Lomond Safari 88kV Powerline.
Portion 0 Of the Farm Weldaba 567 JQ,
North West Province

Terrestrial Biodiversity (Vegetation) Assessment and Plant Compliance Statement

Date: December 2021

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Indemnity

This report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken. The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information at the time of study. Therefore, the author reserves the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

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Expertise of author:

- Working in the field of ecology, and in specific vegetation related assessments, since 2007;
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- Has been working with plants indigenous to South Africa since 1997.

Declaration of independence:

Dimela Eco Consulting in 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 Dimela Eco Consulting is not subjected to or based on approval of the proposed project by the relevant authorities responsible for authorising this proposed project.

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Dimela Eco Consulting 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 Dimela Eco Consulting by the client, and in addition to information obtained during the course of this study, Dimela Eco Consulting present the results and conclusion within the associated document to the best of the authors professional judgement and in accordance with best practise.

_____ ____2021.01.13_____

Antoinette Eyssell Date

SACNASP Reg. No. 400019/11

EXECUTIVE SUMMARY

Dimela Eco Consulting was tasked by MuTingati Environmental and Projects to undertake a terrestrial biodiversity (vegetation) assessment for the proposed Safari-Lomond 88kV powerline. This report forms the vegetation input of a terrestrial biodiversity assessment.

The site is classified as 'very high terrestrial biodiversity sensitivity' by the National Web based Environmental Screening Tool. The powerline area is also classified as medium for plant species, indicating that suitable habitat may be present, but no confirmed habitat or records for such species were previously recorded on the site.

If the specialist is of the opinion that impacts caused by a proposed linear development could be rehabilitated within two years, a vegetation compliance statement could be submitted. However, due to the perceived sensitivity of the area and potential to support plant species of conservation concern, this report entailed a more comprehensive assessment, which includes a site verification, assessment of the route and at least 20m on either side of the route, mapping of vegetation and potential habitat for plant species of conservation concern and an impact assessment.

The terms of reference were interpreted as follows:
Complete a terrestrial plant assessment in line with the terrestrial biodiversity protocols, including

- Research regional background information pertaining the route and substation area such as the North West Biodiversity Sector Plan, vegetation types and threatened ecosystems, recent land use maps as well as aerial imagery;
- List the threatened or protected plant and tree species that was historically recorded in the area and that have a likelihood of being present in and around the servitude;
- Based on the information gathered, undertake a site survey of the servitude, and undertake sampling at regular intervals. The sampling areas will focus on potential sensitive areas or habitats to threatened plants (e.g. wetland, rocky areas, koppies), recording protected trees / plant species at sampling points and any other sensitivities that may be encountered within the servitude;
- Determine the state of the vegetation and vegetation communities present;
- Report and map describing the broad vegetation communities found along the route and its conservation importance and function within the landscape
- Map indicating ecologically sensitive vegetation groupings; and
- Impact assessment and recommendation to mitigate potential impacts.

Include in the above a plant species compliance report.

- Report and map the habitat for plant species of conservation concern for which suitable habitat is present on the site or were confirmed to occur.
- Depending on the results, a plant species assessment may be recommended.

The following limitations is applicable, although not considered fatal flaws to the study:

- Vegetation studies should be conducted during the growing season of all plant species that may

potentially occur. This may require more than one season's survey with two visits undertaken preferably during November and February. This report relied on a single site visit undertaken on the 10th of December 2021, after good summer rains.

- The area has not recently burnt, and some areas were overgrown with either the invasive *Lantana camara* or moribund grasses. This limited visibility and smaller species may have been overlooked.

The Project Area of Influence (PAOI) was defined as per the Species Environmental Assessment Guideline (SANBI, 2020) and is based on the development footprint and the potential extent of the impacts (e.g., edge effects) of the project activities.

- The powerline route was regarded as the primary PAOI.
- A buffer area of 10m on either side of the route in which construction vehicles, equipment and pollution could have an impact, was included as the secondary PAOI.
- Adverse impacts could extent beyond the 10mbuffer an additional 10m was scanned for sensitive ecological features and is referred to here as the tertiary PAOI.

Sampling was undertaken mainly within the primary and secondary AOI. The site was undertaken on the 10th of December 2021, after good summer rainfall fell.

Baseline information

The area that the site is situated in is dominated by shale. According to national spatial layers, the western extent of the route will traverse the origins of a non-perennial drainage line that drains southwards. The powerline traverses the Gauteng Shale Mountain Bushveld vegetation type which is poorly protected and classified as a Vulnerable vegetation unit. The proposed powerline route does not fall within a listed ecosystem; however it traverses a Critical Biodiversity Area 2 (CBA2), with a small portion of a CBA1 in the most western extent. The site is embedded within the Magaliesberg Biosphere Reserve but are excluded from it.

Historic aerial imagery show that in 1969 the area that the powerline is proposed in, comprised grassland with some tree cover in drainage lines or historically disturbed areas. The exisitng reservoirs can already be seen in this image and the commencement of construction activities to the north-west of the route. From the reservoir, the water pipeline route towards the newly constructed facilities can be noted. By 1985 additional pipeline routes can be seen from the reservoir, as well as additional disturbances of unknown origins. Lomond substation was already constructed; however, it seems Safari was not yet in existence. The vegetation comprised grassland with limited tree cover noted. By the year 1996, several additional infrastructures were constructed, and dirt roads traverse the area. Google Earth Satellite image of the area in 2010 and the recent 2021 image, show a significant increase in the tree layer.

During the site visit, it was found that earthworks has compacted the soils close to Safari in the west, which is currently sparsely vegetated. Building rubble was noted directly west of Safari. The route in the eastern extent was also historically disturbed and it is thought than an exisitng pipeline / cable might follow much of the same route. Several historic dirt tracks are still compacted and only sparsely

colonised by vegetation, while heaps of shale were found along most of the western extent of the route. It is likely that shale was mined from the site, or that it was excavated for the construction of the reservoirs, pipelines and other underground infrastructure.

Vegetation groups and Site Ecological Importance

Much of the site comprised open bushveld with densely invaded *Lantana*-thicket along historically disturbed pipeline routes. A dense tree layer is present around the drainage line in the western extent of the route. The vegetation is representative of the Gauteng Shale Mountain Bushveld, albeit dominated by pioneer and encroacher tree species. Several disturbances were noted throughout the proposed powerline route extent and has degraded the bushveld to a secondary state. The vegetation around the substations has been modified by infrastructure and related activities, planted gardens and mowing. However, several trees typical to the Gauteng Shale Mountain Bushveld persists.

The vegetation delineated on the site was grouped as per the table below. The Site Ecological Importance for each vegetation groups is discussed thereafter.

Broad vegetation group		Site Ecological Importance (SEI) – mitigation
1. Secondary Gauteng Shale Mountain Bushveld	*Senegalia caffra-Loudetia simplex* bushveld	Medium (Minimise & Restore)
	Searsia dominated bushveld	Very Low (Minimise)
	Lantana thicket	Low (Minimise & Restore)
2. *Searsia* dominated drainage line		Medium (Minimise & Restore)
3. Modified vegetation		Very Low (Minimise)

Plant species of conservation concern

Most of the threatened species that has been recorded in the area that the site is situated in, occurs on quartz and southern slopes, which is absent from the site. However, suitable habitat is present for four species and the possibility of occurrence for these species range from medium to low. Historic disturbances within the PAOI renders it unlikely to support such species. However, as most of the four species flower in late summer (Feb-March), the possibility of occurring can not be ruled out.

Concluding statement

The site falls in an area that is listed by the National Screening Tool as being of 'High' terrestrial biodiversity. Furthermore, the Screening Tool lists a 'Medium' sensitivity for plant species, indicating that there is a likelihood of plant species of conservation concern being present.

However, much of the proposed development footprint was found to be in a secondary state. Due to the largely modified and secondary nature of the vegetation, the proposed development of the powerline route will have a limited impact on sensitive vegetation. The entire powerline route is within proximity of existing roads. Therefore, limited to no additional access roads are needed, further limiting the proposed developments impacts on vegetation. Most of the powerline route follows a previously disturbed footprint, likely of a cable or pipeline.

According to the North West Biodiversity Sector Plan ((North West Department of Rural, Environment and Agricultural Development (READ), 2015), the site falls within a CBA2. The land use objective in a CBA2 should be to maintain the land in a natural or near-natural state that maximises the retention of biodiversity pattern and ecological process. The powerline may fragment fauna habitat, however, vegetation can regrow and can rehabilitate well. Eskom must strictly manage edge effects and prevent, monitor and rehabilitate negative impacts into adjacent vegetation. The implementation of a rehabilitation and monitoring plan to ensure that the vegetation is retuned to sustainable bushveld post construction must be implemented.

Protocol summary

The following table summaries results of the assessment as per the main requirements of the Protocols for Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial (Vegetation) Biodiversity as published on 20 March 2020.

Biodiversity (vegetation) aspect	Result
Conservation Plan Category: **CBA2**	**Reason for the CBA2** The CBA2 was classified by the North West Biodiversity Sector Plan based on: • the potential habitat for plant species of conservation concern, • the potential presence of primary vegetation, • Special habitats or important ecological features **Can the CBA2 be maintained?** Yes. The vegetation is currently in a secondary state and with adequate rehabilitation, can return to a secondary state. If the powerline servitude remain naturally vegetated and only pruned to Eskom standards, the CBA can be maintained. **Impact on species composition and structure of vegetation** Clearing of the servitude will destroy the species composition and vegetation structure within the development footprint. Edge effects and failed rehabilitation could result in a dominance of bush encroacher species. The resulting vegetation will have a much lower species diversity and an altered structure. However, mitigation measures can be implemented to reduce this impact. **Impact on ecosystem threat status** The powerline route is not situated in a listed ecosystem. However, the Gauteng Shale Mountain Bushveld is poorly protected and classified as a Vulnerable vegetation unit. The vegetation within the PAOI was found to be in a secondary state and can be rehabilitated to such a state post construction.

Biodiversity (vegetation) aspect	Result
Protected Areas	The site is embedded within the Magaliesberg Biosphere Reserve but are excluded from it. The Cradle of Humankind is to the south-west of the powerline route and the Crocodile River Reserve Protected Environment is situated to the south-east of the proposed powerline. No impacts to the protected areas are expected.
SWSA	**Impact(s) on the terrestrial habitat of a SWSA** The site is not situated within a SWSA, however clearing of vegetation can have an impact on water infiltration and flow dynamics to the downstream watercourses.
NFEPA	See aquatic / wetland assessment
Indigenous forest	Not applicable
Sensitive Areas	Other than the medium to low potential occurrence of plant species of conservation concern, the vegetation is not regarded as sensitive to the proposed development of the powerline route.
No go areas	Any vegetation that are not within the 20m buffer area on either side of the powerline (PAOI) as assessed in this report.
Plant species of conservation concern	• No plant species of conservation concern were recorded within walked transects and sample points at the time of this assessment. • Suitable habitat is present for four species, none of which was recorded during the site visit undertaken in December 2021. These species were not in flower at the time of the assessment or could have been obscured by dense vegetation (due to the preceding summer rains). • The possibility of occurrence for these species range from medium to low. Historic disturbances within the PAOI renders it unlikely to support such species. However, as most of the four species flower in late summer (Feb-March), it is recommended that the final footprint, especially pylon footprints, be scanned for such species during the flowering period.
Main impacts:	The main impacts expected are as follows: • Destruction of natural vegetation • Exposure to erosion and subsequent sedimentation or pollution of proximate non-perennial drainage line • Potential increase in invasive vegetation • Bush encroachment • Compaction and destruction of soils • Edge effects to surrounding vegetation
Cumulative impacts:	• If mitigation measures are adequately implemented, no cumulative impacts are expected.
Residual impacts:	• Due to the high frequency of alien invasive plant species, the likelihood of the colonization of areas disturbed by the development being infested remain high. • The risk of introduction of new alien invasive plant species • Pruning of trees and impact on vegetation as part of Eskom maintenance along the powerlines. • Species removed and relocated as part of rehabilitation could die due to transplantation shock or damage during replanting.

Biodiversity (vegetation) aspect	Result
	• If mitigation measures are adequately undertaken, the residual risk is moderate to low as the impacts are unlikely to be exceed the construction impacts and can be remedied if corrective action is taken immediately

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1 INTRODUCTION

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1.1 Locality and Project background

The proposed powerline will replace an existing underground cable between two existing substations on the farm Weldaba 567JQ, within the NECSA premises, Phelindaba. The proposed route is about 2.3 km in extent and will connects the Safari substation in the west, with the Lomond substation in the east (Figure 1). The route falls within the Madibeng Local Municipality in the North West Province and within the quarter degree square (QDS) 2527DD.

The Safari Rural substation is currently supplied through 2 x 88kV underground oil filled cables from the Lomond Main Transmission Substation (MTS). The cables sometimes lose pressure resulting in a loss of supply to the Safari Rural substation. To address the above situation, Eskom identified the following proposed project:

- Construction of a 1 x 88kV chickadee powerline of ±2.3km from Lomond MTS to Safari Rural substation. Steel structures will be utilised to build the HV powerline.
- Part of the 2 x 88kV underground oil filled cables will be dismantled and sealed off.
- The Safari Rural substation will be refurbished by replacing old and redundant equipment.

1.2 Terms of reference

The vegetation assessment will entail the following:

Complete a terrestrial plant assessment in line with the terrestrial biodiversity protocols, including

- Research regional background information pertaining the route and substation area such as the North West Biodiversity Sector Plan, vegetation types and threatened ecosystems, recent land use maps as well as aerial imagery;

- List the threatened or protected plant and tree species that was historically recorded in the area and that have a likelihood of being present in and around the servitude;
- Based on the information gathered, undertake a site survey of the servitude, and undertake sampling at regular intervals. The sampling areas will focus on potential sensitive areas or habitats to threatened plants (e.g. wetland, rocky areas, koppies), recording protected trees / plant species at sampling points and any other sensitivities that may be encountered within the servitude;
- Determine the state of the vegetation and vegetation communities present;
- Report and map describing the broad vegetation communities found along the route and its conservation importance and function within the landscape
- Map indicating ecologically sensitive vegetation groupings; and
- Impact assessment and recommendation to mitigate potential impacts.

Include in the above a plant species compliance report.

- Report and map the habitat for plant species of conservation concern for which suitable habitat is present on the site or were confirmed to occur.
- Depending on the results, a plant species assessment may be recommended.

1.3 Assumptions and limitations

The following limitations is applicable, although not considered fatal flaws to the study:

- Vegetation studies should be conducted during the growing season of all plant species that may potentially occur. This may require more than one season's survey with two visits undertaken preferably during November and February. This report relied on a single site visit undertaken on the 10th of December 2021, after good summer rains.
- The area has not recently burnt, and some areas were overgrown with either the invasive *Lantana camara* or moribund grasses. This limited visibility and smaller species may have been overlooked.

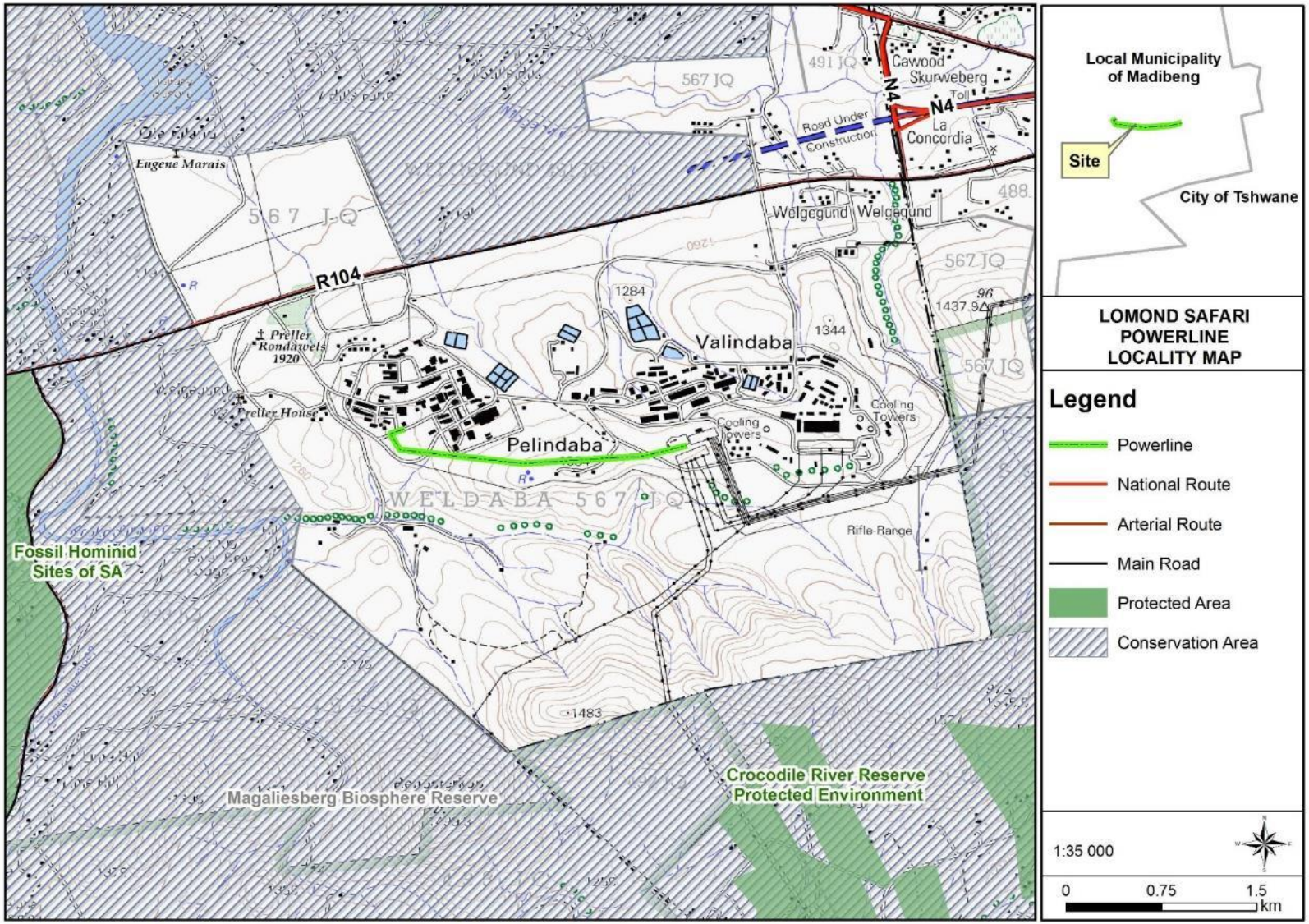


Figure 1: Locality Map

2 METHODOLOGY

The assessment entailed a literature review, a site survey and reporting. The methodology used is shortly summarised below.

2.1 Literature and data review

The description of the regional vegetation relied on literature from Mucina & Rutherford (2006). Several field guides were used to identify plant species, including Van Wyk & Van Wyk (1997), Van Wyk & Malan (1997), Pooley (1998), Henderson (2001), Van Oudtshoorn (2002) and Bromilow (2010).

Data and literature consulted:

- The North West Biodiversity Sector Plan
- Information on plant species recorded for the Quarter Degree Square (QDS) that the site is situated in was extracted from the Botanical Database of Southern Africa hosted by SANBI on the new Plants of Southern Africa website (https://posa.sanbi.org).
- The IUCN conservation status for plant species of conservation concern was verified on the website for the Threatened Species Programme, Red List of South African Plants (Red List of South African plants version 2020(http://redlist.sanbi.org/)).
- Threatened Ecosystem data was extracted from the NEM:BA listed ecosystems layer (SANBI 2008).
- Relevant literature, including historic vegetation reports undertaken for this area.
- Historical aerial imagery downloaded from Chief Directorate: National Geospatial Information Geospatial Portal (http://www.cdngiportal.co.za/cdngiportal).
- Citizen Science Website: iNaturalist.org

2.2 Project Area of Influence (PAOI)

The Project Area of Influence (PAOI) was defined as per the Species Environmental Assessment Guideline (SANBI, 2020) and is based on the development footprint and the potential extent of the impacts (e.g., edge effects) of the project activities (Figure 2).

- The powerline route was regarded as the primary PAOI.
- A buffer area of 10m on either side of the route in which construction vehicles, equipment and pollution could have an impact, was included as the secondary PAOI.
- Adverse impacts could extent beyond the 10mbuffer an additional 10m was scanned for sensitive ecological features and is referred to here as the tertiary PAOI.

Figure 2: Project area of influence (PAOI)

2.3 Field survey

2.3.1 Timing and intensity

The site was undertaken on the 10th of December 2021, after good summer rainfall fell. A sampling and track map is given in Appendix A. Sampling was undertaken mainly within the primary and secondary AOI.

2.3.2 Method

Prior to the site visit, the vegetation was delineated into homogenous units using currently available Google Earth imagery. The field survey focussed on identifying natural and untransformed vegetation, unique features that could indicate local sensitivities such as threatened and protected plants, as well as sensitive ecological features such as wetlands and rocky areas. Transects were walked through the site, mainly in an east-west direction. At several sites along the transects, a survey of total visible floristic composition was undertaken. Plant identification and vegetation description relied on species recorded in the sampling points along the walked transects.

2.4 Mapping

Mapping was done by comparing georeferenced ground survey data to the visual inspection of available Google-Earth Imagery and in that way extrapolating survey reference points to the entire study area. Delineations are therefore approximate, and due to the intricate mosaics and often gradual mergers of vegetation associations, generalisations had to be made. Mapped associations will thus show where a certain vegetation unit is predominant, but smaller inclusions of another vegetation association in this area do exist but have not been mapped separately. Mapping was extrapolated to the secondary PAOI. Significant ecological features were indicated within the tertiary PAOI.

