ECOLOGICAL IMPACT ASSESSMENT REPORT

For the proposed construction and operation of the 2X 400KV Powerlines on different farms in the Kai Garib and Khara Hais Local Municipalities, Northern Cape Province

PREPARED BY

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Declaration of independence

I, Takalani Mudau, as an appointed Ecological Impact Assessment Specialist, hereby declare that I:

- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998); the Environmental Impact Assessment Regulations, 2017 and any specific environmental management act.
- Act as an Independent Ecological Assessment Specialist in this application.
- 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).
- Have no vested interest in the proposed activity proceeding.
- Am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2017 (specifically in terms of regulation 13 of GN No. R. 326) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification.
- Am aware that a false declaration is an offence in terms of regulation 48 of GN No. R326;
- As a registered member of the South African Council for Natural Scientific Professions, will undertake our profession in accordance with the Code of Conduct of the Council, as well as any other societies to which we are members.
- Based on information provided to me by the project proponent, and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of my professional judgement.

Field of expertise: Terrestrial biodiversity assessments, wetland ecology, wetland flora and fauna, and wetland delineations

General terms

Biosphere reserve: An internationally-recognised area of either costal, marine or terrestrial ecosystems. Its main purpose is to reconcile the conservation of biodiversity with its uses, and to promote sustainable development, while harmonising the coexistence of humans and nature.

Buffer zone: The strip of vegetation maintained to limit impacts on natural ecosystems from adjoining land use activities.

Catchment: An area where water is collected by the natural landscape. In a catchment, all rain and run-off water eventually flows to a river, wetland, lake or ocean, or into the groundwater system.

Conservation: In relation to a water resource, conservation is the efficient use and saving of water, achieved through measures like water saving devices, water-efficient processes, water demand management and water rationing.

Ecosystem goods and services: The goods and benefits people obtain from natural ecosystems. Different types of ecosystems provide different ecosystem goods and services. Aquatic ecosystems like rivers and wetlands provide goods like forage for livestock grazing or sedges for craft production and services like pollutant trapping and flood attenuation. They also provide habitat for a range of aquatic biota.

Ecosystem: A working natural system, maintained by internal ecological processes, relationships and interactions between the biotic (plants and animals) and the non-living or abiotic environment (e.g. soil, atmosphere). Ecosystems can operate at different scales, from very small (e.g. a small wetland pan) to large (e.g. an entire water catchment area) landscapes.

Endemic: Refers to a plant, animal species or a specific vegetation type naturally restricted to a particular defined region (not to be confused with indigenous). A species of animal may, for example, be endemic to South Africa in which case it occurs naturally anywhere in the country, or endemic only to a specific geographical area in the country, which means it is restricted to this area and occurs naturally nowhere else in the country.

Environmental Control Officer (ECO): Person tasked with monitoring and supervision of the implementation and control of environmental issues.

Environmental impact: A positive or negative condition that occurs to an environmental component as a result of the activity of a project or facility. This impact can be directly or indirectly caused by the project's different phases (i.e., construction, operation, and decommissioning).

Erosion: The process by which soil and rock are removed from the earth's surface by natural processes like wind or water flow, and then transported to and deposited in other locations. While erosion is a natural process, human activities continue to dramatically increase the rate at which erosion is occurring locally and globally.

Interested and Affected Party (I&AP): Any person, group of persons or organisation interested in or affected by an activity and any organ of state that may have jurisdiction over any aspect covered by the activity.

Land rehabilitation: The process of returning land in a given area to some degree of its former state, after some process (industry, natural disasters, etc.) has resulted in its damage.

Significant impact: Means an impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment.

Threatened plant species: Threatened plants are those species that are vulnerable or at the risk of extinction. According to Version 3.1 of the International Union for Conservation of Nature's (IUCN) Red List Categories and Criteria, the three categories of threat in order of increasing risk of extinction are: Vulnerable (VU), Endangered (EN) and Critically Endangered (CR).

Watercourse: A river or spring; a natural channel or depression in which water flows regularly or intermittently; a wetland, lake or dam into which or from which water flows; and any collection of water which the Minister may, by notice in the gazette, declare to be a watercourse as defined in the National Water Act, 1998 (Act No. 36 of 1998).

List of abbreviations and acronyms

DWS	Department of Water and Sanitation
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
GIS	Geographic Information System
M&R (2006)	Mucina and Rutherford (2006)
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NWA	National Water Act (Act No. 36 of 1998)
POSA	Plants of South Africa, a PRECIS-related database hosted by SANBI
PRECIS	National Herbarium Pretoria (PRE) Computerised Information System
SANBI	South African National Biodiversity Institute
VegMap	Vegetation Map of South Africa, as per Mucina & Rutherford (2006)

Scope of work

The scope of work is mainly concerned with terrestrial ecological assessments, which entail:

- Defining the Present Ecological State (PES) of the ecological resources in the vicinity of the proposed development area.
- Conducting a Species of Conservation Concern (SCC) assessment, including potential for species to occur on the study area.
- Identifying and considering all sensitive landscapes, including wetlands and any other ecologically important features.
- Determining the environmental impacts of the proposed development on the ecology in the proposed project area and to develop mitigation and management measures.
- Verify the whether the site has a medium Agricultural sensitivity theme.

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1 INTRODUCTION

Mveledzo Environmental and Safety Solution (Pty) Ltd (Mveledzo) was appointed by Vombe Consulting (Pty) Ltd (Vombe) to assess the ecological impact for proposed powerline of 400 kV that runs from Aries substation near Kenhardt to Upington substation near Upington, in the Northern Cape, South Africa.

In accordance with The Natural Scientific Professions Act (Act 27 of 2003), only a person registered with the South African Council for Natural Scientific Professions may practice in a consulting capacity. Mr Mudau Takalani (SACNASP registration number 117970), and Mr Khuliso Maphaha (SACNASP registration number 130272), conducted the site survey. The survey was conducted in accordance with the EIA Regulations No. R324-327, Department of Environmental Affairs and Tourism, 7 April 2017 emanating from Chapter 5 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), as well as the National Water Act 1998 (Act 36 of 1998) (NWA) and other relevant legislation. This survey was conducted between 23 and 27 August 2021 with a follow up study conducted between 25 and 27 January 2022

The scope of the study

The scope of the study includes:

- Identifying the fauna and flora that occurs in the study site.
- Identifying (in terms of NEMA, National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA) and other relevant legislation) red data species, protected species and invasive species.
- Indicating possible impacts of the proposed development on the fauna and flora.
- Assessing the agricultural sensitivity,
- Suggesting mitigation measures to limit the impact of the proposed development.

This report, which considers and describes the ecological integrity of the study area, serves as a guide to the Environmental Assessment Practitioner (EAP), regulatory authorities and proponent as to the ecological viability of the proposed development activities. This report is informed by results obtained during a literature survey, as well as information from previous studies on similar environmental conditions (e.g. soil form, topography, catchments and agricultural activities).

2 PROJECT DESCRIPTION

Eskom Holding SOC Limited is proposing to construct a 2X 400kV transmission powerline infrastructure from Aries substation near Kenhardt to Upington substation near Upington. The proposed powerline length is 145 km. The project had received authorisation from the department of Environmental affairs and forestry, however there have been some deviation from the approved lines that have been proposed. This study will focus only on the deviations from the approved line. The project will contribute to the economic development in the Local Municipal area.

3 PROJECT LOCATION

At a regional level, the study area lies within the Northern Cape Province and is situated within the Kai !Garib Local Municipality and Khara Hais Local Municipality . The route for the proposed powerline deviation extending from Aries substation near Kenhardt to Upington substation near Upington, is an approximate distance of 145 km.

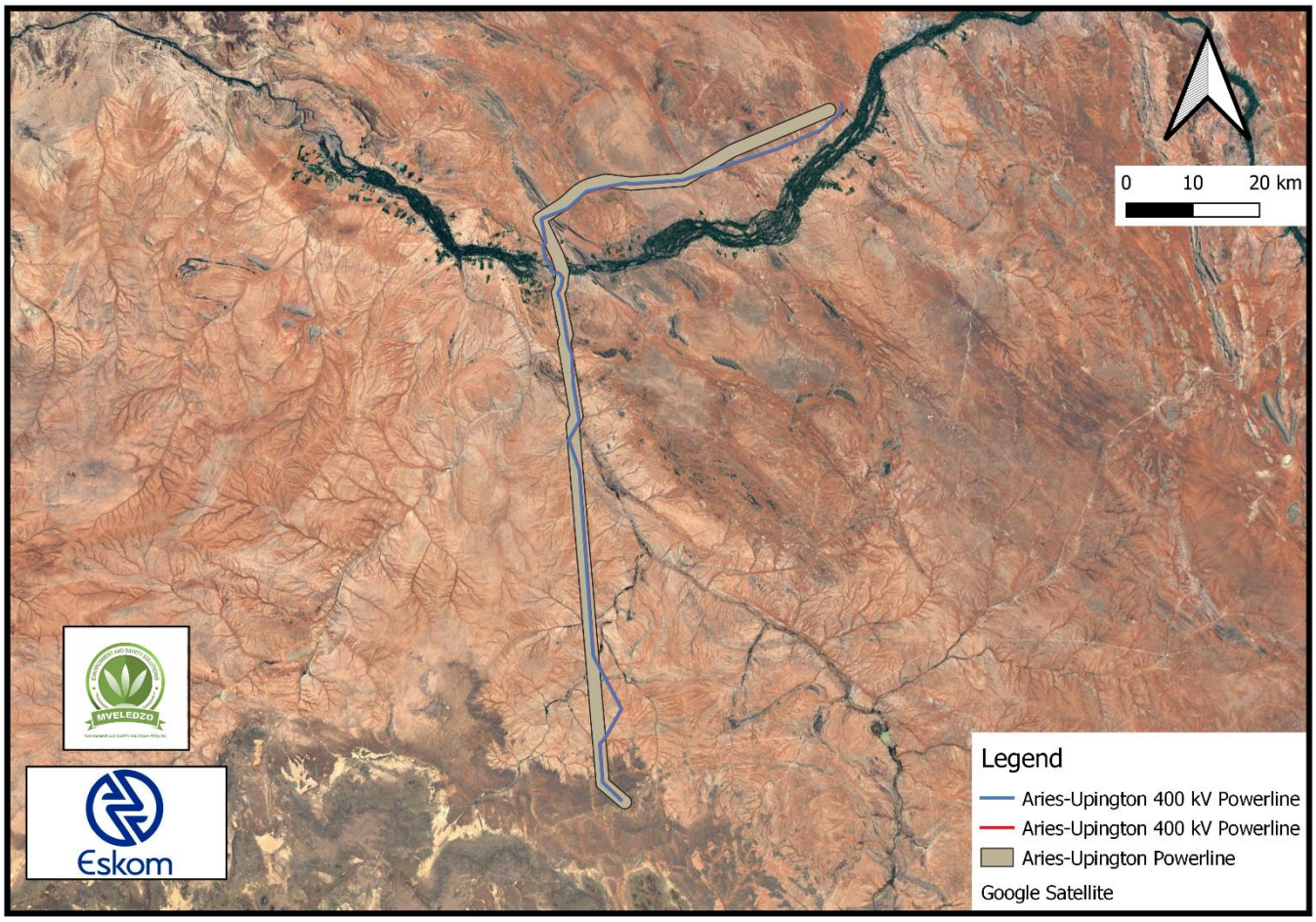

Figure 1: Project location site for the proposed 400

4 ASSUMPTIONS AND LIMITATIONS

All information contained in this report is based on what the specialist discovered on site, as well as what was provided by Vombe Consulting. The report considers likely impacts of the construction and operation of the 2X 400kVPower lines. However, some unique impacts may arise that must be recorded during monitoring. Appropriate corrective actions must be taken to mitigate these impacts.

While engineering drawings and specification of rehabilitation structures fall outside of the scope of this ecological assessment report, consideration will be given to overlaying important sections on final alignment.

There is limited information on specific availability and behaviour of flora and fauna in this study area, as the assessment was done during one season only. Budget constraints and time limitations are some of the issues that might lead to limited assessment of the whole area.

Findings, recommendations and conclusions presented in this report are based on the specialist's best scientific and professional knowledge. No part of this report may be amended or extended without prior written consent of the specialist. Any recommendations, statements or conclusions drawn from or based on this report must clearly cite or refer to this report. Whenever such recommendations, statements or conclusions form part of the main report under investigation, this report must be included in its entirety.

5 SITE BIO-PHYSICAL DESCRIPTION

5.1 Vegetation

The field survey was conducted from 23 to 27 August 2021 and a follow up study was conducted between the 25 and the 27 January 2022 by Mr Takalani Mudau and Mr Khuliso Maphaha, together with the Vombe consulting team, the Heritage specialist and the Avi-fauna specialist. Data recorded include a list of the plant species present, like trees, shrubs, grasses and forbs. Comprehensive species lists were derived for each plant community/ecosystem present on site. These vegetation survey methods have been used as the basis of a national vegetation survey of South Africa (Mucina *et al.* 2000) and are considered efficient in describing vegetation and capturing species information.

