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Terrestrial Ecology Specialist Assessment

Paarde Valley PV2 to Vetlaagte MTS Grid Connection Project near De Aar in Northern Cape Province

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For: Paarde Valley PV2 (Pty) Ltd

5 July 2022

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SPECIALIST DETAILS & DECLARATION

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

The details of Specialists are as follows –

Table 1: Details of Specialist

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

Details of Author:

Dr David Hoare

PhD (Botany) – Nelson Mandela Metropolitan University, Port Elizabeth

Main areas of specialisation

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

Professional Natural Scientist, South African Council for Natural Scientific Professions, Reg. no. 400221/05 (Ecology, Botany)

Member, International Association of Vegetation Scientists (IAVS)

Member, Ecological Society of America (ESA)

Member, International Association for Impact Assessment (IAIA)

Member, Herpetological Association of Africa (HAA)

Employment history

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

Declaration of independence:

David Hoare Consulting (Pty) Ltd 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 David Hoare Consulting (Pty) Ltd is not subjected to or based on approval of the proposed project by the relevant authorities responsible for authorising this proposed project.

Disclosure:

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

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



Dr David Hoare

5 July 2022

Date

INTRODUCTION

Site location and details

The proposed infrastructure is just to the north, north-east and east of the town of De Aar in the Northern Cape Province, within the quarter degree grid 3024CA (Figure 1).

The topography of the study site is gentle to flat. There is a range of hills at the south-eastern end of the corridor and a gentle increase in elevation northwards. The elevation on site varies from 1240 to 1336 m above sea level.

Most of the site consists of natural vegetation (Figure 2). The exception is a gravel road crossing the alignment corridor approximately at its central point.

Proposed project

Paarde Valley PV2 (Pty) Ltd (hereafter referred to as the Applicant) proposes the construction of a 132 kV, double circuit, overhead powerline (OHPL) grid connection from the authorised on-site substation and switching station at Paarde Valley PV2 to Vetlaagte Main Transmission Station (MTS) (which is currently undergoing its own EA application process). The OHPL is proposed to be

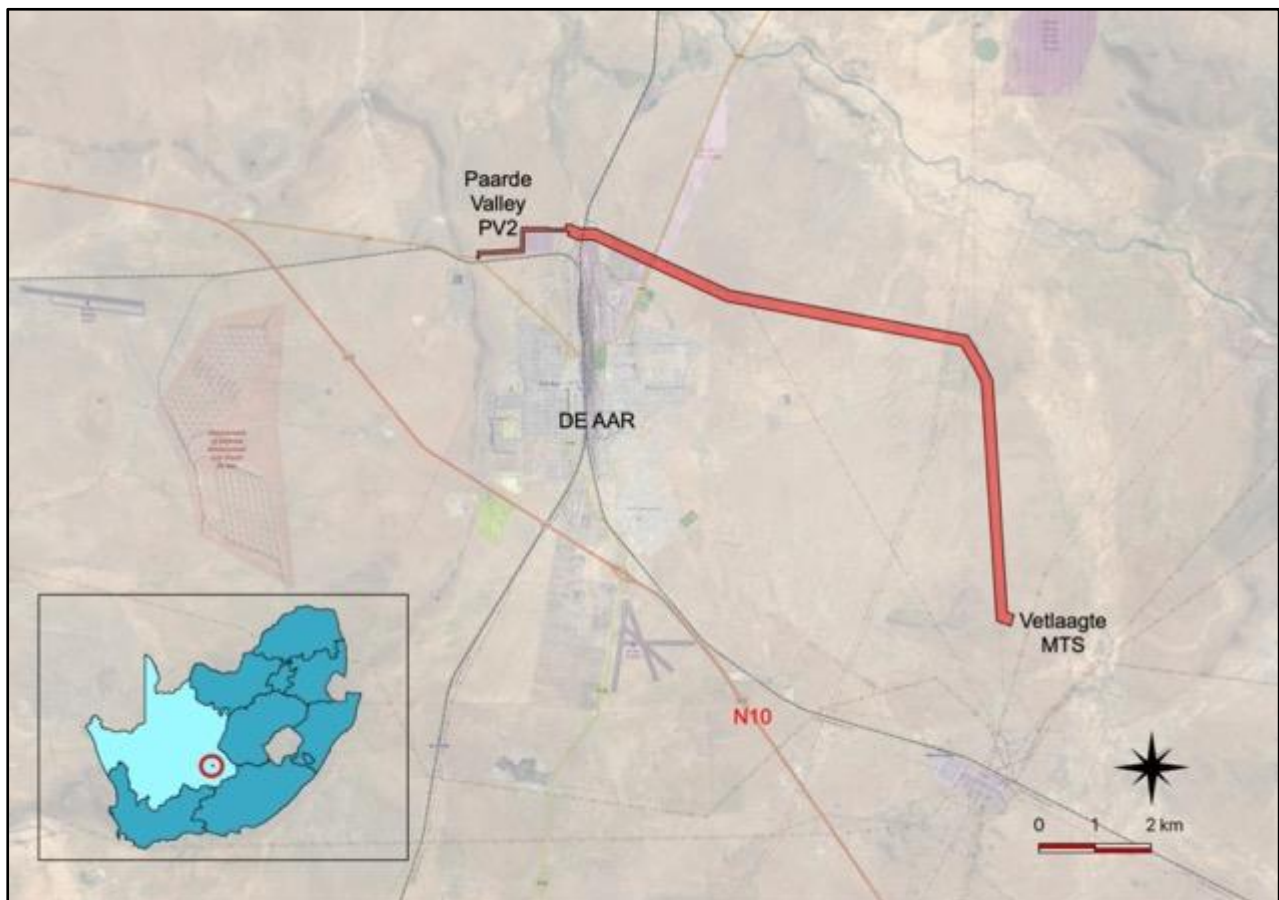


Figure 1: Location of the site adjacent to De Aar.

approximately 12.7 km in length, and is located in the Strategic Transmission Central Corridor . A 200 m corridor (100 m of each side of the line) is assessed here. The final OHPL servitude will be registered as 31 m but during the design development process a corridor of 200 meters is required to allow for minor tower position adjustments. The exact pylon locations will be determined by the outcome of the specialist's investigations, and engineering considerations. On average there will be 4 - 5 towers per km, so that the route will consist of an approximately 40 towers. The teams constructing the OHPL often use cranes and these will fit into an area with a maximum radius of approximately 30 m around the base of each tower, with the final footprint being relatively small. The line will have a capacity of 132kV and will make use of either steel monopole or steel lattice structure in line with Eskom required specifications.