2.5 Site Ecological Importance (sensitivity)

The Site Ecological Importance in terms of vegetation is discussed and mapped as per the requirements of the Species Environmental Assessment Guideline (SANBI, 2020). The assessment criteria and matrices are detailed in Table 1, Table 2, and Table 3.

SEI is considered to be a function of the Biodiversity Importance (BI) of the receptor (e.g. species of conservation concern, the vegetation/fauna community or habitat type present on the site and its resilience to impacts (Receptor Resilience) as follows:

SEI = BI + RR

BI in turn is a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor as follows:

BI = CI + FI

Conservation Importance (CI) is evaluated in accordance with recognised established internationally acceptable principles and criteria for the determination of biodiversity-related value, including the IUCN Red List of Species, Red List of Ecosystems and Key Biodiversity Areas (KBA; IUCN (2016)).

Table 1: Criteria for assessing CI, FI and RR

Classification	Conservation Importance	Functional Integrity	Receptor Resilience
Very high	• Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or Critically Rare species that have a global Extent of Occurrence of < 10 km² • Any area of natural habitat of a CR ecosystem type or large area (> 0.1 % of the total ecosystem type extent) of natural habitat of an EN ecosystem type	• Very large (>100 ha) intact area for any conservation status of ecosystem type or >5 ha for CR ecosystem types • High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches No or minimal current negative ecological impacts with no signs of major past disturbance (e.g. ploughing)	• Habitat can recover rapidly (<5 years for >70% of the original species composition and functionality). • Species very highly likely to remain at a site during impact. • Species very highly likely to return once the impact ceases.
High	• Confirmed or highly likely CR, EN, VU species. IUCN threatened species must be listed under any criterion other than A, include if there are less than 10 locations or < 10 000 mature individuals remaining. • Small area (>0.01% but < 0.1 % of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (> 0.1 %) of natural habitat of VU ecosystem type. • Presence of Rare species.	• Large (>20 ha but <100 ha) intact area for any conservation status of ecosystem type or >10 ha for EN ecosystem types Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches Only minor current negative ecological impacts (e.g. few livestock utilising area) with no signs of major past disturbance (e.g. ploughing) and good rehabilitation potential	• Habitat can recover relatively quickly (5-10 years for >70% of the original species composition and functionality. • Species highly likely to remain at a site during impact. • Species highly likely to return to site once impact ceases.
Medium	• Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN, VU) listed under A criterion only and which have more than 10 locations or more than 10 000 mature individuals. • Any area of natural habitat of threatened ecosystem type with status of VU	• Medium (>5 ha but <20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types • Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches	• Recovers slowly (>10 years for >70 % of the original species composition and functionality • Species moderately likely to remain at site during impact. • Species moderately likely to return to site once impact ceases.

Classification	Conservation Importance	Functional Integrity	Receptor Resilience
	• Presence of range-restricted species • More than 50 % of receptor contains natural habitat with potential to support SCC	• 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	
Low	• No confirmed or highly likely SCC. • No confirmed or highly likely range-restricted species. • Less than 50 % contains natural habitat with limited potential to support SCC.	• Small (1 – 5ha) area. • Almost no connectivity but migration still possible across transformed / degraded habitat; very busy surrounds. Low rehabilitation potential. • Several minor and major ecological impacts.	• Unlikely to recover fully (<50% restored) after >15 years. • Species have low likelihood of remaining at site during the impact. • Species have low likelihood of returning to site once impact ceases.
Very low	• No confirmed and highly unlikely populations of SCC. • No confirmed and highly unlikely populations of range-restricted species. • No natural habitat remaining.	• Very small (<1 ha) area. • No connectivity except for flying species. • Several major current ecological impacts.	• Unable to recover from major impacts. • Species unlikely to remain at site during the impact. • Species unlikely to return once impact ceases.

Table 2: Matrix for determining BI

Biodiversity Importance (BI)		Conservation Importance (CI)				
		Very High	High	Medium	Low	Very Low
Functional Integrity (FI)	Very High	**Very High**	**High**	**High**	**Medium**	**Low**
	High	**Very High**	**High**	**Medium**	**Medium**	**Low**
	Medium	**High**	**Medium**	**Medium**	**Low**	**Very Low**
	Low	**Medium**	**Medium**	**Low**	**Low**	**Very Low**
	Very Low	**Medium**	**Low**	**Very Low**	**Very Low**	**Very Low**

Table 3: Matrix for determining SEI

Site Ecological Importance (SEI) (Mitigation)		Biodiversity Importance (BI)				
		Very High	High	Medium	Low	Very Low
Receptor Resilience (RR)	Very Low	**Very High (Avoid)**	**Very High (Avoid)**	**High (Avoid & Minimise)**	**Medium (Minimise & Restore**	**Low (Minimise & Restore**
	Low	**Very High (Avoid)**	**Very High (Avoid)**	**High (Avoid & Minimise)**	**Medium (Minimise & Restore**	**Very Low (Minimise)**
	Medium	**Very High (Avoid)**	**High (Avoid & Minimise)**	**Medium (Minimise & Restore**	**Low (Minimise & Restore**	**Very Low (Minimise)**
	High	**High (Avoid & Minimise)**	**Medium (Minimise & Restore**	**Low (Minimise & Restore**	**Very Low (Minimise)**	**Very Low (Minimise)**
	Very High	**Medium (Minimise & Restore**	**Low (Minimise & Restore**	**Very Low (Minimise)**	**Very Low (Minimise)**	**Very Low (Minimise)**

3 BASELINE DESCRIPTION OF THE SITE

3.1 Climate

The site falls within the summer rainfall region of South Africa, with most rain falling between November and March (Figure 3) (www.meteoblue.com). Average summer temperature can reach up to 30 °C, with the lowest winter temperatures dropping to about 5 °C. Frost is experienced in winter.

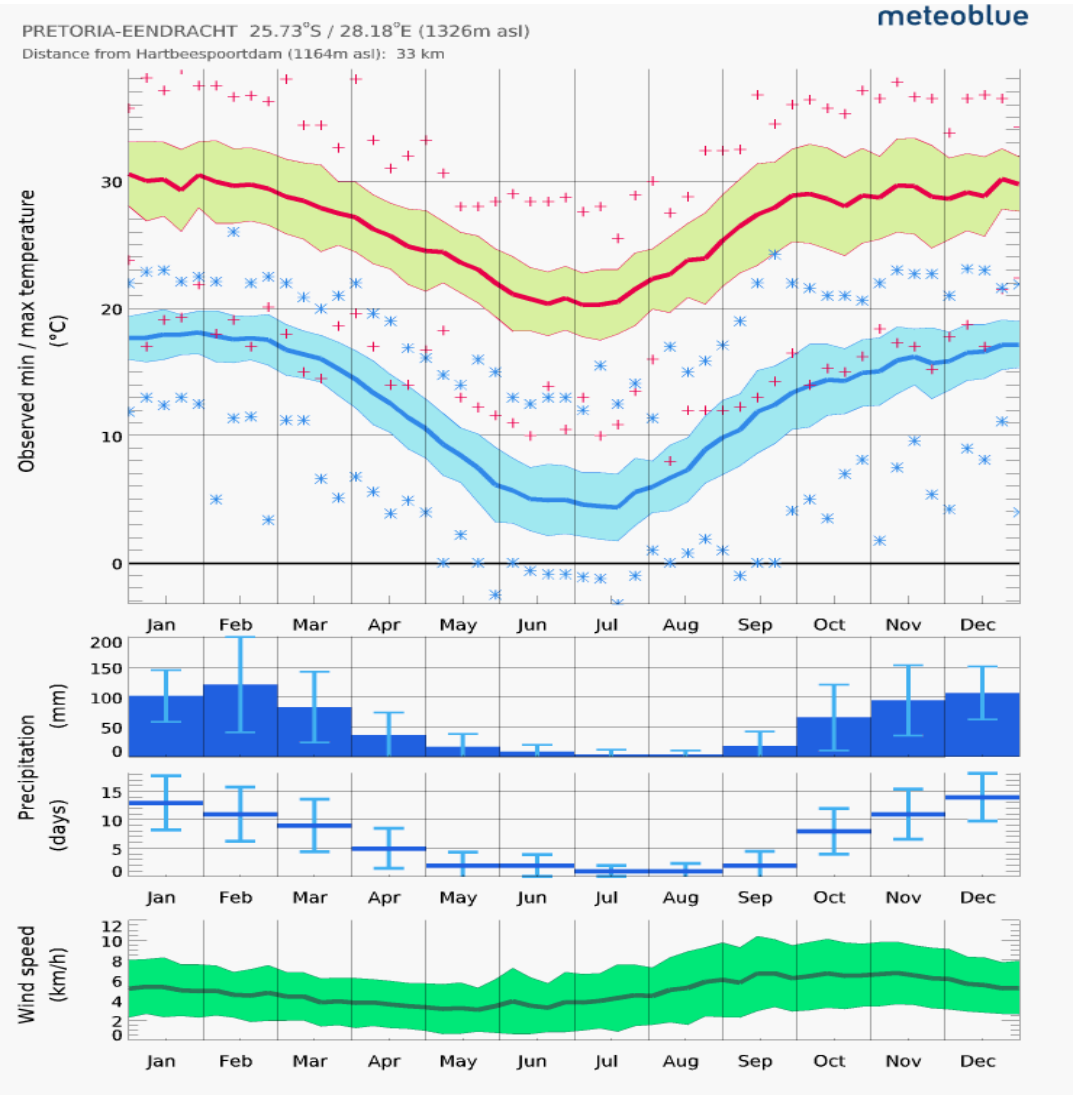


Figure 3: Average temperatures and precipitation for the proximate Pretoria-Eendracht weather station (www.meteoblue.com)

3.2 Geology and Soils

The area that the site is situated in is dominated by shale and some coarser clastic sediments as well as significant andesite from the Pretoria Group (Transvaal Supergroup), all sedimentary rocks. Soils are mostly shallow Mispah. The site is within the Ib4 Land type, which is characterized by a steep topography. Here the soil cover on most of the slope areas is very shallow or absent and the hill crests and lower slopes have less than 0.5m of loamy soils.

3.3 Topography and Hydrology

According to national spatial layers, the western extent of the route will traverse the origins of a non-perennial drainage line that drains southwards (Figure 4). No other rivers or wetland areas are indicated to be present.

3.4 Historical Vegetation Type Overview

The site is situated within the Savanna biome of South Africa. The Savanna biome is the largest biome in southern Africa, occupying over one-third of the surface area of the country (Mucina & Rutherford, 2006). It is characterised by a grassy ground layer and a distinct upper layer of woody plants. Where this upper layer is near the ground the vegetation may be referred to as Shrubveld, where it is dense, as Woodland, and the intermediate stages are commonly known as Bushveld (Mucina & Rutherford, 2006).

The powerline traverses the Gauteng Shale Mountain Bushveld vegetation type (Figure 5). This vegetation occurs on low, broken ridges varying in steepness and with high surface rock cover (Mucina and Rutherford, 2006). The vegetation is a short (3–6 m tall), semi-open thicket dominated by a variety of woody species including *Senegalia caffra, Searsia leptodictya, S. magalismontana, Ehretia rigida, and Euclea crispa, Zanthoxylum capense, Dombeya rotundifolia, Protea caffra, Celtis africana, Ziziphus mucronata, Vangueria infausta, Afrocanthium gilfillanii, Englerophytum magalismontanum, Combretum molle,* and *Olea europaea* subsp. *africana*. The understorey is dominated by a variety of grasses. Some of the ridges form plateaus above the northern slopes that carry scrubby grassland with high surface rock cover. This vegetation unit occurs more frequently on warmer north-facing slopes and is underlain by rocks of sedimentary origin.

Gauteng Shale Mountain Bushveld vegetation unit is poorly protected (less than 1% protected in statutory reserves) and are classified as a Vulnerable vegetation unit. Good condition vegetation should thus be regarded as sensitive.

3.5 Listed Ecosystems

The South African Biodiversity Act (Act 10 of 2004) provides for the listing of threatened or protected ecosystems. These ecosystems are grouped into Critically Endangered-, Endangered-, Vulnerable- and Protected Ecosystems (Section 52(1) (a) of the National Environmental Management: Biodiversity Act (Government Gazette 34809, Government Notice 1002, and 9 December 2011)).

The proposed powerline route does not fall within a listed ecosystem, but within remnant patches of the Gauteng Shale Mountain Bushveld, listed as Least Concern (Figure 6).

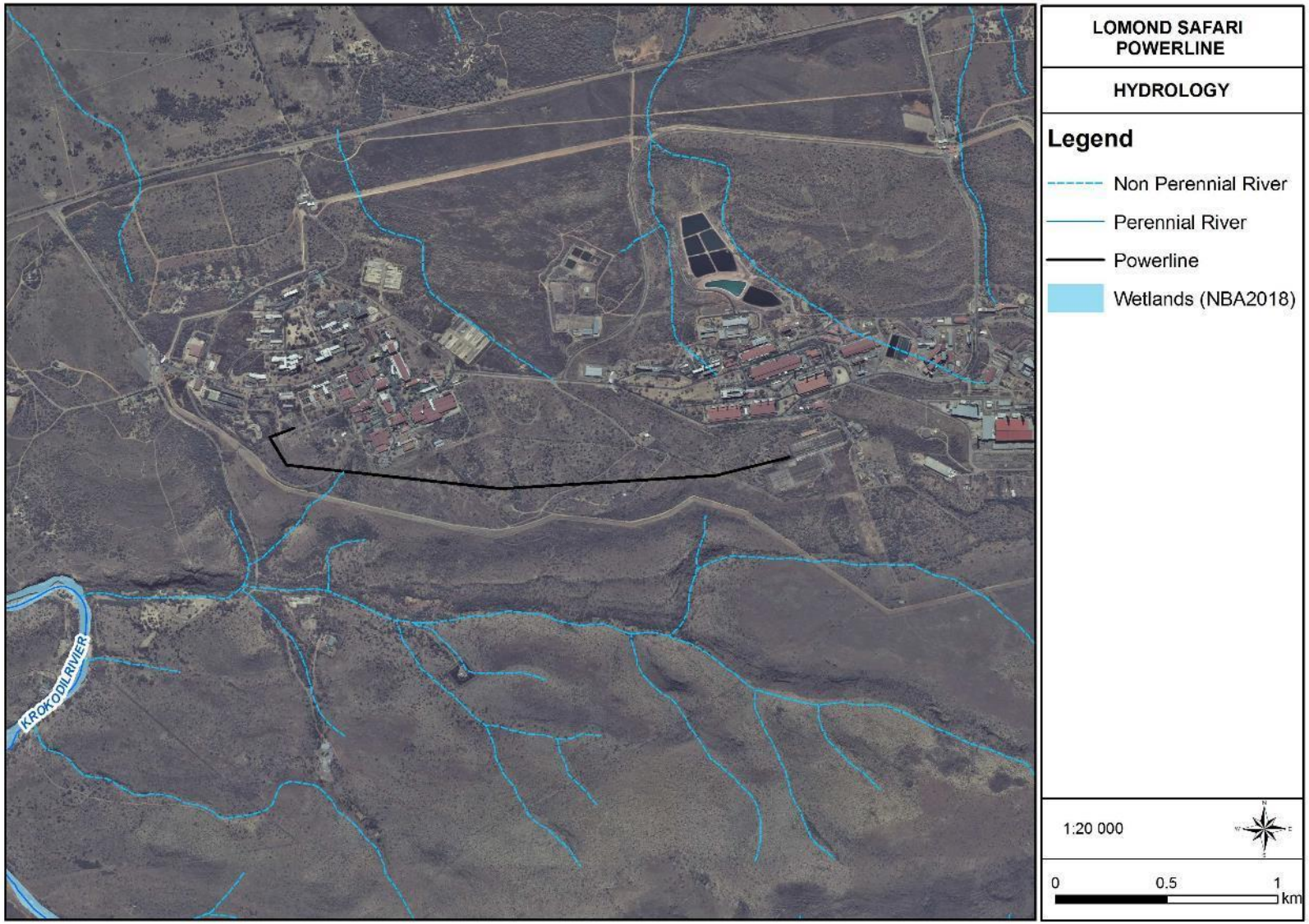


Figure 4: Hydrology of the area that the powerline is situated in

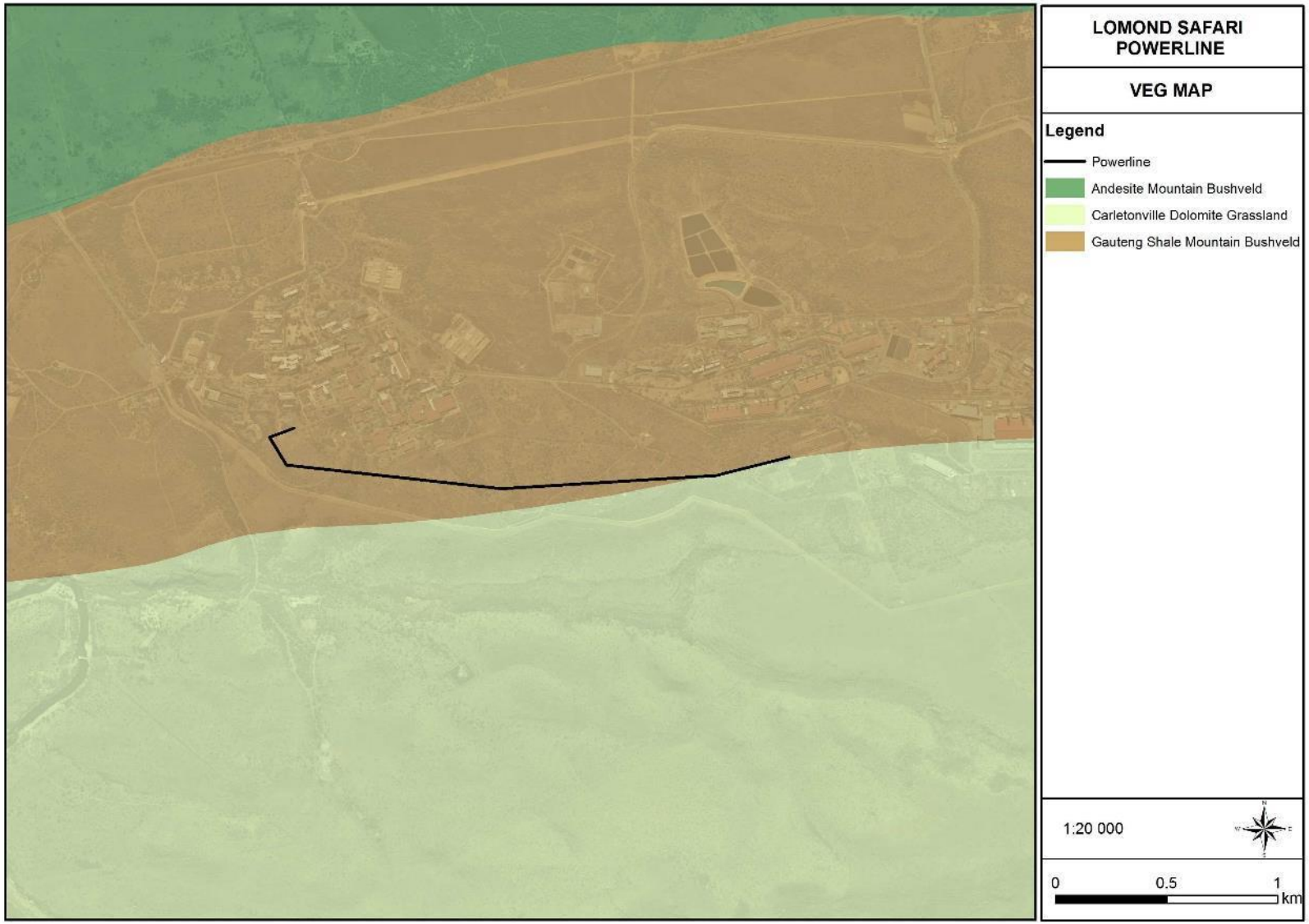


Figure 5: The powerline route falls within the Gauteng Shale Mountain Bushveld vegetation unit