The ecosystems were not only described with respect to their plant species composition, but also their potential as habitat for red data plant species. Critically Endangered (CR), Endangered (EN), Vulnerable (VU) and Protected Species (NEMBA species, TOPS species) were evaluated against the list published in Department of Environmental Affairs and Tourism Notice No. 2007 (NEMBA).

Two Protected trees (Shepherd's Tree and Camel Thorn) were identified in accordance with the list of nationally-protected trees published in Government Notice No. 29062 3 (2006) (National Forests Act, 1998 (Act No. 84 of 1998), as Amended (Department of Water Affairs Notice No 897, 2006). However, not all protected plant species fall under the category of threatened species (Ramarumo and Maroyi, 2020). Threatened plant species are those species that are vulnerable or at the risk of extinction (Moraswi *et al*., 2019). Protected plants are those species listed in the National Forests Act No. 84 of 1998 (Dzerefos *et al*., 2017; Bamigboye et al., 2017). According to Version 3.1 of the IUCN's Red List Categories and Criteria, the three categories of threat in order of increasing risk of extinction are VU, EN and CR (Ramarumo and Maroyi, 2020).

Lists of Red Data plant species for the area were obtained from the SANBI databases, with updated threatened status. These lists were then evaluated in terms of habitat available on site, and present development and presence of man in the area. Alien invasive species and other weeds were indicated according to the Conservation of Agricultural Resources Act (Act No.43 of 1983).

The following conservation value and sensitivity categories were used for each site:

- **High**: Ecologically-sensitive and valuable land with high species richness and/or sensitive ecosystems or Red Data species that should be conserved and no development allowed.
- **Medium-high**: Land where sections are disturbed, but which is, in general, ecologically sensitive to development/disturbances.
- **Medium**: Land on which low-impact development with limited impact on the vegetation/ecosystem could be considered for development. It is recommended that certain portions of the natural vegetation be maintained as open space.
- **Medium-low**: Land of which small sections could be considered for conservation but where the area in general has little conservation value.

- **Low**: Land that has little conservation value and that could be considered for development with little to no impact on the vegetation.

Ecological sensitivity

It has been clearly demonstrated that vegetation forms the basis of the trophic pyramid in an ecosystem, and plays a crucial role in providing the physical habitat in which organisms complete their lifecycles. Therefore, the vegetation of an area will largely determine the ecological sensitivity thereof. According to Kent and Coker (1992), the vegetation sensitivity assessment aims to identify whether the vegetation in the study area is of conservation concern and thus sensitive to development.

To determine the sensitivity of the vegetation (ecosystem) on site, weighting scores are calculated per plant community. The following six criteria are used and each allocated a value of 1-3:

- Conservation status of a regional vegetation unit.
- Listed ecosystem (e.g. wetlands, hills and ridges).
- Protection (e.g. threatened ecosystems, SANBI & DEAT 2009)
- Plant species of conservation concern (e.g. red listed, nationally or provincially protected plant species, habitat or potential habitat to plants species of conservation concern, protected plants or protected trees).
- Situated in ecologically functionally important features (e.g. wetlands or riparian areas, important habitat for rare fauna species).
- Conservation importance (e.g. untransformed and un-fragmented natural vegetation, high plant species richness, important habitat for rare fauna species).

Development on vegetation with High sensitivity will normally not be supported, unless under very specific circumstances. Vegetation with Medium-High or Medium sensitivity should be conserved. Development may be supported on vegetation considered to have Medium-Low or Low sensitivity.

Sensitivity is calculated as the sum the values of the criteria. The vegetation with the lowest score represents the vegetation that has the least / limited sensitivity). A maximum score of 3 can be obtained, a score of 3 indicates high sensitivity. The sensitivity of the site is scored as 2, which has a medium sensitivity. The sensitivity scores are as follows (Table 1):

Table 1: Weighting scores.

Scoring	3	2	1
Sensitivity	High	Medium	Low

Description of the plant communities

According to Mucina and Rutherford (2006), the vegetation of the area in question is mapped as Nama karoo. The Nama Karoo is a vast, open, arid region dominated by low-shrub vegetation and abundance of rock. Although not remarkably rich in species or endemism, the flora and fauna of the region are surprisingly adapted to its climatic boundaries. The distribution of the plant communities identified in this study is shown in the vegetation map (Figure 2) while the sensitivity of the plant communities is indicated in Figure 5. Threatened ecosystems were identified in accordance with SANBI & DEAT (2009), and SANBI (2011) guidelines.

Bushmanland Arid Grassland

The majority of the site is mapped as Bushmanland Arid Grassland and is associated with shallow sandy soils. The abundance of species of concern within this vegetation type is generally low. Protected species observed at the site within this vegetation type include *Boscia albitrunca* and *Vachellia erioloba*. In terms of these species, *Boscia albitrunca* is probably the main species of concern due to its relative abundance compared to the other species. Apart from occasional small ephemeral pans, there are no specific features of concern within this vegetation type.

Kalahari Karroid Shrubland

Kalahari Karroid Shrubland occurs on shallow stony soils across the site. In some areas this may include weathered quartz on the soil surface. The density of protected trees is generally lower within this habitat type compared to the other habitat types at the site.

Lower Gariep Broken Veld

The rocky hills of the site are classified as Lower Gariep Broken Veld. This vegetation type is considered relatively sensitive given its' high diversity as well as the presence of numerous species of concern. Some of the hills are composed of quartz and frequently contain specialised associated species such as *Lithops bromfieldii, anacampseros rufescens, Dinteranthus wilmotianus* and *Aloidendron dichotoma*. This habitat is also considered important for fauna due to the different nature of the habitat it offers compared to the adjacent plains, such as offering cliffs for birds to nest and rocky crevices and loose rock cover for reptiles. Although this is considered to represent an important habitat at the site, it is not within the development footprint. However, in terms of the conservation value of the site, this is highlighted as one of the most important features of the site that adds significantly to its' overall conservation value.

Gordonia Duneveld

There is a strip of Gordonia Duneveld running though the site. These areas are associated with deep red sands that usually form parallel dunes separated by grassy or shrubby interdune flats. The abundance of species of concern associated with this habitat is low but usually includes *Boscia albitrunca* and *Vachelia erioloba*. Due to the presence of the loose sand, this is considered to represent a relatively sensitive vegetation type that is considered vulnerable to disturbance.

Special Habitats

There are several minor habitats of significance at the site including numerous small pans, some drainage lines and quartz hills. Although these features occupy a very small proportion of the site, they are considered to be of significance for fauna and flora and disproportionately add to the value of the site. The drainage lines are of significance as they are flanked by relatively large trees which offer nesting sites to various bird species which favour large trees for nesting sites. The drainage lines are also considered to be of significance as they are used as corridors by various fauna as they move back and forth between the Orange River and the drier interior. The quartz patches represent a restricted habitat that has a variety of associated flora and fauna including specialised species such as *Lithops bromfieldii* (living stone*)* and *Dinteranthus wilmotianus* (green stone plant). This habitat is not well-protected at all and there do not appear to be any such habitat within formal protected areas in the Upington area.

Streams and rivers

There is a portion where the proposed poweline will transact through the Orange River which is one of the biggest river source in South Africa. The rivers have High conservation value and is considered to be in CBA1.

Figure 2: Typical vegetation found at the survey area.

5.2 Fauna

The faunal communities of the area are generally not very diverse, although there are some exceptions in terms of the different groups of fauna. The only red-listed mammal that can reasonably be expected to be resident at the site is the Black-footed Cat *Felis nigripes* which is classified as Vulnerable. The rocky hills are however highlighted as the most important habitat for reptiles and the Klipspringer at the site. No red-listed amphibians are known from the area. The Giant Bullfrog *Pyxicephalus adspersus* is known from the area, but has been down-listed to Least Concern in the latest amphibian assessment. As such, it is clear that the site and area in general is not particularly important for terrestrial vertebrates. In general, the major impact associated with the development of the site for terrestrial vertebrates would be habitat loss and the disruption of the broad-scale connectivity of the landscape. There do not appear to be any particular species that would be disproportionately affected and who's local populations might be compromised by the development. Animal manure, green grass, flowers and fruits (food) indicate the presence of certain faunal species. Infrastructural development in the vicinity significantly reduces the presence of some wild animals in certain localities. Common insects like butterflies and green house flies were also evident, especially near cow dung and the burst sewer system nearby. Rodents, amphibians and reptiles cannot be ruled out as there are settlements in the area.

5.3 CBAs

In this section, the relevant conservation planning tools for the broad area are illustrated and discussed. The most important of these are the Northern Cape Conservation Plan (2016) and the National Protected Area Expansion Strategy for South Africa (2018). These maps below (Figure 5, 6 and 7) indicate biodiversity priority areas required to maintain species richness and ecological processes in the first instance and areas that should be targeted for formal conservation expansion in the second. The two above-mentioned plans are not entirely independent of one another as all areas demarcated as Conservation Expansion Focus Areas, are classified as Tier 1 or Tier 2 CBAs and some of the CBAs are demarcated with the specific purpose in mind of maintaining development-free corridors between existing conservation areas to facilitate future expansion of conservation areas into these corridors. The location of Priority Focus Areas is designed so as to ensure the minimum land requirement to meet conservation targets but also to avoid isolated target areas and append these onto existing conservation areas where possible. The relevant section of the Northern Cape Conservation Plan which maps CBAs for the Northern Cape is illustrated below. The map illustrates that different deviations with their biodiversity classifications. There are no Protected Area Expansion Strategy Focus Areas within or near the site, indicating that the site and adjacent areas have not been identified as important current priorities for conservation expansion. It is however worth noting that the site falls within an area that remains severely under-protected. The impact of the development on NPAES Focus Areas and CBAs is not considered sufficient to warrant the implementation of an offset in their own right.

5.4 Regional climate

Climate is characterised by very hot summers and summer rainfall of 300-400 mm per annum, with very dry winters. The area is frost-free, with a high mean maximum temperature during summer (up to 40°C).

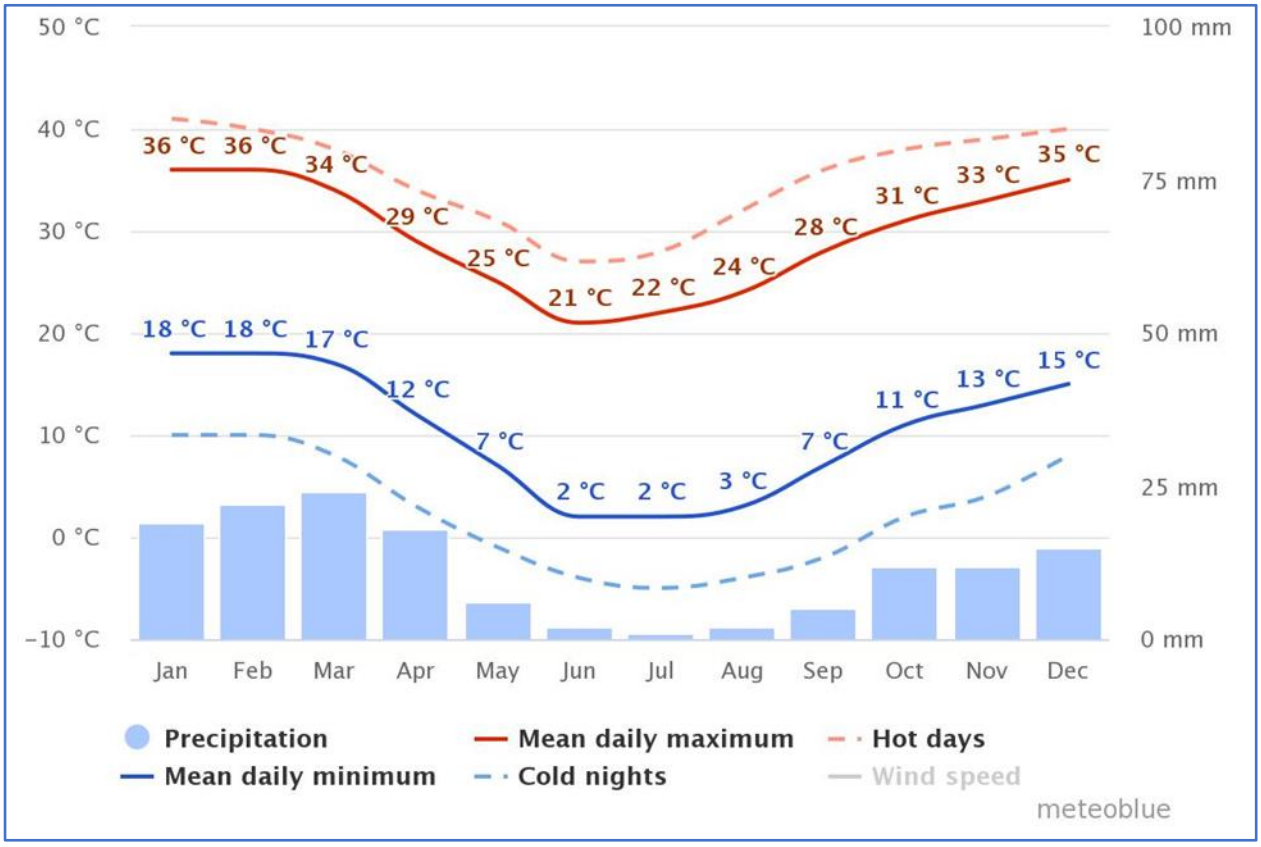

Figure 3: Study area climate.