A monopole self-supporting structure has a maximum base of 5 m in diameter above the ground. In some situations the structures have stays. These would fall into the area with a maximum radius of 30 meters, but the stays themselves are hardly exposed at ground level, with only small steel rods protruding from the ground. Lattice towers have a bigger footprint as each has four legs that are a maximum of 15 m apart so that the final footprint would be approximately 15 m x 15 m. The height of either pylon structure will be up to 32 m.

The project will also include the switching station component of the authorised Paarde Valley PV2 on-site substation, with an approximate footprint area of 100 m x 100m, and a feeder bay at the Vetlaagte MTS with a capacity of 132 kV, as this needs to be handed over to Eskom with the grid connection self-build works once constructed.

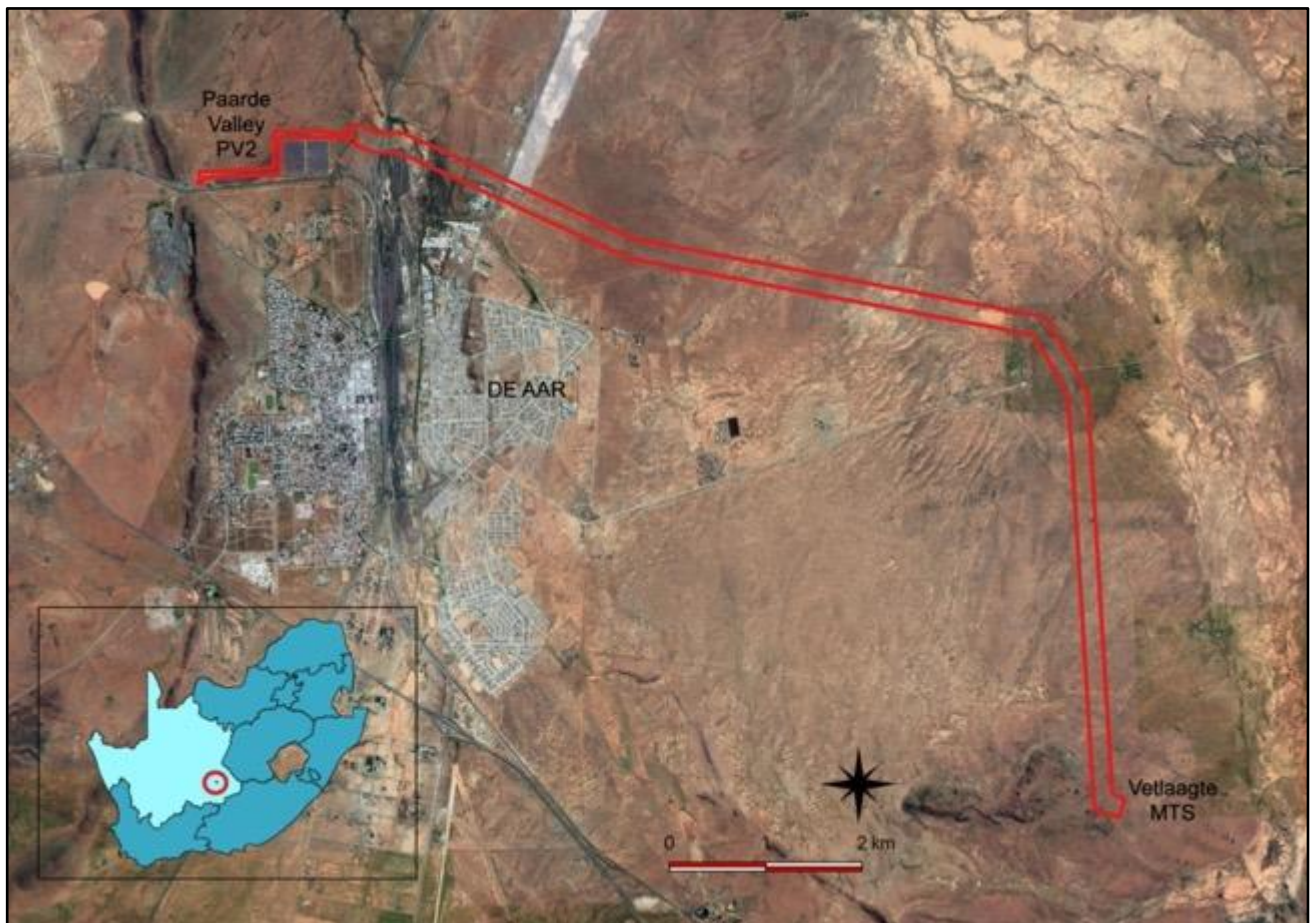


Figure 2: Aerial image of the corridor.

In summary, the infrastructure associated with the proposed Grid Connection works for the Paarde Valley PV2 project (and to be handed back to Eskom following construction), includes the following:

- A 132kV, double circuit Overhead Power Line (OHPL) from the Switching Station connecting to the proposed Vetlaagte Main Transmission Substation (MTS)
- 132kV Feeder bay at the Vetlaagte MTS
- On-site Switching Station (SwS), adjacent to the authorised IPP 132 kV substation. (approximately 100 m x 100 m combined)

The technical details include:

Overhead Powerline:

- Height of pylons Up to 32m
- Type of poles/ pylons to be used. Double Circuit configuration. The alternatives under consideration and to be assessed include Steel lattice or Monopole structures in line with Eskom required specifications
- Transmission line capacity 132kV
- OHPL Service Road (to lie within the OHPL servitude)
 - Length of OHPL service road(s) – Twin tracked service road following line route
 - Width of OHPL service road(s) 6 m
- Switching Station:
 - Footprint of approximately 50 m – 100 m x 100 m adjacent to IPP Substation
 - Area occupied by buildings (Control building, relay room, generator, storage warehouse, water tanks, ablutions) +-1.0 Hectares
 - Switching Station Access Road (separate access servitude from the nearest public road to the Switching Station yard)
 - Compacted gravel
 - Length of access road: +- 2.34 km
 - Width of access road: 8 m .
 - Security fencing height: 2.4 m
 - Type of fencing: Eskom palisade fencing + chainlink fencing for temporary works
 - Capacity of on-site switching station 132kv

The OHPL and Switching station are required to connect the Paarde Valley PV2 Solar farm to the Eskom National Grid. The route selected follows boundary lines and / or existing OHPL routes so as to limit disruption to current farming activities as much as possible.

The activities to be undertaken under this planned application trigger activities listed under the National Environmental Management Act (NEMA), thus, a Basic Assessment process is being followed for this application. The results of the Department of Forestry, Fisheries and the Environment (DFFE) environmental screening report indicates that the proposed project area is located within an area of medium, high and very high environmental sensitivity of Plant, Animal and Terrestrial Biodiversity respectively.