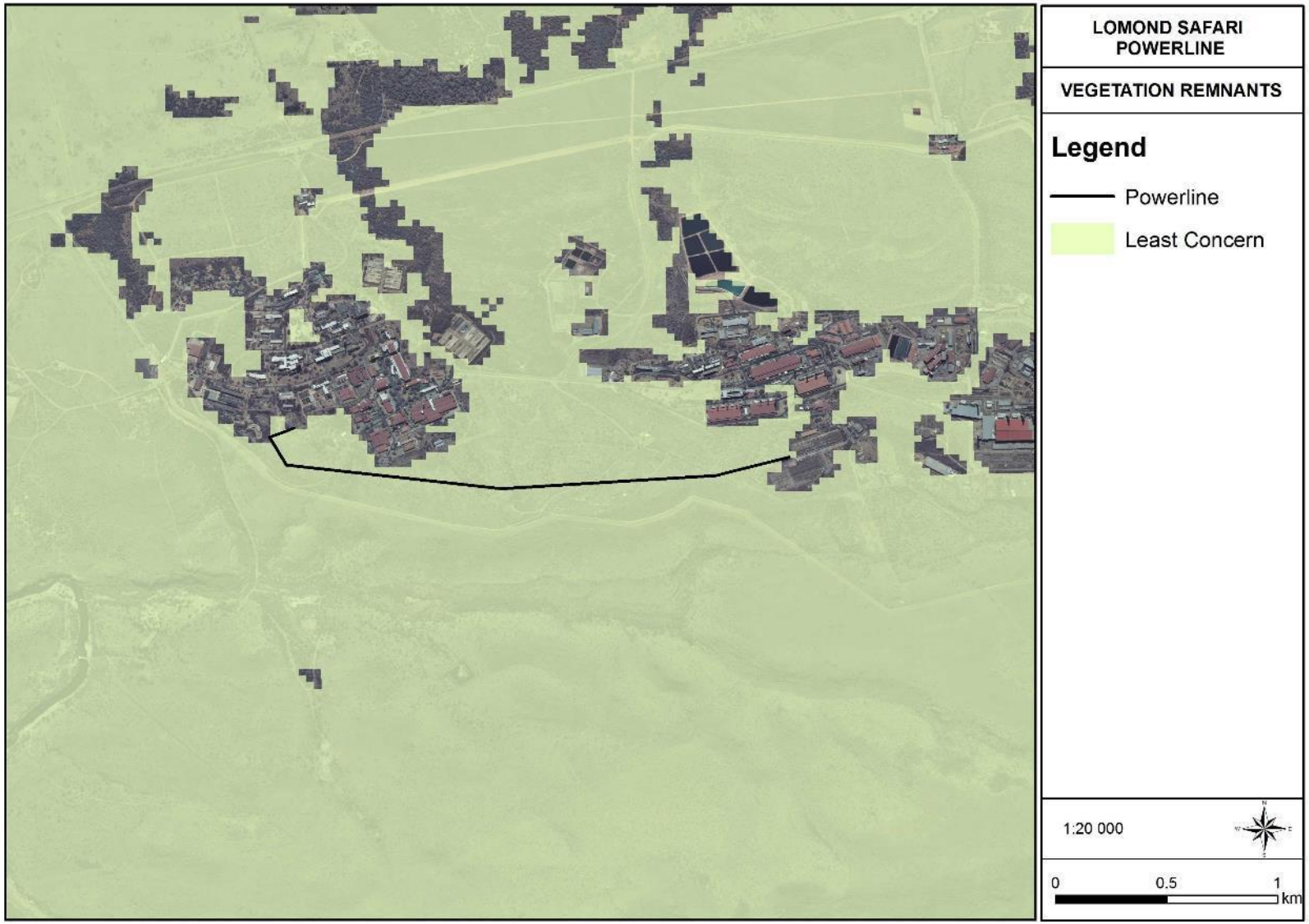


Figure 6: The powerline within the remnants of the Gauteng Shale Mountain Bushveld, listed as Least Concern

3.6 North West Biodiversity Sector Plan

The North West Biodiversity Sector Plan (North West Department of Rural, Environment and Agricultural Development (READ), 2015) includes reference to Critical Biodiversity Areas (CBA's) which are terrestrial and aquatic features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services. These form the key output of a systematic conservation assessment and are the biodiversity sectors inputs into multi-sectoral planning and decision making. CBA's are therefore areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses (North West READ, 2015). In addition, the conservation assessment also made provision for Ecological Support Areas (ESA's), which are areas that are not essential for meeting biodiversity representation targets/thresholds but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree of restriction on land use and resource use in these areas may be lower than that recommended for CBA's (North West READ, 2015).

As per Figure 7, the proposed route falls within a CBA2, with a small portion of a CBA1 traverses in the most western extent. CBA2's was delineated based on the following (Desmet and Schaller, 2015):

- Remaining patches larger than 5 ha of provincially Endangered and Vulnerable ecosystems (vegetation types), i.e. the amount vegetation remaining intact (of these ecosystems) is less than 60%. Any further modification of these vegetation types should be limited to existing irreversibly modified or heavily degraded areas.
- Remaining patches larger than 10 ha of endemic vegetation types to the province. These are vegetation types whose biodiversity target can only be achieved in the NW Province.
- Important natural features (habitats, springs, scenic landscapes) used in the 2008 biodiversity conservation assessment (DACERD, 2009).
- Areas identified as being important for maintaining species of conservation concern (free-ranging red hartebeest (*Alcelaphus buselaphus*), black-footed cat (*Felis nigripes*), vulture nesting areas, Important Bird Areas).

The North West Biodiversity Sector Plan (North West READ, 2015) contains regulations for land use in CBA's as well as ESA areas. According to Recommended Biodiversity-Compatible Land Use Guidelines of the Biodiversity Sector Plan, the land use objective in a CBA2 should be to maintain the land in a natural or near-natural state that maximises the retention of biodiversity pattern and ecological process and include:

- Ecosystems and species fully or largely intact and undisturbed.
- Areas with intermediate irreplaceability or some flexibility in terms of meeting biodiversity targets. There are options for loss of some components of biodiversity in these landscapes

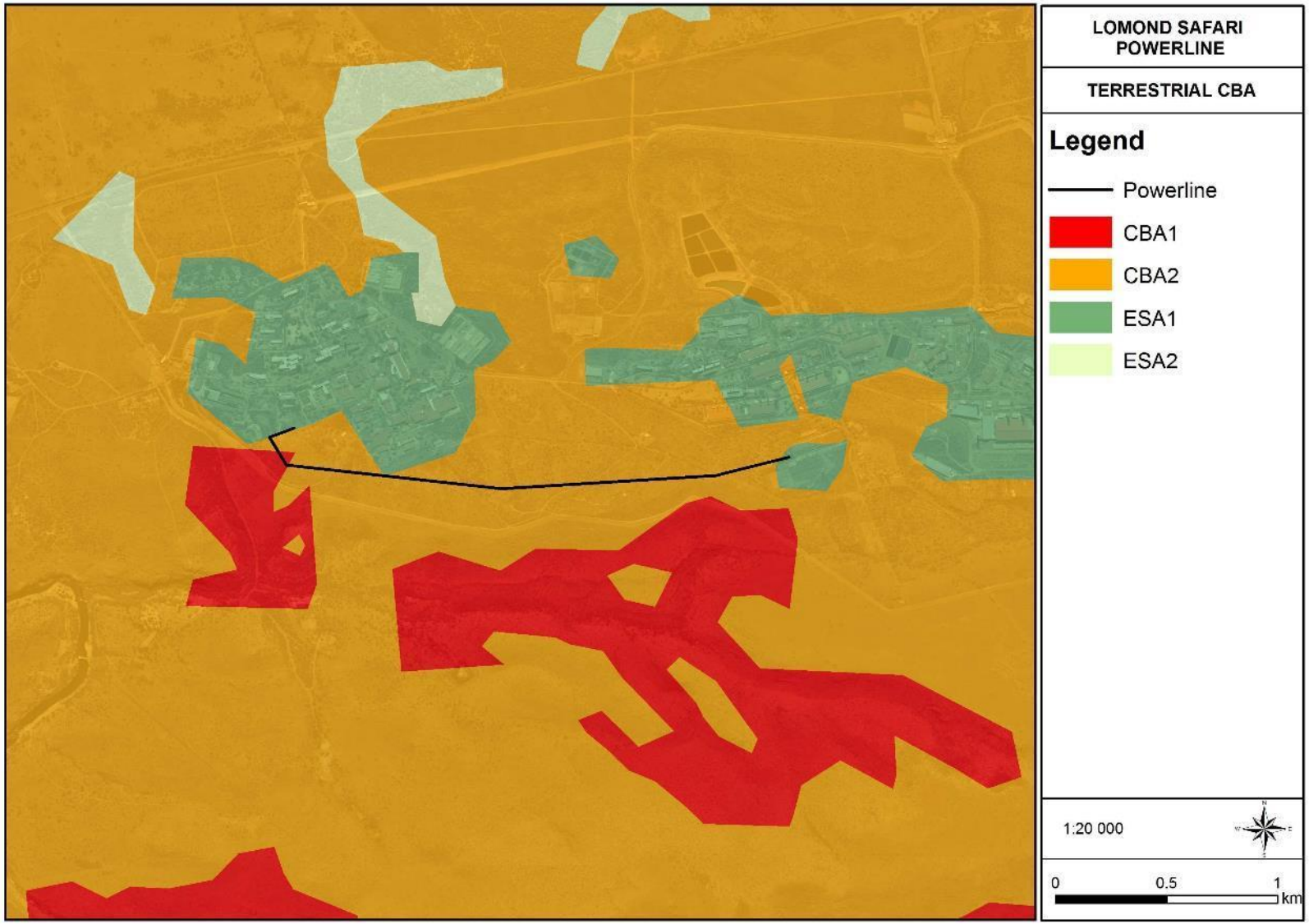


Figure 7: The site falls mostly within a CBA2 (North West Biodiversity Sector Plan)

- without compromising the ability to achieve biodiversity targets, although loss of these sites would require alternative sites to be added to the portfolio of CBAs.
- These are biodiversity features that are approaching but have not passed their limits of acceptable change.

Managing loss of natural habitat in CBAs:

- Further loss of natural habitat should be minimised in CBA2 i.e. land should be maintained as natural vegetation cover as far as possible.
- CBA2s not formally protected should be rezoned where possible to conservation or an appropriate zoning, and where possible declared in terms of the Protected Areas Act.
- CBA 2s can act as possible biodiversity offset receiving areas.
- The provincial biodiversity stewardship programme may wish to prioritise privately owned properties in CBA 2s to be incorporated into the protected area network through biodiversity stewardship agreements.

Degraded or disturbed and CBA 2s should be prioritised for rehabilitation through programmes such as Working for Water and Working for Wetlands.

3.7 Protected Areas

The site is embedded within the Magaliesberg Biosphere Reserve but are excluded from it (Figure 1). The Cradle of Humankind is to the south-west of the powerline route and the Crocodile River Reserve Protected Environment is situated to the south-east of the proposed powerline.

3.8 Ecological drivers and processes in bushveld

Summer rainfall combined with dry winters and frost with marked diurnal temperature variations are unfavourable to tree growth and therefore grasslands comprise mainly of grasses and plants with perennial underground storage organs, for example bulbs and tubers and less trees. In some grassland areas, such as the site and surrounds, the surface topography (e.g. rocky hills and protected valleys) creates habitats that are favourable to shrublands and trees (Mucina & Rutherford, 2006). Generally, the higher the surface rock cover, the higher the occurrence of woody vegetation such as trees and shrubs, relative to herbaceous vegetation (Mucina & Rutherford, 2006).

Frost, fire and grazing maintain the herbaceous grass and forb layer and prevent the establishment of thickets or encroachment by trees into grasslands (Tainton, 1999). Fire is a natural disturbance caused by lightning, and regular burning is therefore essential for maintaining the structure and biodiversity of grasslands. If fire is prevented due to activities such as agriculture and mining, the vegetation structure degrades, and alien species could eventually dominate the natural vegetation. In addition, bush

encroachment (the proliferation of some indigenous species under bad land management) will also occur.

- Where infrastructure and human life is at stake, fires are usually prevented or extinguished as soon as possible, which could lead to an increase in woody vegetation in such areas, as well as a decline in species that are dependent on fire.
- It is expected that the historic land uses on the site and surrounds may have resulted in bush encroachment or bush densification. Bush encroachment is a term used for "stands of plants of the kinds specified in Table 4 of Regulation 16 (CARA), where individual plants are closer to each other than three times the mean crown diameter" (Agricultural Research Council, 2013). Plants in this group are not alien plants, but indigenous plants that tend to become abnormally abundant when the area is degraded (Agricultural Research Council, 2013). The plants themselves are thus not the problem, but their increased abundance or encroachment into open savannah serves as an indicator of poor land management practices. It must be noted that factors causing bush encroachment are complex and likely the result of several variables including water availability, fire frequency and an increase in CO_2 (Letsoli *et al*, 2013, O'Connor *et al* 2014).

3.9 Strategic Water Source Areas (SWSA)

Eight percent of South Africa's land area produces 50% of our surface water. If we can protect this 8% we will go a long way to ensuring a watersecure future for South Africa (WWF, 2013). Strategic Water Source Areas (SWSAs) are landscapes where a relatively large volume of runoff produces water for the majority of South Africa. Strategic water source areas can be regarded as natural 'water factories', supporting growth and development needs that are often a far distance away. Deterioration of water quality and quantity in these areas can have a disproportionately large negative effect on the functioning of downstream ecosystems and the overall sustainability of growth and development in the regions they support (Nel *et al.*, 2013)

According to Le Maitre *et al.* (2018), the project is not located within a SWSA. The Westrand Karst Belt Groundwater Strategic Water Source Area is situated about 2.4km south of the site.

4 RESULTS OF THE FIELD ASSESSMENT

4.1 Land use and land cover on and around the site

Historic aerial imagery sourced from the Chief Directorate: National Geospatial Information Geospatial Portal (http://www.cdngiportal.co.za/cdngiportal), show that in 1969 the area that the powerline is proposed in, historically comprised grassland with some tree cover in drainage lines or historically disturbed areas (Figure 8). The exisitng reservoirs can already be seen in this image and the commencement of construction activities to the north-west of the route. From the reservoir, the water pipeline route towards the newly constructed facilities can be noted. The substations were not yet in existence. High rocky cover, with limited trees can be noted.

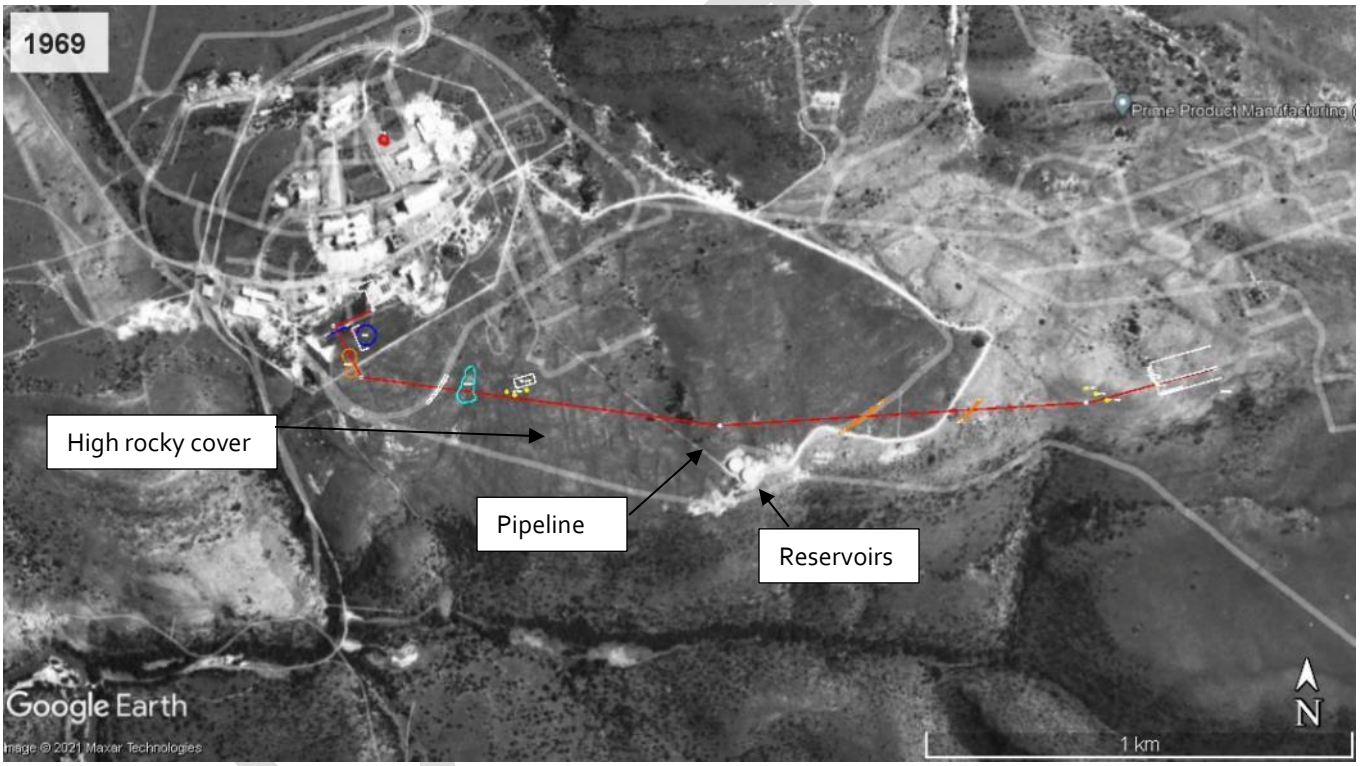


Figure 8: Historic aerial image dated 1969 of the area that the route is situated in. To geofence the image, it was superimposed on Google Earth

By 1985 additional pipeline routes can be seen from the reservoir, as well as additional disturbances of unknown origins. Lomond substation was already constructed; however, it seems Safari was not yet in existence. The vegetation comprised grassland with limited tree cover noted.

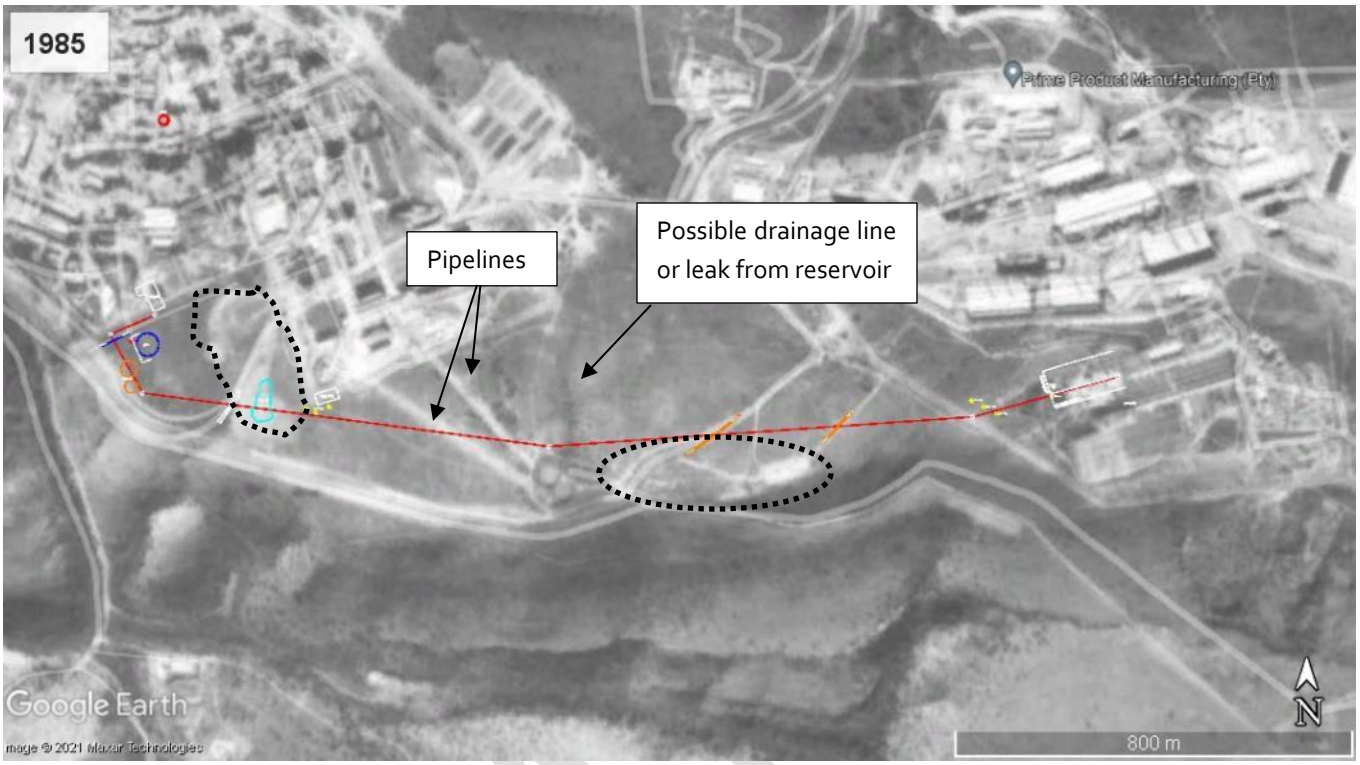


Figure 9: Historic aerial image dated 1985 of the area that the route is situated in. To geofence the image, it was superimposed on Google Earth. Additional disturbances are indicated by the encircled areas

By the year 1996, several additional infrastructures were constructed, and dirt roads traverse the area. The vegetation shows a slight increase in the tree layer and some vegetation clearing / disturbances can be noted (Figure 10). A Google Earth Satellite image of the area in 2010 and the recent 2021 image, show a significant increase in the tree layer (Figure 11 & 12).

During the site visit, it was found that earthworks has compacted the soils close to Safari in the west, which is currently sparsely vegetated. Building rubble was noted directly west of Safari. The route in the eastern extent was also historically disturbed and it is thought than an exisitng pipeline / cable might follow much of the same route (Photograph 1c). Several historic dirt tracks are still compacted and only sparsely colonised by vegetation (Photograph 1d), while heaps of shale were found along most of the western extent of the route (Photograph 1e). It is likely that shale was mined from the site, or that it was excavated for the construction of the reservoirs, pipelines and other underground infrastructure.

