed Cat (*Felis nigripes*), listed as Vulnerable, has been previously recorded in the grid in which the project is located, as well as in four surrounding grids. It's known distribution is on the inland part of most of South Africa, but seemingly not within the winter-rainfall part of the country. It also occurs in Botswana and Namibia. The current project area is towards the edge of the distribution range of the species, but the species is highly likely to occur in the area. The species is nocturnal and carnivorous, favouring any vegetation cover that is low and not too dense. They make use of dens in the daytime, which can be abandoned termite mounds, or dens dug by other animals, such as aardvark, springhares, or cape ground squirrels. Local declines in their population have been attributed to increased densities of natural predators, such as Black-backed Jackal, Caracals and Leopards. They are highly vulnerable to domestic carnivores. The study area is suited to this species, and it could occur there.

Leopard

The Leopard (*Panthera pardus*), listed as Vulnerable, has a wide habitat tolerance, but with a preference for densely wooded areas and rocky areas. They have large home ranges, but do not migrate easily, males having ranges of about 100 km^2 and females 20 km^2. It has not been recorded in any of the adjacent or nearby grids and the overall distribution shows a gap in its distribution that includes the current study area. There is therefore a low probability of this species occurring on site, and if it did occur there it would probably be at very low densities.

African Marsh Rat

The African Marsh Rat (*Dasymys robertsii*), listed as Vulnerable, is patchily distributed in northern South Africa and Zimbabwe. Within South Africa it is found primarily in savanna and lowveld areas, where it is dependent on river and wetland systems. Its distribution coincides with the Limpopo watershed, of which the Olifants River is a tributary. Distribution records suggest that the species is not likely to occur in the study area.

Spotted-necked Otter

The Spotted-necked Otter (*Hydrictus maculicollis*), listed as Vulnerable, is widely but patchily distributed in the higher parts of the eastern half of South Africa. It is also found in lakes and large rivers throughout much of Africa south of 10ºN. They are restricted to areas of permanent fresh water where there is good shoreline cover and an abundant prey base (small fishes). They prefer water that is not silt-laden and is unpolluted, but are known to occur in relatively polluted rivers, such as the Braamfonteinspruit, Jukskei and Blesbokspruit in Gauteng. The site is within the known distribution of this species and there are historical records for one nearby grid to the north-east, although not from the current grid. There is potentially suitable habitat for this species on site within the small dams**.**

Cape Clawless Otter

The Cape Clawless Otter (*Aonyx capensis*), listed as Near Threatened, is widely but patchily distributed throughout South Africa, and is also the most widely found otter in Africa. It is aquatic and seldom found far from permanent water, which needs to be fresh. The site is within the known distribution of this species and there are historical records for one adjacent grid to the north-east, although not from the current grid. There is potentially suitable habitat for this species on site, although water quality may be an issue. It is therefore considered possible that it occurs on site.

African Striped Weasel

The African Striped Weasel (*Poecilogale albinucha*), listed as Near Threatened, is found throughout most of South Africa, except for the arid interior, and into central Africa. It has not been recorded in the grid in which the site is located, but has been recorded in two adjacent grids, and the site is within the overall distribution range for the species. It is found primarily in moist grasslands and fynbos, where adequate numbers of prey may be found. It is considered likely that it could occur on site.

Brown Hyaena

The Brown Hyaena (*Parahyaena brunnea*), listed as Near Threatened, is found in a band running down the centre of the country, expanding into the entire northern parts of the country. There is a gap in the distribution around the current study area, but there is a possibility that vagrant individuals could extend into this area. The species is found in desert areas, particularly along the west coast, semi-desert, open scrub, and open woodland savannah (Mills & Hes 1997). It is a solitary scavenger that travels vast distances every day in search of food. It has a medium chance of occurring in the study area since the distribution range includes the study area, however there are no historical records from nearby. It is a mobile animal that is likely to move away from the path of any construction and development of parts of the site is therefore highly unlikely to have any negative effect on the species. It is considered that there is a low likelihood of it occurring on site.

South African Hedgehog

The South African Hedgehog (*Atelerix frontalis*), listed as Near Threatened, is found in a large part of the central part of South Africa, extending down to the south-eastern coast, and is also found in Namibia, Botswana, Zimbabwe, Lesotho and Eswatini. It requires ample ground cover for cover, nesting and foraging and prefers dense vegetation and rocky outcrops. The site is well-within the known distribution of this species and there are historical records for nearby grids in all directions, and it has been recorded from the current grid. There is therefore a high probability of the study area being suitable for this species. It is considered likely that it could occur on site.

Swamp Musk Shrew

The Swamp Musk Shrew (*Crocidura mariquensis*), listed as Near Threatened, is found in a large part of the north-eastern part of South Africa, extending down to the south-eastern coast. It occurs in wetlands and waterlogged grasslands, predominantly in KwaZulu-Natal, Mpumalanga, Limpopo, Gauteng and eastern North West Provinces. The site is well-within the known distribution of this species and there are historical records for nearby grids in all directions, and it has been recorded from the current grid. There is therefore a high probability of the study area being suitable for this species. It is considered likely that it could occur on site.

Highveld Golden Mole

The Highveld Golden Mole (*Amblysomus septentrionalis*), listed as Near Threatened, is found across the Mpumalanga Highveld from Wakkerstroom northwards to Ermelo and Barberton and westwards through Standerton to north-eastern Free State. It occurs within meadows and edges of marshes in high-altitude grassland in Mpumalanga. They are restricted to friable soils in valleys and on mountainsides. The site is within the known distribution of this species, although higher densities of records occur further east. There are historical records for an adjacent grid to the south-

west, but it has not been recorded from the current grid. There is therefore a medium probability of the study area being suitable for this species. It is considered possible that it could occur on site and individuals could be affected by construction activities if suitable habitat is damaged**.**

White-tailed Rat

The White-tailed Rat (*Mystromys albicaudatus*), listed as Vulnerable, is endemic to South Africa and Lesotho, where it is found primarily in Highveld grasslands, but extending into adjacent Fynbos and Karoo areas. It is terrestrial, but never found in soft, sandy substrates, rocks, wetlands or riverbanks, and do not occur in transformed habitat. The study area is on the edge of the known distribution of this species, with most of Mpumalanga appearing to be a "hole" in the occurrence of the species. There is therefore a low probability of the study area being suitable for this species. It is considered unlikely that it would occur on site.

Vlei Rat

The Vlei Rat (Grassland-type) (*Otomys auratus*), listed as Near Threatened, is near-endemic to South Africa, occurring in the north-eastern half of the country, associated with mesic grasslands and wetlands within alpine, montane, and sub-montane regions. It is likely to be associated with sedges and grasses in densely vegetated wetlands with wet soils. The study area is well within the known distribution of this species and there are historical records for the grid in which the study area is located, as well as two adjacent grids. There is therefore a high probability of the study area being suitable for this species. It is considered likely that it occurs on site and the proposed development could therefore affect this species.

Coppery grass lizard

The Coppery Grass Lizard (*Chamaesaura aenea*), listed as Near Threatened, is endemic to South Africa, where it is found in western Eswatini, Limpopo, Mpumalanga, Gauteng, KwaZulu-Natal, north-eastern Free State and Eastern Cape. It is found on grassy slopes and plateau of the eastern escarpment and Highveld, where it probably shelters in the base of grass tussocks. The study area is within the known distribution of this species and there are historical records for two adjacent grids to the north and south, although not from the current grid. There is therefore a moderate probability of the study area being suitable for this species, including suitable habitat within the project area.

Large-scaled grass lizard

The Large-scaled Grass Lizard (*Chamaesaura macrolepis*), listed as Near Threatened, is endemic to South Africa, Eswatini and Zimbabwe. In South Africa it is found in Limpopo, Mpumalanga, and KwaZulu-Natal. It is found in grassland, especially rocky, grassy hillsides. Its main distribution is within the Indian Ocean Coastal Belt part of KwaZulu-Natal, but there are scattered records on the Highveld. The study area is marginally within the known distribution of this species in the sense that there are records in quarter degree grids up to Gauteng and there are historical records for one nearby grid to the nort-east, although not from the current grid. There is therefore a moderate to low probability of the study area being suitable for this species, including suitable habitat within the project area. It is considered a low likelihood that it could occur on site.

Breyer's Long-tailed Seps

The Breyer's Long-tailed Seps (*Tetradactylus breyeri*), listed as Vulnerable, is endemic to South Africa, where it is found in Free State, Mpumalanga, and KwaZulu-Natal. It occurs in montane and Highveld grassland. The study area is marginally within the known distribution of this species in the sense that there are records in quarter degree grids throughout the Highveld, extending from Blyde River Canyon to the Drakensberg, although not from the current grid or any nearby grids. There is therefore a low probability of the study area being suitable for this species, including suitable habitat within the project area. It is considered unlikely that it would occur on site.

Striped Harlequin Snake

The Striped Harlequin Snake (*Homoroselaps dorsalis*), listed as Near Threatened, is endemic to South Africa, where it is found in western Eswatini, Limpopo, Mpumalanga, Gauteng, KwaZulu-Natal, and Free State. It is partly fossorial and known to inhabit old termitaria in grassland habitat. Most of its range is at moderately high elevations, but it also occurs close to sea level in KwaZulu-Natal. The study area is within the known distribution of this species and there are historical records for one adjacent grid to the north, although not from the current grid. There is therefore a moderate probability of the study area being suitable for this species, including suitable habitat within the project area. It is considered likely that it could occur on site.

The Giant Bull Frog

The Giant Bull Frog (*Pyxicephalus adspersus*) previously listed as Near Threatened, is found in seasonal shallow grassy pans, vleis and other rain-filled depressions in open flat areas of grassland or savanna and, at the limits of its distribution, in Nama Karoo and thicket. For most of the year the species remains buried up to 1 m underground. They emerge only during the peak of the rainy season to forage and breed. If conditions are extremely dry, they may remain cocooned underground for several years. Long distances often separate suitable breeding sites. To breed, they require shallow, rain-filled depressions that retain water long enough for the tadpoles to metamorphose. Before and after breeding, bullfrogs forage in open grassland, feeding mostly on insects, but also on other frogs, lizards, snakes, small birds, and rodents. After breeding males generally bury themselves within 100 m of the breeding site, but females may disperse up to 1 km away. Based on habitat requirements, there is a medium probability that this species occurs in the study area.

Protected animals

There are several animal species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (see Appendix 3). According to this Act, "*a person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7*". Such activities include any that are "*of a nature that may negatively impact on the survival of a listed threatened or protected species*". This implies that any negative impacts on habitats in which populations of protected species occur or are dependent upon would be restricted according to this Act.

Those species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that have a geographical distribution that includes the site are listed in Appendix 3, marked with the letter "N". This includes the following species:

1. Black Wildebeest (does not occur on site),
2. Oribi (unlikely to occur on site),
3. White Rhinoceros (does not occur on site),
4. Black-footed Cat,
5. Serval,
6. Leopard (probably does not occur on site),
7. Cape Clawless Otter,
8. Spotted-necked Otter,
9. Cape Fox,
10. Honey Badger,
11. South African Hedgehog,
12. Brown Hyena, and
13. Giant Bullfrog.

There are additional species protected under the Mpumalanga Nature Conservation Act (Act No. 10 of 1998) (see Appendix 2). These include the following that have a geographical distribution that includes the site:

1. Giant Bullfrog,
2. South African Hedgehog,
3. Honey Badger,
4. Aardwolf,
5. Brown Hyaena,
6. Mountain Reedbuck,
7. Black Wildebeest,
8. Klipspringer,
9. Orbi,
10. Steenbok,
11. Eland,
12. Cape Clawless Otter
13. Spotted-necked Otter,

14. All species of reptiles, except the water leguaan, rock leguaan and all species of snakes, of which the following have a geographical distribution that includes the site:
    - Marsh terrapin
    - Leopard tortoise
    - Common dwarf gecko
    - Spotted dwarf gecko
    - Van Son's gecko
    - Delalande's sandveld lizard
    - Burchell's sand lizard
    - (Spotted sand lizard)
    - Coppery grass lizard
    - Cape grass lizard
    - Large-scaled grass lizard
    - Common girdled lizard
    - Common crag lizard
    - Yellow-throated plated lizard
    - Breyer's long-tailed seps
    - Short-headed legless skink
    - Thin-tailed legless skink
    - Wahlberg's snake-eyed skink
    - Cape skink
    - Red-sided skink
    - Speckled rock skink
    - Variable skink
    - Montane dwarf burrowing skink
    - Common flap-necked chameleon
    - Eastern ground agama
    - Southern rock agama

SITE ECOLOGICAL IMPORTANCE

The Species Environmental Assessment Guidelines (SANBI 2020) require that a Site Ecological Importance is calculated for each habitat on site and provides methodology for making this calculation.

1. **Natural grassland** (open grassland on undulating plains, including moderately to heavily grazed areas).
2. **Wetlands** (seasonal wetlands in drainage valleys).
3. **Old lands** (secondary grasslands on old lands).
4. **Current cultivation** (areas currently cultivated and fallow lands).
5. **Exotic trees** (stands of exotic trees).
6. **Degraded areas** (disturbed areas with weeds or waste ground).
7. **Transformed areas** (no vegetation, due to complete removal and replacement with hard surface or structure).

As per the Species Environmental Assessment Guidelines (SANBI 2020), Site Ecological Importance (SEI) is calculated as a function of the Biodiversity Importance (BI) of the receptor and its resilience to impacts (SEI = BI + RR). The Biodiversity Importance (BI) in turn is a function of Conservation Importance (CI) and Functional Integrity (FI), i.e., BI = CI + FI.

Site ecological importance for habitats found on site – specific to Animal Species Theme:

Habitat	Conservation importance	Functional integrity	Receptor resilience	Site Ecological Importance (BI)
Natural grassland	Low No confirmed or highly likely populations of SCC.	Medium Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types. (Chrissiesmeer Panveld is listed as EN) BUT Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential.	Very low Habitat that is unable to recover from major impacts	Medium (BI = Low)
Wetlands	Low No confirmed or highly likely populations of SCC.	Medium (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types	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	Medium (BI = Low)
Old lands	Low No confirmed or highly likely populations of SCC or range-restricted species.	Very low Several major current negative ecological impacts.	High Habitat that can recover relatively quickly (5-10 years) to restore >75% to restore the original species composition and functionality	Very low (BI = Very low)

Current cultivation	Very low No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	Very low Several major current negative ecological impacts.	Very high Habitat that can recover rapidly	Very low (BI = Very low)
Exotic trees	Very low No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	Very low Several major current negative ecological impacts.	Very high Habitat that can recover rapidly	Very low (BI = Very low)
Degraded	Very low No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	Very low Several major current negative ecological impacts.	Very high Habitat that can recover rapidly	Very low (BI = Very low)
Transformed	Very low No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	Very low Several major current negative ecological impacts.	Very high Habitat that can recover rapidly	Very low (BI = Very low)

The calculation of Site Ecological Importance matches the sensitivity classification given in the previous section of this report but includes an explicit recognition of the ability of each ecosystem to tolerate and recover from disturbance. Guidelines for development activities within different importance levels are given in the Table below.

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 the 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.

DESCRIPTION OF POTENTIAL IMPACTS

Proposed infrastructure in relation to sensitivities

Infrastructure locations relative to mapped sensitivities are shown in Figure 8. The proposed infrastructure includes the following:

Powerlines
There are four powerline alternatives, each of which crosses different proportions of land cover types, shown in the table below. Typically, grid powerlines have pylon / tower structures anything from 200 m to 500 m apart, each of which has a small local footprint (possibly as high as 400 m^2, but probably less than this). Assuming a tower every 200 m and a worst-case tower footprint, estimated impact areas are provided in the bottom row of the table. These are clearly negligible relative to the size of the study area associated with the overall cluster of projects. The alternative with the highest proportion of natural habitat is Alternative 2, for which an estimated total impact area of natural habitat is less than 1 ha.

Distance of each type of habitat in the footprint of the grid alternatives:

Habitat	Status	Alternative 1 (Preferred)	Alternative 2	Alternative 3	Alternative 4
Grassland	Natural	440 m	3520 m	1551 m	827 m
Wetland	Natural	274 m	162 m	65 m	
Exotic trees	Degraded	483 m	1038 m		
Degraded areas	Degraded		583 m	324 m	
Old lands	Secondary		92 m		
Current cultivation	Transformed	2363 m	265 m		181 m
Road	Transformed	20 m	20 m		
TOTAL		**3580 m**	**5680 m**	**1940 m**	**1008 m**
Possible footprint		**19 x 400 m^2 = 0.76 ha**	**29 x 400 m^2 = 1.16 ha**	**11 x 400 m^2 = 0.44 ha**	**6 x 400 m^2 = 0.24 ha**

Potential sensitive receptors in the general study area

A summary of the potential ecological issues for the study area is as follows (issues assessed by other specialists, e.g., on birds and on wetland and hydrological function, are not included here):

- Possible presence of various listed animal species on site. None of these are confirmed for the site.
- Presence of habitat on site for animal species.
- Importance of the site as a corridor through the landscape, primarily due to connected areas of wetlands and grasslands.

Construction Phase Impacts

Direct impacts include the following:

1. Loss of faunal habitat.
2. Direct mortality of fauna due to machinery, construction, and increased traffic.

Operational Phase Impacts

Ongoing direct impacts will include the following:

1. Direct mortality of fauna through traffic, illegal collecting, poaching and collisions and/or entanglement with infrastructure.

Decommissioning Phase Impacts

Direct impacts will include the following:

1. Loss of faunal habitat.
2. Direct mortality of fauna due to machinery, construction, and increased traffic.

ASSESSMENT OF IMPACTS

A detailed assessment, as per the requirements of the protocol for the specialist assessment and minimum report content requirements of environmental impacts on terrestrial animal species for activities requiring environmental authorisation, (20 March 2020), of the significance of all impacts during all phases of the project (Construction, Operation, Decommissioning and Cumulative) is provided below. This also includes all proposed mitigation measures and provides assessment before and after the implementation of proposed mitigation measures.

The proposed site is identified by the national web-based environmental screening tool as being medium sensitivity for Animal Species, and the protocol therefore requires that the sensitivity be confirmed on site, and the level of assessment determined by the outcome of the sensitivity verification. If animal SCC are confirmed or suspected to occur on site then the results must be written up in a Terrestrial Animal Species Assessment Report.

Detailed discussion of each impact, including justification for assigned scores, is provided below.

Design Phase Impacts

No negative impacts occur during the Design Phase of the project since no physical construction activities take place. Nevertheless, measures taken during the Design Phase of the project can potentially have a significant positive effect on the nature, extent and intensity of impacts experienced during the Construction Phase. This is usually as a response to identified issues, leading to design modifications to avoid negative impacts where possible.

Construction Phase Impacts

Impact 1	Loss of faunal habitat	
Issue	Clearing of natural habitat for construction	
Description of Impact		
Construction activities will require clearing of natural habitat, to be replaced by the infrastructure. This will result in permanent local loss of habitat.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Construction	
Criteria	**Without Mitigation**	**With Mitigation**
Extent	1	1
Duration	5	5
Reversibility	3	3
Magnitude (severity of impact)	1	1
Probability	4	3
Significance	40 (MODERATE)	30 (LOW)
Mitigation actions		
The following measures are recommended:	• No driving of vehicles off-road outside of construction areas. • Apply mitigation measures recommended in the Terrestrial Biodiversity Assessment to minimize loss of natural vegetation.	
Monitoring		
The following monitoring is recommended:	As per management plans.	