Geology

Vryheid Formation: This formation has been subdivided into three different lithofacies arrangements. They are dominated by fine-grained mudstone, carbonaceous shale with alternating layers of bituminous coal seams, and coarse-grained, bioturbated immature sandstones respectively.

Topography and drainage

The topography of the region is gently undulating plain, with few low ridges, altitudes of 770 m in the west to 680 m above sea level in the east.

Land-use

The land is mostly used for stock farming (cattle and goats), commercial forestry and settlement.

6 APPLICABLE LEGISLATION

The international, regional, national and provincial legislation, policies and guidelines, that could apply to impacts of the proposed project on biodiversity, are listed below. Although the list is comprehensive, additional legislation, policies and guidelines that have not been mentioned may apply.

6.1 International agreements and policies

The international community has agreed to treat and attend to environmental and water management with one voice. Regional and individual nations have developed their own policies and legislation in line with international agreements, policies and protocols. This is intended to save the biodiversity, ecosystem and environment at large. Such policies include:

- Convention Concerning the Protection of World Cultural and Natural Heritage (1972).
- Agenda 21 regarding sustainable development at global and national levels (1992).
- United Nations Framework Convention on Climate Change (1994).
- Convention on Wetlands of International Importance, especially as Waterfowl Habitat (1975)- Ramsar.
- Convention on the Conservation of Migratory Species of Wild Animals (1983),- Bonn.
- Kyoto Protocol on global warming (2005).
- Convention on Biological Diversity including eco-systems and genetic resources (1992).
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (1975).
- Copenhagen Accord on climate change (2009).

6.2 Regional agreements

The following list of agreements indicate Africa's cooperation with International policies:

- Action Plan of the Environmental Initiative of NEPAD for sustainable development in Africa (2003).
- African Convention on the Conservation of Nature and Natural Resources (1969).

6.3 National legislation

- Constitution of the Republic of South Africa Act (108 of 1996).
- National Environmental Management Act (NEMA), 1998 (Act 107 of 1998).
- Environmental Conservation Act (73 of 1989).
- Environmental Impact Assessment (EIA) regulations: New regulations have been promulgated in terms of Chapter 5 of NEMA and were published on 18 June 2010 in Government Notice No. R. 543. In addition, listing notices (GN 544-546) indicate activities subject to an environmental assessment. A number of these activities are relevant to wetlands, including a range of activities within 32m of a watercourse (which includes wetlands).

- National Environmental Management: Biodiversity Act, 2004: Threatened and Protected Species Regulations.
- National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003).
- National Heritage Resources Act, 1999 (Act No.25 of 1999).
- National Water Act, 1998 (Act 36 of 1998).
- National Forests Act, (Act No. 84 of 1998) and protected tree species.
- National Environmental Management: Biodiversity Act (NEM: BA; Act 10 of 2004).
- Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).
- National list of Ecosystems Threatened and in need of Protection under Section 52(1) (a) of NEM: BA (GG 34809, Notice 1002, 9 December 2011).

6.4 National policies, guidelines and programmes

These are strategic plans and policies developed at national level to offer guidance on natural resource use. These include:

- National Water Resource Strategy (2004).
- National Biodiversity Strategy and Action Plan (Driver *et al*. 2004).
- National Spatial Biodiversity Assessment (DEA & SANBI 2012), including Terrestrial Priority Areas & Threatened Ecosystems (Jonas *et al*. 2012).
- Grasslands Programme (SANBI 2013).

7 METHODOLOGICAL APPROACH TO THE ASSESSMENT

The approach and methodology that was used during this EIA for the 2X 400 KV Poweline construction project includes: Data collection, desktop review of relevant documentation, delineation of the study area for the assessment, field work, general floristic attributes, red data floral assessment, floristic sensitivity analysis, ecological function, general faunal attributes, assumptions and limitations.

7.1 Data collection

Recent information has been published by various government departments, including municipalities and consulting companies that conducted research around the proposed locality. This includes the Municipal Spatial Development Report, to which locals contributed by giving insight into issues relating to indigenous knowledge systems towards. This helped to conduct an impact assessment for this project.

7.2 Desktop review of relevant documentation

The following documents were reviewed at a desktop level to obtain secondary data on the terrestrial, aquatic ecosystems and biodiversity of the locality, as well as to gain an understanding of the scope and context of the proposed project:

- Ball, I.R., H.P. Possingham, and M. Watts. 2009. Marxan and relatives: Software for spatial conservation prioritisation. Chapter 14: Pages 185-195 in Spatial conservation prioritisation.
- Quantitative methods and computational tools. E.Ds. Moilanen, A., K.A. Wilson, and H.P. Possingham. Oxford University Press, Oxford, UK.
- DEAT (2009) Guideline Regarding the Determination of Bioregions and the Preparation and Publication of Bioregional Plans (Government Gazette No.32006, 16 March 2009).
- DEAT (2008) The National Protected Area Expansion Strategy 2008-2012: A framework for Implementation. South African National Biodiversity Institute, National Department of Environmental Affairs and Tourism.
- Driver, A., Sink, K.J., Nell, J.L., Holness, S., van Niekerk, L., Daniels, F. Jonas, Z., Majiedt, P.A., Harris, L. & Maze, K. (2012) National Biodiversity Assessment 2011: An assessment of South Africa's biodiversity and ecosystems. SANBI & DEA, Pretoria.
- Mucina L. & Rutherford, M.C. (Eds) (2006). The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

7.3 General techniques for ecological assessment

7.3.1 General approach

To accurately determine the PES of the study area and capture comprehensive data with respect to floral taxa, the following methodology was used:

- Maps, aerial photographs and digital satellite images were consulted prior to the field assessment to determine broad habitats, vegetation types and potentially sensitive sites. The results of these analyses were then used to focus the field work on specific areas of concern and identify areas where target-specific investigations were required.
- A literature review with respect to habitats, vegetation types and species distribution was conducted.
- Relevant databases consulted during the study area assessment include the South African National Biodiversity Institute (SANBI) Threatened Species Programme (TSP) and Pretoria Computer Information Systems (PRECIS).
- An initial visual on-site assessment of the study area was conducted from 23 August 2021 to 27 August 2021 to confirm the assumptions made during consultation of the maps, as well as a reconnaissance “drive around” followed by a thorough “walk through”.
- A follow up Study was conducted between the 25 an27 January 2022 during the wet season to verify the initial findings during August 2021

7.3.2 Floral method of assessment

Prior to the field visit, a record of floral species of conservation concern (SCC) and their habitat requirements was acquired from SANBI for the quarter degree squares (QDS). Throughout the floral assessment, attention was paid to the identification of SCCs, and suitable habitat that could support them. The probability of occurrence (POC) of each SCC was determined using calculations regarding habitat requirements and level of habitat disturbance. The accuracy of the calculation is based on the available knowledge about the species in question, with many of the species lacking in-depth habitat research.

7.3.3 Vegetation surveys

Vegetation surveys were undertaken by first identifying different habitat units, then analysing the floral species composition. From the surveys, the area was divided into two sub-sections (dry and wet area). Vegetation analysis was conducted in the areas perceived to best represent the various plant communities. Species were recorded and a species list was compiled as per the surveyed area/zone. These species lists were compared with the vegetation expected to be found in the relevant vegetation types, which serves to provide an accurate indication of the ecological integrity and conservational value of each habitat unit.

Data about plant species occurring on-site was gathered by counting them and identifying each species. Plant species were identified using their vernacular Venda and botanical names. This allows scientific and indigenous people to familiarise themselves with the floristic diversity of the study site. Identified plant species were verified by a trained botanist and the botanical names were validated using the International Plant Name Index (IPNI) database. Data about conservation status of the plant species were collected from the SANBI’s Red List of South African Plants and the IUCN databases.

7.3.4 Vegetation Index Score

The Vegetation Index Score (VIS) was designed to determine the ecological state of each sub-habitat unit defined in an assessment site. This enables an accurate and consistent description of the PES concerning the study area. The information gathered during these assessments significantly contributes to sensitivity mapping, leading to a more truthful representation of ecological value and sensitive habitats. The VIS is derived using the following formulas:

VIS = [(EVC) + ((SI x PVC) + (RIS))]

Where:

1. **EVC** is extent of vegetation cover.
2. **SI** is structural intactness.
3. **PVC** is percentage cover of indigenous species.
4. **RIS** is recruitment of indigenous species.

Each of these contributing factors is individually calculated as indicated in the following tables. All scores and tables in Table are used in the final score calculation for each contributing factor.

Table 2: Vegetation Index Score Model tables for classification.

1. EVC = [(EVC1+EVC2)/2]

EVC 1 – Percentage Natural Vegetation Cover						
Vegetation cover %	0%	1-5%	6-25%	26-50%	51-75%	76-100%
Site score						
EVC 1	0	1	2	3	4	5

EVC 2 – Total site disturbance						
Disturbance score	0	Very Low	Low	Moderate	High	Very High
Site score						
EVC 2	5	4	3	2	1	0

2. SI= (SI1+SI2+SI3+SI4)/4

	Trees (SI)		**Shrubs (S2)**		**Forbs (S3)**		**Grasses (S4)**	
Score	*P/S	*PRS	P/S	PRS	P/S	PRS	P/S	PRS
Continuous								
Clumped								
Scattered								
Sparse								

*Present State (P/S) = currently applicable for each habitat unit.
*Perceived reference state (PRS) = if in pristine state.

Each SI score is determined with reference to the following P/S and PRS vegetation distribution scoring table.

P/S				
PRS	Continuous	Clumped	Scattered	Sparse
Continuous	3	2	1	0
Clumped	2	3	2	1
Scattered	1	2	3	2
Sparse	0	1	2	3

3. PVC = [(EVC)-(exotic x 0.7) + (Bare ground x 0.3)]

Percentage Vegetation Cover (Exotic)						
	0%	1-5%	6-25%	26-50%	51-75%	76-100%
Vegetation cover						
PVC Score	0	1	2	3	4	5
Percentage vegetation cover (bare ground)						
	0%	1-5%	6-25%	26-50%	51-75%	76-100%
Vegetation cover %						
PVC score	0	1	2	3	4	5

4. RIS

Extent of indigenous species recruitment	**0**	**Very low**	**Low**	**Moderate**	**High**	**Very high**
RIS						
RIS score						

VIS	**Assessment class**	**Description**
22-25	A	Unmodified, natural
18-22	B	Largely natural with few modifications
14-18	C	Moderately modified
10-14	D	Largely modified

5-10	E	The loss of natural habitat extensive
<5	F	Modified completely

With the VIS model system, it is easy to classify the general floral system into their ecological function and importance in accordance with the set regulations. All methods implemented during this investigation are based on accepted scientific investigative techniques and principles; investigations were performed to accepted standards and norms. Whilst taking the limitations of this investigation into consideration, the Precautionary Principle was also applied throughout the assessments to the aforementioned techniques and principles. The ecological function statement goes well with the VIS assessment classification criteria.

7.3.5 Ecological function

High ecological function: Sensitive ecosystems with low inherent resistance or resilience towards disturbance factors or highly dynamic systems considered to be stable and important for the maintenance of ecosystem integrity (e.g. pristine grasslands, pristine wetlands and pristine ridges).

Medium ecological function: Relatively important ecosystems at gradients of intermediate disturbance. An area may be considered medium ecological function if directly adjacent to sensitive/pristine ecosystem.

Low ecological function: Degraded and highly disturbed systems with little or no ecological function.

7.3.6 Conservation importance

High conservation importance: Ecosystems with high species richness that usually provide suitable habitat for a number of threatened species. Usually termed “no-go” areas, unsuitable for development, and should be protected.

Medium conservation importance: Ecosystems with intermediate levels of species diversity and no threatened species. Low-density development may be allowed, provided current species diversity is conserved.

Low conservation importance: Areas with little or no conservation potential and usually species-poor (most species usually exotic).

7.4 Faunal method of assessment

7.4.1 General faunal field assessment

Avifauna was surveyed (general survey) by means of visual identification. Calls of bird species were used to identify them. However the avifauna birds ranges would not form parts of this report since there was an avifauna specialist who had conducted the report.

Visual sightings and ecological indications were used to identify the small and large mammal inhabitants of the study area. Animal spoors and droppings were also used in the identification process. Evidence of burrowing and soil mounts were used in animal identification criteria. A number of reference sources inter alia Stuart and Stuart (1993) and Smithers (1992) were used for identification purposes.