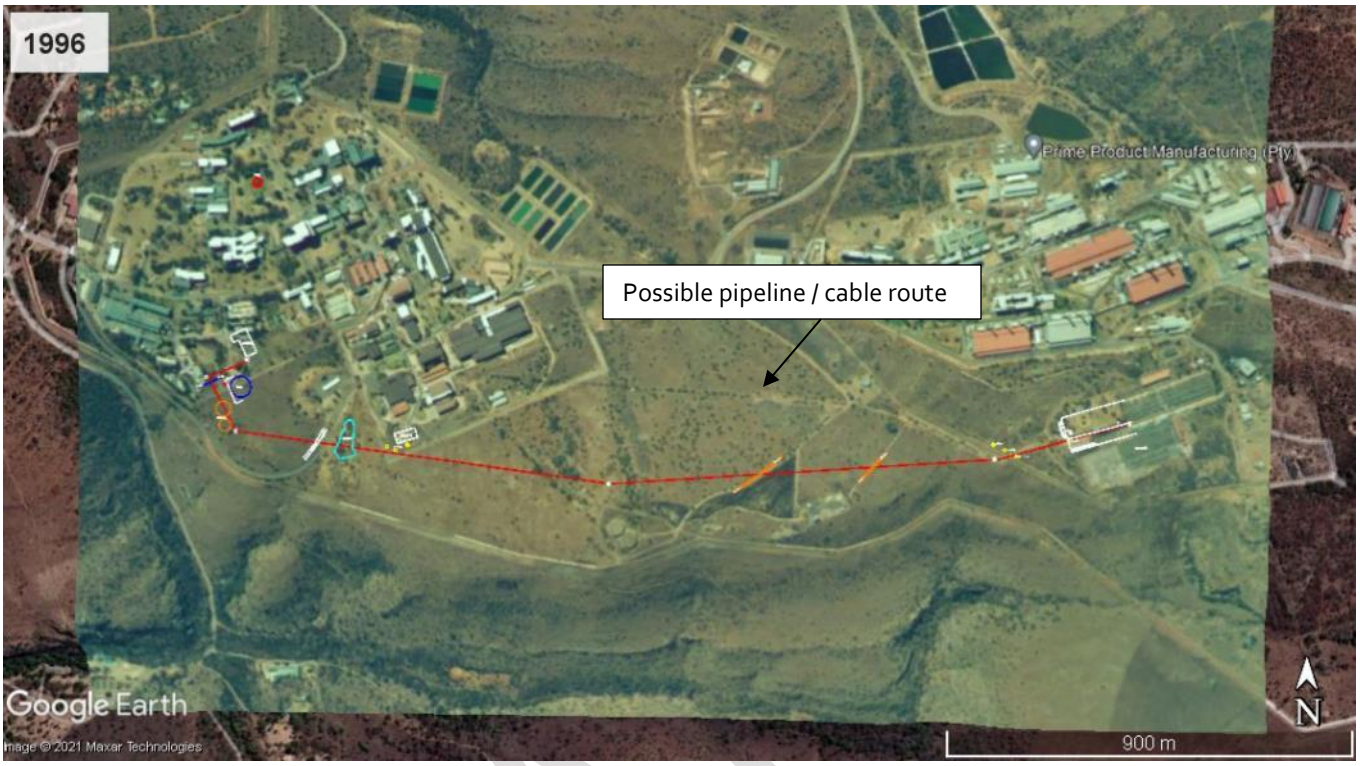


Figure 10: Historic aerial image dated 1996 of the area that the route is situated in. To geofence the image, it was superimposed on Google Earth.

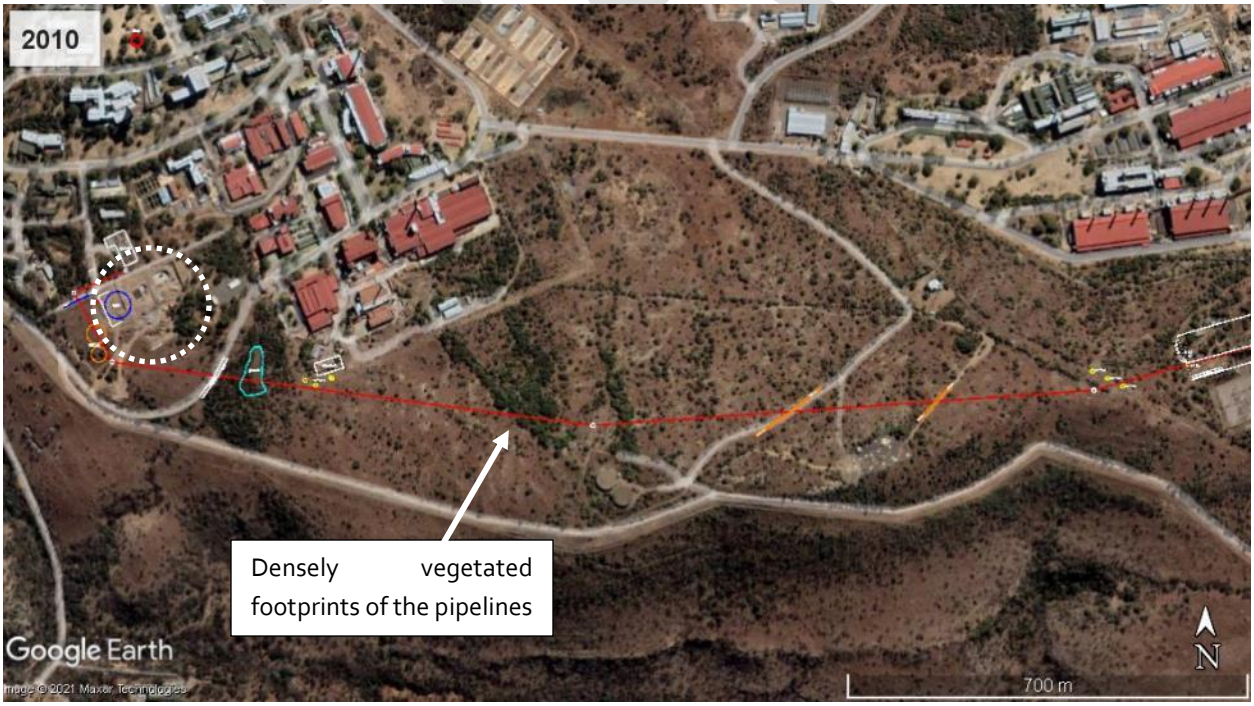


Figure 11: Google Earth satellite imagery of the year 2010, showing a significant increase in the tree layer and additional disturbances in the western extent of the route (dotted circle)

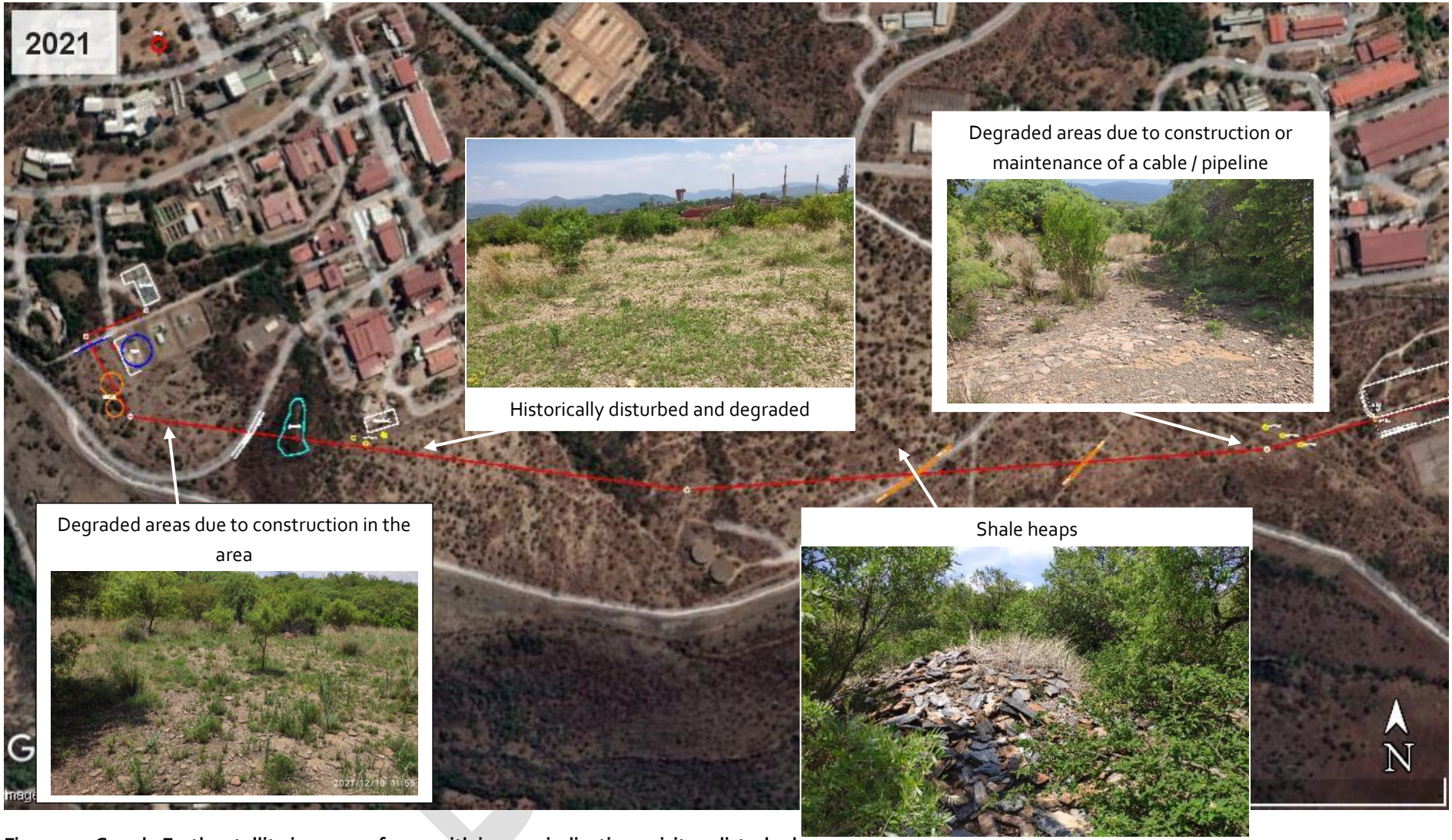


Figure 12: Google Earth satellite imagery of 2021 with images indicating exisitng disturbed areas

Photograph 1: a) Compacted soils to the south of Safari, b) directly west of Safari, c &d) historically disturbed areas that seemingly follow an underground pipe or cable route where the powerline is proposed, e) one of several shale dumps and f) historic dirt tracks that are still compacted and only sparsely colonised by vegetation

4.2 Vegetation groups

Much of the site comprised open bushveld with densely invaded *Lantana*-thicket along historically disturbed pipeline routes. A dense tree layer is present around the drainage line in the western extent of the route. The vegetation is representative of the Gauteng Shale Mountain Bushveld, albeit dominated by pioneer and encroacher tree species. Several disturbances were noted throughout the proposed powerline route extent and has degraded the bushveld to a secondary state. The vegetation around the substations has been modified by infrastructure and related activities, planted gardens and mowing. However, several trees typical to the Gauteng Shale Mountain Bushveld persists.

The vegetation delineated along the powerline route were as follows:

1. Secondary Gauteng Shale Mountain Bushveld
   1.1.1. *Senegalia caffra-Loudetia simplex* bushveld
   1.1.2. *Searsia* dominated open bushveld
   1.1.3. *Lantana camara* thicket

2. *Searsia* domminated drainage line

3. Moderately to severely modified vegetation

Each broad vegetation grouping is discussed below and geographically represented in Figure 13. Plant species that were recorded within each vegetation group at the time of the site visit are listed in Appendix B.

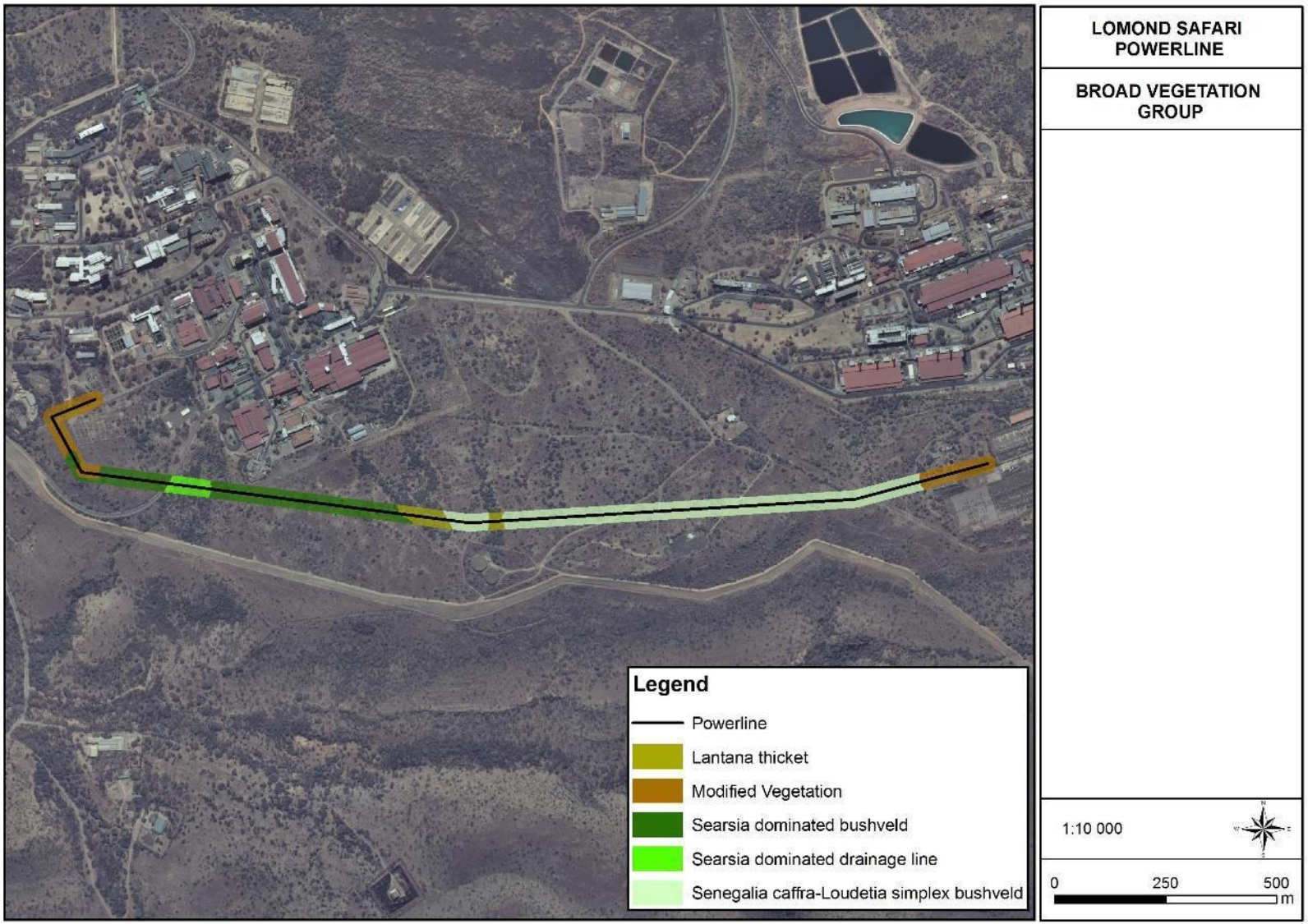


Figure 13: Vegetation groups on the site and within 20m buffer

4.2.1 Secondary Gauteng Shale Bushveld

Historic aerial images show that the vegetation comprised open to wooded grassland in the year 1969 (Figure 8). Subsequent disturbances, fire suppression, lack of grazing and climate change has likely led to the densification of the bushveld in the area.

Most of the route and buffer area surveyed was historically disturbed and comprised secondary bushveld. Secondary bushveld develop where the original bushveld vegetation was removed or impacted on. After such disturbances cease, pioneer grass species, and eventually subclimax grasses and pioneer tree species, colonise the disturbed soils. This results in a secondary bushveld state with a much lower initial species diversity as opposed to the primary (climax) state prior to any disturbances. In the absence of further disturbances, the secondary bushveld could theoretically return to sub climax or climax bushveld vegetation over time. However, grazing and a lack of fire can promote tree growth of pioneer or encroacher species (indigenous plants that tend to become abnormally abundant when the area is degraded) and lead to bush densification. Bush densification is a process whereby open bushveld, become denser and dominated by dense stands of pioneer species, which can become impenetrable.

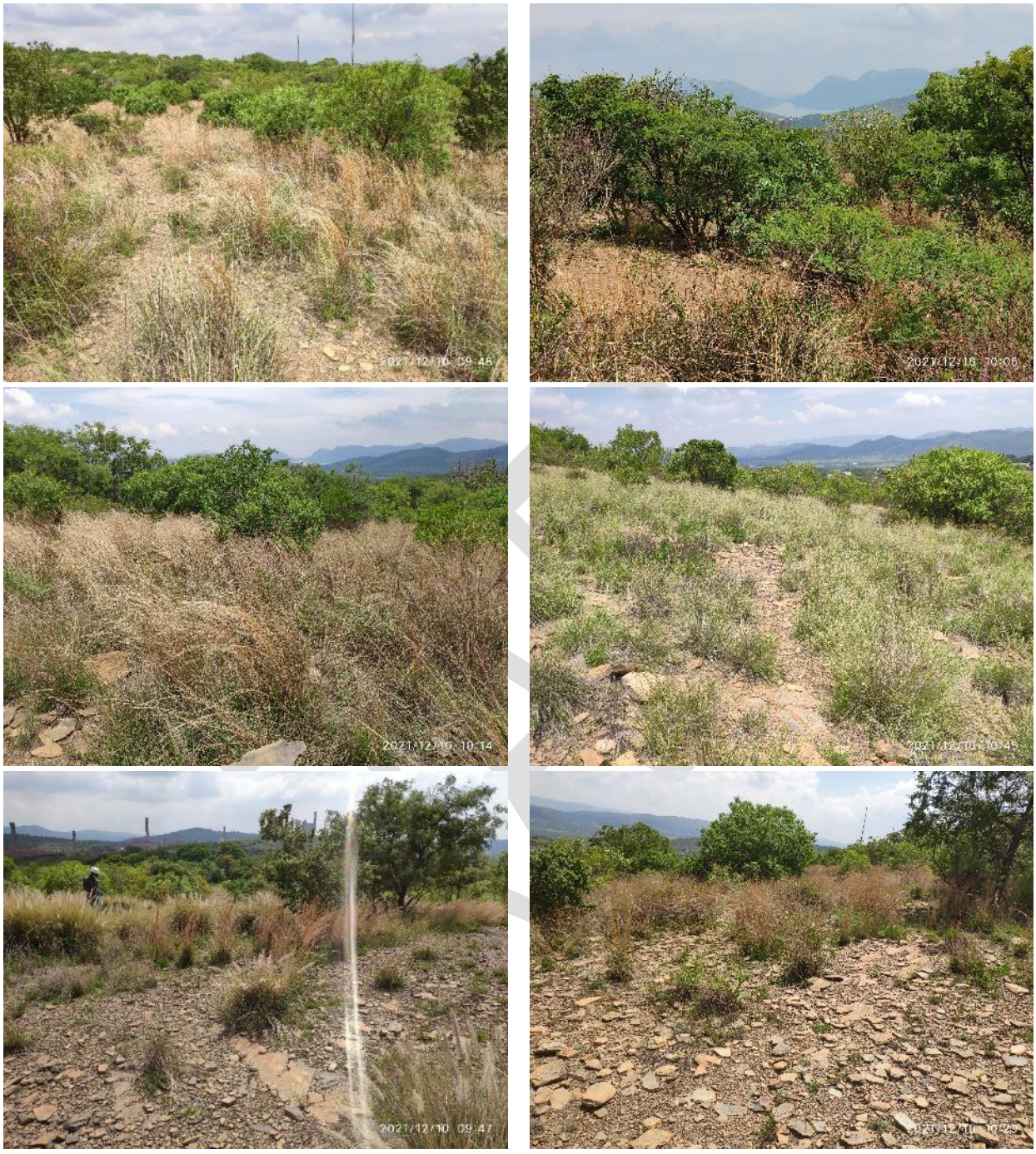
Along the route, the tree layer was typically dominated by encroacher / pioneer species with the most dominant being *Searsia leptodictya*, a species not listed in Table 4 of Regulation 16 of the Conservation of Agricultural Resources Act (CARA) relating to encroachers, but noted to encroach bushveld in recent years. Also, limited geophyte species were recorded, possibly due to historical disturbances.

The species diversity along the eastern extent of the route were higher than within western extent of the route and two sub vegetation groups are described below.

4.2.1.1 *Senegalia caffra-Loudetia simplex* bushveld

The eastern extent of the route was dominated by the trees *Searsia leptodictya, Senegalia caffra* and *Gymnosporia polyacantha.* Other subdominant trees include *Ziziphus mucronata* and *Euclea crispa* subsp. *crispa*.

Portions of the PAOI still reflect some of the natural species composition and include trees such as *Combretum molle, Olea europea* subsp *africana, Searsia pyroides, Ozoroa paniculosa, Ehretia rigida, Mundulea sericea* and *Englerophytum magalismontanum* (Photograph 2). Several forb species were recorded of which the most common was *Felicia muricata* and *Senecio venosus*. In the eastern extent the forb layer was more diverse with species such as *Athrixia elata, Chascanum hederaceum Graderia subintegra* and *Barleria pretoriensis* noted. the shrub *Cryptolepsis oblongifolia* had a patchy dominance, particularly in historically disturbed areas. The weedy *Pseudognaphalium luteo-album* was common in compacted areas. Compacted and degraded areas in the east was dominated by the invasive grass *Pennisetum setaceum*. Other dominant grasses included *Eragrostis nindensis, Loudetia simplex, Melinis repens, Schizachyrium sanguineum* and *Hyparrhenia hirta.*



Photograph 2: Gauteng Shale Mountain Bushveld in the eastern extent of the route. The last two images show compacted and disturbed areas along the route where the invasive grass *Pennisetum setaceum* was dominant.