Direct mortality of fauna due to machinery, construction and increased traffic

Impact 2	Direct mortality of fauna	
Issue	Direct mortality of fauna due to presence of traffic and heavy machinery	
Description of Impact		
Construction activities will require use of heavy machinery and vehicles, as well as placement of various obstructions that may be hazardous		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Construction	
Criteria	**Without Mitigation**	**With Mitigation**
Extent	1	1
Duration	2	2
Reversibility	1	1
Magnitude (severity of impact)	2	1
Probability	3	2
Significance	18 (LOW)	10 (VERY LOW)
Mitigation actions		
The following measures are recommended:	• It is a legal requirement to obtain permits for specimens or protected species that will be lost due to construction of the project. • Conduct a pre-construction walk-through of natural habitat within the development footprint, where possible undertaken in an appropriate season (preferably October to March), prior to construction activities commencing to move any individual animals, such as tortoises, where required. Snake catchers need to be contacted to relocate snakes that are found. • Personnel on site should undergo environmental induction training, including the need to abide by speed limits, the increased risk of collisions with wild animals on roads in rural areas. • Proper waste management must be implemented, ensuring no toxic or dangerous substances are accessible to wildlife. This should also apply to stockpiles of new and used materials to ensure that they do not become a hazard. • No collecting, hunting, or poaching of any plant or animal species, including no killing of snakes • Personnel to be educated about protection status of species, including distinguishing features, to be able to identify protected species. In addition, personnel must be educated on the identification of snakes occurring in the area.	
Monitoring		
The following monitoring is recommended:	As per management plans.	

Operational Phase Impacts

Direct mortality of fauna through traffic, illegal collecting, poaching and collisions and/or entanglement with infrastructure

Impact 3	Direct mortality of fauna	
Issue	Direct mortality of fauna due to presence of traffic and heavy machinery	
Description of Impact		
Construction activities will require use of heavy machinery and vehicles, as well as placement of various obstructions that may be hazardous		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Construction	
Criteria	**Without Mitigation**	**With Mitigation**
Extent	1	1
Duration	4	4
Reversibility	1	1
Magnitude (severity of impact)	2	1
Probability	3	2
Significance	24 (LOW)	14 (VERY LOW)
Mitigation actions		
The following measures are recommended:	• . • Personnel on site should undergo environmental induction training, including the need to abide by speed limits, the increased risk of collisions with wild animals on roads in rural areas. • No collecting, hunting, or poaching of any plant or animal species. • Personnel to be educated about protection status of species, including distinguishing features, to be able to identify protected species. • Appropriate lighting should be installed at substation to minimize impacts on nocturnal animals, as per visual specialist assessment.	
Monitoring		
The following monitoring is recommended:	As per management plans.	

Decommissioning Phase Impacts

Decommissioning phase impacts are identical in nature and rating to that of the construction phase impacts. Please refer to the construction phase for assessment.

Cumulative Impacts

Cumulative impacts on faunal habitat from construction clearing due to a number of projects

Impact	Cumulative impacts on faunal habitat from construction clearing due to a number of projects
Issue	Loss of faunal habitat
Description of Impact	
Construction activities will require clearing of natural habitat, to be replaced by the infrastructure. This will result in possible loss of habitat for populations of SCC.	

Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Construction	
Criteria	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	1	3
Duration	5	5
Reversibility	3	3
Magnitude (severity of impact)	1	3
Probability	4	4
Significance	40 (MODERATE)	56 (MODERATE)

Cumulative impacts of direct faunal mortality due to a number of projects: construction phase

Impact	Cumulative impacts of direct faunal mortality due to a number of projects	
Issue	Loss of faunal habitat	
Description of Impact		
Construction activities will require clearing of natural habitat, to be replaced by the infrastructure. This will result in possible loss of habitat for populations of SCC.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Construction	
Criteria	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	1	3
Duration	2	2
Reversibility	1	1
Magnitude (severity of impact)	2	3
Probability	3	4
Significance	18 (LOW)	36 (MODERATE)

Cumulative impacts of direct faunal mortality due to a number of projects: operational phase

Impact	Cumulative impacts of direct faunal mortality due to a number of projects	
Issue	Loss of faunal habitat	
Description of Impact		
Construction activities will require clearing of natural habitat, to be replaced by the infrastructure. This will result in possible loss of habitat for populations of SCC.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Operation	
Criteria	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	1	3
Duration	4	4
Reversibility	1	1

Magnitude (severity of impact)	2	3
Probability	3	4
Significance	24 (LOW)	44 (MODERATE)

Summary of mitigation measures

The following mitigation measures are recommended to address known potential impacts:

- No driving of vehicles off-road outside of construction areas.
- It is a legal requirement to obtain permits for specimens or protected species that will be lost due to construction of the project.
- Conduct a pre-construction walk-through of natural habitat within the development footprint, where possible undertaken in the correct season (preferably October to March), prior to construction activities commencing to move any individual animals, such as tortoises and snakes, where required. Snakes should be relocated by a qualified snake-catcher.
- Personnel on site should undergo environmental induction training, including the need to abide by speed limits, the increased risk of collisions with wild animals on roads in rural areas.
- Proper waste management must be implemented, ensuring no toxic or dangerous substances are accessible to wildlife. This should also apply to stockpiles of new and used materials to ensure that they do not become a hazard.
- No collecting, hunting, or poaching of any plant or animal species, nor killing of snakes.
- Personnel to be educated about protection status of species, including distinguishing features, to be able to identify protected species. All personnel should be trained to identify snakes occurring in the area.
- Appropriate lighting at the substation should be installed to minimize impacts on nocturnal animals, as per visual specialist assessment.

DISCUSSION AND CONCLUSIONS

Other than birds, which are assessed separately, there are two threatened animal species that are flagged for the site, as well as others not directly flagged that may occur there. It was assessed that neither of these is likely to occur on site. The infrastructure planned for the site has been located primarily in transformed areas (areas with no remaining natural habitat). Vertical infrastructure is widely dispersed and will therefore have a limited impact on habitats.

The main concern in terms of threatened animal species is direct loss of habitat, but this will be limited for this project. Fragmentation of habitat is assessed but will be very limited due to the placement of infrastructure as well as existing patterns of transformation on site. There may also be direct mortality of individual animals, but this is not very likely due to the placement of most of the infrastructure away from natural habitats.

An assessment of these impacts indicates that, after mitigation, they will have a significance of low or very low.

All route options are feasible, although Alternatives 2 and 3 affect a greater length of natural habitat. The preferred alternative (Alternative 1) is preferred here, followed by Alternative 4.

BIBLIOGRAPHY AND REFERENCES:

ALEXANDER, G. & MARAIS, J. 2007. A guide to the reptiles of southern Africa. Struik, Cape Town.

BATES, M.F., BRANCH, W.R., BAUER, A.M., BURGER, M., MARAIS, J., ALEXANDER, G.J. & DE VILLIERS, M.S. 2014. Atlas and Red List of the Reptiles of South Africa. Suricata 1, South African National Biodiversity Institute. ISBN 978-1-919976-84-6.

BIRDLIFE INTERNATIONAL (2022) Species factsheet: Geronticus calvus. Downloaded from http://www.birdlife.org on 08/06/2022.

BRANCH, W.R. (1988) South African Red Data Book—Reptiles and Amphibians. South African National Scientific Programmes Report No. 151.

DU PREEZ, L. & CARRUTHERS, V. 2009. A complete guide to the frogs of southern Africa. Random House Struik, Cape Town.

FRIEDMANN, Y. & DALY, B. (eds.) 2004. The Red Data Book of the Mammals of South Africa: A Conservation Assessment: CBSG Southern Africa, Conservation Breeding Specialist Group (SSC/IUCN), Endangered Wildlife Trust, South Africa.

IUCN (2001). *IUCN Red Data List categories and criteria: Version 3.1*. IUCN Species Survival Commission: Gland, Switzerland.

MARAIS, J. 2004. A complete guide to the snakes of southern Africa. Struik Publishers, Cape Town.

MILLS, G. & HES, L. 1997. The complete book of southern African mammals. Struik Publishers, Cape Town.

MINTER, L.R., BURGER, M., HARRISON, J.A., BRAACK, H.H., BISHOP, P.J. and KLOEPFER, D. (eds.) 2004. Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland. SI/MAB Series #9. Smithsonian Institution, Washington, DC.

MUCINA, L. AND RUTHERFORD, M.C. (editors) 2006. Vegetation map of South Africa, Lesotho and Swaziland: an illustrated guide. *Strelitzia* 19, South African National Biodiversity Institute, Pretoria.

PASSMORE, N.I. & CARRUTHERS, V.C. (1995) South African Frogs; a complete guide. Southern Book Publishers and Witwatersrand University Press. Johannesburg.

SKELTON, P. 2001. A complete guide to the freshwater fishes of southern Africa. Struik Publishers, Cape Town.

TOLLEY, K. & BURGER, M. 2007. Chameleons of southern Africa. Struik Publishers, Cape Town.

APPENDICES:

Appendix 1: Animal species with a geographical distribution that includes the study area.

Notes:

1. Species of conservation concern are in red lettering.
2. Species protected according to the National Environmental Management: Biodiversity Act of 2004 (Act 10 of 2000) marked with "N"

Mammals:

ARTIODACTYLA:

Bovidae:

Red hartebeest
Springbok
[N]Black wildebeest
Blue wildebeest
Blesbok
Plains zebra
Klipspringer
[N]Oribi EN
Grey rhebok NT
Warthog
Bushpig
Steenbok
Mountain reedbuck
Common duiker
Eland
Bushbuck

PERRISODACTYLA:

Rhinocerotidae:

[N]White rhinoceros

HYRACOIDEA:

Procavidae:

Rock hyrax

CARNIVORA:

Felidae:

Caracal
[N]Black-footed cat VU
African wild cat
[N]Serval
[N]Leopard VU

Mustelidae:

[N]Cape clawless otter NT
Striped polecat
[N]Spotted-necked otter NT
[N]Honey badger
African striped weasel NT

Herpestidae:

Water mongoose
Yellow mongoose
Slender mongoose
Dwarf mongoose
Banded mongoose
White-tailed mongoose
Suricate

Canidae:

Black-backed jackal
[N]Cape fox

Viveridae:

Small-spotted genet
Large-spotted genet

Hyaenidae:

[N]Brown hyaena NT
Aardwolf

INSECTIVORA:

Eulipotyphla:

[N]South African hedgehog NT
Reddish-grey musk shrew
Greater musk shrew
Tiny musk shrew
Maquassie musk shrew VU
Swamp musk shrew NT
Lesser grey-brown musk shrew
Dark-footed forest shrew
Forest shrew
Least dwarf shrew
Lesser dwarf shrew

Chrysochloridae:

Highveld golden mole NT

LAGOMORPHA:

Leporidae:

Cape/desert hare
Scrub/savannah hare
Natal red rock rabbit
Hewitt's red rock rabbit

PRIMATA:

Cercopithecidae:

Vervet monkey

RODENTIA:

Muridae:

Tete veld rat
Namaqua rock mouse

Common mole rat
Grey climbing mouse
Brant's climbing mouse
Chesnut climbing mouse
Multimammate mouse
Pygmy mouse
White-tailed rat VU
Angoni vlei rat
Vlei rat (grassland type) NT
Striped mouse
Pouched mouse
Fat mouse
Highveld gerbil
Tree rat
Bathyergidae:
Cape mole-rat
Myoxidae:
Woodland dormouse
Rock dormouse
Hystricidae:
Cape porcupine
Thryonomyidae:
Greater cane rat

MACROSCELIDEA:
Macroscelididae:
Eastern rock sengi

TUBULIDENTATA:
Orycteropodidae:
Aardvark

Reptiles:
Pelomedusidae:
(Marsh terrapin)
Testudinidae:
(Leopard tortoise)
Gekkonidae:
(Common dwarf gecko)
Spotted dwarf gecko
Van Son's gecko
Amphisbaenidae:
Lacertidae:
Delalande's sandveld lizard
Burchell's sand lizard
(Spotted sand lizard)
Cordylidae:
Coppery grass lizard NT
Cape grass lizard
(Large-scaled grass lizard NT)
Common girdled lizard
Common crag lizard
Platysauridae:
Gerrhosauridae:
Yellow-throated plated lizard
(Breyer's long-tailed seps VU)

Scincidae:
Short-headed legless skink
Thin-tailed legless skink
Wahlberg's snake-eyed skink
Cape skink
Red-sided skink
Speckled rock skink
Variable skink
Montane dwarf burrowing skink
Varanidae:
(Southern rock monitor)
Nile monitor
Chamaeleonidae:
(Common flap-necked chameleon)
Agamidae:
Eastern ground agama
Southern rock agama
Typhlopidae:
Bibron's blind snake
Leptotyphlopidae:
Peter's thread snake
Pythonidae
Viperidae:
Puff adder
Rhombic night adder
Lamprophiidae:
Black-headed centipede eater
(Bibron's stiletto snake)
Striped harlequin snake NT
Spotted harlequin snake
Common house snake
Aurora snake
Yellow-bellied snake
Spotted rock snake
Olive ground snake
Dusky-bellied water snake
Brown water snake
Cape wolf snake
(Short-snouted grass snake)
Cross-marked grass snake
Spotted grass snake
Striped grass snake
Many-spotted snake
South African slug eater
Mole snake
Elapidae:
Sundevall's garter snake
Rinkhals
Colubridae:
Red-lipped snake
Southern brown egg-eater
Rhombic egg eater
(Boomslang)
(Southeastern green snake
Western Natal green snake
Spotted bush snake

Amphibians
Bushveld rain frog
Mozambique rain frog
Guttural toad
Flat-backed toad
Raucous toad
Red toad
Painted reed frog
(Yellow-striped reed frog)
Bubbling kassina
Rattling frog
Snoring puddle frog
Striped grass frog
Common platanna
Boettger's caco
Bronze caco
(Mountain caco)
Common river frog
Cape river frog
[N]Giant bullfrog
Striped stream frog
Clicking stream frog
Tremolo sand frog
Natal sand frog
Tandy's sand frog

Appendix 2: Fauna protected under the Mpumalanga Nature Conservation Act No. 10 of 1998.

SCHEDULE 1: SPECIALLY PROTECTED GAME (SECTION 4 (1) (a))

Common name	**Scientific name**
Elephant	Loxodonta africana
All species of rhinoceros	All species of the Family Rhinocerotidae

SCHEDULE 2: PROTECTED GAME (SECTION 4 (1) (b))

Common name	**Scientific name**
AMPHIBIANS, REPTILES AND MAMMALS	
bullfrog	Pyxicephalus adspersus
All species of reptiles excluding the water leguaan, rock leguaan and all species of snakes	All species of the Class Reptilia excluding Varanus niloticus, Varanus exanthematicus and all species of the Sub Order Serpentes
Riverine rabbit	Bungolagus monticularis
hedgehog	Atelerix frontalis
Samango monkey	Cercopithecus mitis
bushbaby	Otolemur crassicaudatus
Lesser bushbaby	Galago moholi
Honey-badger	Mellivora capensis
pangolin	Manis temminckii
aardwolf	Proteles cristatus
Cape hunting dog	Lycaon pictus
Brown hyaena	Hyaena brunnea
antbear	Orycteropus afer
Mountain zebra	Equus zebra zebra
Hartmann's zebra	Equus zebra hartmannae
hippopotamus	Hippopotamus amphibius
giraffe	Girrafa camelopardalis
nyala	Tragelaphus angasi
Red duiker	Cepalophus natalensis
Blue duiker	Philantomba monticola
reedbuck	Redunca arundinum
Mountain reedbuck	Redunca fulvorufula
Sable antelope	Hippotragus niger
Roan antelope	Hippotragus equinus
Black wildebeest	Connochaetes gnou
tsessebe	Damaliscus lanatus
Lichtenstein's hartebeest	Alcelaphus lichtensteinii
klipspringer	Oreotragus oreotragus
oribi	Ourebia ourebi
steenbok	Raphicerus campestris
Sharpe's grysbok	Raphicerus sharper
suni	Neotragus moschatus
Grey rhebok	Pelea capreolus
eland	Taurotragus oryx
waterbuck	Kobus ellipsiprymnus
Cape clawless otter	Aonyx capensis
Spotted necked otter	Lutra maculicollis

SCHEDULE 4: PROTECTED WILD ANIMALS (SECTION 4 (1) (d))

Common name	**Scientific name**
Spotted hyaena	Crocuta Crocuta
Cheetah	Acinonyx jubatus
Leopard	Panthera pardus
Lion	Panthera leo
African buffalo	Syncerus caffer

Appendix 3: Vertebrate animal species protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)

(as updated in R. 1187, 14 December 2007)

CRITICALLY ENDANGERED SPECIES
Reptilia
Loggerhead sea turtle
Leatherback sea turtle
Hawksbill sea turtle

Aves
Wattled crane
Blue swallow
Egyptian vulture
Cape parrot

Mammalia
Riverine rabbit
Rough-haired golden mole

ENDANGERED SPECIES
Reptilia
Green turtle
Giant girdled lizard
Olive ridley turtle
Geometric tortoise

Aves
Blue crane
Grey crowned crane
Saddle-billed stork
Bearded vulture
White-backed vulture
Cape vulture
Hooded vulture
Pink-backed pelican
Pel's fishing owl
Lappet-faced vulture

Mammalia
Robust golden mole
Tsessebe
Black rhinoceros
Mountain zebra
African wild dog
Gunning's golden mole
Oribi
Red squirrel
Four-toed elephant-shrew

VULNERABLE SPECIES
Aves
White-headed vulture
Tawny eagle
Kori bustard
Black stork
Southern banded snake eagle
Blue korhaan
Taita falcon
Lesser kestrel
Peregrine falcon
Bald ibis
Ludwig's bustard
Martial eagle
Bataleur
Grass owl

Mammalia
Cheetah
Samango monkey
Giant golden mole
Giant rat
Bontebok
Tree hyrax
Roan antelope
Pangolin
Juliana's golden mole
Suni
Large-eared free-tailed bat
Lion
Leopard
Blue duiker

PROTECTED SPECIES
Amphibia
Giant bullfrog
African bullfrog

Reptilia
Gaboon adder
Namaqua dwarf adder
Smith's dwarf chameleon
Armadillo girdled lizard
Nile crocodile
African rock python

Aves
Southern ground hornbill
African marsh harrier
Denham's bustard
Jackass penguin

Mammalia

Cape clawless otter
South African hedgehog
White rhinoceros
Black wildebeest
Spotted hyaena
Black-footed cat
Brown hyaena
Serval
African elephant
Spotted-necked otter
Honey badger
Sharpe’s grysbok
Reedbuck
Cape fox

David Hoare
Consulting (Pty) Ltd

Address:
Postnet Suite #116
Private Bag X025
Lynnwood Ridge
0040

41 Soetdoring Avenue
Lynnwood Manor
Pretoria

Cell: 083 284 5111
david@davidhoareconsulting.co.za

Terrestrial Plant Species Assessment

prepared in accordance with the
"Protocol for the Specialist Assessment and minimum report content requirements for environmental impacts on Terrestrial Plant Species"

Camden 1 Wind Grid Connection near Ermelo in Mpumalanga Province

Prepared by: Dr David Hoare
Pr.Sci.Nat. (Botany, Ecology) 400221/05

For: ENERTRAG South Africa (Pty) Ltd
53 Dudley Road,
Parkwood,
Johannesburg
South Africa

20 November 2022

TABLE OF CONTENTS

SPECIALIST DETAILS & DECLARATION

This report has been prepared in accordance with the "Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial plant species", as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), published in GN. No. 320 dated 20 March 2020. It has been prepared independently of influence or prejudice by any parties.

The details of the specialist is as follows:

Specialist	Qualification and accreditation
Dr David Hoare	PhD Botany SACNASP (Pr.Sc.Nat.) Reg. no. 400221/05 (Ecology, Botany)

Statement of independence:

I, David Hoare, as the appointed plant species specialist, hereby declare/affirm the correctness of the information provided in this compliance statement, and that I:

1. meet the general requirements to be independent and
2. have no business, financial, personal, or other interest in the proposed development and that no circumstances have occurred that may have compromised my objectivity; and
3. am aware that a false declaration is an offence in terms of regulation 48 of the EIA Regulations (2014).

_____ 20 November 2022

Dr David Hoare Date

TERMS OF REFERENCE

The specialist study is required to follow the published Protocols, provided in full below for the assessment of impacts on Terrestrial Plant Species. Note that the Protocols require determination of the level of sensitivity, which then determines the level of assessment required, either a full assessment, or a Compliance Statement.