In accordance with GN 320 and GN 1150 (20 March 2020) of the NEMA EIA Regulations of 2014 (as amended), prior to commencing with a specialist assessment, a site sensitivity verification must be undertaken to confirm the current land use and environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tool (i.e., Screening Tool). David Hoare Consulting, as the Ecological specialist, have been commissioned to verify the sensitivity of the project site under these specialist protocols.

The scope of this report is the study area defined above.

Identified Theme Sensitivities

A sensitivity screening report from the DEA Online Screening Tool was requested in the application category: Utilities Infrastructure | Electricity | Distribution and Transmission | Powerline. The DEA Screening Tool report for the area, dated 13/06/2022, indicates the following ecological sensitivities:

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Terrestrial Biodiversity Theme	X			

Terrestrial Biodiversity theme

Sensitivity features are indicated as follows:

Sensitivity	Feature(s)
Very High	Critical Biodiversity Area 2
Very High	Ecological support area
Very High	FEPA Subcatchments

METHODOLOGY

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

Survey timing

The study commenced as a desktop-study followed by a site-specific field study on 4 and 5 March 2022. The site is within the Nama-Karoo Biome. The climate is arid to semi-arid. Rainfall occurs from November to March, but peaks in mid- to late summer (February / March) (Figure 3). Mean annual rainfall is 275 mm per year. There had been relatively good recent rainfalls prior to the field survey. The timing of the survey in early summer is therefore acceptable in terms of assessing the flora and vegetation of the site. The vegetation on site was in relatively good condition in terms of the seasonal presence of perennial plant species, although grass cover had not recovered from the previous winter period. The overall condition of the vegetation was therefore possible to be determined with a moderately high degree of confidence.

Field survey approach

Field surveys included both meander searches of general areas, and active searching in habitats that were considered to be suitable for specific groups or species. During the field survey, the entire corridor was assessed on foot. A hand-held Garmin GPSMap 64s was used to record a track within which observations were made. Digital photographs were taken of features and habitats on site, as well as of all plant and animal species that were seen. All plant and animal species recorded were

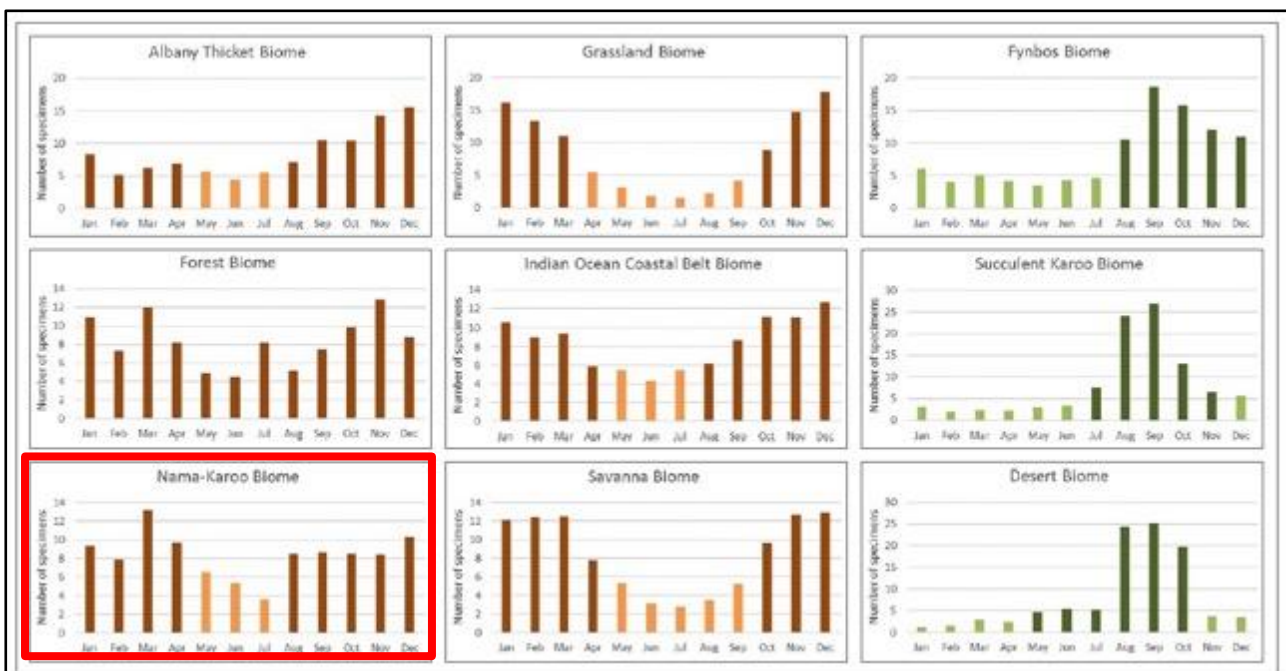


Figure 3: Recommended survey periods for different biomes (Species Environmental Assessment Guidelines). The site is within the Nama Karoo Biome.

uploaded to the iNaturalist website (<https://www.inaturalist.org>) and are accessible by viewing the observations for the site (use the Explore menu, zoom and pan until the desired study area is within the browser window, click the button "Redo search in map", and all observations for that area will be shown and listed).

Aerial imagery from Google Earth was used to identify and assess habitats on site. Patterns identified from satellite imagery were verified on the ground. Digital photographs were taken at locations where features of interest were observed. During the field survey, particular attention was paid to ensuring that all habitat variability was covered physically on the ground.

Digital photographs were taken of features of interest that were seen on site, as well as of habitat in different parts of the site.

Sources of information

Vegetation

- Broad vegetation types occurring on site were obtained from Mucina and Rutherford (2006), with updates according to the SANBI BGIS website (<http://bgis.sanbi.org>). The description of each vegetation type includes a list of plant species that may be expected to occur within the particular vegetation type.
- Mapping was done from aerial imagery on Google Earth, which also provides historical imagery for a period up to 15 years ago.

Regional plans

- Information from the National Protected Areas Expansion Strategy (NPAES) was consulted for possible inclusion of the site into a protected area in future (available on <http://bgis.sanbi.org>).
- A recent (2018) National Biodiversity Assessment (National Biodiversity Assessment 2018, Skowno et al. 2019) has re-assessed the conservation status of vegetation types, but this assessment has not been gazetted.
- The Northern Cape Biodiversity Conservation Plan maps were consulted for inclusion of the site into a Critical Biodiversity Area or Ecological Support Area (biodiversityadvisor.sanbi.org).