7.4.2 Red data faunal assessment

The following parameters were used to assess the probability of occurrence of each red data species:

- Habitat requirements (HR) – Most red data animals have very specific habitat requirements and the presence of these habitat characteristics in the study area was evaluated.
- Habitat status (HS) – The status or ecological condition of available habitat in the area is assessed. Often a high level of habitat degradation prevalent in a specific habitat will negate the potential presence of red data species (this is especially evident in wetland habitats).
- Habitat linkage (HL) – Movement between areas for breeding and feeding is an essential part of the existence of many species. Connectivity of the study area to surrounding habitat and the adequacy of these linkages are evaluated for the ecological functioning of red data species in the study area.

Probability of occurrence is presented in four categories, namely Low, Medium, High and Recorded. To assess the status of red data fauna species in the study area, the following sources were consulted together with the relevant legislation:

- IUCN Red List Categories and Criteria (IUCN, 2001)
- I UCN Red List of Threatened Species (IUCN, 2011) (http://www.iucnredlist.org)
- National conservation: National Environmental Management Act (Act 107 of 1998) (NEMA) and National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA)

7.5 Sensitivity mapping and assessment

An ecological site sensitivity map was produced by integrating the information collected on-site with ecological and biodiversity information available in the literature and various spatial databases. This includes delineating different vegetation and habitat units identified in the field and assigning sensitivity values based on ecological properties, conservation value and the potential presence of SCC. Ecological sensitivity of the units identified in the mapping procedure was rated according to the following scale:

- **Low**: Units with low sensitivity where there is likely to be a negligible impact on ecological processes and terrestrial biodiversity. This category is reserved for areas where the natural vegetation has already been transformed, usually for intensive agricultural purposes like cropping. Most types of development can proceed in these areas with little ecological impact.
- **Medium**: Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impact like erosion is low. Development in these areas can proceed with relatively little ecological impact if appropriate mitigation measures are taken.

- **High**: Areas of natural or transformed land where a high impact is anticipated due to high biodiversity value, sensitivity or important ecological role. Development in these areas is highly undesirable and should proceed with caution as it may not be possible to mitigate all impacts.
- **Very High**: Critical and unique habitats that serve as habitat for rare/endangered species or perform critical ecological roles. These areas are essentially ‘’no-go’’ areas from a developmental perspective and should be avoided at all costs.

8 ECOLOGICAL ASSESSMENT FINDINGS

8.1 Vegetation cover index calculations

The model calculation described in Chapter 7 will be used to classify and categorise the ecology of the area using the following characteristic formulas:

VIS = [(EVC) + ((SI x PVC) + (RIS))] where:

1. **EVC** is extent of vegetation cover.
2. **SI** is structural intactness.
3. **PVC** is percentage cover of indigenous species.
4. **RIS** is recruitment of indigenous species.

1. EVC= [(EVC1+EVC2)/2]

Table 3: EVC calculation table of information.

EVC 1 – Percentage Natural Vegetation Cover						
Vegetation cover %	0%	1-5%	6-25%	26-50%	51-75%	76-100%
Site score						
EVC 1	0	1	2	3	4	5

EVC 2 – Total site disturbance						
Disturbance score	0	Very Low	Low	Moderate	High	Very High
Site score						
EVC 2	5	4	3	2	1	0

Using the EVC formula: [EVC 1 + EVC 2]/2

= [5+4]/2

= 4.5

Table 4: Sensitivity index table.

2. SI= (SI1+SI2+SI3+SI4)/4

	Trees (SI)		**Shrubs (S2)**		**Forbs (S3)**		**Grasses (S4)**	
Score	*P/S	*PRS	P/S	PRS	P/S	PRS	P/S	PRS
Continuous								
Clumped								
Scattered								
Sparse								

*Present State (P/S)= currently applicable for each habitat unit

*Perceived Reference State (PRS)= if in pristine state

Each SI score is determined with reference to the following P/S and PRS scoring table of vegetation distribution.

Table 5: Part 2 section for calculation of sensitivity index.

P/S				
PRS	Continuous	Clumped	Scattered	Sparse
Continuous	3	2	1	0
Clumped	2	3	2	1
Scattered	1	2	3	2
Sparse	0	1	2	3

Using the standard formula: SI= (SI1+SI2+SI3+SI4)/4

SI= [0+1+2+1]/4

SI= 1

3. PVC = [(EVC)-(exotic x 0.7) + (Bare ground x 0.3)]

Table 6: Percentage vegetation cover calculation table.

Percentage vegetation cover (exotic)						
	0%	1-5%	6-25%	26-50%	51-75%	76-100%
Vegetation cover						
PVC Score	0	1	2	3	4	5
Percentage vegetation cover (bare ground)						
	0%	1-5%	6-25%	26-50%	51-75%	76-100%
Vegetation cover %						
PVC score	0	1	2	3	4	5

Using the standard above formula: PVC = [(EVC)-(exotic x 0.7) + (Bare ground x 0.3)]

PVC = [(4.5) -(5x0.7) + (4x 0.3)]

= 2.2

4. RIS

Table 7: Recruitment of indigenous species information table.

Extent of indigenous species recruitment	0	Very low	Low	Moderate	High	Very high
RIS	0	1	2	3	4	5
RIS score	0	1	2	3	4	5

VIS	Assessment class	Description
22-25	A	Unmodified, natural
18-22	B	Largely natural with few modifications
14-18	C	Moderately modified
10-14	D	Largely modified
5-10	E	The loss of natural habitat extensive
<5	F	Modified completely

From the table above the RI is 3 and using the VIS formula of: [EVC + SI] x [PVC +RIS].

Therefore VIS = (4.5+1) x (4)

= 5.5 x 4

= 22 (largely natural with few modification)

The VIS is 22 and classified as B, which can be described (see Table) as largely natural with few changes. The classification ranges have been influenced by human activity like development of roads, housing development, grazing from domestic and game animals, power and telecommunications systems network. From an ecological perspective, the recommendation is to proceed with project construction and operation while highlighting the EMPr's impact monitoring schedule. The ecological management and rehabilitation recommendations in this report must be applied to ensure sustainable project development for the area.

8.2 Plant and animal species identified at the survey area

See 8 for the identified flora and faunal species from the project development site. Cattle and related domesticated animals droppings were seen on site, a clear indication that there are game in the area.

Table 8: Indigenous plant species identified in the project area.

Family	Botanical name	Habit	Common name	Conservation status
Cyperaceae	*Cyperus compressus*	Grass	Annual sedge	L
Apocynaceae	*Themeda triandra*	Grass	Red grass	L
Apocynaceae	*Monocymbium ceresiiforme*	Grass	Oat grass	L
Asparagaceae	*Elionurus muticus*	Grass	Wire grass	L
Amaranthaceae	*Asparagus laricinus Burch.*	Shrub	English view	L
Malvaceae	*Hermannia spinosa*	Shrub	Doll's roses	L
Asteraceae	*Kleinia longiflora*	Shrub	Paintbrush flower	L
Capparaceae	*Boscia albitrunca*	Tree	Shepherd's tree	Protected
Fabaceae	*Vachellia erioloba*	Tree	Camel thorn	Protected
Poaceae	*stipagrostis amanola*	Grass	Desert grass	L
Poaceae	*stipagrostis siliata*	Grass	Tall bushman grass	L
Poaceae	*stipagrostis uniplumis*	Grass	Silky bushman grass	L
Poaceae	*stipagrostis hochstetteriana*	Grass	Spike bushman grass	L
Poaceae	*Schmidtia kalahariensis*	Grass	Kalahari sour grass	L
Fabaceae	*Vachellia tortilis (Forssk.) Gallaso & Banfi subsp. heteracantha (Burch.) Kyal. & Boatwr.*	Tree	Umbrella Thorn	L
Ochnaceae	*Ochna pulchra Hook.*	Shrub	peeling plane	L

Family	Botanical name	Habit	Common name	Conservation status
Rhamnaceae	*Ziziphus mucronata Willd. subsp. mucronata*	Tree	buffalo thorn	L
Aizoaceae	*Lithops bromfieldii*	Succulent	Living Stones	L
Portulacaceae	*anacampseros rufescens*	Succulent	Sunrise succulent	L
Aizoaceae	*Dinteranthus wilmotianus*	Succulent	Living Stone	L
Asphodelacea	*Aloidendron dichotoma*	Succulent	Green Stone Plant	L

Table 9: Problem weeds and invasive alien plant species in the project area.

Family	Botanical name	Habit	Common names	CARA/NEMBA Categories
Meliaceae	*Melia azedarach L.*	Tree	Chinaberry Tree	3/1b
Salicaceae	*Populus alba*	Herb	White poplar	1b
Asteraceae	*Sonchus asper (L.) Hill subsp. asper*	Tree	Prickly Sowthistle	1b
Fabaceae	*Sesbania bispinosa (Jacq.) W.Wight var. bispinosa*	Shrub	Prickly Seban	Weed
Verbenaceae	*Lantana camara L.*	Shrub	Lantana	1b
Amaranthaceae	*Chenopodium album L*	Herb	Baconweed	Weed
Malvaceae	*Malvastrum coromandelianum (L) Garcke*	Herb	Threelobe false mallow	1b
Solanaceae	*Datura ferox L*	Herb	Fierce thornapple	1b
Solanaceae	*Nicandra physalodes (L.) Gaertn.*	Herb	Apple of Peru	1b
Solanaceae	*Datura stramonium L.*	Herb	Thorn Apple	1b
Euphorbiaceae	*Ricinus communis L.*	Herb	Castor bean	2

The majority of animal species that occurs in the grassland biome can be found in and around the proposed area. However, during the survey only Klipspringer,Kudu and the Mangoose were spotted and identified. Some of the animals that may occur in the area are listed in Table . Human activities may have resulted in the majority of them moving on or being hunted down.

Table 10: Indigenous animals anticipated to occur/used to occur on site.

Scientific name	Family	Common name	Status
Oreotragus oreotragus	*Bovidae*	klipspringer	LC
Aepyceros melampus	*Bovidae*	Impala	LC
Tragelaphus sylvaticus	*Bovidae*	Southern Bushbuck	LC

Scientific name	Family	Common name	Status
Oryx gazella	*Bovidae*	Gemsbok	LC
Connochaetes taurinus.	*Bovidae*	Wildebeest	LC
Cercopithecus aethiops	*Cercopithecidae*	Vervet monkey	LC
Herpestes sanguineus	*Herpestidae*	Mangoose	LC
Papio ursinus	*Cercopithecidae*	Cape Baboon	LC
Rock hyrax	*Procaviidae*	Dassie	LC

8.3 Sensitivity mapping

Sensitivity mapping marks areas perceived to be sensitive around or in the vicinity of the project development area. These zones should be avoided when project implementation occurs or some precautionary measures need to be taken to minimise the project development impacts (construction and operation). Some of the mitigation measures are highlighted in this report and the EMPr. Some of the areas to be avoided or treated with care are watercourses, wetlands, riparian belts and buffer zones. These are areas with sensitive species (biodiversity) and their disturbance can destabilise natural ecological recovery patterns. Figure 4 presents the specific boundaries for the river catchment, as well as various elements on site. Figure 5 is a detailed sensitivity map of the area.