4.2.1.2 *Searsia dominated bushveld*

The western extent, west of the reservoirs, were dominated by *Searsia leptodictya* and *S lancea* (Photograph 3: Figure 13). This area was severely degraded and compacted and was likely used as construction camps or for shale mining. The forb diversity was poor. Common species were *Felicia*

muricata and *Senecio venosus.* Additional species were *Triumfetta sonderi*, *Indigofera zeyheri*, and *Hypericum aethiopicum.* The weedy *Pseudognaphalium luteo-album* and *Erigeron albida* were common (Photograph 3). Common grasses included *Melinis repens*, *Hyparrhenia hirta*, *Heteropogon contortus* and *Urochloa mosambicensis*.

Photograph 3: Compacted and degraded *Searsia* dominated bushveld in the western extent of the proposed route

4.2.1.3 *Lantana camara thicket*

Historical aerial imagery in Figures 8 and 9 show the disturbance footprint of the pipeline routes from the reservoir to the developments north-east thereof. In addition, what appears to be a drainage line can be seen on Figure 9. These areas correspond to areas that are currently densely vegetated (Figure 10). The site visit confirmed a dense tree canopy with the edges of the woodland entirely dominated and overgrown by the category 1b invasive *Lantana camara* (Photograph 4). This invasive was recorded through much of the PAOI, where it grows in the shade of tree clumps. However, the historically disturbed footprint of the pipelines was so overgrown with *Lantana* that it outcompeted indigenous shrubs and forbs. This thorny species was so dense in places that it prevented access through the vegetation. Maintenance to the pipeline was undertaken and exposed pipes as well as eroded areas were recorded. Several shale heaps were recorded, likely excavated when the pipeline was constructed.

Other than the dominant *Searsia* species and *Senegalia caffra*, the tree layer included *Celtis africana, Dodonea viscosa, Ehretia rigida, Gymnosporia polyacantha* and the smaller shrub *Rhamnus prinoides.* The grass and forb layer were sparse.

Photograph 4: a & b) Almost impenetrable *Lantana camara* infestation around the edges of a dense tree canopy c) eroded or dug up pipeline route within the dense tree canopy, just beyond the *Lantana* edges and d) exposed pipeline route

No threatened or provincially protected plant species were recorded. Several invasive plant species were noted.

Table 4: Summary of the prominent and dominant species recorded within the secondary Gauteng Shale Mountain Bushveld (Appendix B)

Dominant and abundant taxa recorded
Tree: *Searsia leptodictya, S lancea, Senegalia caffra, Gymnosporia polyacantha, Olea europea* subsp *africana, Combretum molle, Searsia pyroides, Ozoroa paniculosa, Ehretia rigida and Englerophytum magalismontanum, Vachellia karroo, Pelthophorum africanum, Mundulea sericea* Grasses: *Loudetia simplex, Eragrostis nindensis, E. curvula, E. chloromelas, Hyparrhenia hirta, Melinis repens, Schizachyrium sanguineum, Cynodon dactylon, Urochloa mosambicensis* Herbaceous plants: *Felicia muricata, Senecio venosus, Indigofera zeyheri, Athrixia elata, Barleria pretoriensis, Crotalaria lotoides, Chascanum hederaceum* Climber: *Clematis brachiara, Spedamnocarpus pruriens* Shrubs: *Lippia rehmannia, Cryptolepsis oblongifolia, Rhamnus prionoides* Suffretex: *Elephantorrhiza elephantina* Succulent: *Aloe cf zebrina* Ferns: *Pellaea calomelanos, Cheilanthus cf hirta*
Species richness (indigenous species) at the time of the site visits
Total indigenous species recorded in walked transects: **83** Grasses: 22, Climbers: 2 Forbs:32 Trees: 27 Sedges: 0 Ferns / moss: 2
Protected or threatened plant species
None recorded in walked transects, however suitable habitat is present for four (4) species as listed in Appendix C.
Alien and/or invasive plant species
Category 1b invasive species recorded: • *Opuntia ficus-indica* • *Pennisetum setaceum* • *Lantana camara;* and • *Campuloclinium macrocephalum*
Sensitive ecological features
• Groundwater recharge zones • Situated within a CBA2

4.2.2 *Searsia* dominated drainage line

The non-perennial drainage line in the western extent of the route were modified from the reference state. This area likely comprised moist grassland historically (Figure 8). At the time of this assessment, the drainage line comprised a moist depression, dominated by the category 1b invasive *Xanthium spinosum* and surrounded by a dense tree layer (Photograph 5). The moist depression was devoid of indigenous hydrophilic species. Other invasive species included *Verbena brasiliensis* and a *Persicaria* species.

The soil comprised a deeper red soil, compared to the shallow shale with the rest of the PAOI. The surrounding tree layer was dominated by *Searsia lancea* and trees within the drainage line included *Celtis africana, Vachellia karroo, V. robusta, Ziziphus mucronata* and *Searsia pyroides.*

Photograph 5: a & b) Moist depression of the non-perennial stream draining southwards, dominated by invasive plant species and tall indigenous trees around the edges and c & d) surrounding tree layer on deeper red soils

No threatened plant species were recorded.

Table 5: Summary of the prominent species recorded within the *Searsia* dominated drainage line

Dominant and abundant species recorded
Trees: *Searsia lancea, S pyroides, Vachellia karroo, Grewia flava, Gymnosporia buxifolia, Ziziphus mucronata, Searsia lancea, Ehretia rigida* Grass: *Panicum maximum, Setaria pallida fusca, Eragrostis curvula, Digitaria eriantha* Shrubs: *Rhamnus prinoides* Forbs: *Evolvulus alsinoides var linifollus, Corchorus asplenifolius, Chamaecrista mimosoides, Melhania prostrata* Climber: *Clematis brachiara*
Species richness (indigenous species) at the time of the site visits
Total indigenous species recorded in walked transects: **26** Grasses: 8, Climbers: 1 Forbs:2 Trees: 14 Sedges: 0 Ferns / moss: 1
Protected or threatened plant species

None recorded in walked transects
Alien and/or invasive plant species
Category 1b invasive species recorded: • *Lantana camara;* • *Xanthium spinosum,* • *Verbena brasiliensis* • *Persicaria* species
Sensitive ecological features
• Watercourse • Situated within a CBA2

4.2.3 Moderately to severely modified vegetation

Modified vegetation describes an ecological condition class in which some ecological function is maintained even though the vegetation species composition and structure have been compromised. The vegetation around the Safari and Lomond substations was impacted on by historical construction thereof, as well as by surrounding developments. The tee layer included typical species from the Gauteng Shale Mountain Bushveld (Photographs 6 & 7).

Photograph 6: Modified vegetation in the eastern extent of the powerline route, around Lomond substation

Photograph 7: Modified vegetation in the western extent of the powerline route, around Safari substation

Dominant trees include *Searisa leptodictya, Senegalia caffra, Ziziphus mucronata, Celtis africana, Vachellia karroo* and *Ehretia rigida.* The forb species was dominated by invasives such as *Physalis viscosa, Zinnea peruviana* and weedy *Tribulus terrestris.* The grass layer was dominated by pioneer species such as *Cynodond dactylon*, *Hyparrhenia hirta, Urochloa mosambicensis* and *Melinis repens*.

No threatened or protected plants species were recorded or are expected to be present.

Table 6: Summary of the prominent and dominant species recorded within the modified vegetation

Dominant and abundant taxa recorded
Trees: *Searsia lancea, Senegalia caffra, Ziziphus mucronata, Combretum molle*, *Vachellia karoo, Celtis africana* Grasses: *Cynodon dactylon*, *Hyparrhenia hirta, Urochloa mosambicensis, Melinis repens, Eragrostis* species Forb species: -
Species richness (indigenous species) at the time of the site visits
Total indigenous species recorded in walked transects: **31** Grasses: 10, Climbers: 1 Forbs:5 Trees: 15 Sedges: 0 Ferns / moss: 0
Protected or threatened plant species
None recorded in walked transects and none expected to be present.
Alien and/or invasive plant species

Numerous ruderal weeds associated with grazed areas such as *Physalis viscosa, Verbena aristegera, Tribulus terrestris, Bidens pilosa,* and *Zinnia peruviana.*

Category 1b invasive species include:

- *Lantana camara*
- *Verbena brasiliensis*
- *Opuntia-ficus-indica*

4.3 Plant Species of Conservation Concern (national classification and protection)

Plants of conservation concern are those plants that are important for South Africa's conservation decision making processes and include all plants that are Threatened, Extinct in the wild, Data deficient, Near-threatened, Critically rare and Rare (Figure 14). Chapter 4, Part 2 of NEMA Biodiversity Act, 2004 (Act No. 10, 2004) provides for listing of species that are threatened or in need of protection to ensure their survival in the wild, while regulating the activities, including trade, which may involve such listed threatened or protected species and activities which may have a potential impact on their long-term survival.

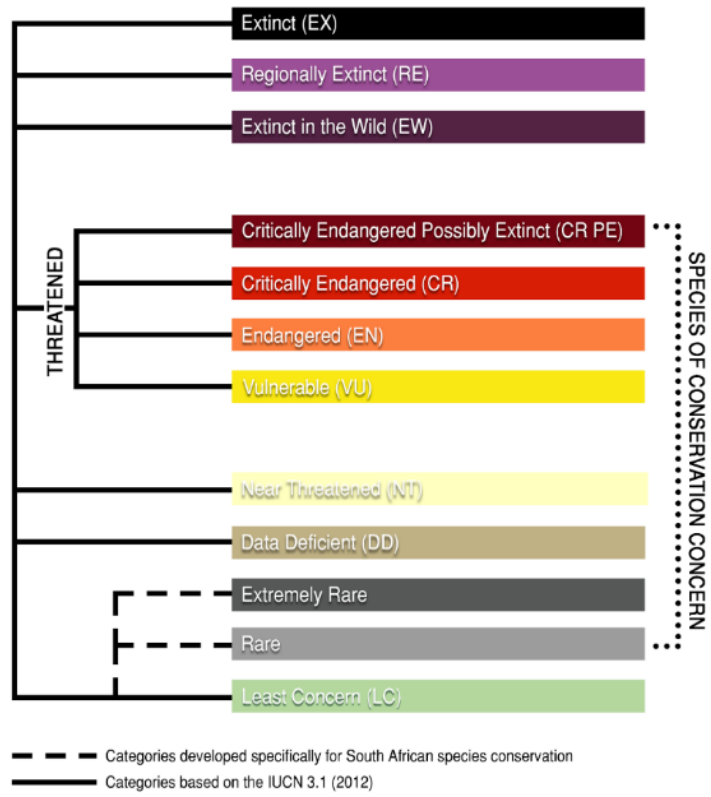


Figure 14: Categories of species of conservation concern (SCC) modified from the IUCN's extinction risk categories (reproduced in part from IUCN, 2012).

A list of plants of conservation concern was compiled using information from the South African National Biodiversity Institute's (SANBI) checklist (SANBI, 2009), Raimondo et al, (2009), Hahn (2013) and

information gathered from the Plants of Southern Africa website (POSA) for the area the site is situated in, and information received from the South African National Biodiversity Institute (SANBI) on sensitive species.

A list of seventeen (17) species that was recorded within the Bojanala Platinum District Municipality (Hahn, 2013) and for which suitable habitat is present on or near the site is given in Appendix C.

4.3.1 Plant species of conservation concern statement

Most of the species listed in Appendix C occurs on quartz and southern slopes, which is absent from the site. Suitable habitat is present for four (4) species and the possibility of occurrence for these species range from medium to low. Historic disturbances within the PAOI renders it unlikely to support such species. However, as most of the four species flower in late summer (Feb-March), it is recommended that the final footprint, especially pylon footprints, be scanned for such species during the flowering period.

4.4 Protected plants

4.4.1 NEMBA Threatened or Protected Plant Species (TOPS)

Chapter 4, Part 2 of the National Environmental Management: Biodiversity Act (No. 10 of 2004), (NEMBA) provides for listing of plant and animal species as threatened or protected. If a species is listed as threatened, it must be further classified as Critically Endangered, Endangered or Vulnerable. These species are commonly referred to as TOPS listed. The Act defines these classes as follows:

- Critically endangered species: any indigenous species facing an extremely high risk of extinction in the wild in the immediate future.
- Endangered species: any indigenous species facing a high risk of extinction in the wild in the near future, although it is not a critically endangered species.
- Vulnerable species: any indigenous species facing an extremely high risk of extinction in the wild in the medium-term future; although it is not a critically endangered species or an endangered species.
- Protected species: any species which is of such high conservation value or national importance that it requires national protection. Species listed in this category will include, among others, species listed in terms of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Certain activities, known as 'Restricted Activities', are regulated on listed species using permits by a special set of regulations published under the Act. Restricted activities regulated under the act are keeping, moving, having in possession, importing and exporting, and selling. The first list of threatened and protected species published under NEMBA was published in the government gazette on the 23rd of February 2007 along with the Regulations on Threatened or Protected Species.

Three (3) TOPS listed species could be present within the larger study area. these are listed as Vulnerable in TOPS. All three species are also listed in Appendix C with a medium to low possibility of being present.

4.4.2 Provincially Protected Plants

Provincially, several plants are protected by the North West Biodiversity Bill (North West Provincial Gazette, No 7603 of 2016). Four provincially protected species were confirmed to occur within the rocky grassland east of the site, while three geophytes were recorded in the grassland, *A larcinus* grassland and wooded grassland. The removal or pruning of these plants will require a permit from the North West Department of Rural, Environment and Agriculture Development.

Two (2) provincially protected plant species were recorded in walked transects as listed in the table below. These species are not threatened and locally common.

Table 7: Provincially protected plant species recorded on the site and surrounds.

Plant genus or specie that is listed as protected	Common name	Vegetation community and occurrence, as well as image
Pallaea calamelanos	Maiden hair fern	Secondary Gauteng Shale Mountain Bushveld 
Cheilanthus cf *hirta*	(fern)	Secondary Gauteng Shale Mountain Bushveld

Plant genus or specie that is listed as protected	Common name	Vegetation community and occurrence, as well as image
		 

4.5 Alien Invasive Plant Species

Declared weeds and invader plant species have the tendency to dominate or replace the canopy or herbaceous layer of natural ecosystems, thereby transforming the structure, composition and function of

natural ecosystems. Therefore, it is important that these plants are controlled and eradicated by means of an eradication and monitoring programme. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species (Henderson, 2001).

The National Environmental Management: Biodiversity Act (NEMBA) (Act 10 of 2004) is the most recent legislation pertaining to alien invasive plant species. In September 2020, an updated list of Alien Invasive Species was published in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (Government Gazette No 78 of 2014). The Alien and Invasive Species Regulations were published in the Government Gazette No. 43726, 18 September 2020. The legislation calls for the removal and / or control of alien invasive plant species (Category 1 species). In addition, unless authorised thereto in terms of the National Water Act, 1998 (Act No. 36 of 1998), no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse.

Below is a brief explanation of the three categories in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA):

Category 1a: Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.

Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.

Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.

Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

The alien plant species identified on the study site are listed in Appendix B. Note that according to the regulations, a person who has under his or her control a category 1b listed invasive species must immediately:

(a) notify the competent authority in writing

(b) take steps to manage the listed invasive species in compliance with

(i) section 75 of the Act;

(ii) the relevant invasive species management programme developed in terms of regulation 4; and

(iii) any directive issued in terms of section 73(3) of the Act.

The following category 1b plants were observed within the site. The infestation levels of Opuntia are regarded as low, whereas verbena was abundant in the moist areas.

Table 8: Category 1b invasive plant species and the vegetation group(s) it was recorded in

Species	Common name	Vegetation groups
Campuloclinium macrocephalum	Pom-Pom Weed	Secondary Gauteng Shale Mountain Bushveld – entire route
Melia azedarach	Syringa	Modified vegetation, close to Safari substation
Opuntia ficus-indica	Sweet Prickly Pear	Secondary Gauteng Shale Mountain Bushveld and modified vegetation
Pennisetum setaceum	Fountain Grass	Secondary Gauteng Shale Mountain Bushveld, eastern extent
Verbena bonariensis	Wild Verbena	Modified vegetation and *Searsia* dominated drainage line
Xanthium spinosum	Spiny cocklebur	*Searsia* dominated drainage line

5 SITE ECOLOGICAL IMPORTANCE

It has been clearly demonstrated that vegetation not only forms the basis of the trophic pyramid in an ecosystem, but also plays a crucial role in providing the physical habitat within which organisms complete their life cycles (Kent & Coker 1992). Therefore, the vegetation of an area will largely determine the ecological sensitivity thereof. Site Ecological Importance (SEI) score for each vegetation group is listed in Table 9 and geographically represented in Figure 15.

5.1 Rating and Analysis

The Site Ecological Importance (SEI) in terms of vegetation is discussed and mapped as per the requirements of the Draft Species Environmental Assessment Guideline (SANBI, 2020) and detailed in the methodology section (Section 2.5).

SEI is a function of the (BI) of the receptor (e.g. species of conservation concern, the vegetation/fauna community or habitat type present on the site and its resilience to impacts as follows:

SEI = Biodiversity Importance (**BI) +** Receptor Resilience **(RR)**

Wherein **BI** in turn is:

BI = Conservation Importance (**CI) +** Functional Integrity (**FI)**

Table 9: Scoring of vegetation that occurs within the PAOIs

Broad vegetation group	Conservation Importance (CI)	Functional Integrity (FI)	Biodiversity Importance (BI)	Receptor Resilience (RR)	Site Ecological Importance (SEI) – mitigation
***Senegalia caffra-Loudetia simplex* bushveld**	Medium[1] to Low	Medium[2]	Medium to Low	Medium[3]	**Medium (Minimise & Restore)**
***Searsia* dominated bushveld**	Low[4]	Low[5]	Low	High [6]	**Very Low (Minimise)**
***Lantana* thicket**	Medium to Low	Low	Medium to Low	Medium to High	**Low (Minimise & Restore)**
***Searsia* dominated drainage line**	Medium to Low	Medium	Medium to Low	Medium	**Medium (Minimise & Restore)**
Modified vegetation	Low	Low	Low	High	**Very Low (Minimise)**

[1] Semi-natural to natural habitat with potential to support SCC
[2] Mostly minor current negative ecological impacts with some major impacts
[3] Recovers slowly, species moderately likely to return
[4] No less than 50 % contains natural habitat with limited potential to support SCC
[5] Several minor and major ecological impacts
[6] Habitat can recover relatively quickly, species highly likely to return to site once impact ceases.

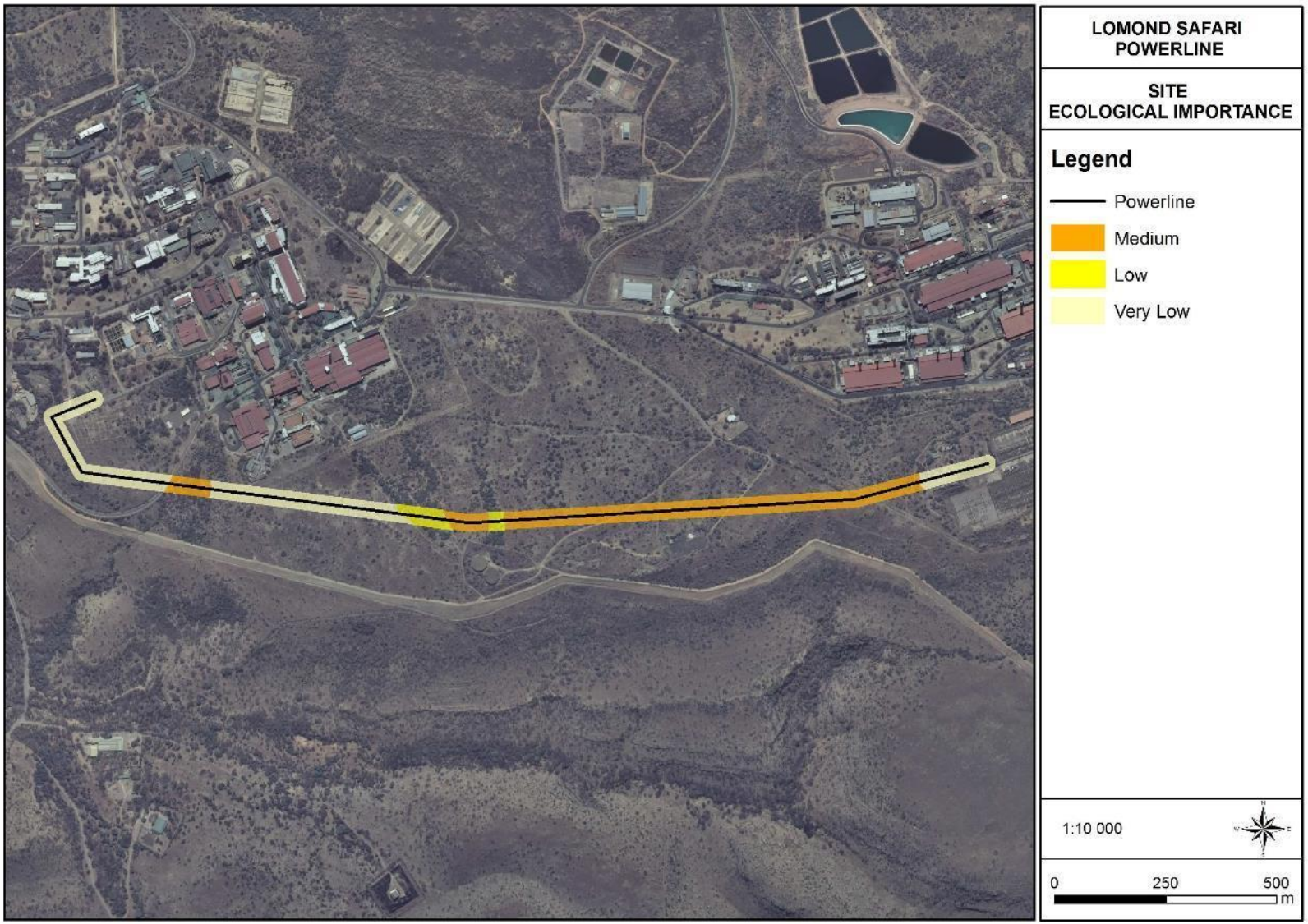


Figure 15: Site Ecological Sensitivity for the proposed powerline

The interpretation of the SEI ranks is described in Table 10 below. This table is a supplemented version of that which appears in the Species Environmental Assessment Guideline (SANBI, 2020). The SEI rating was utilised to generate the vegetation sensitivity map. This plan must be considered along with the fauna sensitivity map and wetland map to obtain an overall sensitivity map.