PROTOCOL FOR THE SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR ENVIRONMENTAL IMPACTS ON TERRESTRIAL PLANT SPECIES

This site sensitivity assessment follows the requirements of The Environmental Impact Assessment Regulations, as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), published in GN. No. 320 dated 20 March 2020.

General information

1.1 An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of "**very high**" or "**high**" sensitivity for terrestrial plant species, must submit a Terrestrial Plant Species Specialist Assessment Report.

1.2 An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of "**medium** sensitivity" for terrestrial plant species, must submit either a Terrestrial Plant Species Specialist Assessment Report or a Terrestrial Plant Species Compliance Statement, depending on the outcome of a site inspection undertaken in accordance with paragraph 4.

1.3 An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of "**low**" sensitivity for terrestrial plant species, must submit a Terrestrial Plant Species Compliance Statement.

1.4 Where the information gathered from the site sensitivity verification differs from the screening tool designation of "very high" or "high" for terrestrial plant species sensitivity on the screening tool, and it is found to be of a "low" sensitivity, then a Terrestrial Plant Species Compliance Statement must be submitted.

1.5 Where the information gathered from the site sensitivity verification differs from the screening tool designation of "low" terrestrial plant species sensitivity and it is found to be of a "very high" or "high" terrestrial plant species sensitivity, a Terrestrial Plant Species Specialist Assessment must be conducted.

1.6 If any part of the development falls within an area of confirmed "very high" or "high" sensitivity, the assessment and reporting requirements prescribed for the "very high" or "high" sensitivity, apply to the entire development footprint. Development footprint in the context of this protocol, means the area on which the proposed development will take place and includes the area that will be disturbed or impacted.

1.7 The Terrestrial Plant Species Specialist Assessment and the Terrestrial Plant Species Compliance Statement must be undertaken within the study area.

1.8 Where the nature of the activity is not expected to have an impact on species of conservation concern (SCC) beyond the boundary of the preferred site, the study area means the proposed development footprint within the preferred site.

1.9 Where the nature of the activity is expected to have an impact on SCC beyond boundary of the preferred site, the project areas of influence (PAOI) must be determined by the specialist in accordance with Species Environmental Assessment Guideline, and the study area must include the PAOI, as determined.

Terrestrial Plant Species Specialist Assessment

2.1 The assessment must be undertaken by a specialist registered with the South African Council for Natural Scientific Professions (SACNASP), within a field of practice relevant to the taxonomic groups ("taxa") for which the assessment is being undertaken.

2.2 The assessment must be undertaken within the study area.

2.3 The assessment must be undertaken in accordance with the Species Environmental Assessment Guideline and must:

2.3.1 Identify the SCC which were found, observed or are likely to occur within the study area;

2.3.2 provide evidence (photographs) of each SCC found or observed within the study area, which must be disseminated by the specialist to a recognized online database facility immediately after the site inspection has been performed (prior to preparing the report contemplated in paragraph 3);

2.3.3 identify the distribution, location, viability and detailed description of population size of the SCC identified within the study area;

2.3.4 identify the nature and the extent of the potential impact of the proposed development to the population of the SCC located within the study area;

2.3.5 determine the importance of the conservation of the population of the SCC identified within the study area, based on information available in national and international databases including the IUCN Red List of Threatened Species, Red List of South African Plants, and/or other relevant databases;

2.3.6 determine the potential impact of the proposed development on the habitat of the SCC located within the study area;

2.3.7 include a review of relevant literature on the population size of the SCC, the conservation interventions as well as any national or provincial species management plans for the SCC. This review must provide information on the need to conserve the SCC and indicate whether the development is compliant with the applicable species management plans and if not, a motivation for the deviation;

2.3.8 identify any dynamic ecological processes occurring within the broader landscape, that might be disrupted by the development and result in negative impact on the identified SCC, for example, fires in fire-prone systems;

2.3.9 identify any potential impact on ecological connectivity within the broader landscape, and resulting impacts on the identified SCC and its long term viability;

2.3.10 determine buffer distances as per the Species Environmental Assessment Guidelines used for the population of each SCC; and

2.3.11 discuss the presence or likelihood of additional SCC including threatened species not identified by the screening tool, Data Deficient or Near Threatened Species, as well as any undescribed species; and

2.3.12 identify any alternative development footprints within the preferred development site which would be of "low" sensitivity" or "medium" sensitivity as identified by the screening tool and verified through the site sensitivity verification.

2.4 The findings of the assessment must be written up in a Terrestrial Plant Species Specialist Assessment Report.

Terrestrial Plant Species Specialist Assessment Report

3.1 This report must include as a minimum the following information:

3.1.1 contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the assessment including a curriculum vitae;

3.1.2 a signed statement of independence by the specialist;

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;

3.1.4 a description of the methodology used to undertake the site sensitivity verification and impact assessment and site inspection, including equipment and modelling used where relevant;

3.1.5 a description of the assumptions made and any uncertainties or gaps in knowledge or data;

3.1.6 a description of the mean density of observations/number of samples sites per unit area of site inspection observations;

3.1.7 details of all SCC found or suspected to occur on site, ensuring sensitive species are appropriately reported;

3.1.8 the online database name, hyperlink and record accession numbers for disseminated evidence of SCC found within the study area;

3.1.9 the location of areas not suitable for development and to be avoided during construction where relevant;

3.1.10 a discussion on the cumulative impacts;

3.1.11 impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);

3.1.12 a reasoned opinion, based on the findings of the specialist assessment, regarding the acceptability or not, of the development related to the specific theme considered, and if the development should receive approval or not, related to the specific theme being considered, and any conditions to which the opinion is subjected if relevant; and

3.1.13 a motivation must be provided if there were any development footprints identified as per paragraph 2.3.12 above that were identified as having "low" or "medium" terrestrial plant species sensitivity and were not considered appropriate.

3.2 A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.

Terrestrial plant species compliance statement

Where the sensitivity in the Screening Report from the web-based Online Screening Tool has been confirmed to be LOW, a Plant Species Compliance Statement is required, either (1) for areas where no natural habitat remains, or (2) in natural areas where there is no suspected occurrence of SCC.

The compliance statement must be prepared by a SACNASP registered specialist under one of the two fields of practice (Botanical Science or Ecological Science).

The compliance statement must:
1. be applicable within the study area
2. confirm that the study area is of "low" sensitivity for terrestrial plant species; and
3. indicate whether or not the proposed development will have any impact on SCC.

The compliance statement must contain, as a minimum, the following information:
1. contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;
2. a signed statement of independence by the specialist;
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;
4. a baseline profile description of biodiversity and ecosystems of the site;
5. the methodology used to verify the sensitivities of the terrestrial biodiversity and plant species features on the site including the equipment and modelling used where relevant;
6. in the case of a linear activity, confirmation from the terrestrial biodiversity specialist that, in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase;

7. where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr;
8. a description of the assumptions made as well as any uncertainties or gaps in knowledge or data; and
9. any conditions to which this statement is subjected.

A signed copy of the compliance statement must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.

INTRODUCTION

Project Background

ENERTRAG South Africa (Pty) Ltd, a subsidiary of ENERTRAG AG, the German-based renewable energy company is proposing to develop electrical grid infrastructure of up to 132kV related to the Camden I Wind Energy Facility (WEF) of up to 200 MW (the Project) near Camden Power Station in the Mpumalanga Province. This will be part of the Camden Renewable Energy Complex that will include:

1. Camden I Wind Energy Facility (up to 200MW).
2. **Camden I Wind Grid Connection (up to 132kV).**
3. Camden up to 400kV Grid Connection and Collector substation.
4. Camden I Solar up to 100MW.
5. Camden I Solar up to 132kV Grid Connection.
6. Camden Green Hydrogen and Ammonia Facility, including grid connection infrastructure and water pipeline.
7. Camden II Wind Energy Facility (up to 200MW).
8. Camden II Wind Energy Facility up to 132kV Grid Connection.

Enertrag SA has appointed WSP as the independent Environmental Assessment Practitioner (EAP) to facilitate the Environmental Impact Assessment (EIA) Process.

This report addresses specifically the up to 132kV electrical grid infrastructure application (Basic Assessment) related to the Camden I Wind Energy Facility (which is subject to a separate Scoping and Environmental Impact Assessment process).

Project description

It is proposed that Camden I Wind Energy Facility will connect to the nearby Camden Collector substation (which in turn will connect to the Camden Power Station), through an up to 132kV powerline (either single or double circuit) between the grid connection substation portion (immediately adjacent the Camden I on-site IPP substation portion) and that of the Camden Collector substation. The powerline will be approximately 5km in length, depending on the authorized location of the collector substation. The onsite grid connection substation will consist of high voltage substation yard to allow for multiple (up to) 132kV feeder bays and transformers, control building, telecommunication infrastructure, access roads, etc. The area for the onsite substation will be up to 1.5ha. The up to 132kV powerline and substation will have a 250m assessment corridor (either side of the centre line), to allow for technical placement and Micrositing as required, including around the on-site grid connection substation and the terminating works required at the Collector Substation (MTS). This application includes the necessary up to 132kV voltage electrical components required for connection at the Collector Substation.

Affected Properties and associated surface rights ownership for the Camden I Wind Grid Connection (up to 132kV) are given below.

Parent Farm	Farm No	Portion No	Owner
Klipbank	295	0	Reyneke Hendrik Jackobus Willem
Adrianople	296	0	Rassie Saaiman Trust
Adrianople	296	1	Lood De Jager Trust
Welgelegen	322	1	Reyneke Hendrik Jackobus Willem
Welgelegen	322	2	Reyneke Hendrik Jackobus Willem
Klipbank	295	3	Reyneke Hendrik Jackobus Willem
Adrianople	296	3	Van Der Meulen Trust

The project is located about 8 km south to south-east of Ermelo in Mpumalanga Provinces, South Africa (Figure 1). The site is halfway between the N11 (Ermelo to Amersfoort) and the N2 (Ermelo to Piet Retief). Camden Power Station (Eskom) is on the north-eastern border of the site. The roads on site are all gravel farm access roads.

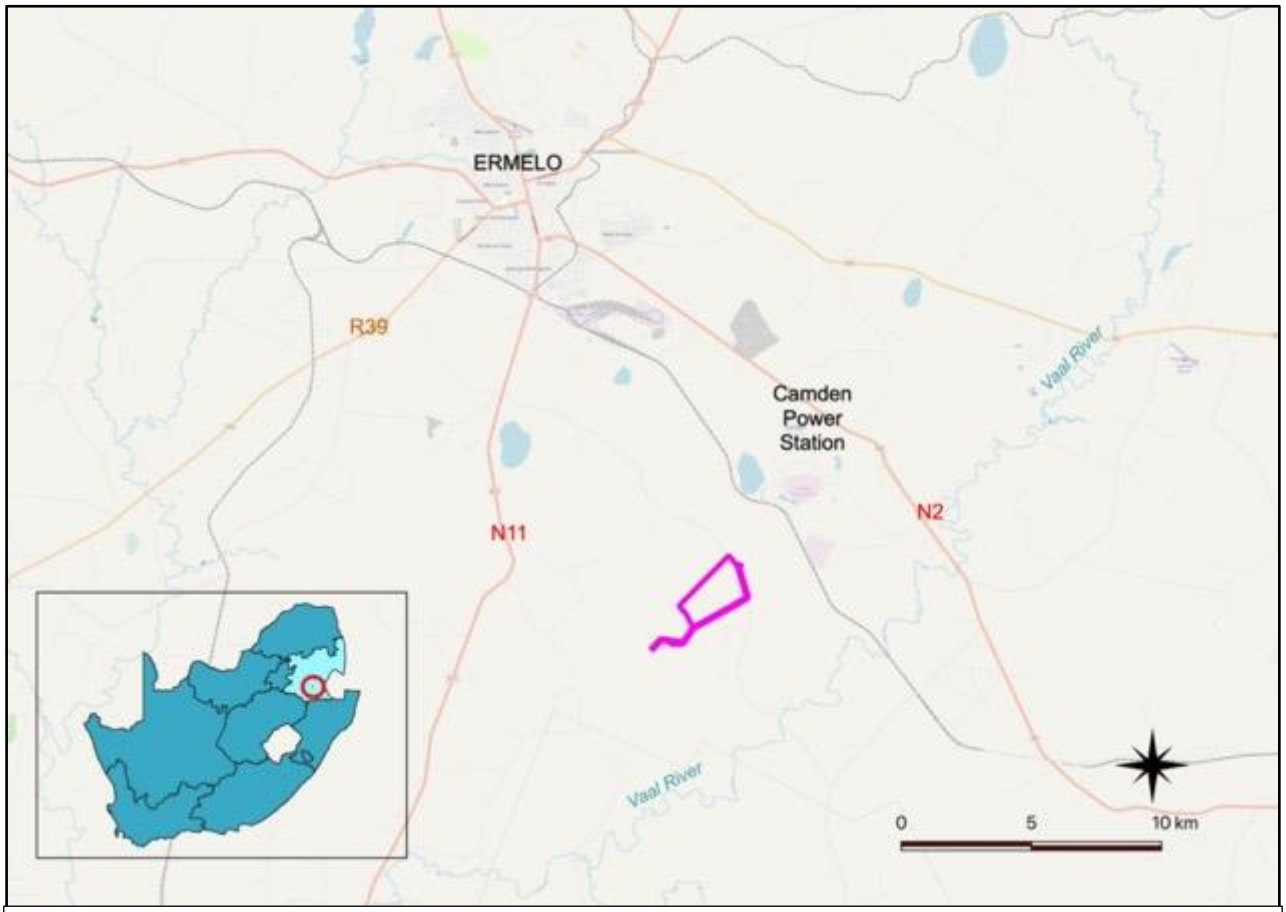

Figure 1: Location of the proposed Project.

SENSITIVITIES IDENTIFIED FROM DFFE ONLINE SCREENING TOOL

Plant Species Theme

A sensitivity screening report from the Department of Forestry, Fisheries and the Environment (DFFE) Online Screening Tool was requested in the application category: Utilities Infrastructure | Electricity | Generation | Renewable | Wind (Figure 2). The DFFE Screening Tool report for the area indicates the following ecological sensitivities:

Theme	**Very High sensitivity**	**High sensitivity**	**Medium sensitivity**	**Low sensitivity**
Plant Species Theme			**X**	

The plant species theme was highlighted as being of Medium sensitivity due the potential presence of the following species:

Sensitivity	Feature(s)
Medium	Sensitive species 1201
Medium	Sensitive species 41
Medium	Sensitive species 691
Medium	Sensitive species 851

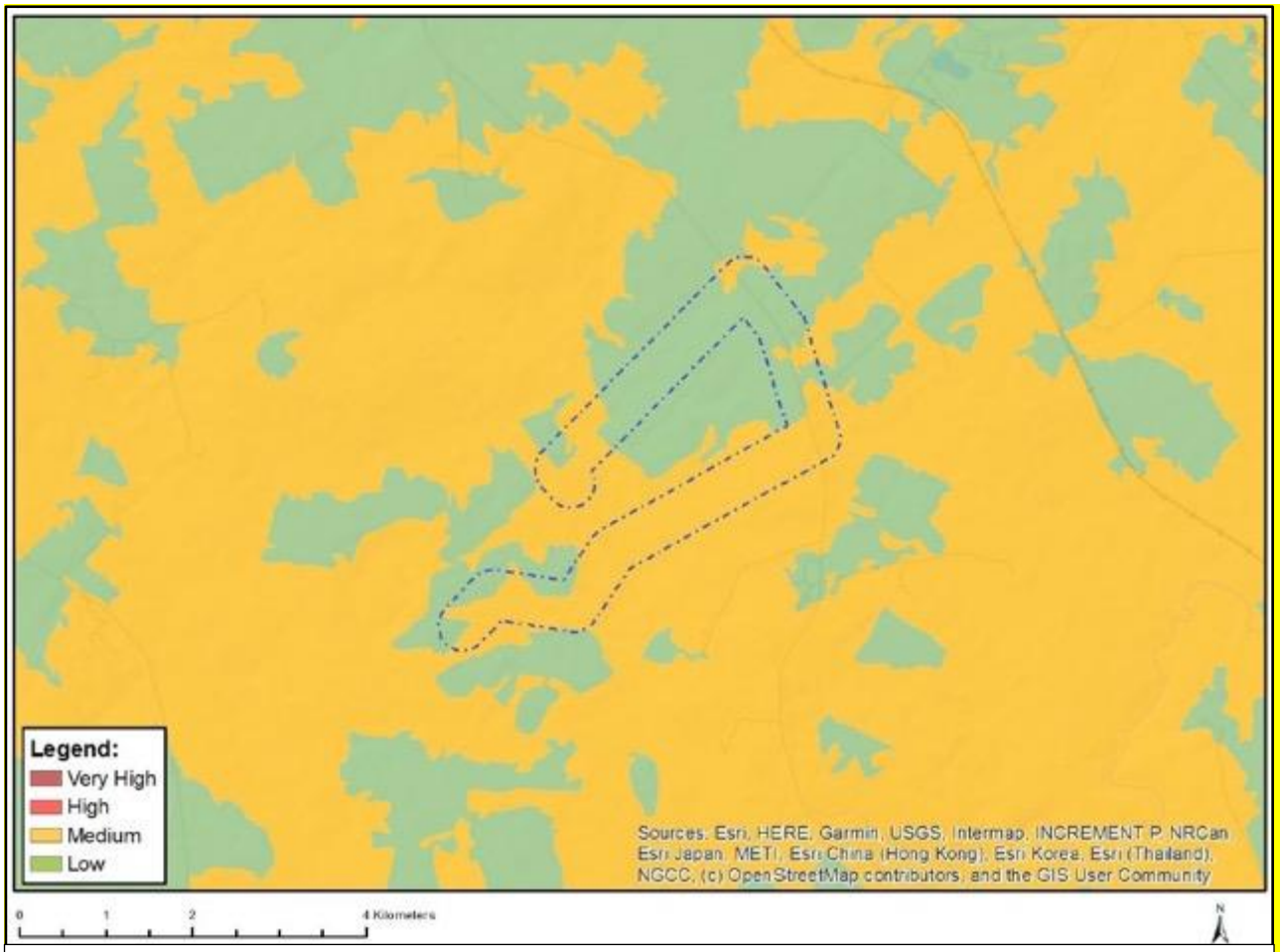

Figure 2: DFFE Screening Tool extract for Plant Species Theme.

METHODOLOGY

The detailed methodology followed as well as the sources of data and information used as part of this assessment is described below.

Survey timing

The study commenced as a desktop-study followed by a site-specific field study on 3–7 February 2020. The site is within the grassland biome with a peak rainfall season in summer, which occurs from October to March (Figure 3). There is, however, a delay between rainfall and vegetation growth, which means the peak growing season is from November to April, with most perennial species characteristic of the vegetation being easily identifiable from January to March. The timing of the field survey was therefore ideal in terms of assessing the vegetation condition and flora composition of the site.