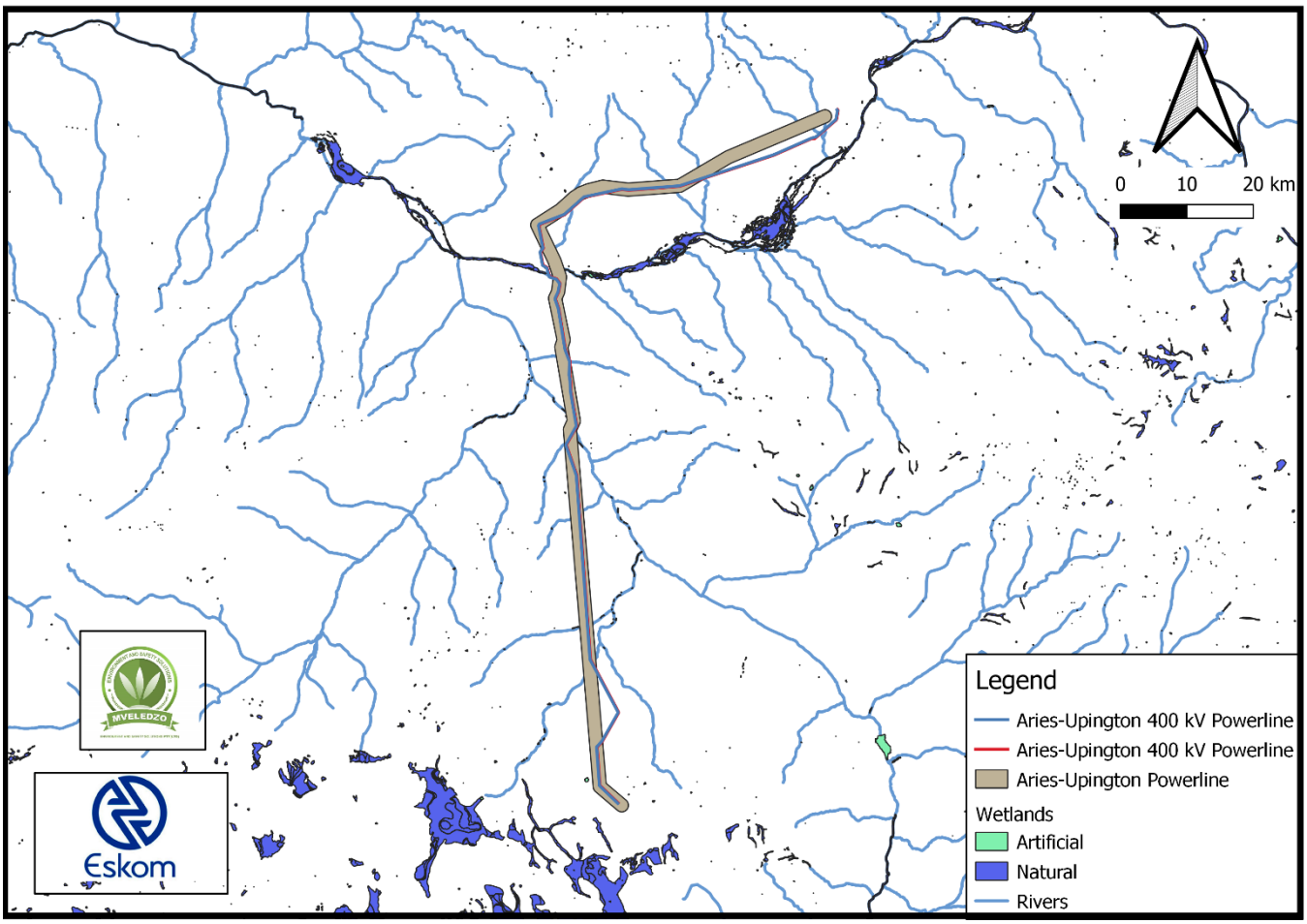

Figure 4: Satellite map of the project site with specific boundaries.

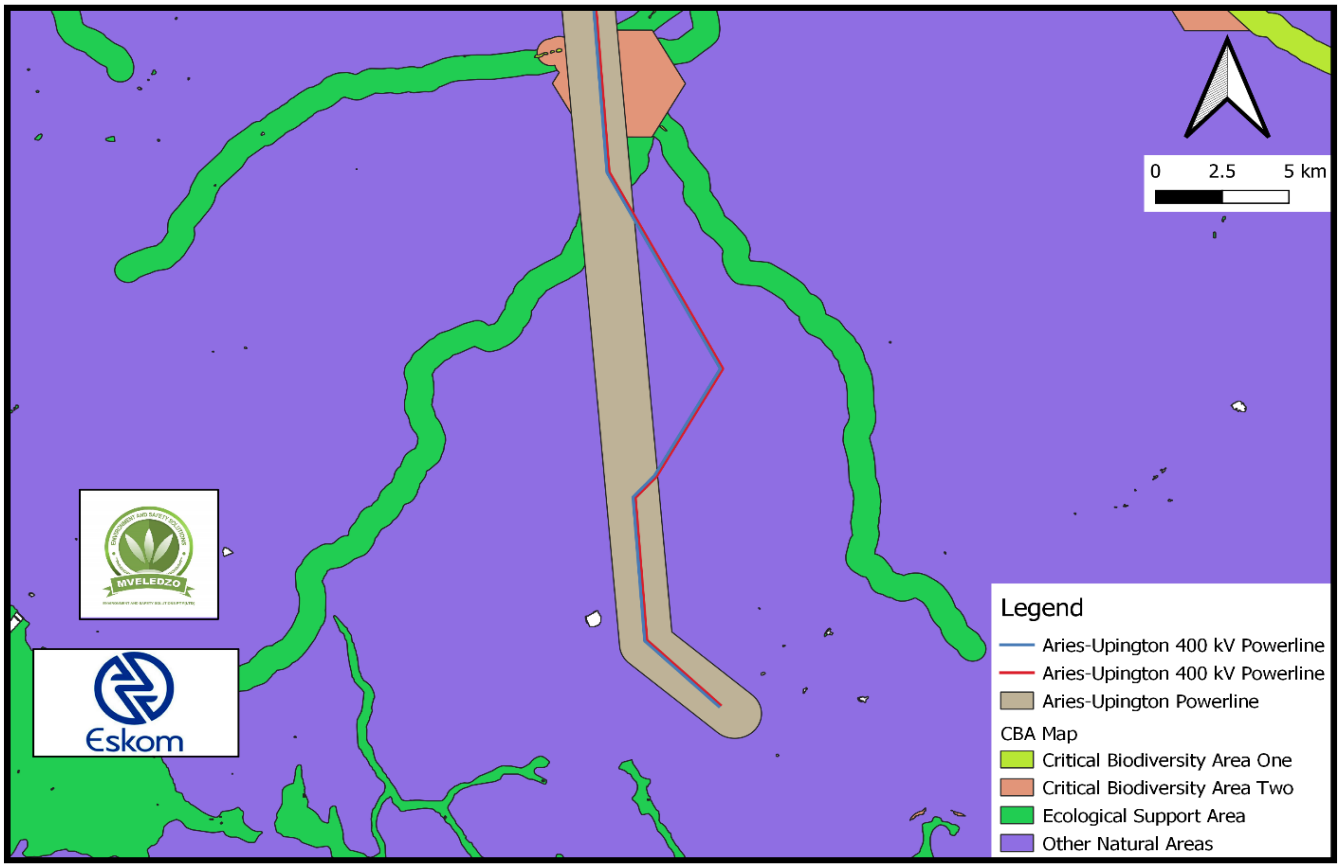

Figure 5: Critical Biodiversity area first deviation

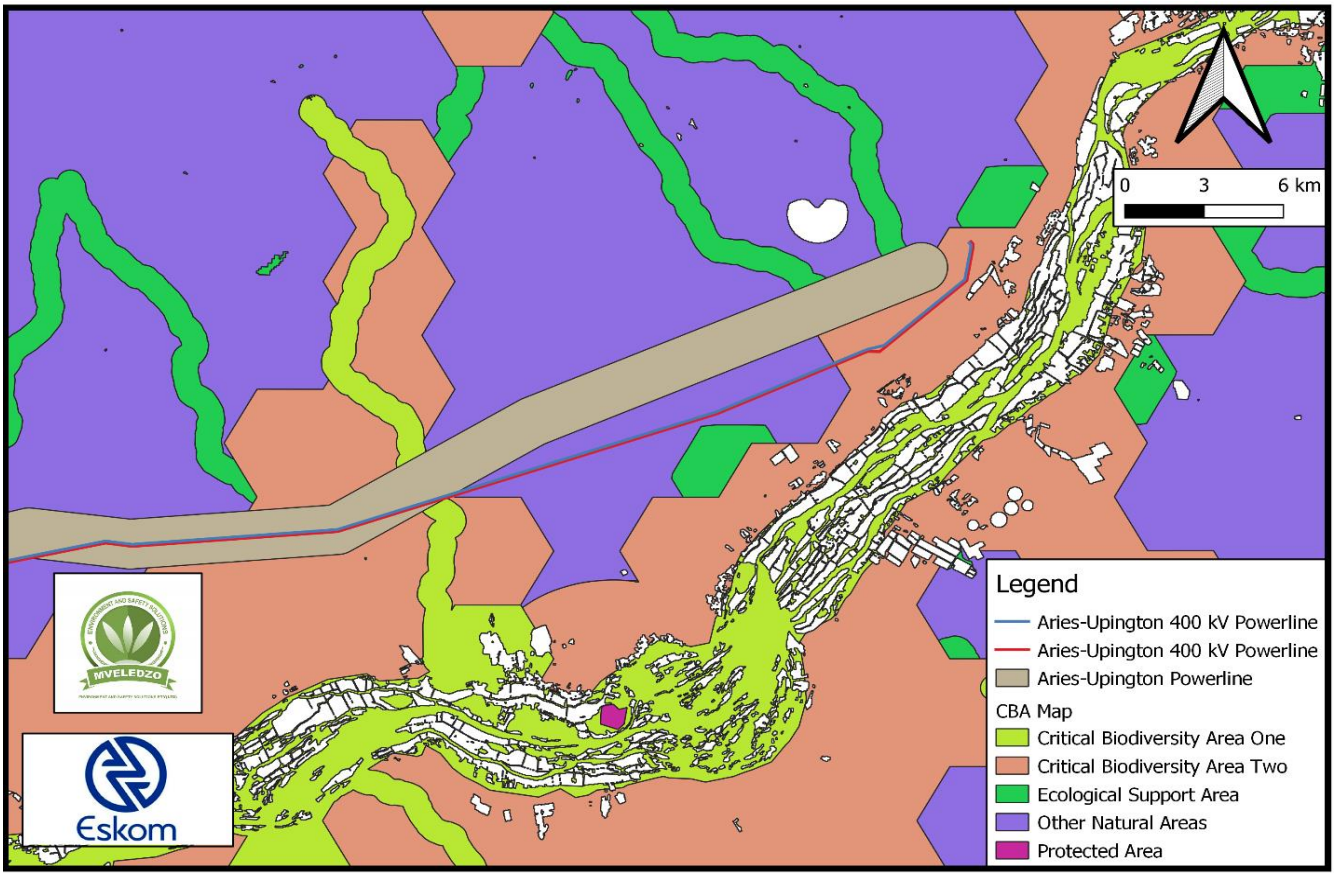

Figure 6: Critical Biodiversity area second deviation

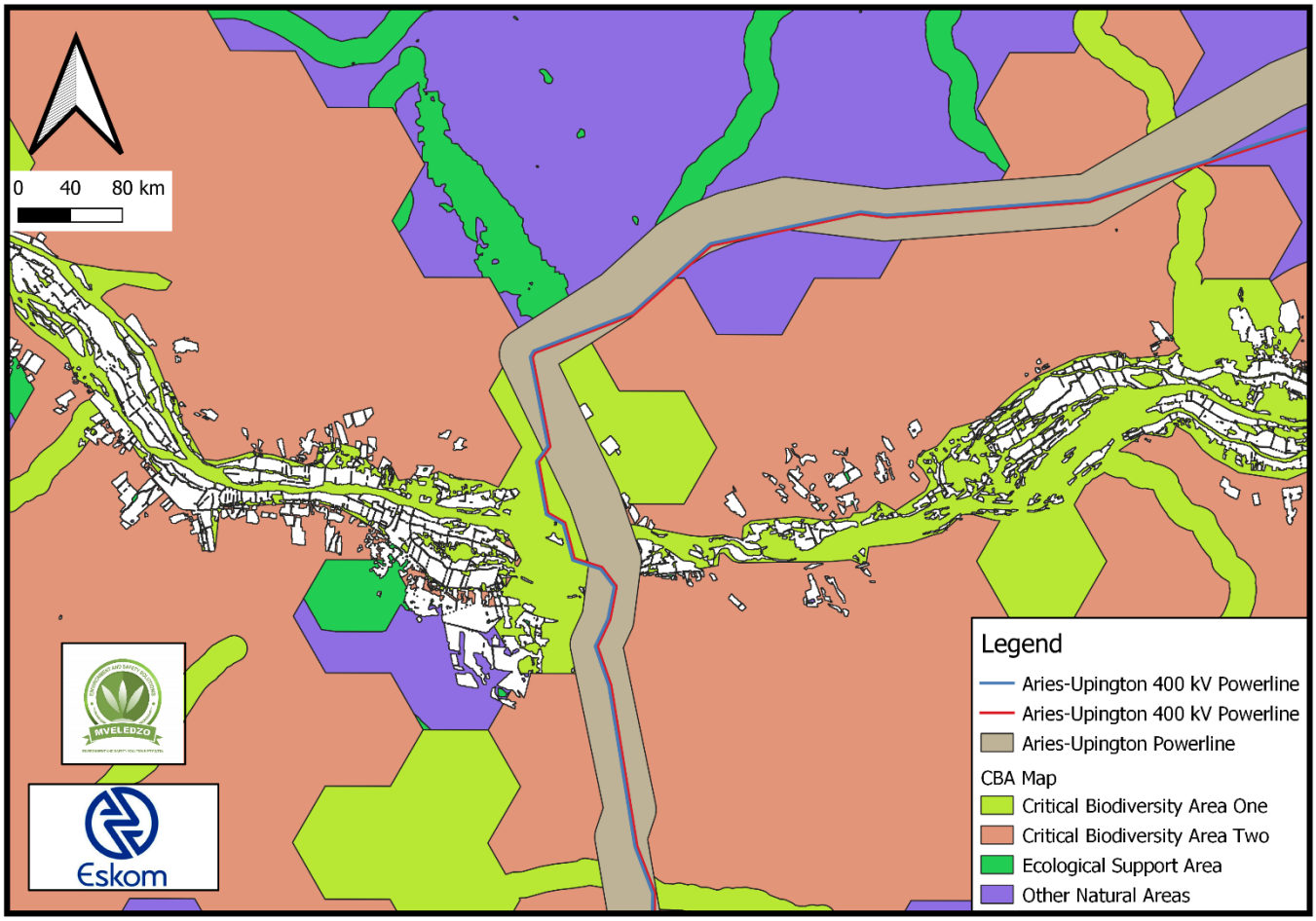

Figure 7: Critical Biodiversity area third deviation

The sensitive area was assessed by identifying the presence or absence of protected or red data plants or animal species, protected areas, intact habitat and species diversity. The main aim to assess the sensitivity of the area is to identify and specify the location and size of such sensitivity since they support functional ecology (they have abundant plant and animal species) due to their special habitat that they provide for different species and the diversity of plants thereof.