Table 10: Guidelines for interpreting Site Ecological Importance (SEI) in the context of the proposed development activities.

SEI	Interpretation in relation to proposed development activities (SANBI, 2020), with *mitigation added by the specialist*
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. • *Development within these areas is not supported.* • *Impacts are difficult to mitigate, if at all* • *Such features usually protected by legislation or guiding policies*
High	Avoidance mitigation wherever possible. Minimization 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. • *Development within these areas is undesirable and impacts are difficult to mitigate, if at all.* • *Impacts must be avoided or managed by an ecological management plan*
Medium	Minimization & restoration mitigation - Development activities of medium impact acceptable followed by appropriate restoration activities • *Development within these areas could proceed, limiting impact to sensitive vegetation, provided that appropriate mitigation measures are taken.* • *High impact developments should be considered with caution, if at all. Development must be restricted in footprint and impacts managed and mitigated by an approved management plan. Edge effects to higher sensitivity classes in its proximity must be mitigated / prevented.*
Low	Minimization & restoration mitigation - Development activities of medium to high impact acceptable followed by appropriate restoration activities • *Developable areas that are connected to sensitive features.* • *Edge effects must be prevented.*
Very Low	Minimization mitigation - Development activities of medium to high impact acceptable and restoration activities may not be required • *Most types of development can proceed within these areas with little to no impact on conservation worthy vegetation.* • *Edge effects to other proximate sensitivity classes must be mitigated / prevented.*

5.2 Discussion of SEI results

5.2.1 Medium SEI

Within medium SEI, high impact developments should be considered with caution. The proposed powerline is regarded as a linear activity and vegetation can rehabilitate post construction, whereafter operational impacts can be mitigated. Development within these areas could proceed, limiting impact to sensitive vegetation, provided that appropriate mitigation measures are taken.

5.2.2 Low and Very low SEI

Within a the low SEI development activities of medium to high impact acceptable followed by appropriate restoration activities. Edge effects to higher sensitivity classes must be prevented.

6 IMPACT ASSESSMENT AND MITIGATION

Mankind depends on the natural environment for many ecological services provided for by ecosystems, ecological processes, and plant species in general. However, any development activities in natural systems will impact on the surrounding natural environment and usually in a negative way. To limit or negate these impacts, the source, extent, duration and intensity of the possible impacts needs to be identified. Once the significance of the impacts is understood, the development could both adequately plan for and mitigate these impacts to a best practise and acceptable level. However, if the impacts are significant, especially in already threatened ecosystems and vegetation units, and no adequate mitigation measures could reduce or avert these impacts, then the development should not be allowed to proceed.

6.1 Impact statement and recommendation

The greatest impact of the construction of powerlines are the removal of vegetation where the pylons are to be placed, as well as vegetation clearing within the servitude. Clearing of vegetation could result in a direct impact on the habitat of or species of conservation concern, while indirect impacts such as soil compaction and soil erosion are highly likely. The potential impacts will be more severe in the sensitive vegetation groups (medium SEI), whereas impacts in modified land are limited to the likely invasion of disturbed soils by alien invasive plant species.

The greatest threat to the rehabilitation of the land disturbed by construction is the risk of invasive plant species that colonise the disturbed soil and spread into adjacent natural areas. Provided that no threatened species are removed or damaged, if remedial measures and monitoring are properly employed, the vegetation that will be disturbed during construction could rehabilitate well over time, and long term impacts on vegetation could thus be minimal.

Although the site falls within a CBA2, there are options for loss of some components of biodiversity in CBA2 landscapes without compromising the ability to achieve biodiversity targets (North West Department of Rural, Environment and Agricultural Development (READ), 2015). Most of the vegetation along the proposed powerline route is in a secondary state and if the vegetation is rehabilitated and pruned to acceptable Eskom standards, the CBA function can be maintained.

6.2 Impact Assessment Criteria

The Significance of the impact is calculated as follows and rating significance is explained below:

Significance = Consequence *(Extent + Duration+ Magnitude)* **X Probability**

I. The **nature,** which shall include a description of what causes the effect, what will be affected and how it will be affected.

II. The **extent,** wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):

III. The **duration**, wherein it will be indicated whether
- the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
- the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
- medium-term (5–15 years) – assigned a score of 3;
- long term (> 15 years) - assigned a score of 4; or
- permanent - assigned a score of 5;

IV. The **consequences (magnitude),** quantified on a scale from 0-10, where
- 0 is small and will have no effect on the environment,
- 2 is minor and will not result in an impact on processes,
- 4 is low and will cause a slight impact on processes,
- 6 is moderate and will result in processes continuing but in a modified way,
- 8 is high (processes are altered to the extent that they temporarily cease), and
- 10 is very high and results in complete destruction of patterns and permanent cessation of processes.

V. The **probability** of occurrence, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where
- 1 is very improbable (probably will not happen),
- 2 is improbable (some possibility, but low likelihood),
- 3 is probable (distinct possibility),
- 4 is highly probable (most likely) and
- 5 is definite (impact will occur regardless of any prevention measures).

VI. The significance, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and

VII. The **status**, which will be described as either positive, negative or neutral.

VIII. The degree to which the impact can be reversed.

IX. The degree to which the impact may cause irreplaceable loss of resources.

X. The degree to which the impact can be mitigated.

The **significance** weightings for each potential impact are as follows:

- **< 30 points:** Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- **30-60 points:** Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- **60 points:** High (i.e. where the impact must have an influence on the decision process to develop in the area).

6.3 Impact Assessments

The tables below list the activities that could impact on the vegetation because of the construction of the powerline. The tables also list recommended mitigation measures to limit the impacts.

6.3.1 Destruction of natural vegetation

Nature: The development will require the removal of vegetation for the purpose of access roads, servitudes and the footprint of the development. Illegal disposal of construction material such as oil, cement etc. could destroy natural vegetation.

The sources of this impact include:

- Clearing of and damage to vegetation in construction footprint, access roads, construction camps, vehicle / machinery traffic and trampling by workers (stepping on small plants);
- Illegal disposal and dumping of construction material such as cement or oil, as well as maintenance materials during construction;
- Edge effects e.g. heavy vehicles turning in adjacent areas;
- Storage of equipment within vegetation; and
- Maintenance vehicles driving within natural or rehabilitated vegetation, not impacted on during the construction, will lead to the destruction of naturally occurring vegetation and compaction of soils and subsequent erosion or colonisation by alien invasive plant species. In addition, failed rehabilitation could lead to soil erosion during rainfall events and flooding.

	Without mitigation	**With mitigation**
CONSTRUCTION PHASE		
Probability	Definite (5)	Highly probable (4)
Duration	Medium-term (3)	Short-term (2)
Extent	Limited to Local Area (2)	Limited to Local Area (2)

Magnitude	Moderate (6)	Low(4)
Significance	**55 (medium)**	**32 (medium)**
Status (positive or negative)	Negative	Negative
OPERATIONAL PHASE		
Probability	Probable (3)	Improbable (2)
Duration	Medium term (3)	Short term (2)
Extent	Limited to Local Area (2)	Limited to the Site (1)
Magnitude	Moderate (6)	Low (4)
Significance	**33 (medium)**	**14 (low)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Moderate
Irreplaceable loss of resources?	Moderate	Low
Can impacts be mitigated?	Yes	

Mitigation:

Planning:

- Removal of vegetation must be restricted to the pylon footprint and trees underneath the powerline must be pruned to acceptable heights, instead of clear-felling. This will limit degradation of the vegetation and the subsequent invasion by alien invasive plant species.
- Keep the work area (e.g. area to be disturbed) to a minimum. Manual labour is recommended to keep the servitude as small as possible, with no heavy vehicles driving over or turning within the high SEI areas

Construction:

An independent Environmental Control Officer (ECO) should be appointed to oversee construction.

- Keep the development footprint in Medium SEI categories as small as possible
- Keep the work area (e.g. area to be disturbed) to a minimum. Manual labour is recommended to keep the servitude as small as possible, with no heavy vehicles driving over or turning within the high SEI areas
- A temporary fence or demarcation must be erected around the construction area (include the actual footprint, as well as areas where material is stored and needed for e.g. trenching) to prevent access to adjacent vegetation.
- Prohibit vehicular or pedestrian access into natural areas beyond the demarcated boundary of the construction area.
- No open fires are permitted within naturally vegetated areas.
- Formalise access roads and make use of existing roads and tracks where feasible, rather than creating new routes through naturally vegetated areas.
- Implement a vegetation rehabilitation plan. Due to the dry climate, natural colonisation could take a long time, in which vegetation may degrade (bush encroachment) or be invaded by alien invasive plant species. Therefore, timeous rehabilitation is imperative. E
- Construction workers may not remove flora and neither may anyone collect seed from the plants without permission from the local authority.
- Introduce adequate sedimentation control measures at watercourse crossings and when excavation or disturbance along watercourses takes place.
- Where topsoils need to be removed, store such in a separate area where such soils can be protected until they can be re-used for post-construction rehabilitation
    - Never mix topsoils with subsoils or other spoil materials
- Maintain site demarcations in position until the cessation of construction work.

- After construction, the land must be cleared of rubbish, surplus materials, and equipment, and all parts of the land must be left in a condition as close as possible to that prior to construction.

Maintenance:

- After construction, the land must be cleared of rubbish, surplus materials, and equipment, and all parts of the land must be left in a condition as close as possible to that prior to construction.
- Ensure that maintenance work does not take place haphazardly, but according to a fixed plan.
- Cordon off areas that are under rehabilitation as no-go areas using danger tape and steel droppers. If necessary, these areas should be fenced off to prevent vehicular, pedestrian and livestock access.
- Maintenance workers may not trample natural vegetation and work should be restricted to previously disturbed footprint. In addition, mitigation measures as set out for the construction phase should be adhered to.
- Address erosion donga crossings, applying soil erosion control and bank stabilisation procedures as specified by the ECO.
- Do not allow erosion to develop on a large scale before effecting repairs. When in doubt, seek advice from the ECO.
- Repair all erosion damage as soon as possible and in any case not later than six months before the termination of the Maintenance Period to allow for sufficient rehabilitation growth
- The servitude must be naturally vegetated and trees pruned in stead of removed (where possible)

Cumulative impacts:

None envisaged

Residual Risks:

- Localised alteration of soil surface characteristics and loss of flora.
- Increased fragmentation of remaining vegetation along the powerline.
- Possible erosion and invasion by alien invasive plant species and densification of bush encroacher species

6.3.2 Exposure to erosion and subsequent sedimentation or pollution of proximate watercourses

Nature: The removal of surface vegetation will expose the soils, which in rainy events would wash down into the watercourses, causing sedimentation. In addition, indigenous vegetation communities are unlikely to colonise eroded soils successfully, particularly due to the high occurrence of invasive plant species in the study area. Seeds from proximate alien invasive plant species can spread easily into these eroded soils. After construction, a lack of rehabilitation or failed rehabilitation will result in bare soils that are susceptible to erosion. Furthermore, maintenance vehicles could disturb rehabilitated areas which could lead to soil erosion, habitat modification, trampling of vegetation as well as the destruction of protected plants and plants of conservation concern. The sources of this impact include:

- Removal of vegetation in proximity to the Searsia dominated drainage line, without proper rehabilitation or failure of rehabilitation;
- Access roads, especially on slopes, channels rainfall and causes erosion;
- Lack of rehabilitation or failed rehabilitation;
- Maintenance vehicles disturbing rehabilitated areas;
- Spillages of construction material and harmful chemicals; and
- Failure of rehabilitation of the construction footprint.

	Without mitigation	**With mitigation**
CONSTRUCTION PHASE		
Probability	Highly Probable (4)	Probable (3)

Duration	Medium-term (3)	Short-term (2)
Extent	Limited to Local Area (2)	Limited to site (1)
Magnitude	High (8)	Low (4)
Significance	**52 (medium)**	**21 (low)**
Status (positive or negative)	Negative	Negative
OPERATIONAL PHASE		
Probability	Probable (3)	Improbable (2)
Duration	Medium term (3)	Short term (2)
Extent	Limited to Local Area (2)	Limited to the Site (1)
Magnitude	Moderate(6)	Low (4)
Significance	**33 (medium)**	**14 (low)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Low
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	Yes	

Mitigation:

Planning:

- Avoid direct impacts into Searsia dominated drainage line and buffer area as recommended by the wetland specialist
- Plan to remove as little indigenous vegetation as possible.
- Compile a stormwater management plan that will safeguard the proximate watercourses from construction and operational impacts.

Construction:

- Do not allow erosion to develop on a large scale before acting.
- Make use of existing roads and tracks where feasible, rather than creating new routes through grassland areas.
- Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction / earthworks in that area (DWAF, 2005).
- Runoff from roads must be managed to avoid erosion and pollution problems.
- Ensure that runoff from compacted or sealed surfaces is slowed down and dispersed sufficiently to prevent accelerated erosion from being initiated (erosion management plan required)
- Remove only the vegetation where essential for construction and do not allow any disturbance to the adjoining natural vegetation cover.
- Colonisation of the disturbed areas by **indigenous** plants species from the surrounding natural vegetation must be monitored to ensure that vegetation cover is sufficient within one growing season. If not, then the areas need to be rehabilitated with a grass seed mix containing species that naturally occur within the study area.
- Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and work areas.
- Prevent spillage of construction material, oils or other chemicals, strictly prohibit other pollution. Ensure there is a method statement in place to remedy any accidental spillages immediately.
- After construction clear any temporarily impacted areas of all foreign materials, re-apply and/or loosen topsoils and landscape to surrounding level.

Operational:

• Do not disturbed soil or indigenous vegetation unnecessary during maintenance. Ensure that maintenance work does not take place haphazardly, but according to a fixed plan. • Cordon off areas that are under rehabilitation as no-go areas using danger tape and steel droppers. If necessary, these areas should be fenced off to prevent vehicular, pedestrian and livestock access. • Monitor rehabilitation and ensure that rehabilitated areas do not erode. • If monitoring finds that indigenous vegetation from the surrounding bushveld is not colonising the site, implement a re-vegetation plan to ensure that grass species that naturally occur in the area, are sowed in order to re-establish indigenous plant cover. • Maintenance workers may not trample natural vegetation and work should be restricted to previously disturbed footprint. In addition, mitigation measures as set out for the construction phase should be adhered to.
Cumulative impacts: Erosion of the development footprint upslope from the watercourses could increase sedimentation However, this could be mitigated.
Residual Risks: • No indigenous vegetation cover in disturbed areas (failed rehabilitation) • Colonisation by alien invasive plant species.

6.3.3 Removal / Destruction of protected plants and plants of conservation concern

Nature: The construction of the powerline could result in the removal of plant species of conservation concern and provincially protected plants, impact on their habitat, pollinators and inevitably the persistence of these species. This could put further strain on the already declining populations.

	Without mitigation	**With mitigation**
CONSTRUCTION PHASE		
Probability	Probable (3)	Improbable (2)
Duration	Medium-term (3)	Short-term (2)
Extent	Limited to Local Area (2)	Limited to site (1)
Magnitude	Moderate (6)	Low (4) Only if plants are avoided or relocated, else rating stays at 6
Significance	**33 (medium)**	**14 (low)**
Status (positive or negative)	Negative	Negative
OPERATIONAL PHASE		
Probability	Probable (3)	Improbable (2)
Duration	Medium term (3)	Short term (2)
Extent	Limited to Local Area (2)	Limited to the Site (1)
Magnitude	Low (4)	Minor (2)
Significance	**27 (low)**	**10 (low)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	Yes	

Mitigation:

Planning:

- Most of the four species flower in late summer (Feb-March), and it is recommended that the final footprint, especially pylon footprints, be scanned for such species during the flowering period.
- Where such species are deemed to be under threat from the construction activity, these plants must be removed by a suitably qualified specialist and replanted as part of vegetation rehabilitation after the construction (Note, these plants may only be removed with the permission of the provincial authority).
- Implement a plant relocation plan for plant species of concern that was recorded during the walkdown, if any. For species that can not be relocated (e.g. large trees), apply for permit for the pruning / removal thereof.

Construction:

- Where possible, the species of conservation concern that were confirmed to occur (if any), should be avoided by construction and related activities. The species should be marked or cordoned off to protect them from construction activities and vehicles. Construction workers should be made aware of the species and the aim to protect them from damage.
- The ECO should take note of any unearthed geophytes or orchids and contact a specialist for the correct naming and threat status of the species. This will determine whether any follow-up action is required.
- Construction workers may not tamper or remove these plants and neither may anyone collect seed from the plants without permission from the local authority.

Maintenance:

- Maintenance workers may not trample natural vegetation and work should be restricted to previously disturbed footprint. In addition, mitigation measures as set out for the construction phase should be adhered to.

Cumulative impacts: If mitigation measures are adequately implemented, no cumulative impacts are expected.

Residual Risks: Species removed (if any) and relocated as part of rehabilitation could die due to transplantation shock or damage during replanting.

6.3.4 Potential increase in invasive vegetation

Nature: The seed of alien invasive plant species that occur on and in the vicinity of the construction areas could spread into the disturbed and stockpiled soil. Also, the construction vehicles and equipment were likely used on various other sites and could introduce alien invasive plant seeds or indigenous plants not belonging to this vegetation unit to the construction site. In addition, if rehabilitation of the indigenous vegetation along the route, are unsuccessful or is not enforced, exotic and invasive vegetation may further invade the area.

	Without mitigation	**With mitigation**
CONSTRUCTION PHASE		
Probability	Highly probable (4)	Probable (3)
Duration	Long-term (4)	Short-term (2)
Extent	Local Area (2)	Site bound (1)
Magnitude	High (8)	Low (4)
Significance	**56 (medium)**	**21 (low)**
Status (positive or negative)	Negative	Negative
OPERATIONAL PHASE		
Probability	Probable (3)	Improbable (2)

Duration	Long term (4)	Short term (2)
Extent	Limited to Local Area (2)	Limited to the Site (1)
Magnitude	Low (4)	Minor (2)
Significance	**30 (medium)**	**10 (low)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	Yes	

Mitigation:

Construction:

- Alien invasive species, in particular category 1b species that were identified within the study area, should be removed from the development footprint and immediate surrounds, prior to construction or soil disturbances. By removing these species, the spread of seeds will be prevented into disturbed soils which could thus have a positive impact on the surrounding natural vegetation.
- All alien seedlings and saplings must be removed as they become evident for the duration of construction.
- All construction vehicles and equipment, as well as construction material should be free of plant material. Therefore, all equipment and vehicles should be thoroughly cleaned prior to access on to the construction areas. This should be verified by the ECO.
- If filling material is to be used, this should be sourced from areas free of invasive species.

Maintenance:

- Implement an alien invasive plant monitoring and management plan whereby the spread of alien and invasive plant species into the areas disturbed by the construction are regularly removed and re-infestation monitored.

Cumulative impacts: The area that the proposed development is situated in is already infested with alien invasive plant species. Therefore, if mitigation measures to limit and prevent the spread of alien species are not implemented, the cumulative impact could lead to remaining natural vegetation transformed by alien plant species.

Residual Risks: Due to the high occurrence of alien invasive plant species in the area, the residual risk of increased alien vegetation cover is moderate to high.

6.3.5 Clearing of land for construction camps and potential pollution of the soil and water

Nature: These may be at one or several locations, area will be cleared and levelled where necessary, site offices may be temporary structures, machinery, building supplies and temporary staff facilities (excluding accommodation) will be housed here. The impacts could include:

- Removal of vegetation
- Levelling and compaction of soils
- Storage of machinery, supplies and staff facilities

This could lead to the loss of vegetation and/or species of conservation concern, alteration, and loss of microhabitats, altered vegetation cover, increased erosion and contamination of soil and groundwater.