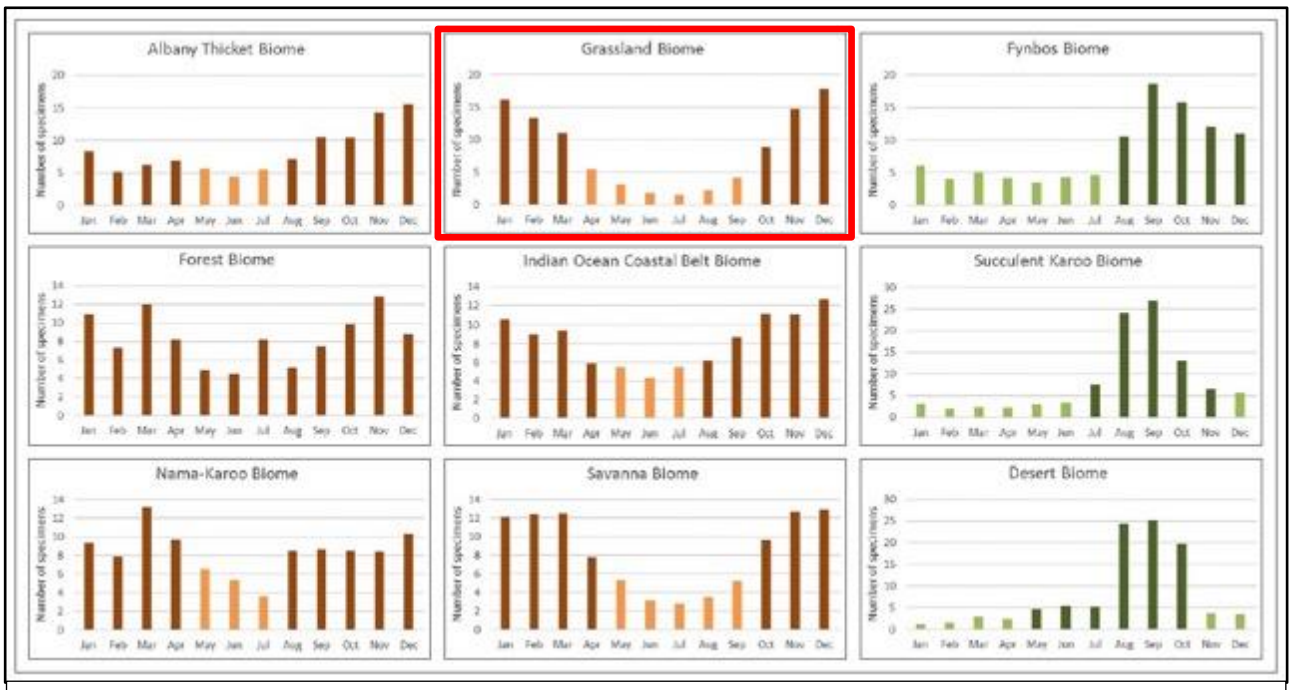

Figure 3: Recommended survey periods for different biomes (Species Environmental Assessment Guidelines).

Field survey approach

During the field survey, all major natural variation on site was assessed and select locations were traversed on foot. A hand-held Garmin GPSMap 64s was used to record a track within which observations were made.

Aerial imagery from Google Earth was used to identify and assess habitats on site. Patterns identified from satellite imagery were verified on the ground. During the field survey, particular attention was paid to ensuring that all habitat variability was covered physically on the ground during the search for plant species. From this ground survey, as well as ad hoc observations on site, a checklist of plant species occurring on site was compiled.

Digital photographs were taken of all plant species that were seen on site. All plant species recorded were uploaded to the iNaturalist website.

Sources of information

Plant species

1. Broad vegetation types occurring on site were obtained from Mucina and Rutherford (2006), with updates according to the SANBI BGIS website (http://bgis.sanbi.org). The description of each vegetation type includes a list of plant species that may be expected to occur within the vegetation type.
2. Plant species that could potentially occur on in the general area was extracted from the NewPosa database of the South African National biodiversity Institute (SANBI) for the quarter degree grids in which the site is located.
3. The IUCN Red List status for plant species, as well as supplementary information on habitats and distribution, was obtained from the SANBI Threatened Species Programme (Red List of South African Plants, http://redlist.sanbi.org).
4. Lists were compiled specifically for any species at risk of extinction (Red List species) previously recorded in the area. Historical occurrences of threatened plant species were obtained from the South African National Biodiversity Institute (http://newposa.sanbi.org) for the quarter degree grids within which the study area is situated. Habitat information for each species was obtained from various published sources. The probability of finding any of these species was then assessed by comparing the habitat requirements with those habitats that were found, during the field survey of the site, to occur there.
5. Regulations published for the National Forests Act (Act 84 of 1998) (NFA) as amended, provide a list of protected tree species for South Africa. The species on this list were assessed to determine which protected tree species have a geographical distribution that coincides with the study area and habitat requirements that may be met by available habitat in the study area. The distribution of species on this list were obtained from published sources (e.g., van Wyk & van Wyk 1997) and from the SANBI database (www.newposa.sanbi.org) for quarter degree grids in which species have been previously recorded. Species that have been recorded anywhere in proximity to the site (within 50 km), or where it is considered possible that they could occur there, were listed, and were considered as being at risk of occurring there.

Limitations

The purpose of the fieldwork undertaken for this Project to characterize the habitat of the study area, compile species checklists from as diverse a variety of habitats as possible, and to map habitats within the entire collection of farms within which the Project is situated. The proposed project layout was provided during the EIA process; therefore no development footprint areas were assessed for the Project, only the general area in which the project is located. A final walk-through to survey conducted in Spring or Summer, where possible, is therefore recommended to check for potential species of conservation concern within footprints of the development.

ASSESSMENT OUTCOMES

Broad vegetation patterns

There are three regional vegetation types occurring in the study area, namely Eastern Highveld Grassland, Amersfoort Highveld Clay Grassland and Eastern Temperate Freshwater Wetlands (Figure 4). These vegetation types are described below and are based on descriptions by Mucina & Rutherford (2006), extracted from the SANBI BGIS website (http://bgis.sanbi.org/vegmap).

Eastern Highveld Grassland

Found in Mpumalanga and Gauteng Provinces, on the plains between Belfast in the east and the eastern side of Johannesburg in the west and extending southwards to Bethal, Ermelo and west of Piet Retief. The vegetation type occurs at an altitude of between 1 520–1 780 m, on slightly to moderately undulating plains, including some low hills and pan depressions. The vegetation is short dense grassland dominated by the usual highveld grass composition (*Aristida*, *Digitaria*, *Eragrostis*, *Themeda*, *Tristachya*, etc.) with small, scattered rocky outcrops with wiry, sour grasses and some woody species (*Acacia caffra*, *Celtis africana*, *Diospyros lycioides* subsp *lycioides*, *Parinari capensis*, *Protea caffra*, *P. welwitschii* and *Searsia magalismontanum*).

Amersfoort Highveld Clay Grassland

This vegetation occurs in Mpumalanga and KwaZulu-Natal Provinces, extending in a north-south band from just south of Ermelo, down through Amersfoort to the Memel area in south, at an altitude of 1 580–1 860 m. Occurring on undulating grassland plains, with small, scattered patches of dolerite outcrops in areas, the vegetation is comprised of a short closed grassland cover, largely dominated by a dense *Themeda triandra* sward, often severely grazed to form a short lawn.

Overgrazing leads to increase in cover of *Seriphium plumosum* (an indigenous species that has low grazing value).

Parts of this unit were once cultivated and now lie fallow and have been left to re-vegetate with pioneer species. These transformed areas are not picked up by satellite for transformation coverage and the percentage of grasslands still in a natural state may be underestimated.

Eastern Temperate Freshwater Wetlands

This vegetation unit is found throughout South Africa and in Lesotho and Eswatini, around water bodies embedded within the Grassland Biome, at an altitude ranging from 750–2 000 m. The landscape is flat or with shallow depressions filled with (temporary) water bodies supporting zoned systems of aquatic and hygrophilous vegetation of temporarily flooded grasslands and ephemeral herb lands.

Vegetation patterning in the form of concentric belts ('rings') is often found in pans. Pan size and depth may be a factor limiting vegetation, as large water bodies with shallow water may experience wave action. This limits the presence of species with floating leaves as well as some submerged and marginal macrophytes. The situation is more complex in vleis as these often have variable microtopography and soil types within a single wetland. It is possible for seasonally inundated zones to occur embedded inside the permanently inundated zone of a vlei if this zone is present.

Habitats on site

Natural habitats:

1. **Natural grassland** (open grassland on undulating plains – the condition is not indicated in the habitat map although there is a gradient from heavily grazed poor condition to moderate condition).
2. **Wetlands** (permanent and seasonal wetlands in drainage valleys, including channels, where they occur).

The total amount of natural habitat remaining on site is 48% of the study area (3222 hectares), the low proportion due to loss of habitat from existing land-use, as well as degradation. The largest factor that has led to loss of natural habitat is cultivation – currently the combination of current cultivation and old lands is a total of 45% of the study area (3024 hectares).

Transformed and degraded areas:

3. **Old lands** (secondary grasslands on previously cultivated areas).
4. **Exotic trees** (stands of exotic trees).
5. **Degraded areas** (disturbed areas with bare ground, weeds, or waste ground).
6. **Current cultivation** (areas currently cultivated and fallow lands).
7. **Transformed** (areas such as roads and buildings where there is no vegetation).

NATURAL VERSUS SECONDARY GRASSLAND	
Natural grassland	Areas of original vegetation in which the soil has not been mechanically disturbed, including areas that are in poor condition due to **overgrazing**, **trampling**, **invasion** by weeds or alien invasive species, **inappropriate fire regimes**, or any other factor that drives natural change in species composition or vegetation structure. The key factor is that the original plants continue to exist, often resprouting after defoliation from sub-surface stems or other storage organs.
Secondary grassland	Areas of vegetation where the original grassland vegetation has been lost through direct **disturbance of the soil** that results in physical removal of the original plants, the most common cause of which is ploughing, but could be other mechanical factors. The vegetation that then develops is a result of recolonization of the area through propagation.

Grassland
The general study area is characterised by an open grassland on the undulating hills and plains and is representative of the listed ecosystem that occurs on site (Eastern Highveld Grassland). It is generally a short to moderate height tussock grassland with closed canopy cover. The soil depth varies, as does the amount of surface rock cover, but tends to have shallow soil. This was the most widespread vegetation community on site, occurring on all the relatively flat plains areas. It is also the area that has been most subject to cultivation.

The general floristic character of this vegetation on site is fairly uniform across wide areas, often dominated by the same suite of species, including the grasses, *Alloteropsis semialata, Aristida diffusa, Aristida junciformis, Bewsia biflora, Brachiaria serrata, Diheteropogon amplectens, Elionurus muticus, Eragrostis capensis, Eragrostis chloromelas, Eragrostis plana, Eragrostis racemosa, Harpochloa falx, Heteropogon contortus, Microchloa caffra, Panicum natalense, Setaria sphacelata var. torta, Themeda triandra,* and *Tristachya leucothrix*, and the forbs, *Acalypha angustata, Anthospermum rigidum subsp. rigidum, Berkheya setifera, Chaetacanthus costatus, Commelina africana, Crabbea acaulis, Cucumis hirsutus, Cucumis zeyheri, Cyanotis speciosa, Gerbera viridifolia, Haplocarpha scaposa, Helichrysum rugulosum, Hemizygia pretoriae, Hermannia transvaalensis, Hibiscus aethiopicus, Hypoxis obtusa, Hypoxis rigidula, Indigofera comosa, Ipomoea ommaneyi, Justicia anagalloides, Kohautia amatymbica, Ledebouria ovatifolia, Monsonia attenuata, Nidorella hottentotta, Pentanisia angustifolia, Pollichia campestris, Scabiosa columbaria, Selago densiflora, Seriphium plumosum, Vernonia galpinii, Vernonia oligocephala,* and *Zornia milneana*. Overall diversity in this unit was high and included a full list of over 100 species. Local species richness was also high at 56 species per 400m^2 sampling area. This rivals the local richness of some of the most species-rich grasslands anywhere in the country. The Provincially protected plant species, *Aloe ecklonis*, was recorded within this unit.

Wetlands
There is one main valley bottom wetland in the study area, which starts as a flat, wide area on the northern boundary of the site (at the coal conveyer). It flows southwards towards the middle of the study area, which is the approximate location of a small grove of exotic trees, where it narrows and changes direction towards the east. Through this area it flows through some rocky patches and then empties onto the floodplain. At the upper end of this valley, the wetland has been affected on both sides by historical cultivation and it has also been partially dammed upstream of there by the construction of the conveyer and the associated service road. Additionally, there is a small impoundment within the bed of the valley about two-thirds of the way down to the trees. Despite these impacts, the lower reaches of this valley system are in good condition and support healthy vegetation (see Figure 10).

Valley bottom wetlands in this general area around Ermelo, such as this one, are generally dominated by a variety of grasses, sedges and herbaceous plants, including the graminoids, *Kyllinga erecta*, *Leersia hexandra*, *Agrostis lachnantha*, *Andropogon appendiculatus*, *Helictotrichon turgidulum*, *Scirpoides burkei*, *Cyperus teneristolon*, *Cyperus macranthus*, *Typha capensis*, *Agrostis erianthe*, *Hemarthria altissima*, *Panicum schinzii*, *Cyperus rigidifolius* and *Arundinella nepalensis*, the herbs, *Centella asiatica*, *Senecio polyodon*, *Senecio erubescens*, *Haplocarpha scaposa*, *Pelargonium luridum*, *Commelina africana*, *Lobelia flaccida*, *Monopsis decipiens*, and *Helichrysum aureonitens*. The species composition depends entirely on the hydrological characteristics of the site, with a greater number of obligate wetland species occurring in more permanently damp areas, whereas dryer areas more closely resembling terrestrial grassland in species composition.

The drainage areas are important habitat for animals, providing refuge and shelter, water, when it is available, palatable vegetation, when surrounding areas are in drought, and softer and deeper soils for burrowing animals. The habitat is also an important flood-attenuation component of the landscape, and a reservoir for soil water. If it occurs on site, this is the habitat in which the protected Giant Bullfrog would be found.

Current cultivation
These are areas that, according to recent satellite imagery, are currently being cultivated, or were recently cultivated (within the last 5 years). If not under crops, they would be a ploughed land, or a fallow land with either weeds or a cover crop. From an ecological or biodiversity perspective, these areas have no natural habitat and have no plant or vegetation biodiversity value. The soil profile has been completely disturbed, removing all original vegetation, including geophytic and resprouting plant species. In the Grassland Biome of South Africa, a large proportion of the indigenous biodiversity consists of herbaceous and low shrubby species that re-sprout seasonally, after fire, or after defoliation from grazing animals, and can persist under these conditions. In cultivated areas, it is possible through natural succession, or through active rehabilitation, to restore a perennial cover of grasses, but the original biodiversity is permanently lost. They also have little value for animal biodiversity, except for species that forage in cultivated areas.

Old lands
These are areas that were previously ploughed for cultivation but have been left for an extended period without ploughing. Through natural succession processes, they generally develop a perennial cover of grasses, but these secondary grasslands are species poor and the original diversity of resprouting species is usually entirely absent. Non-grass species diversity usually consists of re-seeding and weedy species, and sometimes animal- and/or bird-dispersed woody species.

On aerial photographs and satellite images with adequate resolution, these areas are often recognisable by the presence of residual plough lines and other structural features often present in cultivated fields.

Exotic trees
There are planted windrows on the roadsides in various parts of the site, as well as within homestead complex areas. These are mostly deliberately planted some decades ago and are not alien invasive species. There are, however, various places on site where alien invasive species have become established in previously disturbed areas. In both cases, the underlying natural grassland is lost.

Degraded areas
Any areas where the original vegetation is lost due to continuous degradation, such as trampling, severe overgrazing, or some other factor, it is mapped as degraded. These areas are unlikely to restore to natural grassland, even with removal of the drivers of the degradation.

Transformed areas
Areas where natural habitat no longer exists due to development of infrastructure, such as roads, buildings, and other hard surfaces. Current cultivation is also transformed, but has not been replaced by built infrastructure, therefore the soil surface can be colonized by plants, if cultivation is stopped.

Figure 5: Habitats of the study area

Plant species flagged for the study area

According to the DFFE online environmental screening tool, four plant species have been flagged as of concern for the area the current project is in. A description of each species is provided.

Sensitive species 1201
Occurs on dolerite outcrops in grasslands at about 2000m altitude, from Dullstroom in the north to Vryheid in the south. This geophyte is fairly restricted and threatened by alien invasive plants and is therefore listed as Vulnerable on the national Red List. This species is conspicuous when flowering, with attractive pale white flowers in summer. The closest locality at which this species has been observed is Hartebeespruit due south of Campden. It therefore has a MODERATE chance of occurring on the site.

Sensitive species 41
A common and widespread geophyte that is very similar to *Gladiolus crassifolius*, also a widespread and common species with a similar distribution. The main distribution area is Witbank to Lydenburg, and southwards to Piet Retief and Wakkerstroom. It occurs in wetlands or marshes in high altitude grassland that remain wet throughout the year or dry out for only a short period. This species is listed on the South African Red List with a national assessment of Vulnerable but is currently not recognized by the IUCN as it is regarded as a synonym of *G. crassifolius*. Whereas this species is confined more to wetland habitats, *G. crassofolius* has larger leaves, longer spikes and smaller flowers, and is found in drier, more stony habitats. It flowers from October to January and has a high probability of occurring in wetland areas on the study site. Without flowers, the plant can be recognized as a *Gladiolus*. The closest historical record is approximately 30km from the study site. This species has a MODERATE chance of occurring on the site.

Sensitive species 691
A widespread geophyte distributed in Free State, North West, Gauteng, and in Mpumalanga from Belfast and Ermelo to Wolmaransstad. It is found in wetlands in undulating grasslands. The species is currently listed as Vulnerable. It flowers from January to March but its peak flowering month is February. It could feasibly be found in wet areas on the site but is quite conspicuous in February when if flowers. The closest historical record is approximately 40km from the site. It has a MODERATE chance of occurring on the site.

Sensitive species 851
A small succulent perennial herb with white flowers, growing in marshy areas or shallow vleis. This species is listed as Vulnerable but the confidence in this assessment is low (according to the Red List). Its distribution is uncertain because of its taxonomic confusion with the very similar *Crassula inanis*, but it appears to be restricted to the area between Ermelo and Maseru. The closest known record to the site of the Project is in the Bethal area. It has a MODERATE chance of occurring on the site.

Additional listed plant species for the study area
A database search identified additional plant species of conservation concern that could also occur on site that are not flagged in the Screening Tool output. These include the following:

Taxon	Red List status	Habitat and distribution	Flowering Time	Probability of occurrence
Alepidea cordifolia APIACEAE	Endangered (SA)	Widespread and extremely common across the eastern highveld of Mpumalanga, the eastern Free State, and north-western KwaZulu-Natal. It occurs along the north and north-eastern borders of Lesotho and is also found in Eswatini, on the Eastern Highlands of Zimbabwe and the Chimanimani Mountains of Mozambique. Forest margins, west and south facing mountain slopes and near drainage lines or islands within wetlands. Open grassland or on forest margins, often amongst rocks and/or along streams.	Summer, mostly February to March	**MODERATE** (within known overall distribution)
Alepidea longeciliata APIACEAE	Endangered	Between Breyten, Lothair, Middelburg and Stoffberg. Recorded from 2 neighbouring grids. Eastern Highveld Grassland. Grassland, Karoo Sandstone, above 1600 m. Possibly associated with edges of pans.	Summer	**MODERATE** (within known overall distribution)
Aspidoglossum xanthosphaerum APOCYNACEAE	Vulnerable	Mpumalanga, Groenvlei and Ermelo. Closest known record is from Breyten and just to the west of Ermelo. Montane grassland, marshy sites, 1800 m.	Unknown	**HIGH**
Bowiea volubilis subsp. volubilis HYACINTHACEAE	Vulnerable (national)	Eastern Cape to Limpopo Province. Widespread elsewhere in southern and eastern Africa. Low and medium altitudes, usually along mountain ranges and in thickly vegetated river valleys, often under bush clumps and in boulder screes, sometimes found scrambling at the margins of karroid, succulent bush in the Eastern Cape. Occurs in bushy kloofs at the coast and inland in KwaZulu-Natal. In Gauteng, Mpumalanga and North West Province it is often found in open woodland or on steep		LOW (site within gap in distribution, habitat not suitable)

		rocky hills usually in well-shaded situations. Tolerates wet and dry conditions, growing predominantly in summer rainfall areas with an annual rainfall of 200-800 mm.		
Brachystelma gerrardii APOCYNACEAE	Endangered	KwaZulu-Natal, Waterberg, Wolkberg and Eswatini. Open grassland, 400-1800 m. Site is within overall distribution range, but plant absent from Mpumalanga highveld.		LOW
Eucomis pallidiflora subsp. polevansii HYACINTHACEAE	Near Threatened	Pilgrim's Rest and Lydenburg to Eswatini to southern Mpumalanga. Wetlands in grassland, often in standing water up to 300 mm deep. Recorded at Ermelo in similar habitat as that found on site.		**HIGH**
Gladiolus robertsoniae IRIDACEAE	Near Threatened	South-eastern Gauteng, northern Free State and south-western Mpumalanga. Moist highveld grasslands, found in wet, rocky sites, mostly dolerite outcrops, wedged in rock crevices.		**HIGH**
Habenaria barbertonii ORCHIDACEAE	Near Threatened	Gauteng and Mpumalanga. Rocky hillsides, in bushveld in association with acacias, 1000-1500 m.	February to March	**MODERATE** (habitat may not be suitable)
Khadia carolinensis AIZOACEAE	Vulnerable	Carolina and Belfast. Eastern Highveld Grassland, Lydenburg Montane Grassland, Rand Highveld Grassland. Well-drained, sandy loam soils among rocky outcrops, or at the edges of sandstone sheets, Highveld Grassland, 1700 m.		HIGH
Kniphofia typhoides ASPHODELACEAE	Near Threatened	Gauteng, Limpopo, Mpumalanga, North West, Parys to Lydenburg to Paulpietersburg to Newcastle. Low lying wetlands and seasonally wet areas in climax Themeda triandra grasslands on heavy black clay soils, tends to disappear from degraded grasslands.		**MODERATE** (habitat may not be suitable)
Merwilla plumbea HYACINTHACEAE	Near Threatened	Widespread in eastern half of South Africa. Also in Eswatini and Lesotho. Montane mistbelt		**HIGH**

		and Ngongoni grassland, rocky areas on steep, well drained slopes. 300-2500 m.		
Miraglossum davyi APOCYNACEAE	Vulnerable	Dullstroom, Middelburg and Standerton. Grassland (Lydenburg Montane Grassland, Soweto Highveld Grassland, Eastern Highveld Grassland).		**HIGH**
Pachycarpus suaveolens APOCYNACEAE	Vulnerable	Gauteng and Mpumalanga to Eswatini. Lydenburg Montane Grassland, Eastern Highveld Grassland, Soweto Highveld Grassland. Short or annually burnt grasslands, 1400-2000 m.		**HIGH**
Riocreuxia aberrans APOCYNACEAE	Near Threatened	Dullstroom to Ermelo. Grassland. Wedged in cracks among rocks on exposed quartzite ridges.		LOW (habitat not suitable)

Protected species recorded in the study area

None of the three species protected under the National Forests Act (Appendix 1) have been previously recorded in the area in which the site is located. A full list of plants that could occur on site, as well as those recorded, is given in Appendix 2.