9 IMPACT ASSESSMENT

The aim of this section is to identify the potential ecological impacts that are likely to arise as a result of the development. The major impacts affect the operation phase of development, but should be considered during the planning stage.

9.1 Impact assessment methodology

The impact assessment was done according to the following methodology:

- Impact direction may be positive, neutral or negative with respect to the particular impact (e.g., a habitat gain for a key species would be classed as positive, whereas a habitat loss would be considered negative).
- Magnitude is a measure of the degree of change in a measurement or analysis (e.g., the area of pasture, is therefore, classified as none/negligible, low, moderate or high). The categorisation of the impact magnitude may be based on a set of criteria (e.g. health risk levels, ecological concepts and/or professional judgment) pertinent to each of the discipline areas and key questions analysed.
- The magnitude and outline the rationale used. Appropriate, widely-recognised standards are used as a measure of the level of impact.
- Duration refers to the length of time over which an environmental impact may occur: i.e. transient (less than 1 year), short-term (0-5 years), medium term (5-15 years), long-term (greater than 15 years with impact ceasing after closure of the project) or permanent.
- Scale/geographic extent refers to the area that could be affected by the impact and is classified as site, local, regional, national, or international.
- Probability of occurrence is a description of the probability of the impact actually occurring as improbable (less than 5% chance), low probability (5%-40% chance), medium probability (40%-60% chance), highly probable (most likely, 60%-90% chance) or definite (impact will definitely occur).
- Impact significance was rated by the specialist using the scoring system shown in Table .

Table 11: Model scoring system for assessment of significance.

Magnitude	Scale	Duration	Probability
10-Very high	5-International	5-Permanent	5-Definite
8- High	4-National	4-Long-term (impact ceases when activity does)	4-Highly probable
6-Moderate	3-Regional	3-Moderate (5 to 15years)	3-Medium probability
4-Low	2-Local	2-Short-term (0 to 5 years)	2-Low probability
2-Minor	1-Site only	1-Transient	1-Improbable
0-None			0-None
Maximum SP is 100 points SP> 75 High Environmental Significance SP 30 to 75 Moderate Environmental Significance SP< 30 Low Environmental Significance			

After ranking these factors for each impact, the significance of the two aspects, occurrence and severity were assessed using the following formula:

SP (Significance Points) = (Magnitude + Duration + Scale) x Probability

The maximum value is 100 significance points (SP). The potential environmental impacts were then rated as of High (SP >75), Moderate (SP 30 – 75) or Low (SP <30) significance, both with and without mitigation measures on the following basis:

Table 12: Significance points table.

SP> 75	Indicates high environmental significance	Where it would influence the decision regardless of any possible mitigation. An impact that could influence the decision about whether or not to proceed with the project.
SP 30 to 75	Indicates moderate environmental significance	Where it could have an influence on the decision unless it is mitigated. An impact or benefit that is sufficiently important to require management. Of moderate significance - could influence the decisions about the project if left unmanaged.
SP< 30	Indicates low environmental significance	Where it will not have an influence on the decision. Impacts with little real effect and that should not have an influence on or require modification of the project design or alternative mitigation.
+	Positive	An impact that is likely to result in positive consequences/effects.

9.2 Impacts rating matrix

The impact rating matrix for the project is shown in Table 2.

Table 23: 2 X 400Kv Poweline Development impact rating matrix.

Project development phase	Potential impact and/or respect	Significance rating before mitigation	Mitigation	Significance rating after mitigation
Construction	• Loss of biodiversity and habitats. • Loss of species of conservation concern. • Irresponsible construction practices may pollute the residual ecological buffer zone and riparian belt of the active and existing water course (e.g. faecal contamination, construction debris or pollution of surface water through hydrocarbons, cement dust and litter material). • Poor storm-water management in the construction area, and context of soil stockpiles could lead to the siltation and/or pollution of the area of residual hydromorphic soils or the sensitive riparian corridor, and sediments being washed into the natural water-way drainage system. • The movement of machinery in the area could cause compaction or physical disturbance of these soils. • Temporary (illegal) construction access to the active water-flow zones and buffer area (riparian corridor) to abstract water could cause hydrological and morphological impacts (erosion, channel morphology changes, undercutting of riparian areas, etc.) and degrade the resource quality.	**Extent**: Local (2) **Duration**: Medium-term (2) **Intensity**: Moderate (2) **Probability**: Possible (2) **Significance**: Medium (8)	• Construction to be guided by the EMPr and mitigation measures in this report. • Construction to be monitored by an ECO according to the stipulations of the EMPr. • No batching or chemical/fuel storage areas to be located within 50m of the area of ecologically-sensitive riparian belt. • Construction-phase storm-water controls to be implemented along the stretch of the construction zones adjacent to the area and around all stockpiles. • No temporary construction accesses to be constructed into the riparian corridor of the waterway, unless authorised by the Department of Water. • Sanitation through any surface water feature and no machinery to enter the sensitive zone.	**Extent**: Site (1) **Duration**: Medium-term (2) **Intensity**: Low (1) **Probability**: Possible (2) **Significance**: Low (6)

Project development phase	Potential impact and/or respect	Significance rating before mitigation	Mitigation	Significance rating after mitigation
Operation phase	• Poor servicing and housekeeping in different developed factories can result in soil compaction, and soil and water contamination by leaking hydrocarbons from service vehicles. • Poor maintenance of service roads can accelerate erosion and siltation of the river-bed. • Waste management from service crew can choke the riverine water systems as and attract scavenging animals like birds, rats and dogs to the campsites and the water-way. • Increased possibility of having uncontrolled sprouting of invasive plant species.	**Extent**: Local (2) **Duration**: Medium term (2) **Intensity**: High (3) **Probability**: Possible (2) **Significance**: Medium (9)	• Ensure service routes are draining. Authorisation for use to be obtained from relevant authorities. Minimise activity on sensitive portions of the riverine, if it happens, the ECO should recommend how to rehabilitate the affected areas. • Ensure that service routes have silt-trapping mechanisms on their sides. • Clean-up the area where servicing would have taken place to prevent waste. • Frequently monitor water quality from operational site and ensure that the riverine buffer zone is maintained.	**Extent**: Local (2) **Duration**: Medium term (2) **Intensity**: Low (1) **Probability**: Possible (2) **Significance**: Medium (7)
Decommissioning stage	• Similar general impacts as detailed during construction due to irresponsible actions during decommissioning could occur.	**Extent**: Local (2) **Duration**: Medium-term (2) **Intensity**: Moderate (2) **Probability**: Possible (2) **Significance**: Medium (8)	• Decommissioning to be guided by an EMPr compiled for the decommissioning stage. • No temporary access to be constructed through any unauthorised route to the buffer zone. • As decommissioning is similar to construction, construction-related mitigation measures must be implemented.	**Extent**: Site (1) **Duration**: Medium-term (2) **Intensity**: Low (1) **Probability**: Possible (2) **Significance**: Low (6)

Project development phase	Potential impact and/or respect	Significance rating before mitigation	Mitigation	Significance rating after mitigation
Cumulative impacts	• The 2 x 400 Kv operation may prevent unprecedented loss/damage to the ecological status if properly managed using this matrix. • Current impacts on the ecologically sensitive area include invasive alien vegetation (which are very common in the area), and loss of biodiversity as the area to be developed will be cleared for powerline and related infrastructure.		• Refer to aforementioned phase-specific mitigation measures.	

9.3 Ecological management plan

The 2X 400kV Powerline development, if properly managed from construction to operational stage, will have almost insignificant impact on the existing ecosystem (especially during operation). In most cases, ecological management plans are designed for once-off projects. With the existence of waterbodies in the project area, it would be advisable to develop an ecological monitoring schedule and/or system to frequently check and advise on the condition of the ecologically-sensitive parts in the peripheries of the project, e.g. water quality of the water-way and drainage system.

The area requires development of an active ecological buffer zone which should be managed with an active invasive species eradication, monitoring and management plan. This ecological management guideline will assist in setting up a proper management system for the project. As highlighted earlier, a few issues require attention, like waste management issues, handling of hydrocarbons, storm-water management systems and invasive species management. Mechanical and biological removal of invasive species will be recommended, but monitoring of the latter should be ensured as this might result in abnormal population skewing of certain species in an ecosystem. The area's rehabilitation plan is discussed properly in the following section.

9.4 Rehabilitation plan

This activity should not wait until decommissioning, but should remain a concurrent activity from construction right through to operation and decommissioning. After each stage of construction, the affected area should be cleared of rubble and rehabilitated to the satisfaction of the ECO. The area should also be drained to minimise stagnation of water during construction and operation. Figure 5 will assist significantly when trying to identify the zones that should not be impacted by construction or operations.

All affected areas in the project development site should be rehabilitated to its original state before development to blend the new environment with the old. Project budget usually includes rehabilitation planning and costs. This report defines rehabilitation as the reinstatement of the temporarily disturbed areas affected by project development (in this case "construction or construction related activities") to a state that resembles conditions prior to disturbance. Undisturbed systems should not be rehabilitated unless 2X 400kV powerline activities significantly affect the system itself. The ECO will assist in identifying areas that might require rehabilitation and include them during the process to ensure that all project footprints (external) are addressed. These additional points will affect budget and should be expected. When planning for development, rehabilitation costs should be flexible. The Powerline project (construction and operation) involve three phases which are all going to impact the environment and therefore would require conservation management and rehabilitation planning. The ecological management is highlighted in Section 9.3. The following are the well-known development phases for the Powerline project:

- Phase One: Clearing of the area where construction will be active.
- Phase Two: Construction of the infrastructure and all related features.

- Phase Three: operation of all the developed infrastructure and factories.

It is highly recommended that rehabilitation around the construction footprint takes place immediately after disturbance to limit detrimental effects resulting from, e.g., rainfall events after removal or clearing of the existing material (especially storm-water drainage towards the existing waterbodies and/or road drainage systems). This rehabilitation plan will assist in this. Rehabilitation measures must blend well with the existing ecological buffer of the area. It is imperative that rehabilitation of disturbed areas takes places after each construction phase. This will minimise costs and time.

Erosion and siltation should be minimised by construction of silt-traps and/or gabion rock blocks for surface run-off draining from service roads around the active portions of the project; this will be anchored or supported with soil binding grass. An active invasive species monitoring and management plan will form part of this rehabilitation. The final stage of rehabilitation requires that local and/or indigenous plant species be planted to enable the area to naturally recover (natural succession), as well as blend with the existing natural vegetation in the area. Sloping areas will be terraced or benched and top-soil covered (at least 30cm) to assist in encouraging natural growth of plants. A local agricultural expert will be consulted to assist in the determination of what plant species seed-mix should be applied. Proper care and maintenance should be carried out with independent supervision from the ECO. Monitoring of the rehabilitation process from each phase should be emphasised and the ECO must assist with blending mechanisms as promulgated in this report. Table 3 lists the rehabilitation measures that should be undertaken when monitoring post-construction corrective actions. Each impact is followed by the corrective measure (in this instance rehabilitation) and the time frames will act as a guide, that can be altered depending on the on-site activities.

Table 3: Impact related rehabilitation plan table.