	Without mitigation	**With mitigation**
CONSTRUCTION PHASE		
Probability	Probable (3)	Improbable (2)

Duration	Medium-term (3)	Short-term (2)
Extent	Local Area (2)	Site bound (1)
Magnitude	Moderate (6)	Low (4)
Significance	**33 (moderate)**	**14 (low)**
Status (positive or negative)	**Negative**	**Negative**
OPERATIONAL PHASE		
Probability	Probable (3)	Improbable (2)
Duration	Short-term (2)	Very short-term (1)
Extent	Local Area (2)	Site bound (1)
Magnitude	Moderate (6)	Low (4)
Significance	**30 (Moderate)**	**12 (low)**
Status (positive or negative)	**Negative**	**Negative**
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Not Applicable	Not Applicable
Can impacts be mitigated?	Reasonably	

Mitigation:

Construction:

- Keep the clearing of natural veld to a minimum and locate construction camps within transformed or modified areas.
- No building of temporary infrastructure allowed in watercourses and buffers as recommended by the wetland specialist.
- After the final layout has been approved, conduct a thorough footprint investigation to determine any protected plant species population location and size.
- Stay within demarcated temporary construction areas and strictly prohibit any off-road driving or parking of vehicles and machinery outside designated areas
- Prevent spillage of construction material and other pollutants, contain, and treat any spillages immediately, strictly prohibit any pollution/littering according to the relevant EMPr
- No open fires may be lit for cooking or any other purposes, unless in specifically designated and secured areas
- Facilities may not be used as staff accommodation
- No vehicles may be washed on the property, except in suitably designed and protected areas
- No vehicles may be serviced or repaired on the property, unless it is an emergency in which case adequate spillage containment must be implemented
- After construction remove all foreign material prior to starting the rehabilitation
- The rehabilitation plan for all temporarily affected areas must aim to re-introduce species naturally occurring in the Gauteng Shale Mountain bushveld
- Monitor the establishment of invasive species and remove as soon as detected, whenever possible before regenerative material can be formed

Maintenance:

- Monitor all sites disturbed by construction activities for colonisation by exotics or invasive plants and control these as they emerge. Monitoring should continue for at least two years after construction is complete.

Cumulative impacts: If mitigation measures are not strictly implemented, erosion of the development area, contamination of ground water and the spread and establishment of invasive species can take place. This will lead to the increase in modified areas and fragmentation of natural and semi-natural vegetation.
Residual Risks: Compaction on construction camps could result in altered topsoil characteristics and vegetation composition. These areas are also prone to invasion by alien invasive plant species.

6.3.6 Compaction and destruction of soils

Nature: The movement of heavy machinery over vegetated areas during construction and maintenance will result in soil compaction that will modify habitats, destroy vegetation, and inhibit re-vegetation. Soil compaction because of vehicles and traffic, could lead to a decrease of water infiltration and an increase of water runoff. Such areas are more likely to be colonised by pioneer, alien invasive plant species, than indigenous species. This will further transform the vegetation of the area. The health of the topsoil is imperative for re-vegetation. Incorrect stripping, handling and storage could lead to failed rehabilitation.

	Without mitigation	**With mitigation**
CONSTRUCTION PHASE		
Probability	Probable (3)	Improbable (2)
Duration	Long-term (4)	Short-term (2)
Extent	Local (2)	Site bound (1)
Magnitude	High (8)	Low (4)
Significance	**56 (moderate)**	**14 (low)**
Status (positive or negative)	Negative	Negative
OPERATIONAL PHASE		
Probability	Probable (3)	Improbable (2)
Duration	Short term (2)	Short term (2)
Extent	Limited to Site (1)	Limited to the Site (1)
Magnitude	Moderate (4)	Minor (2)
Significance	**21 (low)**	**10 (low)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	Moderate	Low
Can impacts be mitigated?	Yes	

Mitigation:

Construction:

- Vehicles and machinery may not veer from the dedicated roads.
- Once construction is complete, obsolete roads should be obliterated by breaking the surface crust and erecting earth embankments to prevent erosion, while the natural species composition should be re-established.
- Prior to construction, the topsoil must be removed and stored separately from subsoil. The topsoil is imperative for the successful re-establishment of indigenous vegetation and it carries seed from the existing vegetation
- Topsoil (the upper 25 cm of soil) is an important natural resource; where it must and can be stripped, never mix it with subsoil or any other material, store and protect it separately until it can be re-applied, minimise handling of topsoil.

- Topsoil is typically stored in berms with a width of 150 – 200 cm, and a maximum height of 100 cm, preferably lower, ideally in a disturbed but weed-free area. Place berms along contours or perpendicular to the prevailing wind direction.
- Rapid decomposition of organic material in warm, moist topsoils decreases microbial activity necessary for nutrient cycling, and reduces the number of beneficial micro-organisms in the soil. Therefore, topsoil should therefore not be stored for extensive periods and it is recommended that the reapplication of topsoil takes place as soon as possible. Adhere to the following general rule: *the larger the pile of topsoil storage needs to be, the shorter should be the time it is stored*
- Topsoil handling should be limited to stripping, piling (once), and re-application.
- Any movement of heavy machinery or vehicles over stored topsoils must be strictly prohibited.

Maintenance:

- Maintenance vehicles may not deviate from dedicated roads.

Cumulative impacts: Failed rehabilitation and soil compaction associated with the development could lead to a cumulative invasion by alien invasion plant species from the surrounding transformed vegetation that can easily spread into the compacted soils.

Residual Risks: Altered soil characteristics and vegetation that remain in an unstable, pioneer phase or invaded by alien invasive plant species.

6.3.7 Bush densification

Nature: The savanna is prone to bush densification e.g. "stands of plants of the kinds specified in Table 4 of Regulation 16 (CARA), where individual plants are closer to each other than three times the mean crown diameter" (Agricultural Research Council, 2013). Plants in this group are not alien plants, but indigenous plants that tend to become abnormally abundant when the area is degraded (Agricultural Research Council, 2013). The plants themselves are thus not the problem, but their increased abundance or encroachment into open bushveld serves as an indicator of poor land management practices and. This is exasperated by a lack of fire and large herbivores.

Encroacher species are highly likely to establish in disturbed and degraded areas if not managed.

	Without mitigation	**With mitigation**
CONSTRUCTION PHASE		
Probability	Probable (3)	Improbable (2)
Duration	Long term (4)	Medium term (3)
Extent	Limited to site(1)	Limited to site(1)
Magnitude	Moderate (6)	Low (4)
Significance	**33 (moderate)**	**16 (low)**
Status (positive or negative)	Negative	Neutral
Reversibility	Rehabilitation is possible but could take several years	Reversible
Irreplaceable loss of resources?	Moderate	Low
Can impacts be mitigated?	Yes	

Mitigation:

Construction:

- Leave as much natural vegetation intact as possible.
- Do not disturbed soil unnecessary.
- Monitor rehabilitation and do not allow grazing to take place until such time that re-vegetation was found to be successful.
- Ensure that areas outside of the operational footprint that were disturbed, are adequately rehabilitated and that dense stands of encroacher species are prevented.

Operation:

- Monitor the establishment of dense stands of encroacher species and remove as soon as detected.
- A rehabilitation plan, using indigenous species from the study area, must be implemented that will restore disturbed areas beyond the footprint of the infrastructure to what it was prior to construction, thereby making the impact on the remainder of the site negligible in the long term.

Cumulative impacts: Possible bush densification on the site and loss of indigenous species diversity.

Residual Risks: Bush densification

7 CONCLUSION

The site falls in an area that is listed by the National Screening Tool as being of 'High' terrestrial biodiversity. Furthermore, the Screening Tool lists a 'Medium' sensitivity for plant species, indicating that there is a likelihood of plant species of conservation concern being present.

However, much of the proposed development footprint was found to be in a secondary state. Due to the largely modified and secondary nature of the vegetation, the proposed development of the powerline route will have a limited impact on sensitive vegetation. The entire powerline route is within proximity of existing roads. Therefore, limited to no additional access roads are needed, further limiting the proposed developments impacts on vegetation. Most of the powerline route follows a previously disturbed footprint, likely of a cable or pipeline.

According to the North West Biodiversity Sector Plan ((North West Department of Rural, Environment and Agricultural Development (READ), 2015), the site falls within a CBA2. The land use objective in a CBA2 should be to maintain the land in a natural or near-natural state that maximises the retention of biodiversity pattern and ecological process. The powerline may fragment fauna habitat, however, vegetation can regrow and can rehabilitate well. Eskom must strictly manage edge effects and prevent, monitor and rehabilitate negative impacts into adjacent vegetation. The implementation of a rehabilitation and monitoring plan to ensure that the vegetation is retuned to sustainable bushveld post construction must be implemented.

Most of the threatened species that has been recorded in the area that the site is situated in, occurs on quartz and southern slopes, which is absent from the site. However, suitable habitat is present for four species and the possibility of occurrence for these species range from medium to low. Historic disturbances within the PAOI renders it unlikely to support such species. However, as most of the four species flower in late summer (Feb-March), it is recommended that the final footprint, especially pylon footprints, be scanned for such species during the flowering period.

8 PROTOCOL SUMMARY

For ease of reference, the following table summaries results of the assessment as per the main requirements of the Protocols for Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial (Vegetation) Biodiversity as published on 20 March 2020.

Table 11: Summary of the main terrestrial (vegetation) biodiversity findings

Biodiversity (vegetation) aspect	Result
Conservation Plan Category: **CBA2**	**Reason for the CBA2** The CBA2 was classified by the North West Biodiversity Sector Plan based on: • the potential habitat for plant species of conservation concern, • the potential presence of primary vegetation, • Special habitats or important ecological features **Can the CBA2 be maintained?** Yes. The vegetation is currently in a secondary state and with adequate rehabilitation, can return to a secondary state. If the powerline servitude remain naturally vegetated and only pruned to Eskom standards, the CBA can be maintained. **Impact on species composition and structure of vegetation** Clearing of the servitude will destroy the species composition and vegetation structure within the development footprint. Edge effects and failed rehabilitation could result in a dominance of bush encroacher species. The resulting vegetation will have a much lower species diversity and an altered structure. However, mitigation measures can be implemented to reduce this impact. **Impact on ecosystem threat status** The powerline route is not situated in a listed ecosystem. However, the Gauteng Shale Mountain Bushveld is poorly protected and classified as a Vulnerable vegetation unit. The vegetation within the PAOI was found to be in a secondary state and can be rehabilitated to such a state post construction. **Impact on explicit subtypes in the vegetation; and the impact on overall species and ecosystem diversity of the site;** See above
Protected Areas	The site is embedded within the Magaliesberg Biosphere Reserve but are excluded from it. The Cradle of Humankind is to the south-west of the powerline route and the Crocodile River Reserve Protected Environment is situated to the south-east of the proposed powerline. No impacts to the protected areas are expected.
SWSA	**Impact(s) on the terrestrial habitat of a SWSA** The site is not situated within a SWSA, however clearing of vegetation can have an impact on water infiltration and flow dynamics to the downstream watercourses.
NFEPA	See aquatic / wetland assessment
Indigenous forest	Not applicable
Sensitive Areas	Other than the medium to low potential occurrence of plant species of conservation concern, the vegetation is not regarded as sensitive to the proposed development of the powerline route.

Biodiversity (vegetation) aspect	Result
No go areas	Any vegetation that are not within the 20m buffer area on either side of the powerline (PAOI) as assessed in this report.
Plant species of conservation concern	• No plant species of conservation concern were recorded within walked transects and sample points at the time of this assessment. • Suitable habitat is present for four species, none of which was recorded during the site visit undertaken in December 2021. These species were not in flower at the time of the assessment or could have been obscured by dense vegetation (due to the preceding summer rains). • The possibility of occurrence for these species range from medium to low. Historic disturbances within the PAOI renders it unlikely to support such species. However, as most of the four species flower in late summer (Feb-March), it is recommended that the final footprint, especially pylon footprints, be scanned for such species during the flowering period.
Main impacts:	The main impacts expected are as follows: • Destruction of natural vegetation • Exposure to erosion and subsequent sedimentation or pollution of proximate non-perennial drainage line • Potential increase in invasive vegetation • Bush encroachment • Compaction and destruction of soils • Edge effects to surrounding vegetation
Cumulative impacts:	• If mitigation measures are adequately implemented, no cumulative impacts are expected.
Residual impacts:	• Due to the high frequency of alien invasive plant species, the likelihood of the colonization of areas disturbed by the development being infested remain high. • The risk of introduction of new alien invasive plant species • Pruning or trees and impact on vegetation as part of Eskom maintenance along the powerlines. • Species removed and relocated as part of rehabilitation could die due to transplantation shock or damage during replanting. • If mitigation measures are adequately undertaken, the residual risk is moderate to low as the impacts are unlikely to be exceed the construction impacts and can be remedied if corrective action is taken immediately

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10 GLOSSARY

Alien species	Plant taxa in a given area, whose presence there, is due to the intentional or accidental introduction as a result of human activity
Azonal	Water-logged and salt-laden habitats require specially adapted plants to survive in these habitats. Consequently the vegetation deviates from the typical surrounding zonal vegetation and are considered to be of azonal character (Mucina & Rutherford, 2006)
Biodiversity	Biodiversity is the variability among living organisms from all sources including inter alia terrestrial, marine and other aquatic ecosystems and ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems
Biome	A major biotic unit consisting of plant and animal communities having similarities in form and environmental conditions, but not including the abiotic portion of the environment.
Buffer zone	A collar of land that filters edge effects.
Conservation	The management of the biosphere so that it may yield the greatest sustainable benefit to present generation while maintaining its potential to meet the needs and aspirations of future generations. The wise use of natural resources to prevent loss of ecosystems function and integrity.
Conservation concern (Plants of…)	Plants of conservation concern are those plants that are important for South Africa's conservation decision making processes and include all plants that are Threatened (see **Threatened**), Extinct in the wild, Data deficient, **Near threatened**, Critically rare, Rare and **Declining**. These plants are nationally protected by the National Environmental Management: Biodiversity Act. Within the context of these reports, plants that are provincially protected are also discussed under this heading.
Conservation status	An indicator of the likelihood of that species remaining extant either in the present day or the near future. Many factors are taken into account when assessing the conservation status of a species: not simply the number remaining, but the overall increase or decrease in the population over time, breeding success rates, known threats, and so on
Conservation Importance	The importance of a site for supporting biodiversity features of conservation concern present e.g. populations of IUCN Threatened and Near-Threatened species (CR, EN, VU & NT), Rare, range-restricted species, globally significant populations of congregatory species, and areas of threatened ecosystem types, through predominantly natural processes.
Community	Assemblage of populations living in a prescribed area or physical habitat, inhabiting some common environment.
Critically Endangered	A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future.
Data Deficient	There is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. However, "data deficient" is therefore not a category of threat. Listing of taxa in this category

	indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate.
Declining	A taxon is declining when it does not meet any of the five IUCN criteria and does not qualify for the categories Threatened or Near Threatened, but there are threatening processes causing a continuous decline in the population (Raimondo *et al*, 2009).
Ecological Corridors	Corridors are roadways of natural habitat providing connectivity of various patches of native habitats along or through which faunal species may travel without any obstructions where other solutions are not feasible
Ecosystem	Organisms together with their abiotic environment, forming an interacting system, inhabiting an identifiable space
Edge effect	Inappropriate influences from surrounding activities, which physically degrade habitat, endanger resident biota and reduce the functional size of remnant fragments including, for example, the effects of invasive plant and animal species, physical damage and soil compaction caused through trampling and harvesting, abiotic habitat alterations and pollution
Endangered	A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future
Endemic	Naturally only found in a particular and usually restricted geographic area or region
Exotic species	Plant taxa in a given area, whose presence there, is due to the intentional or accidental introduction as a result of human activity
Forb	An herbaceous plant other than grasses.
Habitat	Type of environment in which plants and animals live
Indigenous	Any species of plant, shrub or tree that occurs naturally in South Africa
In Situ	"In the place" In Situ conservation refers to on-site conservation of a plant species where it occurs. It is the process of protecting an endangered plant or animal species in its natural habitat. The plant(s) are not removed, but conserved as they are. Removal and relocation could kill the plant and therefore in situ conservation is preferred/ enforced.
Invasive species	Naturalised alien plants that have the ability to reproduce, often in large numbers. Aggressive invaders can spread and invade large areas
Mitigation	The implementation of practical measures to reduce adverse Impacts
Near Threatened	A Taxon is Near Threatened when available evidence indicates that that it nearly meets any of the five IUCN criteria for Vulnerable, and is therefore likely to qualify for a threatened category in the near future (Raimondo *et al*, 2009).
Plant Community	A collection of plant species within a designated geographical unit, which forms a relatively uniform patch, distinguishable from neighbouring patches of different vegetation types. The components of each plant community are influenced by soil type, topography, climate and human disturbance. In many cases there are several soil types within a given plant community (Gobbat *et al*, 2004)
Protected Plant	According to Provincial Nature Conservation Ordinances or Acts, no one is allowed to sell, buy, transport, or remove this plant without a permit from the responsible authority. These plants are protected by provincial legislation.
Threatened	Species that have naturally small populations, and species which have been reduced to small (often unsustainable) population by man's activities

Red Data	A list of species, fauna and flora that require environmental protection - based on the IUCN definitions. *Now termed Plants of Conservation Concern*
Species diversity	A measure of the number and relative abundance of species
Species richness	The number of species in an area or habitat
Suffrutex	Low-growing woody shrub or perennial with woody base, sometimes referred to as underground trees
Threatened	Threatened Species are those that are facing a high risk of extinction, indicated by placing in the categories Critically Endangered (CR), Endangered (E) and Vulnerable (VU) (Raimondo *et al,* 2009)
Transformation	The removal or radical disturbance of natural vegetation, for example by crop agriculture, plantation forestry, mining or urban development. Transformation mostly results in a serious and permanent loss of biodiversity and fragmentation of ecosystems, which in turn lead to the failure of ecological processes. Remnants of biodiversity may survive in transformed landscapes
Vegetation Association	A complex of plant communities ecologically and historically (both in spatial and temporal terms) occupying habitat complexes at the landscape scale. Mucina and Rutherford (2006) state: "Our vegetation units are the obvious vegetation complexes that share some general ecological properties such as position on major ecological gradients and nutrient levels and appear similar in vegetation structure and especially floristic composition".
Vulnerable	A taxon is Vulnerable when it is not Critically Endangered or Endangered but meets any of the five IUCN criteria for Vulnerable and are therefore facing a high risk of extinction in the wild in the future (Raimondo *et al*, 2009)

APPENDIX A: SAMPLE POINT AND TRACK MAP

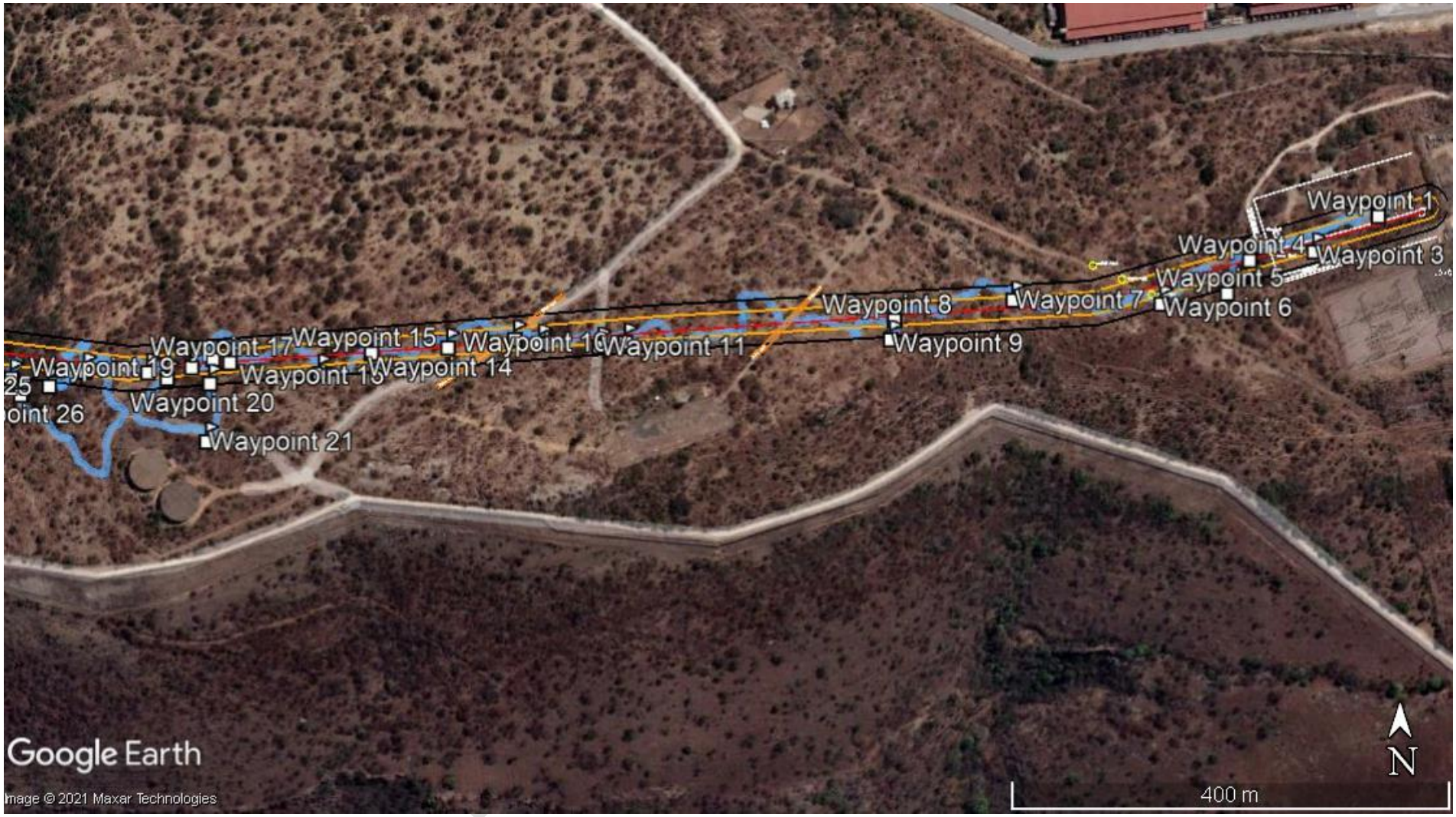

Figure 16: Sample points and tracks in eastern extent of route

Figure 17: Sample points and tracks in eastern extent of route

APPENDIX B: SPECIES RECORDED DURING THE FIELD SURVEYS

1 = species recorded in broad vegetation group

M = Medicinal

P= Protected by provincial legislation

Species	Common name	Habitat notes	Secondary Gauteng Shale Mountain Bushveld	Searsia drainage line	Modified
Trees					
Senegalia caffra (M)	Common Hook-thorn	Grassland, bushveld, often on rocky ridges	1	1	1
Acacia (Vachellia) karroo (M)	Sweet Thorn	Widespread, often proliferate in overgrazed areas	1	1	1
Vachellia robusta	Ankle Thorn	Bushveld and grassland		1	1
Antidesma venosum	Tassel Berry	Moist bushveld and wooded grassland			1
Celtis africana	Stinkwood	Wooded areas or bush clumps, usually on dolomite	1	1	1
Combretum apiculatum(M)	Red Bushwillow	Bushveld, often in low altitudes and in rocky places	1		
Combretum molle	Velvet Bushwillow	Bushveld or sheltered rocky places in grassland	1	1	1
Dichrostachys cinerea (M)	Sickle Bush	Bushveld, often invasive and thicket-forming	1		
Dodonea viscosa subsp angustifolia (M)	Sand Olive	Open areas associated with bushveld, wooded grassland and forest	1		
Ehretia rigida	Puzzle Bush	Wooded grassland, bushveld	1	1	1
Elephantorrhiza elephantina (M)	Elephant's root	Grassland. Bushveld, often in disturbed places.	1		
Englerophytum magalismontanum	Transvaal Milkplum / Stamvrug	Rocky outcrops or riverine fringing forests.	1		
Euclea crispa subsp crispa	Blue Guarri	Rocky slopes, kloofs, along rivers and forest margins	1		1
Gymnosporia polyacantha	Kraal-Spike Thorn	Bushveld, valley bushveld, karoid vegetation and grassland	1		1