There are several species recorded on site that are protected under the Mpumalanga Nature Conservation Act No. 10 of 1998 (Appendix 3). It is a legal requirement to obtain a permit from the provincial authorities for the destruction of any of these species. A comprehensive walk-through survey of the final footprint is required to compile a complete list of these protected species.

SITE ECOLOGICAL IMPORTANCE

The Species Environmental Assessment Guidelines (SANBI 2020) require that a Site Ecological Importance is calculated for each habitat on site and provides methodology for making this calculation.

1. **Natural grassland** (open grassland on undulating plains, including moderately to heavily grazed areas).
2. **Wetlands** (seasonal wetlands in drainage valleys).
3. **Pans** (seasonally inundated areas on the river floodplain).
4. **Old lands** (secondary grasslands on old lands).
5. **Current cultivation** (areas currently cultivated and fallow lands).
6. **Exotic trees** (stands of exotic trees).
7. **Degraded areas** (disturbed areas with weeds or waste ground).
8. **Transformed areas** (no vegetation, due to complete removal and replacement with hard surface or structure).

As per the Species Environmental Assessment Guidelines (SANBI 2020), Site Ecological Importance (SEI) is calculated as a function of the Biodiversity Importance (BI) of the receptor and its resilience to impacts (SEI = BI + RR). The Biodiversity Importance (BI) in turn is a function of Conservation Importance (CI) and Functional Integrity (FI), i.e., BI = CI + FI.

Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km2. IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A.

Site ecological importance for habitats found on site – specific to Plant Species Theme:

Habitat	Conservation importance	Functional integrity	Receptor resilience	Site Ecological Importance (BI)
Natural grassland	High Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km2. IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A.	Medium Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types. (Chrissiesmeer Panveld is listed as EN) BUT Mostly minor current negative ecological impacts with some major impacts (e.g. established population of	Very low Habitat that is unable to recover from major impacts	High (BI = Medium)

		alien and invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential.		
Wetlands	High Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km2. IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A.	Medium (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types	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	High (BI = Medium)
Old lands	Low No confirmed or highly likely populations of SCC or range-restricted species.	Very low Several major current negative ecological impacts.	High Habitat that can recover relatively quickly (5-10 years) to restore >75% to restore the original species composition and functionality	Very low (BI = Very low)
Current cultivation	Very low No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	Very low Several major current negative ecological impacts.	Very high Habitat that can recover rapidly	Very low (BI = Very low)
Exotic trees	Very low No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	Very low Several major current negative ecological impacts.	Very high Habitat that can recover rapidly	Very low (BI = Very low)
Degraded	Very low No confirmed or highly likely populations of	Very low Several major current negative	Very high Habitat that can recover rapidly	Very low (BI = Very low)

	SCC or range-restricted species. No natural habitat remaining.	ecological impacts.		
Transformed	Very low No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	Very low Several major current negative ecological impacts.	Very high Habitat that can recover rapidly	Very low (BI = Very low)

The calculation of Site Ecological Importance matches the sensitivity classification given in the previous section of this report but includes an explicit recognition of the ability of each ecosystem to tolerate and recover from disturbance. Guidelines for development activities within different importance levels are given in the Table below.

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 the 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.

POSSIBLE IMPACTS

Anticipated impacts

For all infrastructure components there is the possibility that individuals or populations of plant species of conservation concern may be lost due to construction impacts. Based on known information, and data collected on site, the probability of encountering species of conservation concern at any location is considered to be low. Due to the high degree of transformation on site, there is limited amount of habitat in which rare species are likely to be found. Most of the proposed road network, which is the infrastructure component of wind projects with the highest impact on natural habitats, is within transformed areas (see Figure 6).

The best mitigation to address uncertainty issues related to SCC is to do a walk-through survey of all final infrastructure positions to check for SCC, and to collect the necessary data for any flora permits that may be required.

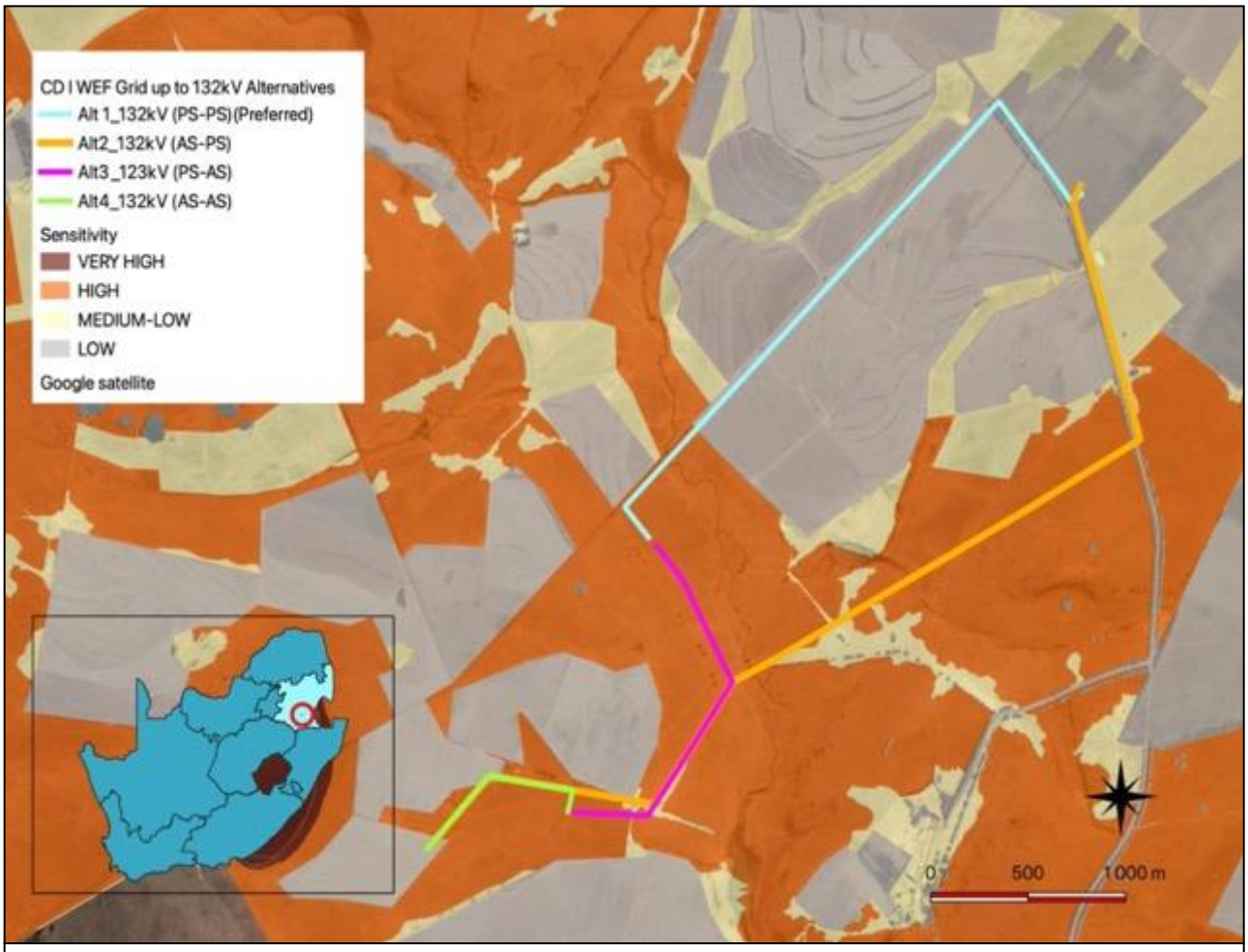

Figure 3: Location of proposed infrastructure relative to plant species sensitivity of the study area.

Based on the field data and desktop assessment of SCC, the specific habitats, or locations where the risk is considered to be higher than anywhere else is within the wetlands and adjacent grasslands (Figure 6). Any areas with permanent moisture are potential habitat for one SCC.

Proposed infrastructure in relation to sensitivities

Infrastructure locations relative to mapped Plant Theme sensitivities are shown in Figure 6.

Construction Phase Impacts

The only impact is potential loss of individuals of SCC.

Operation Phase Impacts

No significant impacts on plant species are expected during this phase due to minimal additional impacts on remaining natural habitat.

Decommissioning Phase Impacts

No significant impacts on plant species are expected during this phase due to minimal additional impacts on remaining natural habitat.

ASSESSMENT OF IMPACTS

A detailed assessment, as per the requirements the protocol for the specialist assessment and minimum report content requirements of environmental impacts on terrestrial plant species for activities requiring environmental authorisation, (20 March 2020), of the significance of all impacts during all phases of the project (Construction, Operation, Decommissioning and Cumulative) is provided below. This also includes all proposed mitigation measures and provides assessment before and after the implementation of proposed mitigation measures.

Construction Phase Impacts

Loss of individuals of Species of Conservation Concern due to clearing for construction

Impact 1	Loss of individuals of Species of Conservation Concern due to clearing for construction	
Issue	Clearing of natural habitat for construction	
Description of Impact		
The impact will occur due to clearing of indigenous vegetation for the purposes of construction of infrastructure.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Construction	
Criteria	**Without Mitigation**	**With Mitigation**
Extent	2	2
Duration	5	5
Reversibility	5	5
Magnitude (severity of impact)	2	2
Probability	3	1
Significance	42 (MODERATE)	14 (VERY LOW)
Mitigation actions		
The following measures are recommended:	1. It is a legal requirement to obtain permits for specimens or protected species that will be lost due to construction of the project 2. Prior to construction commencing, undertake a detailed walk-through survey of footprint areas that are within habitats where SCC are likely to occur. 3. Where significant populations of SCC are found, collect the data for any flora permits or micro-siting of infrastructure that may be required. 4. Prior to construction commencing, compile a Plant Rescue Plan, including monitoring specifications (timeframe, frequency etc). 5. Undertake monitoring (as per the Plant Rescue Plan specifications) to evaluate whether further measures would be required to manage impacts.	

Monitoring	
The following monitoring is recommended:	As per management plans.

Cumulative Impacts

Cumulative impacts on SCC from construction clearing due to a number of projects

Impact	Cumulative impacts on SCC from construction clearing due to a number of projects	
Issue	Loss of individuals of Species of Conservation Concern	
Description of Impact		
Construction activities will require clearing of natural habitat, to be replaced by the infrastructure. This will result in possible loss of populations of SCC.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Construction	
Criteria	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	2	3
Duration	5	5
Reversibility	5	5
Magnitude (severity of impact)	2	3
Probability	1	3
Significance	14 (VERY LOW)	48 (MEDIUM)

Summary of mitigation measures

The following mitigation measures are recommended to address known potential impacts:

1. It is a legal requirement to obtain permits for specimens or protected species that will be lost due to construction of the project.
2. A detailed pre-construction walk-through survey will be required during a favourable season where possible, to locate any individuals of protected plants, as well as for any populations of threatened plant species. This survey must cover the footprint of all approved infrastructure, including internal service roads and footprints of tower structures (final infrastructure layout). The best season is **early to late Summer** if possible, taking administrative processes into account, but will be influenced by recent rainfall and vegetation growth.
3. It is possible that some plants lost to the development can be rescued and planted in appropriate places in rehabilitation areas, but the description and appropriateness of such measures must be included in a Plant Rescue Plan. Any such measures will reduce the irreplaceable loss of resources as well as the cumulative effect. Note that Search and Rescue is only appropriate for some species and that a high mortality rate can be expected from individuals of species that are not appropriate to transplant.
4. Prior to construction commencing, a Plant Rescue Plan must be compiled to be approved by the appropriate authorities as part of the EMPr approval.
5. Prior to construction commencing, an Alien Species Management Plan must be compiled to be approved by the appropriate authorities as part of the EMPr approval.
6. For any plants that are transplanted, annual monitoring should take place to assess survival. This should be undertaken as per the frequency specified in the management plan and be undertaken by a qualified botanist. The monitoring programme must be designed prior to translocation of plants and should include control sites (areas not disturbed by the project) to evaluate mortality relative to wild populations.
7. No collecting or poaching of any plant species.

Summary of monitoring recommendations

Specific monitoring recommendations should be provided in the Plant Rescue Plan, the Alien Invasive Management Plan, and the Rehabilitation Plan. The following are broad recommendations:

Rescued plants

1. The location of all transplanted rescued plants must be recorded, along with the identity of the plant.
2. The health / vigour of each transplanted individual should be monitored as per the frequency and duration specified in the management plan.
3. As a scientific control, an equal number of non-transplanted individuals of the same species, within similar habitats, should be monitored in the same way as the transplanted specimens. This will provide comparative data on the survival of wild populations relative to transplanted plants.

Threatened species

1. If populations of threatened plant species are found to occur on site, monitoring of population health should take place as per the frequency and duration specified in the management plan. This should be appropriate to the species concerned.

CONCLUSIONS

There are four plant species of conservation concern flagged by the screening tool that could possibly occur on site, as well as additional species from historical records from SANBI databases and specifically mentioned by provincial conservation authorities, but none were seen during general field surveys. A targeted walk-through survey of footprint of construction areas is required prior to the commencement of construction, to determine whether any occur in the footprint of the development. This survey can take place at the same time as the required walk-through surveys for permitting purposes, or it can be undertaken as a separate targeted survey. It is recommended that this is undertaken in optimum growing season where possible.

Required pre-construction survey

For permitting purposes, the following flora survey is required prior to construction activities taking place:

Detailed floristic walk-through survey of all footprint areas to document composition, especially of protected species. It is suggested this be undertaken after an appropriate time-period after rainfall, where possible, to allow emergence of any species of potential concern. The survey must also cover all footprint areas, including final road alignments. Renewable energy projects including their grid infrastructure, as assessed here tend to have high fluidity in terms of layout and technology, due to the current rapid evolution of the technology, which allows more efficient deployment of infrastructure. However, this means that "final" layouts regularly change. The walk-through survey:

1. MUST ASSESS THE FOOTPRINT THAT WILL BE CONSTRUCTED – if this changes then the new footprint areas must be subject to a walk-through survey in full.
2. MUST BE UNDERTAKEN IN THE CORRECT SEASON, if possible, taking administrative processes into account.
3. MUST BE ADEQUATELY RESOURCED TO ENSURE IT IS DONE PROPERLY.
4. MUST BE UNDERTAKEN BY A COMPETENT BOTANIST WITH KNOWLEDGE OF THE AREA.

REFERENCES

IUCN (2001). *IUCN Red Data List categories and criteria: Version 3.1*. IUCN Species Survival Commission: Gland, Switzerland.

MUCINA, L. AND RUTHERFORD, M.C. (editors) 2006. Vegetation map of South Africa, Lesotho and Swaziland: an illustrated guide. *Strelitzia* 19, South African National Biodiversity Institute, Pretoria.

VAN WYK, A.E. AND SMITH, G.F. (Eds) 2001. Regions of Floristic Endemism in Southern Africa: A review with emphasis on succulents, pp. 1-199. Umdaus Press, Pretoria.

APPENDICES

Appendix 1: List of protected tree species (National Forests Act, 1998).

In terms of section 15(1) of the National Forests Act, 1998, no person may cut, disturb, damage or destroy any protected tree; or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any product derived from a protected tree, except under a licence or exemption granted by the Minister of Agriculture, Forestry and Fisheries. The list of Protected Tree Species under the National Forest Act, 1998 (Act No. 84 of 1998) is attached here as Appendix 1. The most recent version of this list was published in the Government Gazette No. 41887 on 7 September 2018, designated as GN No. 536 of 2018, and contains 47 species distributed across South Africa.