Impact	Rehabilitation	Timeframe
Vegetation clearing: On portions where structures will be built.	• Restrict vegetation clearing to the mapped engineering design pegging, as spelt in the planning stage. • Where some concrete structures are removed, disturb as little vegetation as possible. • Soil clearing to establish proper foundation for the structures and stockpiling areas should be done by clearing topsoil and separating stockpiling for later use during rehabilitation. • It is advisable not to store the removed structures, stockpiles and material for use in ecologically-sensitive areas like riparian belts, watercourses and ecological buffer areas. • Where vegetation removal is imminent, remove it with roots and parts of their structures to ensure replanting on disturbed portions. If the area will be re-used to construct the new structures, temporary measures to prevent topsoil wash-out during rainfall must be implemented. • Reseed using seed-mix of indigenous species on the affected zones. • Minimise uncontrolled slope attenuation and heavy erosion by constructing storm-water control berms, gabion rock blocks as velocity dissipaters, and installing culverts to spread the flowing surface run-off especially on service routes. Rehabilitation should be assisted by ripping compacted soil and sowing a tree species naturally occurring in the savannah biome of the same area. Ripping should be done to a depth of 250mm in two directions at right angles to the slope; this aids in loosening soil and allowing seed germination.	• After clearing demarcated areas, particularly where the existing footprint will not be used. • As and when monitoring indicates degradation of vegetation or failure of the rehabilitation.
Soil compaction: Likely to occur on all portions where construction will be prevalent	• Do not rip and/or scratch areas under wet conditions, as the soil will not break up and compaction will be worsened.	• Immediately after any construction phase (except where the next phase

Impact	Rehabilitation	Timeframe
and even at operational stage of the project, especially on service road routes. This impact will decrease permeability of the soil resulting in disturbance of the sub-surface flows and natural vegetation establishment.	• Do not permit vehicular or pedestrian access into natural or seasonally wet areas during and immediately after rainy periods, until that soil has dried out (DAWF, 2005). • Areas where soil has been compacted should be ripped to encourage vegetation growth.	follows immediately and makes use of the same construction footprint). • As and when monitoring indicates severe compaction due to maintenance, especially when the ECO considers it necessary.
Removal of vegetation for new drain ways/ditches: Impact from construction of drain ways for surface water drainage from the service routes (compaction, vegetation clearing, and noise creation, pollution from site leakages, erosion and siltation).	• Where possible, remove vegetation as turfs or territories that can be replanted as part of the rehabilitation of vegetation around the exact portions of the footprint. • Where soils are removed, topsoil and subsoil must be stockpiled separately in low heaps of less than 2m high. Top soil is a valuable resource for rehabilitation and vegetation of disturbed areas. After construction, compacted areas should be ripped and topsoil replaced from the areas where it was removed. • All sloped areas must be re-vegetated by using removed plant tufts or by seeding with a grass-mix containing species naturally occurring in the area. Sloped areas where vegetation has been removed or destroyed should be replanted immediately after completion of construction to avoid erosion. • Areas with minimal disturbance can be ripped and allowed to naturally re-vegetate. This excludes sloped areas and re-vegetation must be monitored to ensure that alien invasive plant species do not colonise the disturbed areas. • If natural re-vegetation is unsuccessful, corrective action should be taken, including seeding and planting by a specialist as stipulated in the EMP.	• Immediately after construction and stringing of conductors. • As and when monitoring indicate degradation of vegetation along the project area.

Impact	Rehabilitation	Timeframe
Pollutants released during service and construction: Construction can expose hydrocarbons to the watercourse area and vegetation through machinery leaks and biogeochemical reactions of bedrock resulting in disturbed sensitive environs.	• In case of emergencies or unforeseen events, the problem must be remediated immediately and any spillage into any watercourses be reported to the Department of Water Affairs. The soil must be stabilised (import additional topsoil if necessary) and re-vegetated as soon as possible. Re-vegetation should include seeds from the adjacent grassland and any rescued protected plants and/or plants of conservation concern that might have been impacted. • Remove all project-related material/support equipment immediately on completion of any construction phases.	• Immediately after a construction phase. • Anytime during operational phase of the piggery project, especially when maintenance activities might have resulted in pollution.
Invasive and alien species spreading.	• Appoint a specialist in invasive species control, eradication, management and monitoring. Identified invasive species should be removed prior to construction. This will prevent seed spreading into disturbed soils or to downstream areas. • Mechanical removal is the preferred control mechanism using machinery depending on how congested the area is and this should be a continuous programme. Biological eradication mechanisms will work, but requires an ecological specialist for population blooming management. • A register of the methods used, dates undertaken, and herbicides (if used) and dosage used must be kept and available on site. The register must include incidents of poisoning or spillage.	• Immediately after vegetation clearing, project commissioning and during progression of the project; and • Should be an on-going process and at decommissioning phase.

10 CONCLUSIONS AND RECOMMENDATIONS

The motivations for this Powerline project include the cumulative impact of the development on habitat loss, fragmentation and the loss of individuals of protected tree species. However, given the scale of development at the site and combined impact on ecological function and biodiversity at the site, exceptional mitigation beyond standard avoidance and minimising of impacts is warranted. In order to address these concerns, the developer must only develop and clear only areas that are to be developed. However, this should not be accepted without critical evaluation and the current analysis provides an examination of the potential of the site to be used to reduce the residual impacts of the development. This investigation reveals the following outcomes and conclusions regarding the site and its potential value and limitations:

From a terrestrial biodiversity perspective, the Very High sensitivity areas are most commonly associated with CBA 1, CBA 2 and Ecological support area. The High sensitivity areas are most commonly associated with protected areas, Mountain and Catchment Areas. Given the length of the power line on the diverting options and the diverse nature of the receiving environment, it is not surprising that some impact on these higher sensitivity areas is unavoidable, but can rather be minimised through measure stated in this report and other measures that have been identified in all specialist reports Including EMPr.

New scientific evidence suggests that conservation and sustainable development go hand-in-hand (Heywood and Iriondo, 2003; Pool-Stanvliet, 2013; Tshisikhawe, 2016; and Pool-Stanvliet *et al*., 2018).

Search and rescue must be conducted prior to the construction phase to search and relocate the animals and plants of conservation concern. The conservation statuses and high distributional range of almost all the plant species found within the proposed area of development including all the sensitive environment must be considered. All areas with the river and the streams must be avoided with a buffer that will be determined by the specialist always maintained. This will aid in reaching the goal of the South African National Development Plan 2030 to "[ensure] environmental sustainability and measurable economic growth" (National Planning Commission, 2012).

Further investigation and assessments may be required to inform future rehabilitation. Failure to conduct such investigations and assessments may have a detrimental impact on closure planning and rehabilitation. Concurrent rehabilitation of affected areas is suggested to blend the developed site actively during all project stages.

11 AGRUCULURAL STATEMENT

The desktop study confirmed that the proposed development site is of a "Medium" Agricultural sensitivity, as classified by the DEA Screening Tool. The land is mostly used for stock farming (cattle and goats), commercial forestry and settlement. The landtypes of the area predict shallow rocky soils. This is further substantiated by satellite images of the survey area. These soils will have a low water holding capacity which will limit crop production and are not deemed suitable for irrigation. It is the specialist's opinion that the proposed development site is of a low agricultural sensitivity and that the development at the

proposed site will not significantly impact agricultural activities. In terms of agricultural sensitivity, the proposed development should thus be allowed to proceed at the identified site subject to recommendations provided.

Recommendations

1. Restrict the proposed development to the smallest footprint possible and do not disturb/alter areas outside the development;
2. Ensure that access roads are kept clear and that construction and operational activities do not interfere with agricultural activities.
3. Maintain security of the sites by appointing guards and providing support to the local farmers;
4. Spray water on roads to reduce dust, especially during harvest time.