Species	Common name	Habitat notes	Secondary Gauteng Shale Mountain Bushveld	Searsia drainage line	Modified
Mundulea sericea	Cork Bush	Grassland and bushveld, usually associated with rocky outrops	1		
Olea europea subsp africana (M)(P in NC, Mpu)	Wild Olive	Wide range of habitats, usually on rocky hillsides or on streambanks.	1	1	1
Ozoroa paniculosa	Common Resin Tree	Bushveld	1		
Ozoroa sphaerocarpa (M)	Currant Resin Tree	Bushveld, often on rocky hillsides	1		
Pappea capensis	jacket-plum	Bushveld and wooded grassland or scrubveld.	1	1	
Peltophorum africanum (M)	Weeping Wattle	Dry bushveld and sand forest usually on deep sand.	1		1
Rhamnus prinoides	Dogwood	Rocky grassland, often along watercourses	1	1	1
Searsia lancea	Sour Karee	Grassland and bushveld	1	1	
Searsia leptodictya	Mountain Karee	Grassland and bushveld, often in rocky places	1	1	1
Searsia magalismontana	Bergtaaibos	Grassland and Bushveld, on rocky ridges.	1		
Searsia pyroides	Common Wild Currant	Mountain grassland, bushveld, grassland - wide range of habitats	1	1	
Vangueria infausta	Wild Medlar	Mainly on rocky hillsides.	1		
Zanthoxylum capense	Small Knobwood	Rocky ridges, usually among other woody species, forest margins	1	1	1
Ziziphus mucronata	Buffalo-thorn	Widespread, in various habitats	1	1	1
Ziziphus zeyheriana	Dwarf Buffalo-thorn	Grassland	1		
Number of indigenous tree species recorded = 29			**27**	**14**	**15**
Grasses					
Aristida canescens	Pale Three-awn	Disturbed, eroded soil	1		1
Aristida diffusa	Iron Grass	Rocky soils agaisnt slopes, typical in shallow soils in overgrazed veld. Increaser III	1		
Brachiaria serrata	Saw-tooth grass	Rocky, undisturbed grassland	1		
Cymbopogon caesius (also known as C excavatus)	Broad-leafed Turpentine Grass	Most soils, usually in disturbed areas. Increaser I grass, not palatable	1	1	

Species	Common name	Habitat notes	Secondary Gauteng Shale Mountain Bushveld	Searsia drainage line	Modified
Cynodon dactylon	Couch grass	Most soils, usually in disturbed areas. Increaser II grass, palatable	1	1	1
Digitaria eriantha	Finger Grass	Sandy, rocky soil in arid areas or next to rivers/vlei's in areas with higher rainfall. Planted for pasture	1	1	
Eragrostis chloromelas	Curly leaf	Rocky slopes, mostly in open grassland. Increaser II grass	1		
Eragrostis curvula	Weeping Love Grass	Mostly occurs in disturbed areas / sown as pasture. Increaser II grass	1	1	1
Eragrostis cf lehmanniana	Lehmann's Grass	Sandy soil, mostly in disturbed land. Increaser II grass	1		1
Eragrostis nindensis	Wether Love grass	Disturbed or shallow soils, often on granite hills. Increaser II	1		
Heteropogon contortus	Spear Grass	Rocky, sloped land and common on disturbed road reserves. Increaser II grass. Palatable in early summer	1		1
Hyparrhenia filipendula	Fine Thatching Grass	Bushveld and open grassland. Increaser I	1		
Hyparrhenia hirta	Common Thatching Grass	Well drained, rocky soil in open grassland and disturbed areas. Increaser I grass	1	1	1
Loudetia simplex	common russet grass	Open grassland, poor sandy soil to rocky slopes and vlei's. Increaser II	1		
Melinis nerviglumis	Bristle-leaved Red Top	Undisturbed grassland, rocky slopes and soils.	1		
Melinis repens	Natal Red Top	Disturbed grassland. Increaser II grass.	1	1	1
Panicum maximum	Guinea Grass	Grow in shade under trees, also in sun, moist to dry areas.		1	

Species	Common name	Habitat notes	Secondary Gauteng Shale Mountain Bushveld	Searsia drainage line	Modified
Panicum natalense	Natal Panicum (Suurbuffelsgras)	Open, mountainous grassland on well drained soil. Often grows on rocky slopes and where veld is frequently burnt.	1		
Schizachyrium sanguineum	Red Autumn Grass	Open grassland and Bushveld. Often in moist areas and vlei's. Palatable climax grass	1		
Setaria pallida-fuscua	Garden Bristle Grass	Disturbed areas e.g. next to roads and where rainwater collect	1	1	1
Setaria sphacelata var. torta	Creeping Bristle Grass	Well drained soils, often in previously disturbed areas. Decreaser grass	1		1
Themeda triandra	red grass	Undisturbed or disturbed open grassland. Decreaser Grass	1		
Urochloa mosambicensis	Bushveld Signal Grass	Disturbed areas such as farmland, also in compacted soils. Good grazing grass. Increaser II	1		1
Minimum number of indigenous grass species = 32			**22**	**8**	**10**
Climbers					
Clematis brahiata	Traveller's Joy	Bushy hillsides, particularly rocky places	**1**	**1**	**1**
Spedamnocarpus pruriens		Clumps of bush, open bushveld and rocky ridges	**1**		
Number of climbers recorded = 2			**2**	**1**	**1**
Small shrubs / Forbs / succulents					
Aloe marlothii	Mountain Aloe	Rocky hillsides and ridges	1		
Aloe zebrina		Grassland and bushveld	1		
Athrixia elata	Daisy-tee Bush	Rocky slopes	1		
Barleria pretoriensis		Bushveld, rocky hillsides	1		
Chamaecrista mimosoides (M)	Fishbone Cassia	Grassland/bushveld	1		
Chascanum hederaceum		Grassland	1		
Cleome maculata		Grassland, often a weed of disturbed sandy places	1		1

Species	Common name	Habitat notes	Secondary Gauteng Shale Mountain Bushveld	Searsia drainage line	Modified
Corchorus asplenifolius (M)	geel varingblaartjie	Woodland, grassland on margins of marshes		1	
Crotalaria lotoides	mealie crotalaria	Bushveld	1		
Cryptolepsis oblongifolia	Bokhoring	Rocky Grassland	1		
Evolvulus alsinoides var linifollus		Rocky places, a weed in overgrazed areas.	1		1
Felicia muricata		Grassland, proliferating in overgrazed/disturbed places	1		1
Gerbera viridifolia subsp viridifolia		Grassland	1		
Gomphocarpus fructicosus	Milkweed	Disturbed areas	1		1
Graderia subintegra	Wild Penstemon	Grassland	1		
Grewia flava	Velvet Raisin	Bushveld and wooded grassland, often in drier areas and on Kalahari sand	1		
Helichrysum coriaceum	Vaalteebossie	Grassland and rocky hillsides	1		
Helichrysum nudifolium (M)	Hottentot's tea	Grassland	1		
Hibiscus pusillus		Grassland, rocky areas and disturbed places	1	1	
Hypericum aethiopicum	St. John's Wort / Vlieepisbossie	Grassland	1		
Indigofera comosa		Grassland and rocky ridges	1		
Indigofera setiflora		Grassland, rocky places	1		
Indigofera zeyheri		Rocky grassland, sometimes in moist depressions	1		
Kalanchoe paniculata	hassieoor	Grows in shallow soils overlaying rock.	1		
Melhania prostrata		Grassland and bushveld	1		
Pavonia burchelii		Rocky areas, savanna	1		
Pentanissia angustifolia (M)		Grassland.	1		
Rhynchosia caribaea (M)		Grassland and bushveld. Mainly Pretoria/Magaliesberg area	1		

Species	Common name	Habitat notes	Secondary Gauteng Shale Mountain Bushveld	Searsia drainage line	Modified
Senecio venosus		Grassland, often in rocky places	1		
Tephrosia longipes		Grassland/ rocky grassland	1		
Tribulus terrestris	Common Devil's Thorn / Dubbeltjie	Spreading weed in disturbed places			1
Triumfetta sonderii (M)	Maagbossie	Grassland and rocky ridges	1		
Hilliardiella aristata (V. natalensis) (M)		Grassland	1		
Vernonia galpinii	Bloukwasbossi	Grassland, rock\y	1		
Minimum number of indigenous forb species recorded = 34			**32**	**2**	**5**
Ferns and mosses					
Cheilanthus cf hirta		Forest floors, could alo adapt to exposed situations amongst rocks or in drier deciduous woodland	1		
Pellaea calomelanos **(P)**	Hard Fern	Grassland, often in moist or rocky places.	1	1	
Number of ferns and mosses = 2			**2**	**1**	**0**
Alien / Invasive Species					
Cosmos bipinnatus (Bidens formosa)	Cosmos	Weed in disturbed places			1
Campuloclinium macrocephalum	Pom-Pom Weed	Invasive weed, Category 1b	1		1
Erigeron (Conyza) albida	Tall Fleabane	Weed	1	1	1
Lantana camara	Lantana	Form dense impenetrable thickets, replacing indigenous vegetation. Declared Category 1b invasive (NEMBA)			
Melia azedarach	Syringa	Category 1b (3 in urban areas)	1		
Opuntia ficus-indica	Sweet Prickly Pear	Category 1b	1		1
Pennisetum setaceum	Fountain Grass	Category 1b, except sterile cultivars	1		1
Persicaria sp		Invasive in moist areas		1	

Species	Common name	Habitat notes	Secondary Gauteng Shale Mountain Bushveld	Searsia drainage line	Modified
Physalis viscosa	sticky gooseberry	Weed with underground rhizomes			1
*Pseudognaphalium luteo-album**	Cud Weed	Moist places in grassland.	1		1
Schkuhria pinnata	Dwarf Marigold	Weedy annual herb from S America			1
Tagetes minuta	Khaki Weed	Weed in disturbed places. Has become naturalised and due to the vast amount of seed set, difficult to control	1	1	1
Verbena aristegera	Fine-leaved Verbena	Garden escape, now naturalised along roadsides and disturbed areas			1
Verbena bonariensis	Wild Verbena	Category 1b (NEMBA)		1	1
Xanthium spinosum	spiny cocklebur	Category 1b		1	
Zinnia peruviana	Wildejakobregop	Naturalised Weed			1
Number of alien and invasive species recorded= 16			**7**	**5**	**12**
		Indigenous species per vegetation group	**85**	**26**	**31**

APPENDIX D: SPECIALIST CV

Curriculum Vitae

Antoinette Eyssell-Knox

Personal Information Summary

Name:	Antoinette Eyssell-Knox
Highest qualification:	MSc Environmental Science (2010), University of Pretoria
Professional membership:	SACNASP Pr Sci Nat (400019/11) Ecological Science
Company:	Dimela Eco Consulting
Contact details:	Antoinette@dimela-eco.co.za
	Tel 083 642 6295

Professional Experience

1. Environmental Management:

I have been working in the field of environmental management as a vegetation specialist since the year 2007 (11 years). I have been self-employed since November 2011.

Nov 2011 – current:	Dimela Eco Consulting
Sep 2007 – Nov 2011:	Strategic Environmental Focus (SEF)

Main field of work and experience include:

- Vegetation assessments, overviews or scans;
- Strategic ecological assessments;
- Ecological management, rehabilitation- and biodiversity action plans (including alien vegetation management);
- Specialist input: Gauteng and North-West Outlook Reports, ecological conditional requirements for Green Star rating;
- Ground-truthing of vegetation related data;
- Review of ecological reports; and
- Mentoring.

2. Environmental Education:

2011 – current:	Writer of the ecology feature for the bimonthly Supernova Kids Magazine
Aug 2003 – Sep 2007:	Snr Environmental Education Officer, South African National Biodiversity Institute (SANBI), Pretoria National Botanical Garden

3. Horticulture

Jun – Jul 2003:	Horticultural Trainer, 7 Shaft Training Centre, Johannesburg
May 1997 – Mar 2002	Horticulturist, Pretoria National Botanical Garden (then NBI, now SANBI)

Qualifications

- M.Sc Environmental Science, University of Pretoria (2010)

Dissertation: *Land cover change and its effect on future land uses*

- B. Sc (Hons) Horticulture, University of Pretoria (1999-2000)

Dissertation: *Horticultural uses of the indigenous Barleria species*

- B. Sc (Agriculture) Horticulture, University of Pretoria (1993-1996)

Memberships and Affiliations

SACNASP: Registered as a Professional Natural Scientist in the field of ecology since 2011 (Reg no 400019/11)

Botsoc: Member of the Botanical Society of Southern Africa since 2013

Course History

2018: Asteraceae Identification Course

2015: SAGIC Invasive Species Consultant Training

2012: Tools for Wetland Assessment (Rhodes University – September 2012)

2012: Landscape Functional Assessment, introductory workshop with David Tongway and Prof Klaus Kellner (North West University)

2012: Soil Classification and Wetland Delineation (Terra Soil)

2007: ISO 14000 Advanced EMS Auditors Course (SGS & University of Pretoria)

2007: Introduction into Forestry Stewardship Council (FSC) (University of Pretoria)

2006: Permaculture training course (S.E.E.D)

2005: Project Management Course (Wildlife and Environment Society of South Africa (WESSA) Umgeni Valley)

2004: Grass and plant identification courses

Presentations

July 2007: Environmental Education in a changing world, World Environmental Education Conference (WEEC), Durban

Sept2006: Environmental Education, BGCI Conference, Oxford England

Selected Project Experience (2011 onwards)

1. <u>Provincial Environmental Outlook Reports</u>

2017-2018: Vegetation input: Gauteng Outlook Report

in process: Vegetation input: North-West Outlook Report

2. <u>Open Space Planning</u>

Nov 2015: The proposed Kaalspruit Open Space Project, Thembisa, Gauteng. Kaalspruit River Rehabilitation Biodiversity Scan: (NuLeaf Planning and Environmental)

2015-2016: City of Johannesburg Open Space Planning – vegetation input for Linbro Park, Bassonia, Kyalami and Ruimsig areas (Iggdrasil)

3. Management- and Rehabilitation Plans

April-May 2012: Vegetation base line study and input into Biodiversity Action Plan for Kumba Iron Ore (Lidwala Consulting Engineers)

Jan 2015: Environmental Management Plan for the Krugersdorp Nature Reserve – vegetation section

Jan 2016: Tharisa Mine Railway Line – Vegetation rehabilitation plan (Limosella Consulting)

Sept 2016: General vegetation rehabilitation plan for the proposed Mezo Kitchens Panel Processing Facility (Shangoni)

Nov 2016: General Ecological Rehabilitation and Monitoring Plan for the N4 additional lane between: R52 Koster offramp & D1325 Marikana Interchange; and The R512 (Brits West Interchange) & K67 (Ga-Rankuwa Interchange) North West and Gauteng Provinces

Nov 2016: Biodiversity Management Plan: Afrisam (Sa) (Pty) Ltd, Dudfield Cement – vegetation input

June 2017: Rehabilitation planning for the Klip- Lower and Upper Rietspruit Water Management Units (Pregio, via Limosella Consulting)

Dec 2017: Eskom underground cable river crossings – vegetation input into rehabilitation plants (Envirolution)

4. Linear Infrastructure

March 2012: Kranspoort road upgrade Protected tree identification (Lidwala Consulting Engineers)

Oct 2012: Eskom: Perseus to Gamma Vegetation assessment (Mokgope Consulting)

March 2013: Diepsloot Eskom line and substation, Johannesburg (Envirolution)

Nov 2013: Masa Ngwedi 750kV and 400kV lines (Limpopo & North-West Provinces) Section D & E Vegetation Input for EMP (Mandara Consulting)

2013-2014 Eskom: Northern Alignments (Perseus in the Northern Cape to Juno in the Western Cape) (Mokgope Consulting)

Feb 2014: Meteor substation, as well as the 88kV line between the Pulsar, Meteor and Sonland substations, Sebokeng, (Nsovo Environmental Consulting)

Dec2014: Upgrading of Internal Roads in Stinkwater, Hammanskraal (Gauteng) (GladAfrica)

Sept 2015: Railway Siding for GCMC Open Cast Mine, Lephalale (Limpopo)

Feb 2016: N4 - Additional lane between Brits and Rustenburg (Environamic)

Nov 2016: Aggeneis-Paulputs 400kV Powerline and Substations Upgrades

Feb 2017: Proposed Lulamisa to Diepsloot East to Blue Hills to Crowthorne 88kv Power Line / Cable and 2 Substations Gauteng (Envirolution)

May 2017: Proposed 132 kV Powerline Between Fochville Municipal Substation and an Existing Line, Gauteng Province (Envirolution)

5. Solar Developments

January 2012: Schmidsdrift, Northern Cape Vegetation Assessment for Solar Panels (Nuleaf)

Aug 2015: Proposed Construction of A 75mw Solar Energy Facility Project, Limpopo Tshikovha Environmental and Communication Consulting

6. Mining

April 2012:	Rietfontein Open Cast Vegetation assessment (Cabanga Concepts)
Jan 2013:	Vierfontein Colliery Vegetation assessment and EMP input (Cabanga Concepts)
Jan 2017:	G&W Base and Industrial Minerals Koppies Betonite Mine Vegetation Assessment & Management Input Report (Cabanga Concepts)

7. Other Development

Dec 2013:	Marekele Bush camp – vegetation & fauna assessments (NuLeaf)
May 2013:	Komati Power Station – Coal stockyard (Envirolution)
April 2014:	Blesboklaagte & Leeupoort Township development (Shangoni)
May 2014:	Goldi Farm Composting Site, Section 24G Fauna and Flora assessment and Summary document (Shangoni)
Feb 2015:	TOPIGS: Proposed Piggery,Mpumalanga(Shangoni)
May 2015:	Kwaggasrant Recycling Facility Upgrade (Shangoni)
Oct 2016:	Proposed piggery on portion 139 of the farm Honingnestkrans 269JR Vegetation and Fauna investigation (Methale Environmental Consulting)
Oct 2017:	Ongoing Clinic Development & Proposed Emergency Medical Services Facility on Prt 79 of the farm De Wagendrift 417 JR Gauteng Province. (Methale Environmental Consultants)

8. Plant relocation and monitoring

April 2014:	Relocation of *C bulbipermum,* overlooked Colliery in Mpumalanga (Cabanga Concepts)
Feb 2017:	Monitoring report for the relocated *Crinum bulbispermum* at Overlooked Colliery
May 2017:	Relocation of protected plant species: Evander Mine

9. International:

Oct 2009:	Tatu, Nairobi: Vegetation Assessment (Kenya) (Lokisa Environmental Consulting)
Sept 2014:	Vegetation input to the Regional Environmental and Social Assessment of Coal-based Energy Projects along the South Africa- Botswana Border (World bank Project, Mott MacDonald)

10. Mentorship:

May 2017:	Technical Peer Review of the vegetation section for the Emfuleni Bulk Water Supply Pipelines: Ecological Assessment. GIBB Engineering & Architecture (Pty) Ltd
Nov 2017:	Mentorship and Technical Peer Review of the vegetation section for the Merensky-Kennedy Powerline: vegetation assessment GIBB Engineering & Architecture (Pty) Ltd