DESKTOP DESCRIPTION

Regional vegetation patterns

There is one regional vegetation type in the study area, namely Northern Upper Karoo (NKu3), which occurs throughout the site (Figure 4), briefly described below, including expected species composition. The description below for this vegetation type is as published in Mucina and Rutherford (2006). The information is provided here for reference purposes. The actual patterns observed on site are described in a section below ("Habitats on site"), in which species observed on site are provided. These can be compared to the information here to give an indication of the similarity to the broad vegetation patterns.

Northern Upper Karoo

Distribution

Northern Cape and Free State Provinces: Northern regions of the Upper Karoo plateau from Prieska, Vosburg and Carnarvon in the west to Philipstown, Petrusville and Petrusburg in the east. Bordered in the north by Niekerkshoop, Douglas and Petrusburg and in the south by Carnarvon, Pampoenpoort and De Aar. A few patches occur in Griqualand West. Altitude varies mostly from 1 000–1 500 m.

Vegetation & Landscape Features

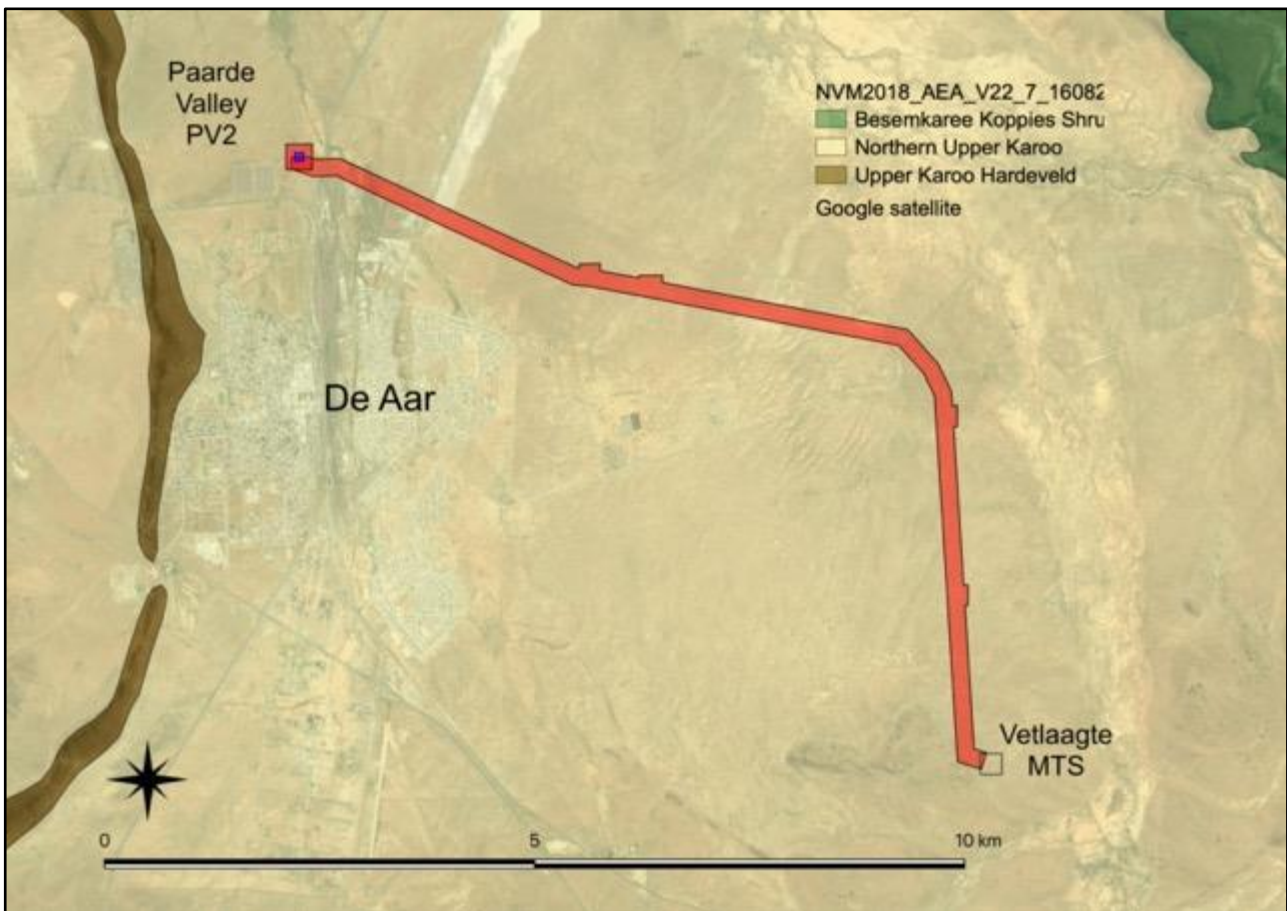


Figure 4: Regional vegetation types of the site and surrounding areas.

Shrubland dominated by dwarf karoo shrubs, grasses and *Senegalia mellifera* subsp. *detinens* and some other low trees (especially on sandy soils in the northern parts and vicinity of the Orange River). Flat to gently sloping, with isolated hills of Upper Karoo Hardeveld in the south and Vaalbos Rocky Shrubland in the northeast and with many interspersed pans.

Geology & Soils

Shales of the Volksrust Formation and to a lesser extent the Prince Albert Formation (both of the Ecca Group) as well as Dwyka Group diamictites form the underlying geology. Jurassic Karoo Dolerite sills and sheets support this vegetation complex in places. Wide stretches of land are covered by superficial deposits including calcretes of the Kalahari Group. Soils are variable from shallow to deep, red-yellow, apedal, freely drained soils to very shallow Glenrosa and Mispah forms. Mainly Ae, Ag and Fc land types.

Climate

Rainfall peaks in autumn (March). MAP ranges from about 190 mm in the west to 400 mm in the northeast. Mean maximum and minimum monthly temperatures for Britstown are 37.9°C and -3.6°C for January and July, respectively. Corresponding values are 37.1°C and -4.8°C for De Aar and 39.0°C and -2.3°C for Kareekloof (northwest of Strydenburg).

Important Taxa

Small Trees: *Senegalia mellifera* subsp. *Detinens* and *Boscia albitrunca*.

Tall Shrubs: *Lycium cinereum* (d), *L. horridum*, *L. oxycarpum*, *L. schizocalyx* and *Rhigozum trichotomum*.