Botanical name	**English common names**	**Other common names Afrikaans (A), Sepedi (P), Sesotho (S), Setswana (T), Tshivenda (V), isiXhosa (X), isiZulu (Z), Xitsonga (XT)**	**National tree number**
Acacia erioloba	Camel thorn	Kameeldoring (A)/Mogohlo (NS)/Mogo̭tlho̭ (T)/	168
Acacia haematoxylon	Grey camel thorn	Vaalkameeldoring (A)/Mokholo (T))	169
Adansonia digitata	Baobab	Kremetart (A)/Seboi (NS)/Mowana (T)/Ximuwu (XT	467
Afzelia quanzensis	Pod mahogany	Peulmahonie (A)/Mutokota (V)/Inkehli (Z)	207
Balanites subsp. maughamii	Torchwood	Groendoring (A)/Ugobandlovu (Z)	251
Barringtonia racemosa	Powder-puff tree	Poeierkwasboom (A)/Iboqo (Z)	524
Boscia albitrunca	Shepherd's tree	Witgat (A)/Mohlo̭pi (NS)/Motlho̭pi (T)/ Muvhombwe (V)/Umgqomogqomo (X)/Umvithi (Z)	122
Brachystegia spiciformis	Msasa	Msasa (A)	198.1
Breonadia salicina	Matumi	Mingerhout (A)/Mohlomḙ (NS)/Mutu-lume (V)/Umfomfo (Z)	684
Bruguiera gymnorrhiza	Black mangrove	Swartwortelboom (A)/isiKhangati (X)/IsiHlobane (Z)	527
Cassipourea swaziensis	Swazi onionwood	Swazi-uiehout (A)	531.1
Catha edulis	Bushman's tea	Boesmanstee (A)/Mohlatse (NS)/Igqwaka (X)/Umhlwazi (Z)	404

Ceriops tagal	Indian mangrove	Indiese wortelboom (A)/isinkaha (Z)	525
Cleistanthus schlechteri var. schlechteri	False tamboti	Bastertambotie (A)/Umzithi (Z)	320
Colubrina nicholsonii	Pondo weeping thorn	Pondo-treurdoring (A)	453.8
Combretum imberbe	Leadwood	Hardekool (A)/Mohwelere-tšhipi (NS)/Motswiri (T)/Impondondlovu (Z)	539
Curtisia dentata	Assegai	Assegaai (A)/Umgxina (X)/Umagunda (Z)	570
Elaeodendron transvaalensis	Bushveld saffron	Bosveld-saffraan (A)/Monomane (T)/Ingwavuma (Z)	416
Erythrophysa transvaalensis	Bushveld red balloon	Bosveld-rooiklapperbos (A)/Mofalatsane (T)	436.2
Euclea pseudebenus	Ebony guarri	Ebbeboom-ghwarrie (A)	598
Ficus trichopoda	Swamp fig	Moerasvy (A)/Umvubu (Z)	54
Leucadendron argenteum	Silver tree	Silwerboom (A)	77
Lumnitzera racemosa var. racemosa	Tonga mangrove	Tonga-wortelboom (A)/isiKhaha-esibomvu (Z)	552
Lydenburgia abbottii	Pondo bushman's tea	Pondo-boesmanstee (A)	407
Lydenburgia cassinoides	Sekhukhuni bushman's tea	Sekhukhuni-boesmanstee (A)	406
Mimusops caffra	Coastal red milkwood	Kusrooimelkhout (A)/Umthunzi (X)/Umkhakhayi (Z)	583
Newtonia hildebrandtii var. hildebrandtii	Lebombo wattle	Lebombo-wattel (A)/Umfomothi (Z)	191
Ocotea bullata	Stinkwood	Stinkhout (A)/Umhlungulu (X)/Umnukane (Z)	118
Ozoroa namaquensis	Gariep resin tree	Gariep-harpuisboom (A)	373.2
Philenoptera violacea	Apple-leaf	Appelblaar (A)/Mphata (NS)/Mohata (T)/isiHomohomo (Z)	238
Pittosporum viridiflorum	Cheesewood	Kasuur (A)/Kgalagangwe (NS)/Umkhwenkwe (X)/Umfusamvu (Z)	139
Podocarpus elongatus	Breede River yellowwood	Breërivier geelhout (A)	15
Podocarpus falcatus (Afrocarpus falcatus)	Outeniqua yellowwood	Outniekwageelhout (A)/Mogo͘bago͘ba (NS)/Umkhoba (X)/Umsonti (Z)	16
Podocarpus henkelii	Henkel's yellowwood	Henkel se geelhout (A)/Umsonti (X)/Umsonti (Z)	17
Podocarpus latifolius	Real yellowwood	Regte-geelhout (A)/Mogo͘bago͘ba (NS)/Umcheya (X)/Umkhoba (Z)	18

Protea comptonii	Saddleback sugarbush	Barberton-suikerbos (A)	88
Protea curvata	Serpentine sugarbush	Serpentynsuikerbos (A)	88.1
Prunus africana	Red stinkwood	Rooistinkhout (A)/Umkhakhase (X)/Umdumezulu (Z)	147
Pterocarpus angolensis	Wild teak	Kiaat (A)/Moroto (NS)/Mokwa (T)/Mutondo (V)/Umvangazi (Z)	236
Rhizophora mucronata	Red mangrove	Rooiwortelboom (A)/isiKhangathi (X)/Umhlume (Z)	526
Sclerocarya birrea subsp. caffra	Marula	Maroela (A)/Morula (NS)/Morula (T)/Umganu (Z) /Nkanyi (XT)	360
Securidaca longepedunculata	Violet tree	Krinkhout (A)/Mmaba (T)	303
Sideroxylon inerme subsp. inerme	White milkwood	Witmelkhout (A)/Ximafana (X)/Umakhwelafingqane (Z)	579
Tephrosia pondoensis	Pondo poison pea	Pondo-gifertjie (A)	226.1
Warburgia salutaris	Pepper-bark tree	Peperbasboom (A)/Molaka (NS)/Mulanga (V)/isiBaha (Z)	488
Widdringtonia cedarbergensis	Clanwilliam cedar	Clanwilliamseder (A)	19
Widdringtonia schwarzii	Willowmore cedar	Baviaanskloofseder (A)	21
Berchemia zeyheri (RHAMNACEAE) LC	Red ivory Pink ivory	Rooi-ivoor (A) / Rooihout (A) / Monee (S) / umNeyi (SW) / umNini (Z, X) / Xiniyani (TS) / Moye (T) / Munia-niane (V)	450
Diospyros mespiliformis (EBENACEAE) LC	Jackal berry	Jakkalsbessie (A) / Musuma (V) / Muntoma (TS) / Mgula (TS)	606
Schinziophyton rautanenii	Manketti / Mongongo	Mankettiboom (A) / Monghongho (T) / Makongwa (T)	337
Umtiza listeriana	Umtiza	Umtiza (X) / Omtisa (A)	205

Appendix 2: Plant species recorded on site and nearby.

This list was compiled by extracting a list of species that have been recorded within a rectangular area that includes the study area as well as similar habitats in surrounding areas, as obtained from SANBI (www.newposa.sanbi.org) accessed on 12 September 2021. It is probable that it includes some species that occur in habitats that do not occur on site. The list was supplemented from field observations, as well as observations from the online iNaturalist tool and database (https://www.inaturalist.org), which are photographic observations verified by an online community.

The list is arranged by family in alphabetical order. Species listed in green are those that were found on site.

Acanthaceae
Blepharis innocua
Blepharis stainbankiae
Blepharis subvolubilis
Crabbea acaulis
Dyschoriste burchellii
Justicia anagalloides
Ruellia cordata
Thunbergia atriplicifolia
Thunbergia pondoensis

Achariaceae
Ceratiosicyos laevis
Kiggelaria africana

Agapanthaceae
Agapanthus inapertus. subsp. *intermedius*

Agavaceae
Chlorophytum comosum
Chlorophytum cooperi
Chlorophytum fasciculatum
Chlorophytum galpinii

Aizoaceae
Delosperma sutherlandii
Khadia carolinensis
Mossia intervallaris
Ruschia sp.

Alliaceae
Tulbaghia acutiloba
Tulbaghia cernua
Tulbaghia leucantha
Tulbaghia ludwigiana

Amaranthaceae
Amaranthus hybridus subsp. cruentus; Naturalised
Amaranthus hybridus subsp. hybridusvar. hybridus; Naturalised
Amaranthus thunbergii
Chenopodium album; Naturalised
Cyathula cylindrica var. cylindrica
Cyathula uncinulata
Gomphrena celosioides; Naturalised
Guilleminea densa; Naturalised; Invasive

Amaryllidaceae
Boophone disticha
Brunsvigia natalensis
Brunsvigia radulosa
Crinum bulbispermum
Cyrtanthus breviflorus
Cyrtanthus stenanthus var. major
Cyrtanthus tuckii var. transvaalensis
Cyrtanthus tuckii var. tuckii
Haemanthus humilis. subsp. hirsutus
Haemanthus montanus
Nerine angustifolia
Nerine gracilis
Nerine krigei
Nerine rehmannii
Scadoxus puniceus

Anacardiaceae
Ozoroa engleri
Searsia dentata
Searsia discolor
Searsia magalismontana subsp. magalismontana
Searsia rigida var. rigida
Searsia tumulicola var. tumulicola

Apiaceae
Afrosciadium magalismontanum
Alepidea peduncularis
Centella asiatica
Heteromorpha arborescens var. abyssinica

Apocynaceae
Anisotoma pedunculata
Asclepias albens
Asclepias aurea
Asclepias brevicuspis
Asclepias crassinervis
Asclepias cucullata subsp. cucullata
Asclepias cultriformis
Asclepias eminens
Asclepias fulva

Asclepias gibba var. gibba
Asclepias gibba var. media
Asclepias macropus
Asclepias multicaulis
Asclepias stellifera
Aspidoglossum araneiferum
Aspidoglossum biflorum
Aspidoglossum glanduliferum
Aspidoglossum lamellatum
Aspidoglossum ovalifolium
Aspidoglossum xanthosphaerum
Brachystelma foetidum
Brachystelma pygmaeum subsp. pygmaeum
Cordylogyne globosa
Gomphocarpus fruticosus
Gomphocarpus rivularis
Miraglossum pulchellum
Pachycarpus campanulatus var. sutherlandii
Pachycarpus grandiflorus subsp. grandiflorus
Pachycarpus macrochilus
Pachycarpus plicatus
Pachycarpus scaber
Pachycarpus suaveolens
Parapodium costatum
Raphionacme hirsuta
Riocreuxia picta
Riocreuxia polyantha
Schizoglossum atropurpureum atropurpureum
Schizoglossum nitidum. Indigenous
Schizoglossum peglerae
Sisyranthus huttoniae
Sisyranthus imberbis
Stenostelma periglossoides
Woodia sp.
Xysmalobium asperum
Xysmalobium parviflorum
Xysmalobium stockenstromense
Xysmalobium undulatum var. undulatum

Aponogetonaceae
Aponogeton junceus

Araceae
Zantedeschia albomaculata subsp. macrocarpa
Zantedeschia rehmannii

Asparagaceae
Asparagus bechuanicus
Asparagus cooperi
Asparagus devenishii
Asparagus fractiflexus

Asparagus laricinus
Asparagus ramosissimus
Asparagus virgatus

Asphodelaceae
Aloe bergeriana
Aloe boylei
Aloe davyana
Aloe ecklonis
Aloe graciliflora
Aloe hlangapies
Aloe jeppeae
Aloe maculata subsp. maculata
Bulbine abyssinica
Bulbine capitata
Kniphofia albescens
Kniphofia porphyrantha
Kniphofia typhoides
Trachyandra asperata var. carolinensis
Trachyandra asperata var. macowanii
Trachyandra asperata var. nataglencoensis
Trachyandra asperata var. swaziensis
Trachyandra gerrardii
Trachyandra saltii var. saltii

Aspleniaceae
Asplenium aethiopicum
Asplenium capense

Asteraceae
Adenanthellum osmitoides
Afroaster hispidus
Afroaster serrulatus
Artemisia afra
Athrixia elata
Berkheya echinacea subsp. echinacea
Berkheya insignis
Berkheya pinnatifida subsp. ingrata
Berkheya radula
Berkheya setifera
Berkheya speciosa. subsp. lanceolata
Berkheya zeyheri subsp. zeyheri
Bidens pilosa; Naturalised
Callilepis salicifolia
Campuloclinium macrocephalum; Naturalised; Invasive
Cineraria lyratiformis
Cirsium vulgare; Naturalised; Invasive, NEMBA Category 1b
Conyza gouanii
Conyza pinnata
Conyza podocephala
Cosmos bipinnatus; Naturalised

Cotula anthemoides
Denekia capensis
Dichrocephala integrifolia subsp. integrifolia
Dicoma anomala
Didelta carnosa var. carnosa
Dimorphotheca caulescens
Dimorphotheca jucunda E
Dimorphotheca spectabilis
Dimorphotheca zeyheri
Erigeron bonariensis; Naturalised; Invasive
Erigeron canadensis; Naturalised; Invasive
Euryops gilfillanii
Euryops laxus (
Euryops transvaalensis subsp. setilobus
Felicia filifolia subsp. filifolia
Felicia muricata subsp. muricata
Felicia muricata subsp. strictifolia
Gamochaeta antillana; Naturalised; Invasive
Gamochaeta pensylvanica; Naturalised
Gazania krebsiana. subsp. serrulata
Geigeria aspera var. aspera
Geigeria burkei subsp. burkei var. burkei
Geigeria burkei subsp. burkei var. intermedia
Geigeria burkei subsp. valida
Geigeria filifolia
Gerbera ambigua
Gerbera natalensis
Gerbera piloselloides
Gerbera viridifolia
Gnaphalium filagopsis
Haplocarpha scaposa
Helichrysum adenocarpum subsp. adenocarpum
Helichrysum albilanatum
Helichrysum aureonitens
Helichrysum aureum var. monocephalum
Helichrysum caespititium
Helichrysum callicomum
Helichrysum cephaloideum
Helichrysum griseum
Helichrysum miconiifolium
Helichrysum molestum
Helichrysum mundtii
Helichrysum nudifolium var. nudifolium
Helichrysum nudifolium var. pilosellum
Helichrysum opacum
Helichrysum oreophilum
Helichrysum rugulosum
Helichrysum splendidum
Helichrysum subglomeratum
Hilliardiella aristata
Hilliardiella elaeagnoides

Hilliardiella hirsuta
Hilliardiella nudicaulis
Hypochaeris radicata; Naturalised
Lactuca inermis
Lasiospermum pedunculare
Lopholaena segmentata
Macledium zeyheri subsp. zeyheri
Nidorella anomala
Nidorella auriculata
Nidorella resedifolia subsp. resedifolia
Osteospermum moniliferum subsp. canescens
Osteospermum scariosum var. scariosum
Othonna natalensis
Parapolydora fastigiata
Polydora angustifolia
Pseudognaphalium luteoalbum cryptogenic
Pseudognaphalium oligandrum
Pseudopegolettia tenella
Pulicaria scabra
Schistostephium crataegifolium
Schkuhria pinnata; Naturalised
Senecio affinis
Senecio albanensis var. albanensis
Senecio bupleuroides
Senecio coronatus
Senecio erubescens var. erubescens
Senecio harveianus
Senecio hieracioides
Senecio isatideus
Senecio laevigatus var. integrifolius
Senecio laevigatus var. laevigatus
Senecio latifolius
Senecio madagascariensis
Senecio othonniflorus
Senecio oxyriifolius subsp. oxyriifolius
Senecio pentactinus
Senecio polyodon
Senecio rhomboideus
Senecio scitus
Senecio speciosus
Senecio subcoriaceus
Senecio venosus
Seriphium plumosum
Sonchus asper subsp. asper; Naturalised; Invasive
Sonchus nanus
Sonchus oleraceus; Naturalised; Invasive
Tagetes minuta; Naturalised; Invasive
Tolpis capensis
Ursinia montana subsp. montana
Ursinia nana subsp. leptophylla
Ursinia nana subsp. nana

Ursinia paleacea
Ursinia tenuiloba

Bartramiaceae
Philonotis falcata
Philonotis hastata

Begoniaceae
Begonia sutherlandii subsp. *sutherlandii*

Blechnaceae
Blechnum attenuatum
Blechnum australe subsp. *australe*

Boraginaceae
Cynoglossum austroafricanum
Cynoglossum hispidum
Cynoglossum lanceolatum
Lithospermum cinereum
Myosotis graminifolia
Myosotis sylvatica; Naturalised

Brassicaceae
Erucastrum austroafricanum
Heliophila carnosa
Lepidium schinzii
Lepidium transvaalense
Nasturtium officinale; Naturalised; Invasive
Rorippa fluviatilis var. fluviatilis
Rorippa nudiuscula
Sisymbrium turczaninowii
Turritis glabra; Naturalised

Bruchiaceae
Cladophascum gymnomitrioides

Bryaceae
Anomobryum julaceum
Bryum apiculatum
Bryum argenteum
Bryum cellulare
Bryum dichotomum

Cactaceae
Opuntia ficus-indica; Naturalised; Invasive, NEMBA Category 1b

Campanulaceae
Wahlenbergia undulata
Wahlenbergia virgata

Caryophyllaceae

Cerastium arabidis
Cerastium capense
Dianthus transvaalensis
Dianthus sp.
Herniaria erckertii subsp. erckertii
Pollichia campestris
Silene burchellii subsp. modesta
Silene burchellii subsp. pilosellifolia
Silene undulata
Spergularia media; Naturalised

Celastraceae
Gymnosporia buxifolia
Maytenus undata

Cleomaceae
Cleome monophylla

Colchicaceae
Colchicum longipes
Colchicum striatum
Gloriosa modesta

Commelinaceae
Commelina africana var. africana
Commelina africana var. krebsiana
Commelina africana var. lancispatha
Commelina benghalensis
Commelina subulata
Cyanotis speciosa

Convolvulaceae
Convolvulus arvensis; Naturalised; Invasive
Convolvulus natalensis
Convolvulus sagittatus
Convolvulus thunbergii
Falkia oblonga
Ipomoea bathycolpos
Ipomoea crassipes var. crassipes
Ipomoea oblongata
Ipomoea ommanneyi
Ipomoea simplex
Merremia verecunda
Xenostegia tridentata subsp. angustifolia

Crassulaceae
Crassula alba var. alba
Crassula barbata subsp. barbata
Crassula capitella subsp. nodulosa
Crassula compacta
Crassula lanceolata subsp. transvaalensis

Crassula natans var. minus
Crassula natans var. natans
Crassula setulosa var. setulosa forma setulosa
Crassula tuberella
Crassula vaginata subsp. vaginata

Cucurbitaceae
Coccinia adoensis
Cucumis anguria var. longaculeatus
Cucumis hirsutus
Cucumis myriocarpus subsp. myriocarpus
Cucumis zeyheri

Cyperaceae
Ascolepis capensis
Bulbostylis densa subsp. afromontana
Bulbostylis humilis
Bulbostylis oritrephes
Bulbostylis schoenoides
Bulbostylis scleropus
Carex ludwigii
Carex rhodesiaca
Cyperus congestus
Cyperus denudatus
Cyperus difformis
Cyperus esculentus var. esculentus
Cyperus fastigiatus
Cyperus laevigatus
Cyperus longus var. longus
Cyperus longus var. tenuiflorus
Cyperus margaritaceus var. margaritaceus
Cyperus marginatus
Cyperus obtusiflorus var. flavissimus
Cyperus parvinux
Cyperus rigidifolius
Cyperus rupestris var. rupestris
Cyperus schlechteri
Cyperus sphaerospermus
Cyperus squarrosus
Cyperus uitenhagensis
Cyperus teneristolon
Cyperus usitatus
Dracoscirpoides surculosa
Eleocharis dregeana
Eleocharis limosa
Fimbristylis complanata
Fuirena coerulescens
Isolepis cernua var. cernua
Isolepis costata
Isolepis fluitans var. fluitans
Isolepis sepulcralis

Isolepis setacea
Kyllinga alata
Kyllinga erecta var. erecta
Kyllinga pulchella
Lipocarpha nana
Lipocarpha rehmannii
Pycreus betschuanus
Pycreus chrysanthus
Pycreus cooperi
Pycreus macranthus
Pycreus nitidus
Pycreus pumilus
Pycreus rehmannianus
Rhynchospora brownii
Schoenoplectus corymbosus
Schoenoplectus decipiens
Schoenoplectus muriculatus
Schoenoplectus tabernaemontani; Naturalised
Schoenoxiphium sp.
Scirpoides burkei

Dioscoreaceae
Dioscorea dregeana

Dipsacaceae
Scabiosa columbaria

Droseraceae
Drosera burkeana

Dryopteridaceae
Dryopteris athamantica

Ebenaceae
Diospyros austro-africana var. microphylla
Diospyros lycioides subsp. guerkei
Euclea sp.