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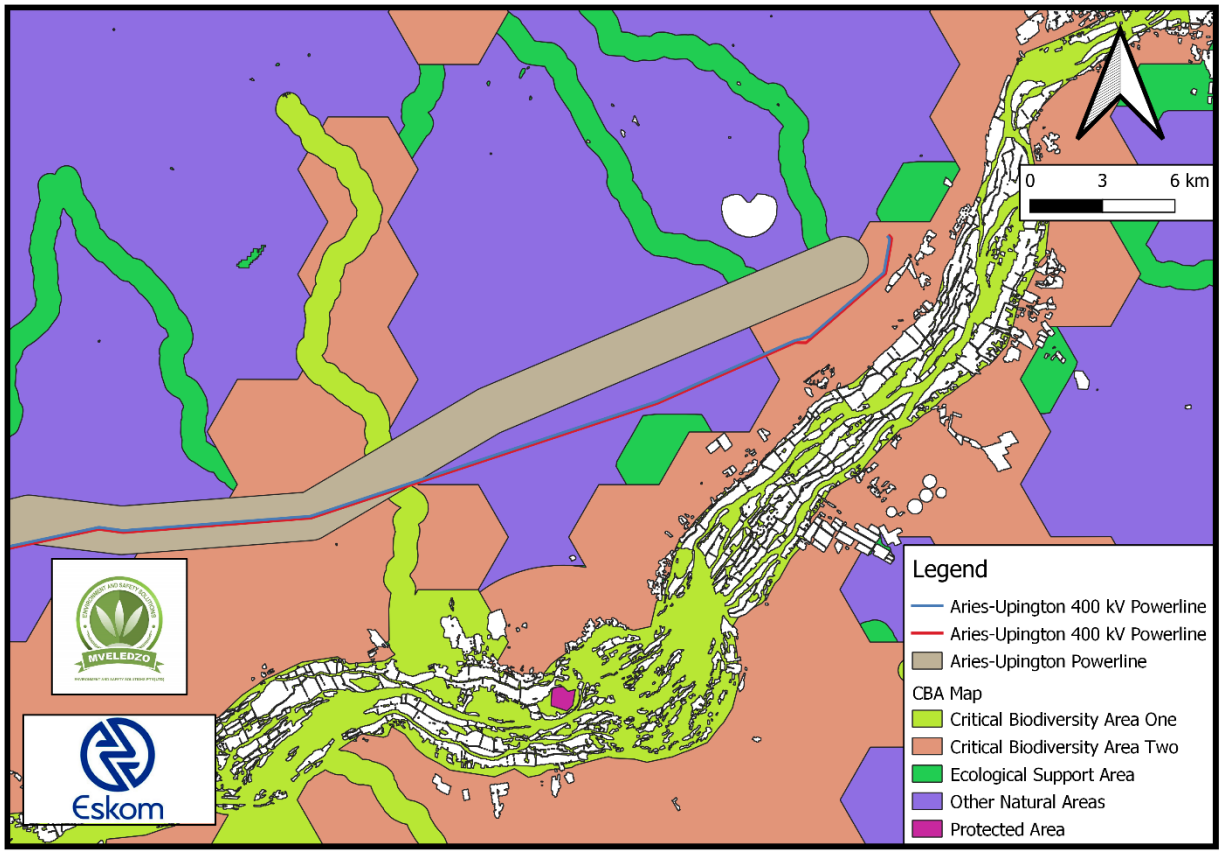
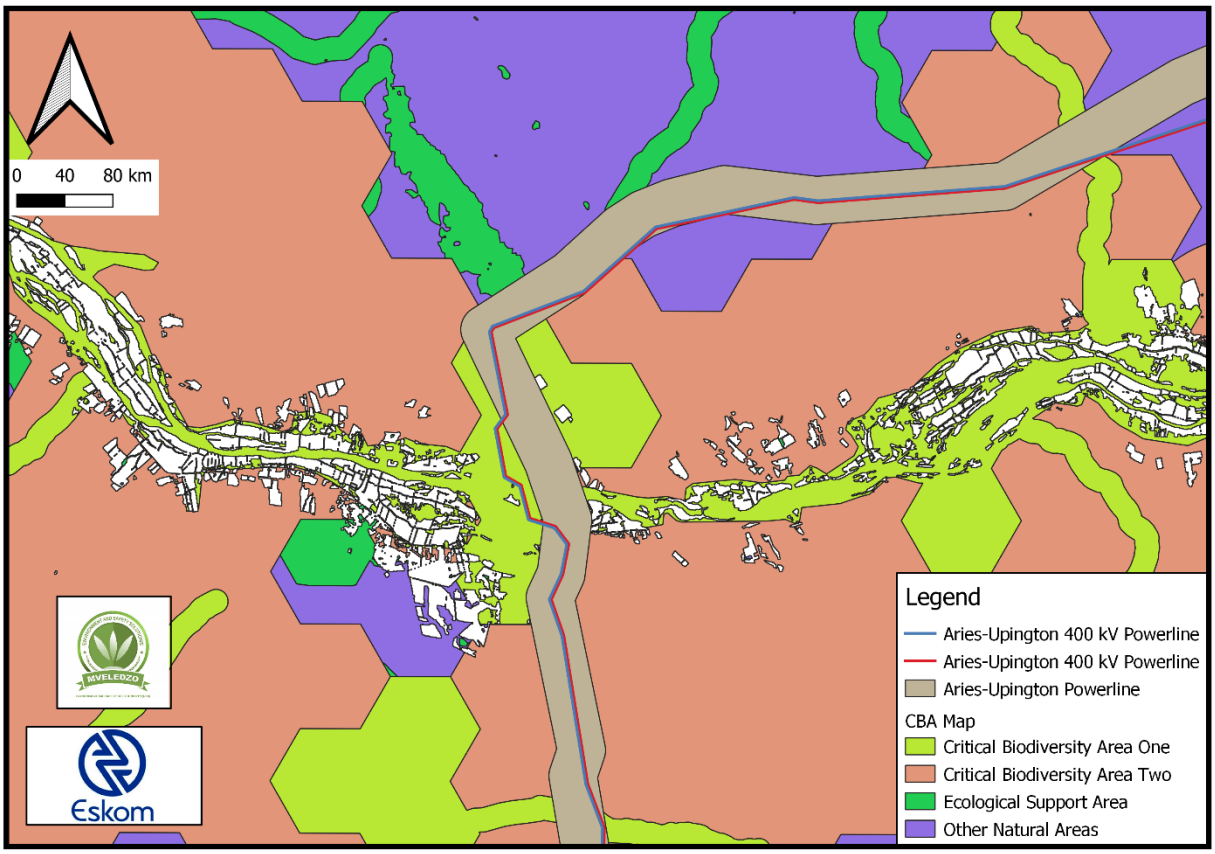
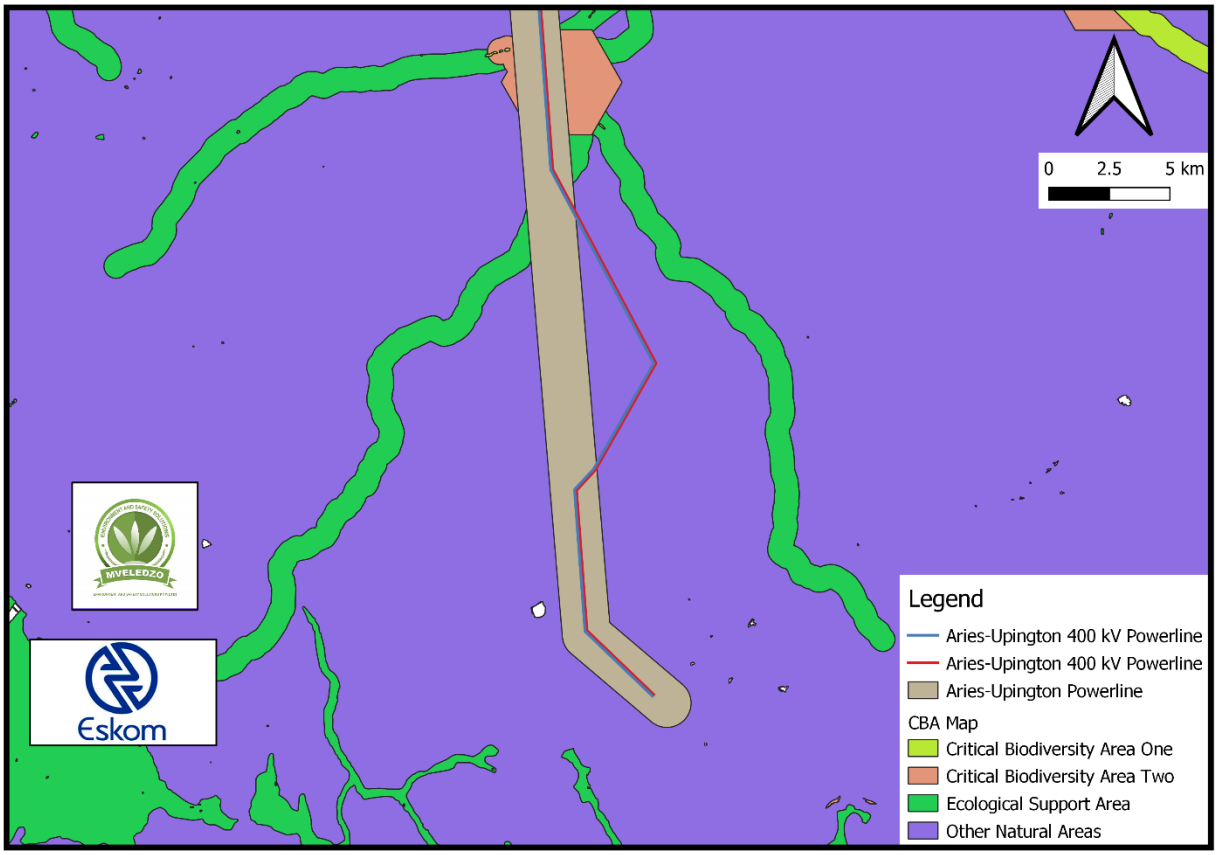
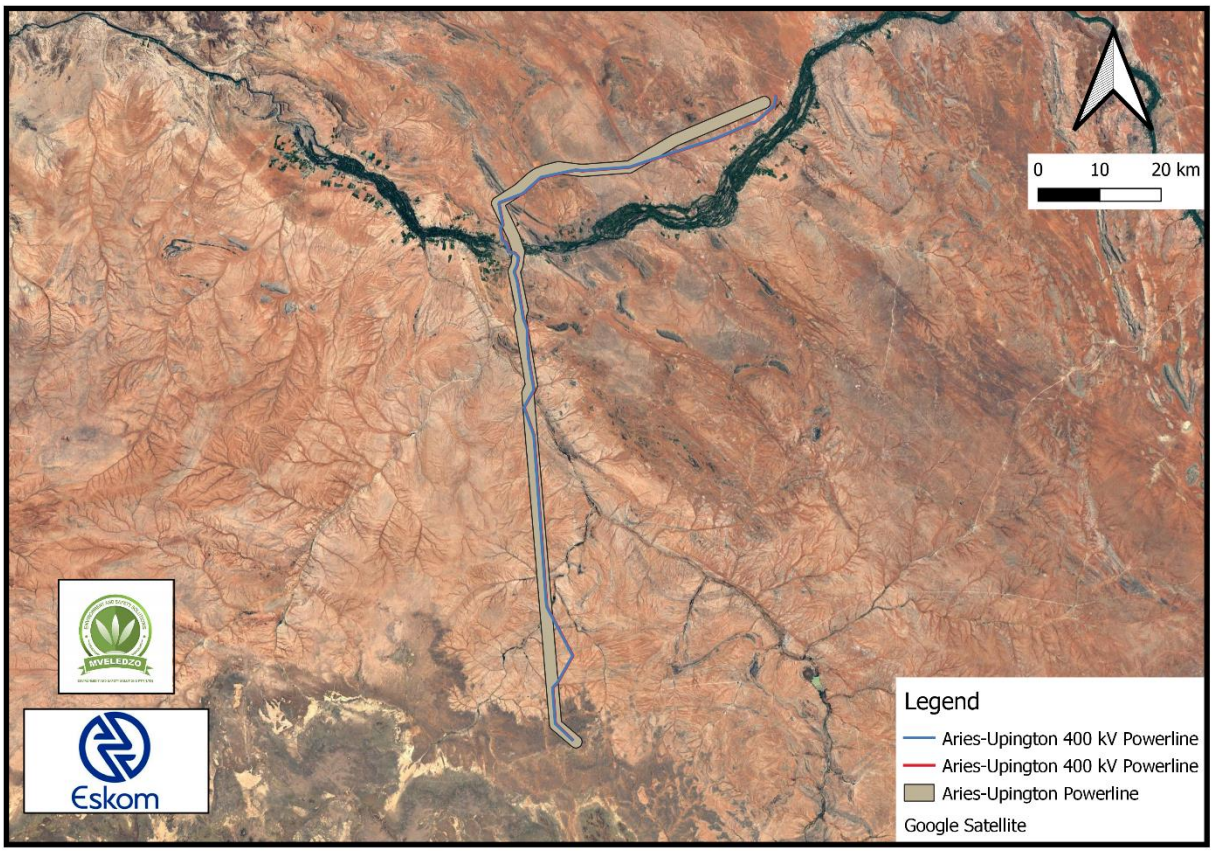
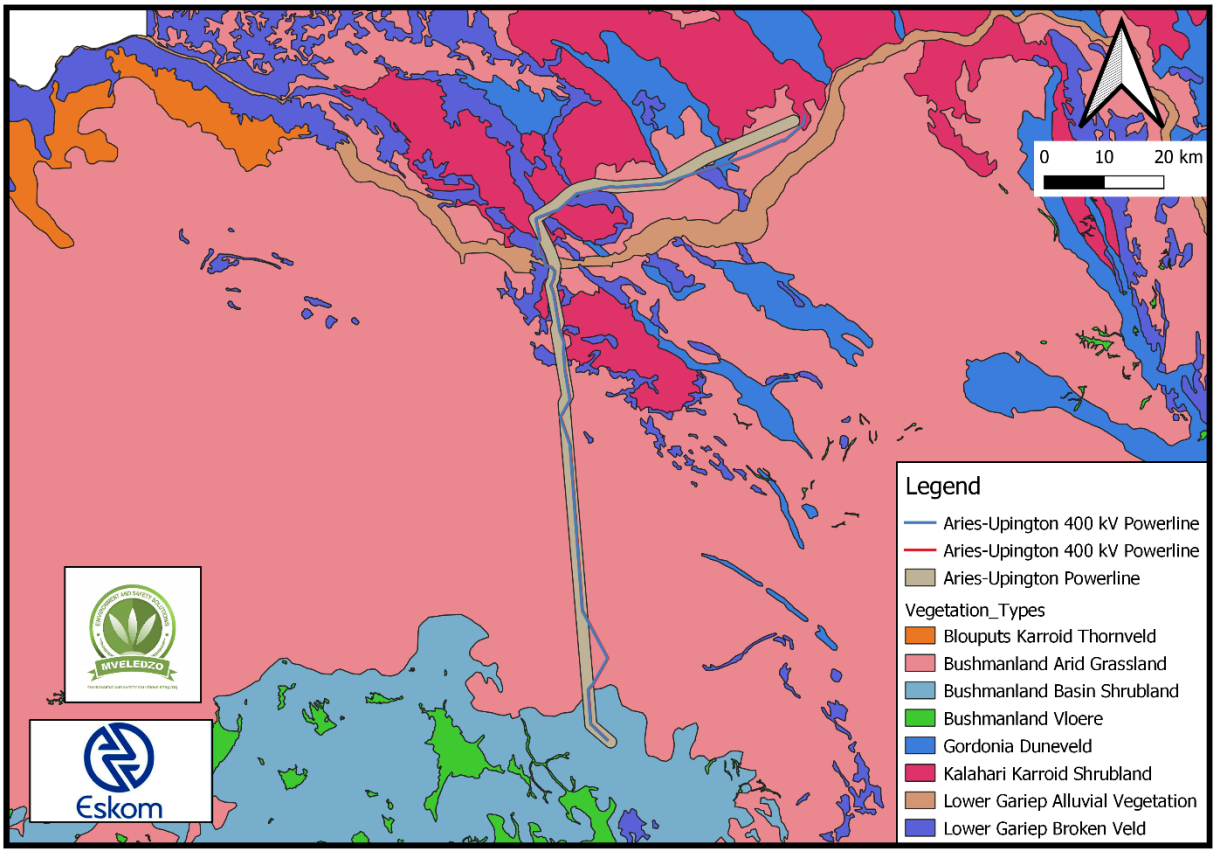
Appendix A: Different types of maps on the proposed site.




0 40 80 km
Legend
Aries-Upington 400 kV Powerline
Aries-Upington 400 kV Powerline
Aries-Upington Powerline
CBA Map
Critical Biodiversity Area One
Critical Biodiversity Area Two
Ecological Support Area
Other Natural Areas
MVELEDZO
Eskom


0 2.5 5 km
Legend
Aries-Upington 400 kV Powerline
Aries-Upington 400 kV Powerline
Aries-Upington Powerline
CBA Map
Critical Biodiversity Area One
Critical Biodiversity Area Two
Ecological Support Area
Other Natural Areas
MVELEDZO
Eskom


0 10 20 km
Legend
Aries-Upington 400 kV Powerline
Aries-Upington 400 kV Powerline
Aries-Upington Powerline
Google Satellite
MVELEDZO
Eskom


0 10 20 km
Legend
Aries-Upington 400 kV Powerline
Aries-Upington 400 kV Powerline
Aries-Upington Powerline
Vegetation_Types
Blouputs Karroid Thornveld
Bushmanland Arid Grassland
Bushmanland Basin Shrubland
Bushmanland Vloere
Gordonia Duneveld
Kalahari Karroid Shrubland
Lower Gariep Alluvial Vegetation
Lower Gariep Broken Veld
MVELEDZO
Eskom

Appendix B: Site pictures taken in August 2021

Photo 1: Shows the vegetation on proposed site for the Powerline

Photo 2: Shows nest on the protected tree within the proposed site

Photo 3: Shows the Vegetation on the proposed development site

Photo 4: Shows the mountainous area where the powerline is to pass through

Photo5: Shows the vegetation within the proposed site

Photo 6: Showing vegetation onsite

Photo 7: Showing the hill within the proposed site

Photo 8: Showing a Klipspringer on the proposed site

Appendix C: Site pictures taken in January 2022

Photo 1: Showing a vegetation and towards a hill on the proposed site

Photo 2: Showing the area dominated by the grasses on the proposed site

Photo 3: Showing the vegetation towards the substation

Photo 4: Showing vegetation on the proposed site

Photo 5: Showing the *Acacia SPP* on the proposed site

Photo 6: Showing the proposed site towards the railway line