Low Shrubs: *Chrysocoma ciliata* (d), *Gnidia polycephala* (d), *Pentzia calcarea* (d), *P. globosa* (d), *P. incana* (d), *P. spinescens* (d), *Rosenia humilis* (d), *Amphiglossa triflora*, *Aptosimum marlothii*, *A. spinescens*, *Asparagus glaucus*, *Barleria rigida*, *Berkheya annectens*, *Eriocephalus ericoides* subsp. *ericoides*, *E. glandulosus*, *E. spinescens*, *Euryops asparagoides*, *Felicia muricata*, *Helichrysum lucilioides*, *Hermannia spinosa*, *Leucas capensis*, *Limeum aethiopicum*, *Melolobium candicans*, *Microloma armatum*, *Osteospermum leptolobum*, *O. spinescens*, *Pegolettia retrofracta*, *Pentzia lanata*, *Phyllanthus maderaspatensis*, *Plinthus karooicus*, *Pteronia glauca*, *P. sordida*, *Selago geniculata*, *S. saxatilis*, *Tetragonia arbuscula* and *Zygophyllum lichtensteinianum*.

Succulent Shrubs: *Hertia pallens*, *Salsola calluna*, *S. glabrescens*, *S. rabieana*, *S. tuberculata* and *Zygophyllum flexuosum*.

Semiparasitic Shrub: *Thesium hystrix* (d),

Herbs: *Chamaesyce inaequilatera*, *Convolvulus sagittatus*, *Dicoma capensis*, *Gazania krebsiana*, *Hermannia comosa*, *Indigofera alternans*, *Lessertia pauciflora*, *Radyera urens*, *Sesamum capense*, *Sutera pinnatifida*, *Tribulus terrestris* and *Vahlia capensis*.

Succulent Herb: *Psilocaulon coriarium*.

Geophytic Herb: *Moraea pallida*.

Graminoids: *Aristida adscensionis* (d), *A. congesta* (d), *A. diffusa* (d), *Enneapogon desvauxii* (d), *Eragrostis lehmanniana* (d), *E. obtusa* (d), *E. truncata* (d), *Sporobolus fimbriatus* (d), *Stipagrostis obtusa* (d), *Eragrostis bicolor*, *E. porosa*, *Fingerhuthia africana*, *Heteropogon contortus*, *Stipagrostis ciliata*, *Themeda triandra*, *Tragus berteronianus*, *T. koelerioides* and *T. racemosus*.

Biogeographically Important Taxa

Herb (western distribution limit): *Convolvulus boedeckerianus*.

Tall Shrub (southern limit of distribution): *Gymnosporia szyszylowiczii* subsp. *namibiensis*.

Endemic Taxa

Succulent Shrubs: *Lithops hookeri* and *Stomatium pluridens*.

Low Shrubs: *Atriplex spongiosa*, *Galenia exigua*.

Herb: *Manulea deserticola*.

Vegetation conservation status

National status

The conservation status of Northern Upeer Karoo is Least Concern.

The vegetation type is not listed in The National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004).

Table 2: Conservation status of vegetation types occurring in the study area, according to Mucina et al. 2005 and the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011).

Vegetation Type	Status (Mucina et al. 2005)	Status (NEMBA – 2011)	Status (NBA 2018)
Northern Upper Karoo	Least threatened	LC	LC

Provincial C-Plan status

The Northern Cape CBA map classifies the natural vegetation of the province according to conservation value in decreasing value, as follows:

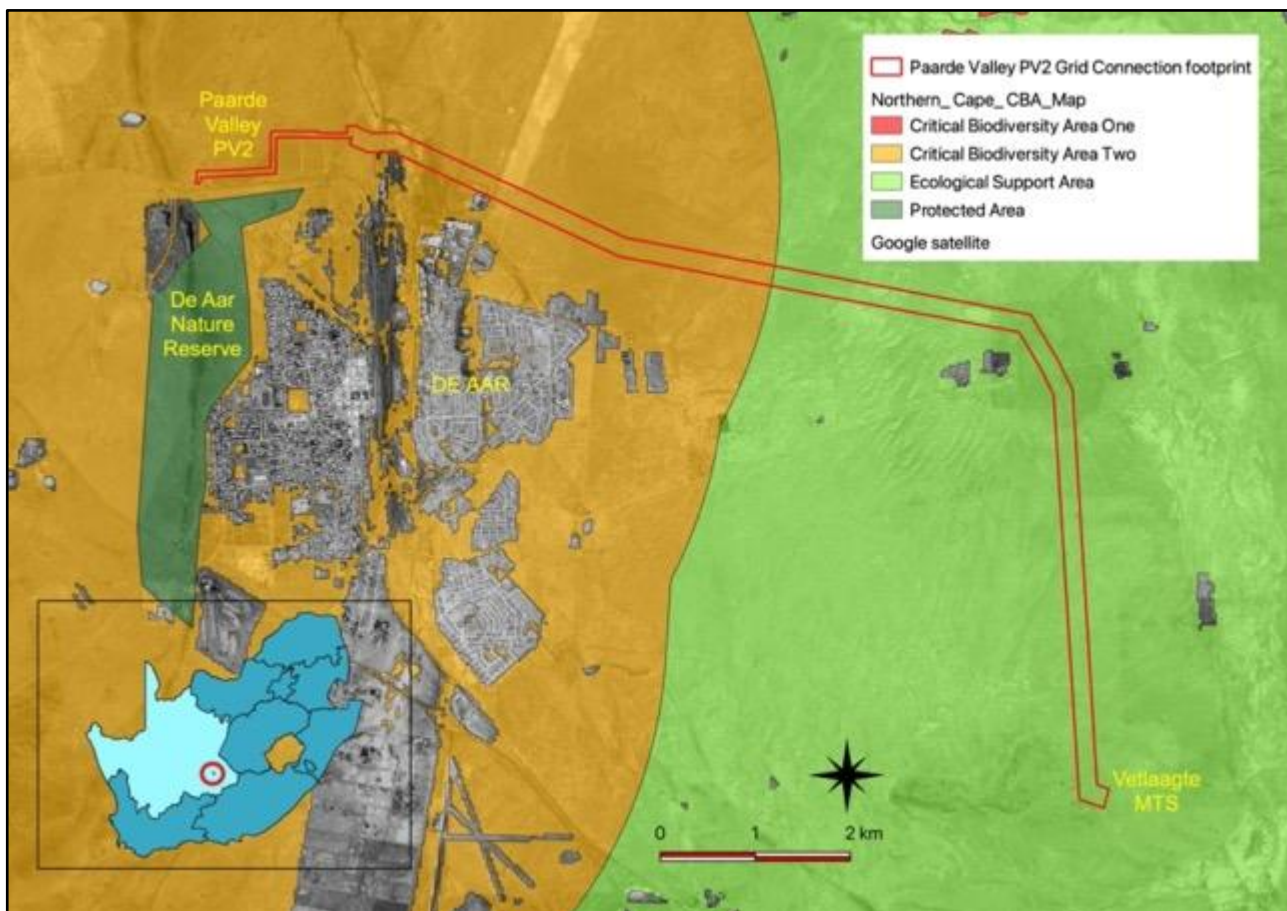


Figure 5: Northern Cape Biodiversity Conservation Plan for the site and surrounding areas.