Ericaceae
Erica alopecurus var. alopecurus
Erica cerinthoides var. cerinthoides
Erica drakensbergensis
Erica oatesii

Eriocaulaceae
Eriocaulon abyssinicum
Eriocaulon sonderianum

Euphorbiaceae
Acalypha angustata
Acalypha caperonioides var. caperonioides

Acalypha wilmsii
Euphorbia gueinzii
Euphorbia inaequilatera
Euphorbia natalensis
Euphorbia striata

Exormothecaceae (Liverworts)
Exormotheca holstii

Fabaceae
Acacia dealbata; Naturalised; Invasive
Aeschynomene rehmannii var. leptobotrya
Aeschynomene rehmannii var. rehmannii
Alysicarpus zeyheri
Argyrolobium harveyanum
Argyrolobium humile
Argyrolobium lotoides
Argyrolobium pauciflorum
Argyrolobium rupestre subsp. rupestre
Argyrolobium speciosum
Argyrolobium transvaalense
Argyrolobium tuberosum
Aspalathus callosa Indigenous
Chamaecrista capensis var. capensis
Chamaecrista capensis var. flavescens
Chamaecrista comosa
Crotalaria distans subsp. distans
Crotalaria eremicola subsp. eremicola
Crotalaria globifera
Crotalaria magaliesbergensis
Crotalaria sphaerocarpa subsp. sphaerocarpa
Dichilus strictus
Dolichos angustifolius
Dolichos falciformis
Elephantorrhiza elephantina
Elephantorrhiza praetermissa
Eriosema cordatum
Eriosema kraussianum
Eriosema salignum
Eriosema simulans
Erythrina zeyheri
Indigastrum fastigiatum
Indigofera buchananii
Indigofera comosa
Indigofera dimidiata
Indigofera dregeana
Indigofera evansiana
Indigofera frondosa
Indigofera hedyantha
Indigofera hilaris var. hilaris
Indigofera longibarbata

Indigofera melanadenia
Indigofera placida
Indigofera rostrata
Indigofera sanguinea
Indigofera tristoides
Lablab purpureus subsp. uncinatus
Leobordea adpressa subsp. adpressa
Leobordea eriantha
Leobordea foliosa
Lespedeza cuneata; Naturalised
Lessertia frutescens subsp. microphylla
Listia heterophylla
Lotus discolor subsp. discolor
Medicago laciniata var. laciniata; Naturalised
Melolobium alpinum
Melolobium calycinum
Melolobium microphyllum
Melolobium obcordatum
Melolobium wilmsii
Mucuna coriacea
Pearsonia cajanifolia subsp. cryptantha
Pearsonia sessilifolia subsp. filifolia
Pearsonia sessilifolia subsp. sessilifolia
Rhynchosia adenodes
Rhynchosia nervosa var. nervosa
Rhynchosia pauciflora
Rhynchosia pedunculata
Rhynchosia reptabunda
Rhynchosia totta var. totta
Tephrosia capensis var. acutifolia
Tephrosia capensis var. capensis
Tephrosia natalensis subsp. natalensis
Tephrosia semiglabra
Trifolium africanum var. africanum
Trifolium africanum var. lydenburgense
Vigna luteola var. luteola
Vigna oblongifolia var. oblongifolia
Vigna unguiculata subsp. unguiculata var. unguiculata
Zornia capensis subsp. capensis
Zornia linearis
Zornia milneana

Fagaceae
Quercus robur; Naturalised

Gentianaceae
Chironia krebsii
Chironia palustris subsp. *transvaalensis*
Chironia purpurascens subsp. *humilis*
Exochaenium grande
Sebaea leiostyla

Sebaea repens
Sebaea sedoides var. sedoides

Geraniaceae
Geranium multisectum
Geranium robustum
Geranium wakkerstroomianum
Monsonia angustifolia
Monsonia attenuata
Monsonia brevirostrata
Pelargonium alchemilloides
Pelargonium luridum
Pelargonium minimum
Pelargonium pseudofumarioides
Pelargonium sidoides

Gesneriaceae
Streptocarpus dunnii
Streptocarpus galpinii
Streptocarpus pentherianus

Haloragaceae
Laurembergia repens subsp. *brachypoda*

Hyacinthaceae
Albuca baurii
Albuca setosa
Albuca shawii
Albuca virens subsp. virens
Dipcadi brevifolium
Dipcadi marlothii
Dipcadi viride
Drimia calcarata
Drimia depressa
Drimia elata
Drimia multisetosa
Drimia pauciflora
Drimia sphaerocephala
Eucomis autumnalis subsp. clavata
Eucomis montana
Eucomis pallidiflora subsp. pallidiflora
Ledebouria cooperi
Ledebouria humifusa
Ledebouria leptophylla
Ledebouria marginata
Ledebouria ovatifolia
Ledebouria revoluta
Merwilla plumbea
Ornithogalum candicans
Ornithogalum capillare
Ornithogalum esterhuyseniae

Ornithogalum flexuosum
Ornithogalum juncifolium var. juncifolium
Schizocarphus nervosus

Hydrocharitaceae
Lagarosiphon muscoides

Hypericaceae
Hypericum aethiopicum subsp. *sonderi*
Hypericum lalandii

Hypoxidaceae
Empodium elongatum
Hypoxis acuminata
Hypoxis argentea var. *argentea*
Hypoxis filiformis
Hypoxis hemerocallidea
Hypoxis iridifolia
Hypoxis multiceps
Hypoxis obtusa
Hypoxis rigidula var. *rigidula*

Iridaceae
Aristea torulosa
Babiana bainesii
Crocosmia paniculata
Dierama insigne
Dierama mossii
Dierama tyrium
Gladiolus crassifolius
Gladiolus dalenii subsp. dalenii
Gladiolus ecklonii
Gladiolus elliotii
Gladiolus longicollis subsp. platypetalus
Gladiolus paludosus
Gladiolus papilio
Gladiolus robertsoniae
Gladiolus sericeovillosus subsp. calvatus
Gladiolus sericeovillosus subsp. sericeovillosus
Gladiolus vinosomaculatus
Gladiolus woodii
Hesperantha coccinea
Hesperantha longicollis
Hesperantha rupestris
Moraea elliotii
Moraea filicaulis
Moraea pallida
Moraea pubiflora
Watsonia bella
Watsonia pulchra

Juncaceae
Juncus dregeanus subsp. dregeanus
Juncus exsertus
Juncus oxycarpus
Juncus punctorius

Lamiaceae
Acrotome hispida
Acrotome inflata
Aeollanthus buchnerianus
Ajuga ophrydis
Leonotis ocymifolia var. raineriana
Mentha aquatica
Ocimum obovatum subsp. obovatum var. obovatum
Platostoma rotundifolium
Pycnostachys reticulata
Rotheca hirsuta
Salvia aurita var. galpinii
Salvia repens var. repens
Salvia runcinata
Stachys hyssopoides
Stachys kuntzei
Stachys natalensis var. natalensis
Stachys nigricans
Syncolostemon albiflorus
Syncolostemon concinnus
Syncolostemon pretoriae
Teucrium trifidum

Lentibulariaceae
Utricularia prehensilis

Limeaceae
Limeum sulcatum var. *sulcatum*

Linaceae
Linum thunbergii

Linderniaceae
Linderniella nana

Lobeliaceae
Cyphia elata
Lobelia erinus
Lobelia flaccida subsp. *flaccida*
Lobelia sonderiana
Monopsis decipiens

Lythraceae
Nesaea sagittifolia var. *sagittifolia*
Nesaea schinzii

Malvaceae
Grewia flava
Grewia occidentalis var. *occidentalis*
Hermannia cordata
Hermannia cristata
Hermannia depressa
Hermannia transvaalensis
Hibiscus aethiopicus var. *ovatus*
Hibiscus microcarpus
Hibiscus trionum; Naturalised
Malva parviflora var. *parviflora*; Naturalised
Pavonia columella
Sida chrysantha
Sida rhombifolia subsp. *rhombifolia*

Melianthaceae
Melianthus dregeanus subsp. *insignis*

Menispermaceae
Stephania abyssinica var. *tomentella*

Menyanthaceae
Nymphoides thunbergiana

Molluginaceae
Psammotropha myriantha

Myrsinaceae
Rapanea melanophloeos

Myrtaceae
Eucalyptus camaldulensis; Naturalised; Invasive, NEMBA Category 1b in riparian areas

Ochnaceae
Ochna natalitia

Onagraceae
Epilobium capense
Ludwigia palustris; Naturalised
Oenothera stricta subsp. *stricta*; Naturalised; Invasive
Oenothera tetraptera; Naturalised; Invasive

Orchidaceae
Brachycorythis ovata subsp. *ovata*
Brachycorythis pubescens
Brownleea parviflora
Disa aconitoides subsp. *aconitoides*
Disa cooperi
Disa nervosa
Disa patula var. *transvaalensis*

Disa stachyoides
Disa versicolor
Disperis cooperi
Disperis fanniniae
Eulophia cooperi
Eulophia hians var. *hians*
Eulophia hians var. *inaequalis*
Eulophia hians var. *nutans*
Eulophia ovalis var. *bainesii*
Eulophia ovalis var. *ovalis*
Eulophia parvilabris
Habenaria barbertoni
Habenaria clavata
Habenaria dives
Habenaria epipactidea
Habenaria falcicornis subsp. *caffra*
Habenaria lithophila
Neobolusia tysonii
Orthochilus foliosus
Orthochilus leontoglossus
Orthochilus vinosus
Orthochilus welwitschii
Pterygodium nigrescens
Satyrium hallackii subsp. *ocellatum*
Satyrium longicauda var. *longicauda*
Satyrium neglectum subsp. *neglectum var. neglectum*
Satyrium parviflorum
Satyrium trinerve
Schizochilus zeyheri

Orobanchaceae
Alectra capensis
Buchnera reducta
Cycnium adonense
Cycnium tubulosum subsp. tubulosum
Harveya speciosa
Melasma scabrum var. scabrum
Sopubia cana var. cana
Sopubia simplex
Striga asiatica
Striga bilabiata subsp. bilabiata
Striga elegans
Striga gesnerioides

Orthotrichaceae
Orthotrichum diaphanum

Oxalidaceae
Oxalis convexula
Oxalis corniculata; Naturalised; Invasive
Oxalis obliquifolia

Oxalis smithiana

Papaveraceae
Argemone ochroleuca; Naturalised; Invasive, NEMBA Category 1b
Papaver aculeatum

Peraceae
Clutia hirsuta var. hirsuta
Clutia monticola var. *monticola*
Clutia natalensis
Clutia virgata

Phrymaceae
Mimulus gracilis

Phyllanthaceae
Phyllanthus glaucophyllus

Phytolaccaceae
Phytolacca octandra; Naturalized; Invasive

Plantaginaceae
Linaria vulgaris; Naturalised; Invasive
Plantago lanceolata
Veronica anagallis-aquatica

Poaceae
Agrostis continuata
Agrostis eriantha var. eriantha
Agrostis gigantea; Naturalised
Agrostis lachnantha var. lachnantha
Alloteropsis semialata subsp. eckloniana
Alloteropsis semialata subsp. semialata
Andropogon appendiculatus
Andropogon eucomus
Andropogon lacunosus
Andropogon schirensis
Anthoxanthum odoratum var. odoratum; Naturalised
Aristida adscensionis
Aristida bipartita
Aristida canescens subsp. canescens
Aristida congesta subsp. barbicollis
Aristida congesta subsp. congesta
Aristida diffusa subsp. burkei
Aristida junciformis subsp. junciformis
Aristida recta
Aristida scabrivalvis subsp. scabrivalvis
Aristida vestita
Arundinella nepalensis
Avena sativa; Naturalised; Invasive
Bothriochloa insculpta

Brachiaria eruciformis
Brachiaria humidicola
Brachiaria serrata
Briza minor; Naturalised; Invasive
Bromus catharticus; Naturalised; Invasive
Bromus leptoclados
Calamagrostis epigejos var. capensis
Catalepis gracilis
Chloris virgata
Ctenium concinnum
Cymbopogon caesius
Cymbopogon dieterlenii
Cymbopogon pospischilii
Cynodon dactylon
Cynodon hirsutus
Cynodon transvaalensis
Dactylis glomerata; Naturalised; Invasive
Digitaria ciliaris; Naturalised
Digitaria diagonalis var. diagonalis
Digitaria diversinervis
Digitaria eriantha
Digitaria flaccida
Digitaria sanguinalis; Naturalised
Digitaria ternata
Digitaria tricholaenoides
Diheteropogon amplectens var. amplectens
Echinochloa crus-galli
Ehrharta erecta var. natalensis
Eleusine coracana subsp. africana
Elionurus muticus
Enneapogon scoparius
Eragrostis caesia
Eragrostis capensis
Eragrostis chloromelas
Eragrostis cilianensis
Eragrostis curvula
Eragrostis gummiflua
Eragrostis lappula
Eragrostis lehmanniana var. chaunantha
Eragrostis lehmanniana var. lehmanniana
Eragrostis mexicana subsp. virescens; Naturalised
Eragrostis obtusa
Eragrostis patentissima
Eragrostis plana
Eragrostis planiculmis
Eragrostis racemosa
Eragrostis remotiflora
Eragrostis sclerantha subsp. sclerantha
Eragrostis tef; Naturalised
Eriochrysis brachypogon
Festuca caprina

Festuca scabra
Fingerhuthia africana
Fingerhuthia sesleriiformis
Harpochloa falx
Helictotrichon turgidulum
Hemarthria altissima
Heteropogon contortus
Holcus lanatus; Naturalised; Invasive
Hyparrhenia anamesa
Hyparrhenia dregeana
Hyparrhenia hirta
Imperata cylindrica
Koeleria capensis
Leersia hexandra
Lolium multiflorum; Naturalised; Invasive
Lolium temulentum; Naturalised; Invasive
Lophacme digitata
Loudetia densispica
Loudetia simplex
Melinis nerviglumis
Microchloa caffra
Monocymbium ceresiiforme
Panicum ecklonii
Panicum natalense
Panicum schinzii
Paspalum dilatatum; Naturalised; Invasive
Paspalum distichum; Naturalised; Invasive
Paspalum urvillei; Naturalised; Invasive
Pennisetum clandestinum; Naturalized; Invasive
Pennisetum macrourum
Pennisetum sphacelatum
Pennisetum thunbergii
Pennisetum unisetum
Perotis sp.
Phalaris arundinacea; Naturalised
Phalaris canariensis; Naturalised
Phalaris minor; Naturalised
Poa annua; Naturalised
Poa binata
Pogonarthria squarrosa
Rendlia altera
Sacciolepis chevalieri
Sacciolepis typhura
Schizachyrium sanguineum
Setaria incrassata
Setaria nigrirostris
Setaria pumila
Setaria sphacelata var. sphacelata
Setaria sphacelata var. torta
Sorghum bicolor subsp. arundinaceum
Sporobolus albicans

Sporobolus centrifugus
Sporobolus discosporus
Sporobolus fimbriatus
Stiburus alopecuroides
Stiburus conrathii
Themeda triandra
Trachypogon spicatus
Tragus berteronianus
Tragus racemosus
Triraphis andropogonoides
Tristachya leucothrix
Tristachya rehmannii
Urochloa panicoides

Polygalaceae
Polygala africana
Polygala albida subsp. albida
Polygala gerrardii
Polygala gracilenta
Polygala hottentotta
Polygala krumanina
Polygala ohlendorfiana
Polygala transvaalensis
Polygala transvaalensis subsp. transvaalensis
Polygala uncinata
Polygala virgata var. decora

Polygonaceae
Oxygonum dregeanum subsp. *canescens* var. *canescens*
Oxygonum dregeanum subsp. *swazicum*
Persicaria amphibia; Naturalised
Persicaria decipiens
Persicaria hystricula
Persicaria lapathifolia; Naturalised; Invasive
Persicaria madagascariensis
Rumex acetosella subsp. angiocarpus; Naturalised; Invasive, NEMBA Category 1b
Rumex crispus; Naturalised; Invasive
Rumex lanceolatus
Rumex sagittatus
Rumex woodii

Pontederiaceae
Pontederia cordata; Naturalised

Portulacaceae
Portulaca oleracea; Naturalised

Pottiaceae
Didymodon tophaceus
Trichostomum brachydontium

Proteaceae
Protea roupelliae subsp. *roupelliae*

Pteridaceae
Cheilanthes eckloniana
Cheilanthes hirta var. *brevipilosa*
Cheilanthes hirta var. *hirta*
Cheilanthes hirta var. *nemorosa*
Cheilanthes multifida subsp. *lacerata*
Cheilanthes quadripinnata
Cheilanthes viridis var. *viridis*
Pellaea calomelanos var. *calomelanos*
Pityrogramma argentea

Ranunculaceae
Clematis brachiata
Peltocalathos baurii
Ranunculus dregei
Ranunculus multifidus
Ranunculus trichophyllus

Rhamnaceae
Ziziphus zeyheriana

Rosaceae
Agrimonia procera; Naturalised; Invasive
Alchemilla capensis
Alchemilla woodii
Rubus ludwigii subsp. ludwigii
Sanguisorba minor subsp. muricata; Naturalised

Rubiaceae
Anthospermum herbaceum
Anthospermum rigidum subsp. rigidum
Canthium inerme
Cephalanthus natalensis
Galium capense subsp. capense
Galium capense subsp. garipense var. garipense
Kohautia amatymbica
Kohautia caespitosa subsp. brachyloba
Pachystigma pygmaeum
Pachystigma thamnus
Pentanisia angustifolia
Pentanisia prunelloides subsp. prunelloides
Pentanisia prunelloides subsp. latifolia
Richardia brasiliensis; Naturalised
Spermacoce natalensis

Ruscaceae
Eriospermum cooperi var. *cooperi*
Eriospermum corymbosum

Eriospermum flagelliforme
Eriospermum porphyrium
Eriospermum porphyrovalve

Rutaceae
Ruta graveolens; Naturalised

Salicaceae
Salix babylonica var. *babylonica*; Naturalised

Santalaceae
Thesium asterias
Thesium costatum var. costatum
Thesium costatum var. juniperinum
Thesium goetzeanum
Thesium pallidum
Thesium scirpioides

Scrophulariaceae
Chaenostoma neglectum
Chaenostoma patrioticum
Diclis rotundifolia
Gomphostigma virgatum
Hebenstretia angolensis
Hebenstretia comosa Indigenous
Hebenstretia oatesii subsp. oatesii
Hebenstretia rehmannii
Jamesbrittenia aurantiaca
Jamesbrittenia montana
Jamesbrittenia stricta
Limosella longiflora
Limosella maior
Manulea bellidifolia
Manulea rhodantha subsp. *aurantiaca*
Melanospermum rupestre
Melanospermum transvaalense
Nemesia fruticans
Selago capitellata
Selago densiflora
Selago galpinii
Teedia lucida
Tetraselago longituba
Zaluzianskya elongata
Zaluzianskya rubrostellata
Zaluzianskya spathacea

Solanaceae
Cestrum parqui; Naturalised; Invasive
Datura stramonium; Naturalised; Invasive, NEMBA Category 1b
Physalis angulata; Naturalised; Invasive
Solanum aculeatissimum; Naturalised

Solanum campylacanthum
Solanum capense
Solanum elaegnifolium; Naturalised; Invasive, NEMBA Category 1b
Solanum humile
Solanum lichtensteinii
Solanum panduriforme
Solanum retroflexum
Solanum sisymbriifolium; Naturalised; Invasive, NEMBA Category 1b

Thymelaeaceae
Gnidia fastigiata
Gnidia gymnostachya
Gnidia nodiflora
Lasiosiphon burchellii
Lasiosiphon caffer
Lasiosiphon kraussianus
Lasiosiphon microcephalus

Typhaceae
Typha capensis

Valerianaceae
Valeriana capensis var. *capensis*

Verbenaceae
Chascanum latifolium var. *transvaalense*
Lantana rugosa
Verbena bonariensis; Naturalised; Invasive, NEMBA Category 1b
Verbena rigida; Naturalised; Invasive

Vitaceae
Cissus diversilobata

Xyridaceae
Xyris capensis
Xyris gerrardii

Zygophyllaceae
Tribulus terrestris

Appendix 3: Flora protected under the Mpumalanga Nature Conservation Act No. 10 of 1998.