1. Protected
2. Critical Biodiversity Area One (Irreplaceable Areas) (RED)
3. Critical Biodiversity Area Two (Important Areas) (ORANGE)
4. Ecological Support Area (GREEN)
5. Other Natural Area (YELLOW)

This shows features within the study area within two of these classes, as follows (Figure 5):

1. Critical Biodiversity Area Two: north-eastern tip of the corridor.
2. Ecological Support Areas: Remainder of the corridor, which corresponds with all remaining natural habitat.

RESULTS OF FIELD SURVEY

Habitats on site

Plains

This is the widespread plains vegetation of the area around De Aar and occupies most of the area within the corridor (Figure 6). It is generally found on loamy soils with relatively low rock cover. The vegetation consists mostly of low dwarf shrubs, along with various grasses, especially after recent rainfall. It is relatively species poor, and is uniform across wide areas. There are some areas that are slightly raised relative to the general lowland plains, and have shallow rocky soils. They often occur on low rises, as well as forming a gradient to hills. The vegetation has many more dwarf shrubs and less grass than the lowland plains, and there is a higher species richness and more diverse local composition.

The vegetation consists mostly of low dwarf shrubs, such as *Pentzia incana*, *Chrysocoma ciliata*, *Aizoon africanum*, *Eriocephalus ericoides*, and *Ruschia intricata*, along with various grasses, including *Aristida congesta*, *Fingerhuthia africana*, *Eragrostis lehmanniana*, *Eragrostis obtusa*, *Chloris virgata*, *Stipagrostis uniplumis*, *Enneapogon cenchroides*, and *Cynodon dactylon*. It is relatively species poor, in terms of plant species, and is uniform across wide areas.

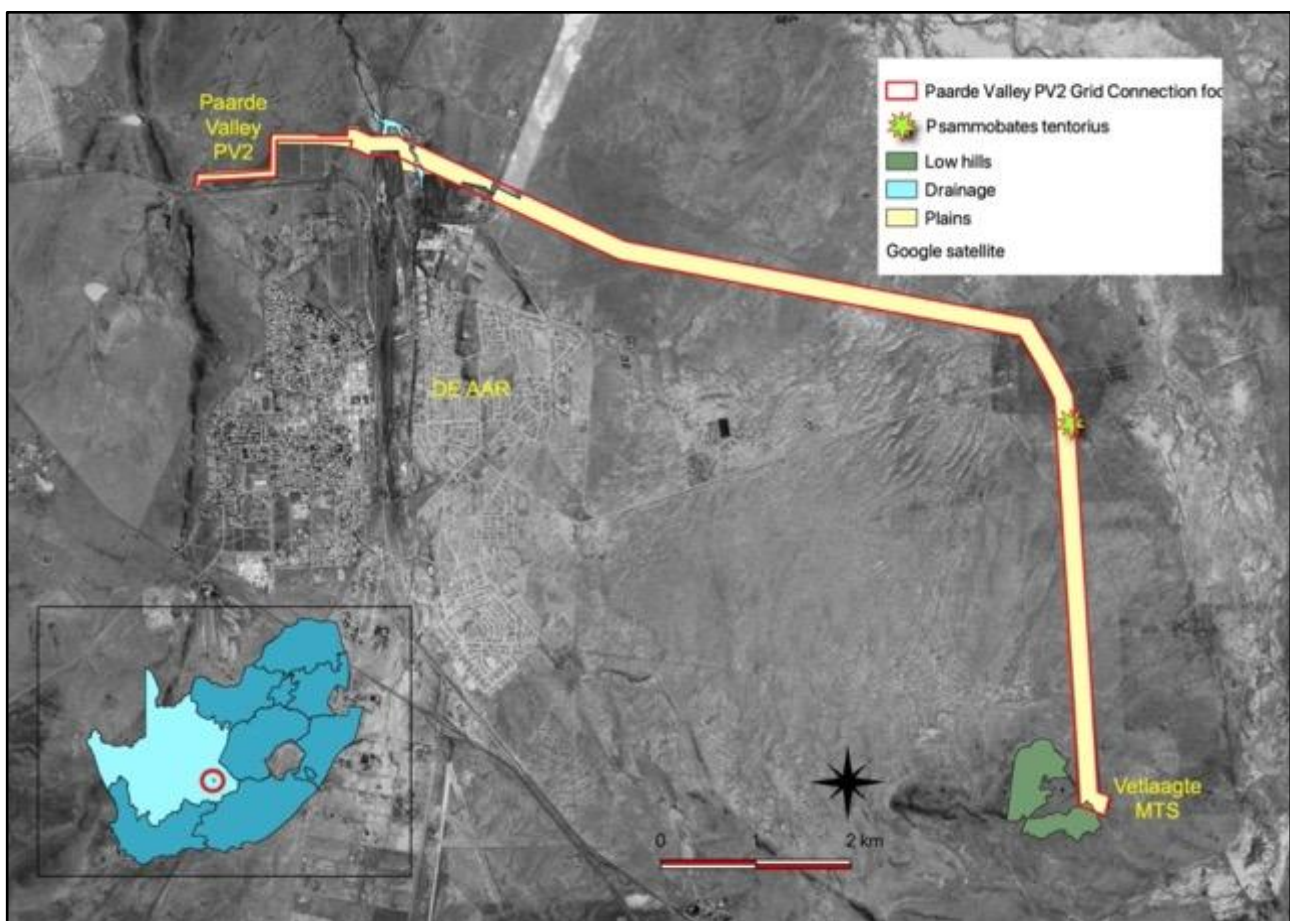


Figure 6: Habitats within the corridor.

The plains support a variety of animal species, characteristically including the following mammals: *Raphicerus campestris* (Steenbok), *Antidorcas marsupialis* (Springbok), *Lepus saxatilis* (Scrub hare), *Lepus capensis* (Cape hare), *Geosciurus inauris* (Cape Ground Squirrel), *Suricata suricatta* (Suricate), *Cynictis penicillata* (Yellow mongoose), *Herpestes pulverulentus* (Cape grey mongoose), *Hystrix africaeaustralis* (Porcupine), *Cryptomys hottentotus* (Common mole rat), *Phacocoercus africanus* (Common warthog), *Ictonyx striatus* (Striped polecat), *Proteles cristatus* (Aardwolf), *Oryctopus afer* (Aardvark), *Lupulella mesomelas* (Black-backed jackal), and *Caracal caracal* (Caracal), the following reptiles: *Stigmochelys pardalis* (Leopard tortoise), *Bitis arietans* (Puffadder), *Naja nivea* (Cape cobra), *Psammophylax rhombatus* (Rhombic skaapesteker), *Psammobates tentorius* (Karoo tent tortoise), *Pedioplanis namaquensis* (Namaqua sand lizard).

Low hills

There are a small number of low hills at the southern end of the study area (Figure 6) that have a steeper topography than the surrounding plains, are more rocky, and include various amounts of scattered rock and outcrops.

The vegetation is much more diverse than the surrounding plains and includes a higher diversity of woody shrubs, such as *Searsia burchellii*, *Diospyros austro-africanus*, *Boscia albitrunca* (PROTECTED TREE), *Asparagus glaucus*, and *Felicia filifolia*. The grass species composition is also different and includes *Heteropogon contortus*, *Themeda triandra*, and *Cenchrus ciliaris*.

Many of the species characteristic of the plains take refuge in the low hills, but there are also species most commonly found only in the hills, such as *Pronolagus saundersiae* (Hewitts red rock rabbit), *Atelerix frontalis* (Hedgehog), *Elephantulus rupestris* (Western rock elephant shrew), *Macroscelides proboscideus* (Round-eared elephant shrew), *Trachylepis sulcata* (Western rock skink), *Varanus albigularis* (Rock monitor)

Drainage

In the general De Aar area, the drainage areas include a variety of valley bottoms that are sometimes channelled and sometimes not, depending on the size. There is one of these that crosses the corridor near to the northern end (Figure 6). The margins generally grade into the surrounding karoo vegetation. The bottom is either bare soil or hollows that become waterlogged during rainfall. There are a number of built structures to hold back drainage, either for creating waterbodies or for erosion control. In places are well-defined channels in which recognisable wetland vegetation occurs. There are also local shallow depressions, as well as artificial waterholes, where wetland-like conditions exist.

Wetland vegetation is dominated by species such as *Afroscirpoides dioeca*, *Limosella major*, *Juncus rigidus*, *Eleocharis dregeana* and *Lobelia thermalis*. As is typical with wetland vegetation, there is often characteristic zonation driven by levels of water in the soils, sometimes resulting in localised areas dominated by a single species, and repetition of patterns in widely divergent areas.

These habitats are habitat for a number of animals, including the following amphibians: *Amietia poyntoni* (Poynton's river frog), *Breviceps adpersus* (Common rain frog), *Cacosternum boettgeri* (Common caco), *Poyntonophrynus vertebralis* (Southern pygmy toad), *Pyxicephalus adpersus* (African bullfrog), *Tomopterna tandyi* (Tandy's sand frog), and *Vandijkophrynus garipeensis* (Karoo toad). In addition, drainage areas are important migration corridors because they provide shrub vegetation cover and a low point in the landscape through which animals can move. They often also have soil moisture conditions that support vegetation growth even when surrounding plains are dry from drought conditions, which means that they provide a food supply when there is nothing else available in the landscape.



Figure 7: View of vegetation at substation site towards the north.



Figure 8: View of vegetation at substation site towards the east.



Figure 9: View of plains vegetation in central part of corridor.



Figure 10: View of corridor along northern part of site.



Figure 11: Stream in corridor near substation at PV2.



Figure 12: View along existing powerline towards PV2.



Figure 13: Vegetation within hills showing scattered rock piles.



Figure 14: Typical view of plains at southern end of corridor.

ASSESSMENT OF PROPOSED INFRASTRUCTURE

The switching station occurs within lowland plains and most of the power line is within lowland plains, A full walk-through of the switching station site was undertaken in the field and no specific features of concern were noted (see Figure 6 and 7 for view of switching station site). Possible impacts from the proposed project are as follows:

1. Loss of natural habitat.
2. Loss of individuals of protected trees, protected plants or other listed species (no specific concerns seen on site).
3. Loss of faunal habitat.
4. Invasion by alien invasive plant species as a result of disturbance.

The impact of the proposed project is relatively insignificant relative to the approved solar PV projects within the same area.

Grid

There are two technology alternatives being assessed here:

1. A monopole self-supporting structure with a maximum base of 5 m in diameter above the ground. In some situations the structures have stays that would fall into the area with a maximum radius of 30 meters.
2. Lattice towers each with four legs that are a maximum of 15 m apart so that the final footprint would be approximately 15 m x 15 m.

Assessment of impacts: Construction Phase

Possible impacts during the construction phase are as follows:

1. Loss of natural habitat.
2. Loss of individuals of protected trees, protected plants or other listed species.

These are assessed below (Table 3-4).

Impact 1: Loss of natural habitat: both technology options

The monopole structure will have a slightly smaller local footprint per pylon, but this does not change any of the categorically defined impact assessment scores.

The extent of the impact is "site specific" since it takes place on site or within 100 m of the proposed activity. At this scale, the pylons will cause localised loss of habitat that will overall lead to slight alteration in natural functions and processes within the assessment area (corridor). The duration of the impact is permanent, but there is no assessment category for this, so it is scored as "long-term".

Table 3: Assessment of impact: "Loss of natural habitat".

	Proposed project: grid (both options)		"No go"	
	Without Mitigation	With mitigation	Without Mitigation	With mitigation
Nature	Negative	Negative		
Extent	Site specific	Site specific	Site specific	Site specific
Magnitude	Low	Low	Zero	Zero

Duration	Long-term	Long-term	Long Term	Long Term
Consequence	Slight	Slight	Zero	Zero
Significance	Low	Low	Negligible	Negligible
Probability	Definite	Definite	Possible	Possible
Confidence	High	High	High	High
Reversibility	Low	Low	High	High
Irreplaceable loss of resources	Medium	Medium	Low	Low
Cumulative Impact	Medium	Medium	Zero	Zero
Degree to which the impact can be avoided	Low		Medium	
Degree to which the impact can be managed	Medium		Medium	
Degree to which the impact can be mitigated	Medium		Medium	

Mitigation

1. Minimise vegetation clearing and disturbance to footprint areas only by clearly demarcating the working area.
2. Rehabilitate disturbed areas according to the Environmental Management Programme (EMPr).
3. Implement alien invasive plant management in line with the EMPr.

Impact 2: Loss of individuals of listed and protected plant species: both technology options

The monopole structure will have a slightly smaller local footprint per pylon, but this does not change any of the categorically defined impact assessment scores.

The extent of the impact is "site specific" since it takes place on site or within 100 m of the proposed activity. At this scale, loss of plants will lead to slight alteration in natural functions and processes within the assessment area (switching station). The duration of the impact is permanent, but there is no assessment category for this, so it is scored as "long-term".