SCHEDULE 11: PROTECTED PLANT SPECIES (SECTION 69 (1) (a))

Common name	**Scientific name**
All species of tree ferns, excluding the bracken fern	All species of the Genus: Cyathea capensis and Cyathea dregei
All species of cycads in Republic of South Africa and the seedlings of the species of cycads referred to in Schedule 12	All species of the family Zamiaceae occurring in the Republic of South Africa and the seedlings of the species of Encephalartos referred to in Schedule 12
All species of yellow wood	Podocarpus spp.
All species of arum lilies	Zantedeschia spp.
"volstruiskos"	Schizobasis intricata
"knolklimop"	Bowiea volubilis
All species of red-hot pokers	Kniphofia spp.
All species of aloes, excluding: (a) all species not occurring in Mpumalanga and (b) the following species: all species of haworthias all species of agapanthus all species of squill	Aloe spp., excluding: (a) all species not occurring in Mpumalanga and (b) the following species: Haworthia spp. Agapanthus spp. Scilla spp.
All species of pineapple flower	Eucomis spp.
All species of dracaena	Dracaena spp.
All species of paintbrush	Haemanthus spp. and Scadoxus spp.
Cape poison bulb	Boophone disticha
All species of clivia	Clivia spp.
All species of brunsvigia	Brunsvigia spp.
All species of crinum	Crinum spp.
Ground lily	Ammocharis coranica
All species of fire lily	Cyrtanthus spp.
All species of elephantsfoot	Dioscorea spp.
River lily	Hesperantha coccinea
All species of gladioli	Gladiolus spp.
All species of watsonia	Watsonia spp.
Wild ginger	Siphonochilus aethiopicus
All species of orchids	All species of the family Orchidaceae
All species of the family proteaceae	All species of the family Proteaceae
All species of black stinkwood	Ocotea spp.
kiaat	Pterocarpus angolensis
tamboti	Spirostachys africana
The following species of euphorbias: Euphorbia bernardii and Euphorbia grandialata	The following species of euphorbias: Euphorbia bernardii and Euphorbia grandialata
Common bersama	Bersama tysoniana
Red ivory	Berchema zeyheri
Pepperbark tree	Warburgia salutaris
All species of ardenia	Adenia spp.
Bastard onion wood	Cassipourea gerrardii
Assegai tree	Curtisia dentata
All species of olive trees	All species of the Genus Olea
All species of impala lilies	All species of the Genus Adenium

Kudu lily	Pachypodium saundersii
All species of brachystelma	Brachystelma spp.
All species of ceropegia	Ceropegia spp.
All species of huerniopsis and huernia	Huerniopsis and Huernia spp.
All species of duvalia	Duvalia spp.
All species of stapeliads	Stapelia spp.
All species of orbeanthus	Orbeanthus spp.
All species of orbeas	Orbea spp.
All species of orbeopsis	Orbeopsis spp.

SCHEDULE 12: SPECIALLY PROTECTED PLANT SPECIES (SECTION 69 (1) (b))
In this schedule "seedling" means a plant of which the diameter of the trunk or bulb, either above or below the ground, does not exceed 150 mm.

Common name	**Scientific name**
All plants, excluding seedlings, of the following species of cycads: dolomiticus, dyer, middelburg, eugene marais, heenan, inopinus, laevifolius, lanatus, lebombo, ngoyanus, paucidentatus, modjadje and villosus	All plants, excluding seedlings, of the following species of the Genus Encephalartos: E. dolomiticus, E. dyerianus, E. middelburgensis, E. eugene maraisii, E. heenanii, E. inopinus, E. laevifolius, E. lanatus, E. lebomboensis, E. ngoyanus, E. paucidentatus, E. transvenosus and E. villosus and any species derived from the above species
All plants of the following species of cycads: cupidus and humilus	All plants of the following species of the Genus Encephalartos: E. cupidus and E. humilus
All species of cycads in their natural habitat	All plants of the Genus Encephalartos in their natural habitat

Appendix 4: Flora protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)

(as updated in R. 1187, 14 December 2007)

CRITICALLY ENDANGERED SPECIES

Flora

Adenium swazicum
Aloe pillansii
Diaphananthe millarii
Dioscorea ebutsniorum
Encephalartos aemulans
Encephalartos brevifoliolatus
Encephalartos cerinus
Encephalartos dolomiticus
Encephalartos heenanii
Encephalartos hirsutus
Encephalartos inopinus
Encephalartos latifrons
Encephalartos middelburgensis
Encephalartos nubimontanus
Encephalartos woodii

ENDANGERED SPECIES

Flora

Angraecum africae
Encephalartos arenarius
Encephalartos cupidus
Encephalartos horridus
Encephalartos laevifolius
Encephalartos lebomboensis
Encephalartos msinganus
Jubaeopsis caffra
Siphonochilus aethiopicus
Warburgia salutaris
Newtonia hilderbrandi

VULNERABLE SPECIES

Flora

Aloe albida
Encephalartos cycadifolius
Encephalartos Eugene-maraisii
Encephalartos ngovanus
Merwilla plumbea
Zantedeschia jucunda

PROTECTED SPECIES

Flora

Adenia wilmsii
Aloe simii
Clivia mirabilis
Disa macrostachya
Disa nubigena
Disa physodes
Disa procera
Disa sabulosa
Encephelartos altensteinii
Encephelartos caffer
Encephelartos dyerianus
Encephelartos frederici-guilielmi
Encephelartos ghellinckii
Encephelartos humilis
Encephelartos lanatus
Encephelartos lehmannii
Encephelartos longifolius
Encephelartos natalensis
Encephelartos paucidentatus
Encephelartos princeps
Encephelartos senticosus
Encephelartos transvenosus
Encephelartos trispinosus
Encephelartos umbeluziensis
Encephelartos villosus
Euphorbia clivicola
Euphorbia meloformis
Euphorbia obesa
Harpagophytum procumbens
Harpagophytum zeyherii
Hoodia gordonii
Hoodia currorii
Protea odorata
Stangeria eriopus

Appendix 5: Curriculum vitae: Dr David Hoare

Education
Matric - Graeme College, Grahamstown, 1984
BSc (majors: Botany, Zoology) - Rhodes University, 1991-1993
BSc (Hons) (Botany) - Rhodes University, 1994 with distinction
MSc (Botany) - University of Pretoria, 1995-1997 with distinction
PhD (Botany) – Nelson Mandela Metropolitan University, Port Elizabeth

Main areas of specialisation
- Vegetation ecology, primarily in grasslands, thicket, coastal systems, wetlands.
- Plant biodiversity and threatened plant species specialist.
- Alien plant identification and control / management plans.
- Remote sensing, analysis and mapping of vegetation.
- Specialist consultant for environmental management projects.

Membership
Professional Natural Scientist, South African Council for Natural Scientific Professions, 16 August 2005 – present. Reg. no. 400221/05 (Ecology, Botany)
Member, International Association of Vegetation Scientists (IAVS)
Member, Ecological Society of America (ESA)
Member, International Association for Impact Assessment (IAIA)
Member, Herpetological Association of Africa (HAA)

Employment history
1 December 2004 – present, Director, David Hoare Consulting (Pty) Ltd. Consultant, specialist consultant contracted to various companies and organisations.
1 January 2009 – 30 June 2009, Lecturer, University of Pretoria, Botany Dept.
1 January 2013 – 30 June 2013, Lecturer, University of Pretoria, Botany Dept.
1 February 1998 – 30 November 2004, Researcher, Agricultural Research Council, Range and Forage Institute, Private Bag X05, Lynn East, 0039. Duties: project management, general vegetation ecology, remote sensing image processing.

Experience as consultant
Ecological consultant since 1995. Author of over 800 specialist ecological consulting reports. Wide experience in ecological studies within grassland, savanna and fynbos, as well as riparian, coastal and wetland vegetation.

Publication record:
Refereed scientific articles (in chronological order):
Journal articles:

HOARE, D.B. & BREDENKAMP, G.J. 1999. Grassland communities of the Amatola / Winterberg mountain region of the Eastern Cape, South Africa. *South African Journal of Botany* 64: 44-61.

HOARE, D.B., VICTOR, J.E., LUBKE, R.A. & MUCINA, L., 2000. Vegetation of the coastal fynbos and rocky headlands south of George, South Africa. *Bothalia* 30: 87-96.

VICTOR, J.E., **HOARE, D.B.** & LUBKE, R.A., 2000. Checklist of plant species of the coastal fynbos and rocky headlands south of George, South Africa. *Bothalia* 30: 97-101.

MUCINA, L, BREDENKAMP, G.J., **HOARE, D.B** & MCDONALD, D.J. 2000. A National Vegetation Database for South Africa *South African Journal of Science* 96: 1-2.

HOARE, D.B. & BREDENKAMP, G.J. 2001. Syntaxonomy and environmental gradients of the grasslands of the Stormberg / Drakensberg mountain region of the Eastern Cape, South Africa.. *South African Journal of Botany* 67: 595 – 608.

LUBKE, R.A., **HOARE, D.B.**, VICTOR, J.E. & KETELAAR, R. 2003. The vegetation of the habitat of the Brenton blue butterfly, Orachrysops niobe (Trimen), in the Western Cape, South Africa. *South African Journal of Science* 99: 201–206.

HOARE, D.B & FROST, P. 2004. Phenological classification of natural vegetation in southern Africa using AVHRR vegetation index data. *Applied Vegetation Science* 7: 19-28.

FOX, S.C., HOFFMANN, M.T. and HOARE, D. 2005. The phenological pattern of vegetation in Namaqualand, South Africa and its climatic correlates using NOAA-AVHRR NDVI data. South African Geographic Journal, 87: 85–94.

Pfab, M.F., Compaan, P.C., Whittington-Jones, C.A., Engelbrecht, I., Dumalisile, L., Mills, L., West, S.D., Muller, P., Masterson, G.P.R., Nevhutalu, L.S., Holness, S.D., **Hoare, D.B.** 2017. The Gauteng Conservation Plan: Planning for biodiversity in a rapidly urbanising province. Bothalia, Vol. 47:1. a2182. https://doi.org/10.4102/abc.v47i1.2182.

Book chapters and conference proceedings:

HOARE, D.B. 2002. Biodiversity and performance of grassland ecosystems in communal and commercial farming systems in South Africa. Proceedings of the FAO's Biodiversity and Ecosystem Approach in Agriculture, Forestry and Fisheries Event: 12–13 October, 2002. Food and Agriculture Organisation of the United Nations, Viale delle Terme di Caracalla, Rome, Italy. pp. 10 - 27.

STEENKAMP, Y., VAN WYK, A.E., VICTOR, J.E., **HOARE, D.B.**, DOLD, A.P., SMITH, G.F. & COWLING, R.M. 2005. Maputaland-Pondoland-Albany Hotspot. In: Mittermeier, R.A., Gil, P.R., Hoffmann, M., Pilgrim, J., Brooks, T., Mittermeier, C.G., Lamoreux, J. & Fonseca, G.A.B. da (eds.) *Hotspots revisited.* CEMEX, pp.218–229. ISBN 968-6397-77-9

STEENKAMP, Y., VAN WYK, A.E., VICTOR, J.E., **HOARE, D.B.**, DOLD, A.P., SMITH, G.F. & COWLING, R.M. 2005. Maputaland-Pondoland-Albany Hotspot. **Error! Hyperlink reference not valid.**.

HOARE, D.B., MUCINA, L., RUTHERFORD, M.C., VLOK, J., EUSTON-BROWN, D., PALMER, A.R., POWRIE, L.W., LECHMERE-OERTEL, R.G., PROCHES, S.M., DOLD, T. and WARD, R.A. *Albany Thickets.* in Mucina, L. and Rutherford, M.C. (eds.) 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19, South African National Biodiversity Institute, Pretoria.

MUCINA, L., **HOARE, D.B.**, LÖTTER, M.C., DU PREEZ, P.J., RUTHERFORD, M.C., SCOTT-SHAW, C.R., BREDENKAMP, G.J., POWRIE, L.W., SCOTT, L., CAMP, K.G.T., CILLIERS, S.S., BEZUIDENHOUT, H., MOSTERT, T.H., SIEBERT, S.J., WINTER, P.J.D., BURROWS, J.E., DOBSON, L., WARD, R.A., STALMANS, M., OLIVER, E.G.H., SIEBERT, F., SCHMIDT, E., KOBISI, K., KOSE, L. 2006. *Grassland Biome*. In: Mucina, L. & Rutherford, M.C. (eds.) The

vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

RUTHERFORD, M.C., MUCINA, L., LÖTTER, M.C., BREDENKAMP, G.J., SMIT, J.H.L., SCOTT-SHAW, C.R., **HOARE, D.B.**, GOODMAN, P.S., BEZUIDENHOUT, H., SCOTT, L. & ELLIS, F., POWRIE, L.W., SIEBERT, F., MOSTERT, T.H., HENNING, B.J., VENTER, C.E., CAMP, K.G.T., SIEBERT, S.J., MATTHEWS, W.S., BURROWS, J.E., DOBSON, L., VAN ROOYEN, N., SCHMIDT, E., WINTER, P.J.D., DU PREEZ, P.J., WARD, R.A., WILLIAMSON, S. and HURTER, P.J.H. 2006. *Savanna Biome*. In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

MUCINA, L., RUTHERFORD, M.C., PALMER, A.R., MILTON, S.J., SCOTT, L., VAN DER MERWE, B., **HOARE, D.B.**, BEZUIDENHOUT, H., VLOK, J.H.J., EUSTON-BROWN, D.I.W., POWRIE, L.W. & DOLD, A.P. 2006. *Nama-Karoo Biome*. In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

MUCINA, L., SCOTT-SHAW, C.R., RUTHERFORD, M.C., CAMP, K.G.T., MATTHEWS, W.S., POWRIE, L.W. and **HOARE, D.B.** 2006. *Indian Ocean Coastal Belt.* In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

Conference Presentations:

HOARE, D.B. & LUBKE, R.A. *Management effects on diversity at Goukamma Nature Reserve, Southern Cape*; Paper presentation, Fynbos Forum, Bienne Donne, July 1994

HOARE, D.B., VICTOR, J.E. & LUBKE, R.A. *Description of the coastal fynbos south of George, southern Cape*; Paper presentation, Fynbos Forum, Bienne Donne, July 1994

HOARE, D.B. & LUBKE, R.A. *Management effects on fynbos diversity at Goukamma Nature Reserve, Southern Cape*; Paper presentation, South African Association of Botanists Annual Congress, Bloemfontein, January 1995

HOARE, D.B. & BOTHA, C.E.J. *Anatomy and ecophysiology of the dunegrass Ehrharta villosa var. maxima*; Poster presentation, South African Association of Botanists Annual Congress, Bloemfontein, January 1995

HOARE, D.B., PALMER, A.R. & BREDENKAMP, G.J. 1996. *Modelling grassland community distributions in the Eastern Cape using annual rainfall and elevation*; Poster presentation, South African Association of Botanists Annual Congress, Stellenbosch, January 1996

HOARE, D.B. Modelling vegetation on a past climate as a test for palaeonological hypotheses on vegetation distributions; Paper presentation, Randse Afriakaanse Universiteit postgraduate symposium, 1997

HOARE, D.B., VICTOR, J.E. & BREDENKAMP, G.J. *Historical and ecological links between grassy fynbos and afromontane fynbos in the Eastern Cape*; Paper presentation, South African Association of Botanists Annual Congress, Cape Town, January 1998

LUBKE, R.A., HOARE, D.B., VICTOR, J.E. & KETELAAR, R. *The habitat of the Brenton Blue Butterfly*. Paper presentation, South African Association of Botanists Annual Congress, Cape Town, January 1998

HOARE, D.B. & PANAGOS, M.D. Satellite stratification of vegetation – structure or floristic composition? Poster presentation at the 34th Annual Congress of the Grassland Society of South Africa, Warmbaths, 1-4 February 1999.

HOARE, D.B. & WESSELS, K. Conservation status and threats to grasslands of the northern regions of South Africa, Poster presentation at the South African Association of Botanists Annual Congress, Potchefstroom, January 2000.

HOARE, D.B. Phenological dynamics of Eastern Cape vegetation. Oral paper presentation at the South African Association of Botanists Annual Congress, Grahamstown, January 2002.
HOARE, D.B., MUCINA, L., VAN DER MERWE, J.P.H. & PALMER, A.R. Classification and digital mapping of grasslands of the Eastern Cape Poster presentation at the South African Association of Botanists Annual Congress, Grahamstown, January 2002.
HOARE, D.B. Deriving phenological variables for Eastern Cape vegetation using satellite data Poster presentation at the South African Association of Botanists Annual Congress, Grahamstown, January 2002.
MUCINA, L., RUTHERFORD, M.C., HOARE, D.B. & POWRIE, L.W. 2003. VegMap: The new vegetation map of South Africa, Lesotho and Swaziland. In: Pedrotti, F. (ed.) Abstracts: Water Resources and Vegetation, 46th Symposium of the International Association for Vegetation Science, June 8 to 14 – Napoli, Italy.
HOARE, D.B. 2003. Species diversity patterns in moist temperate grasslands of South Africa. Proceedings of the VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa. African Journal of Range and Forage Science. 20: 84.

Unpublished technical reports:

PALMER, A.R., HOARE, D.B. & HINTSA, M.D., 1999. Using satellite imagery to map veld condition in Mpumalanga: A preliminary report. Report to the National Department of Agriculture (Directorate Resource Conservation). ARC Range and Forage Institute, Grahamstown.
HOARE, D.B. 1999. The classification and mapping of the savanna biome of South Africa: methodology for mapping the vegetation communities of the South African savanna at a scale of 1:250 000. Report to the National Department of Agriculture (Directorate Resource Conservation). ARC Range and Forage Institute, Pretoria.
HOARE, D.B. 1999. The classification and mapping of the savanna biome of South Africa: size and coverage of field data that exists on the database of vegetation data for South African savanna. Report to the National Department of Agriculture (Directorate Resource Conservation). ARC Range and Forage Institute, Pretoria.
THOMPSON, M.W., VAN DEN BERG, H.M., NEWBY, T.S. & HOARE, D.B. 2001. Guideline procedures for national land-cover mapping and change monitoring. Report no. ENV/P/C 2001-006 produced for Department of Water Affairs and Forestry, National Department of Agriculture and Department of Environment Affairs and Tourism. Copyright: Council for Scientific and Industrial Research (CSIR) and Agricultural Research Council (ARC).
HOARE, D.B. 2003. Natural resource survey of node O R Tambo, using remote sensing techniques, Unpublished report and database of field data for ARC Institute for Soil, Climate & Water, ARC Range and Forage Institute, Grahamstown.
HOARE, D.B. 2003. Short-term changes in vegetation of Suikerbosrand Nature Reserve, South Africa, on the basis of resampled vegetation sites. Gauteng Department of Agriculture, Conservation, Environment and Land Affairs, Conservation Division.
BRITTON, D., SILBERBAUER, L., ROBERTSON, H., LUBKE, R., HOARE, D., VICTOR, J., EDGE, D. & BALL, J. 1997. The Life-history, ecology and conservation of the Brenton Blue Butterfly (*Orachrysops niobe*) (Trimen)(*Lycaenidea*) at Brenton-on-Sea. Unpublished report for the Endangered Wildlife Trust of Southern Africa, Johannesburg. 38pp.
HOARE, D.B., VICTOR, J.E. & MARNEWIC, G. 2005. Vegetation and flora of the wetlands of Nylsvley River catchment as component of a project to develop a framework for the sustainable management of wetlands in Limpopo Province.

Consulting reports:

Total of over 800 specialist consulting reports for various environmental projects from 1995 – present.

Workshops / symposia attended:

International Association for Impact Assessment Annual Congress, Durban, 16 – 19 May 2018.

Workshop on remote sensing of rangelands presented by Paul Tueller, University of Nevada Reno, USA, VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa.

VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa.

BioMap workshop, Stellenbosch, March 2002 to develop strategies for studying vegetation dynamics of Namaqualand using remote sensing techniques

South African Association of Botanists Annual Congress, Grahamstown, January 2002.

28th International Symposium on Remote Sensing of Environment, Somerset West, 27-31 March 2000.

Workshop on Vegetation Structural Characterisation: Tree Cover, Height and Biomass, 28th International Symposium on Remote Sensing of Environment, Strand, 26 March 2000.

South African Association of Botanists Annual Congress, Potchefstroom, January 2000

National Botanical Institute Vegmap Workshop, Kirstenbosch, Cape Town, 30 September-1 October 1999.

Sustainable Land Management – Guidelines for Impact Monitoring, Orientation Workshop: Sharing Impact Monitoring Experience, Zithabiseni, 27-29 September 1999.

WWF Macro Economic Reforms and Sustainable Development in Southern Africa, Environmental Economic Training Workshop, development Bank, Midrand, 13-14 September 1999.

34th Annual Congress of the Grassland Society of South Africa, Warmbaths, 1-4 February 1999

Expert Workshop on National Indicators of Environmentally Sustainable Development, Dept. of Environmental Affairs and Tourism, Roodevallei Country Lodge, Roodeplaat Dam, Pretoria, 20-21 October 1998.

South African Association of Botanists Annual Congress, Cape Town, January 1998

Randse Afrikaanse Universiteit postgraduate symposium, 1997.

South African Association of Botanists Annual Congress, Bloemfontein, January 1995.