Table 4: Assessment of impact: "Loss of individuals of listed and protected plant species".

	Proposed project: grid (both options)		"No go"	
	Without Mitigation	With mitigation	Without Mitigation	With mitigation
Nature	Negative	Negative	Neutral	Neutral
Extent	Site specific	Site specific	Site specific	Site specific
Magnitude	Low	Low	Zero	Zero
Duration	Long-term	Long-term	Long Term	Long Term
Consequence	Slight	Slight	Zero	Zero
Significance	Very Low	Very Low	Negligible	Negligible
Probability	Possible	Unlikely	None	None
Confidence	High	High	High	High
Reversibility	Low	Low	Low	Low
Irreplaceable loss of resources	Medium	Medium	Low	Low
Cumulative Impact	Medium	Medium	Zero	Zero
Degree to which the impact can be avoided	Low		Medium	
Degree to which the impact can be managed	Medium		Medium	
Degree to which the impact can be mitigated	Medium		Medium	

Mitigation

1. All mitigation measures that apply for "Loss of habitat".

2. It is a legal requirement to obtain a flora permit for any protected plants that will be lost due to construction of the project, as per the Northern Cape Nature Conservation Act No. 9 of 2009 (listed in Appendix 1), the National Environmental Management: Biodiversity Act, Act 10 of 2004 (listed in Appendix 2), and the National Forests Act, No. 84 of 1998 (listed in Appendix 3).
3. A detailed pre-construction walk-through survey by an ecological / botanical specialist will be required during a favourable season to locate any individuals of protected plants, as well as for any populations of threatened plant species. This survey must cover the footprint of all approved infrastructure, including internal access roads (final infrastructure layout). The best season is early to late Summer, but dependent on recent rainfall and vegetation growth.
4. Implement plant rescue according to the EMPr.

Assessment of impacts: Operation Phase

Possible impacts during the construction phase are as follows:

1. Invasion by alien invasive plant species as a result of disturbance (equal risk for both options).

These are assessed below (Table 5).

Impact 3: Invasion by alien invasive plant species: both technology options

The extent of the impact is "site specific" since it takes place on site or within 100 m of the proposed activity. At this scale, alien invasion in previously disturbed areas could possibly cause notable to severe localised alteration in natural functions and processes within the assessment area (corridor). This is especially true for dense invasion by *Prosopis* species, which can form dense thickets that exclude all other vegetation and completely alter ecosystem structure and function. The duration of the impact is potentially permanent, but there is no assessment category for this, so it is scored as "long-term".

Table 5: Assessment of impact: "Invasion by alien invasive plant species".

	Proposed project: Grid (both options)		"No go"	
	Without Mitigation	With mitigation	Without Mitigation	With mitigation
Nature	Negative	Negative	Negative	Negative
Extent	Site specific	Site specific	Site specific	Site specific
Magnitude	High	Low	Low	Low
Duration	Long Term	Long Term	Long Term	Long Term
Consequence	Moderate	Slight	Slight	Slight
Significance	Low	Very Low	Very Low	Very Low
Probability	Probable	Possible	Possible	Possible
Confidence	High	High	High	High
Reversibility	Medium	High	High	High
Irreplaceable loss of resources	Medium	Medium	Medium	Medium
Cumulative Impact	Medium	Medium	Zero	Zero
Degree to which the impact can be avoided	Medium		Medium	
Degree to which the impact can be managed	Medium		Medium	
Degree to which the impact can be mitigated	Medium		Medium	

Mitigation

1. Implement alien invasive management according to the EMPr.
2. Rehabilitate disturbed areas, as per the EMPr.

Assessment of impacts: Decommissioning Phase

It is difficult to predict circumstances that will be prevalent at the time of decommissioning. The worst-case scenario is that the impacts will be the same as during the Construction Phase. For the purposes of this assessment, it should be treated as such.

Switching Station

Assessment of impacts: Construction Phase

Possible impacts during the construction phase are as follows:

1. Loss of natural habitat.
2. Loss of individuals of protected trees, protected plants or other listed species.

These are assessed below (Table 6-7).

Impact 4: Loss of natural habitat

The switching station is approximately 100 m x 100 m.

The extent of the impact is "site specific" since it takes place on site or within 100 m of the proposed activity. At this scale, the construction will cause localised loss of habitat that will overall lead to severe alteration in natural functions and processes within the assessment area (switching station site). The duration of the impact is permanent, but there is no assessment category for this, so it is scored as "long-term".

Table 6: Assessment of impact: "Loss of natural habitat".

	Proposed project		"No go"	
	Without Mitigation	With mitigation	Without Mitigation	With mitigation
Nature	Negative	Negative	Neutral	Neutral
Extent	Site specific	Site specific	Site specific	Site specific
Magnitude	Severe	Severe	Zero	Zero
Duration	Long Term	Long Term	Long Term	Long Term
Consequence	Moderate	Moderate	Zero	Zero
Significance	Medium	Medium	Negligible	Negligible
Probability	Definite	Definite	Possible	Possible
Confidence	High	High	High	High
Reversibility	Zero	Zero	High	High
Irreplaceable loss of resources	Low	Low	Low	Low
Cumulative Impact	Medium	Medium	Zero	Zero
Degree to which the impact can be avoided	Low		Medium	
Degree to which the impact can be managed	Low		Medium	
Degree to which the impact can be mitigated	Low		Medium	

Mitigation

1. Minimise vegetation clearing and disturbance to footprint areas only by clearly demarcating the working area.
2. Rehabilitate disturbed areas according to the EMPr.
3. Implement alien invasive management according to the EMPr.

Impact 5: Loss of individuals of listed and protected plant species: both technology options

The extent of the impact is "site specific" since it takes place on site or within 100 m of the proposed activity. At this scale, loss of plants will lead to slight alteration in natural functions and processes within the assessment area (switching station). The duration of the impact is permanent, but there is no assessment category for this, so it is scored as "long-term".

Table 7: Assessment of impact: "Loss of individuals of listed and protected plant species".

	Proposed project		"No go"	
	Without Mitigation	With mitigation	Without Mitigation	With mitigation
Nature	Negative	Negative	Neutral	Neutral
Extent	Site specific	Site specific	Site specific	Site specific
Magnitude	Low	Low	Zero	Zero
Duration	Long Term	Long Term	Long Term	Long Term
Consequence	Slight	Slight	Zero	Zero
Significance	Very Low	Negligible	Negligible	Negligible
Probability	Possible	Unlikely	None	None
Confidence	High	High	High	High
Reversibility	Low	Low	Low	Low
Irreplaceable loss of resources	Low	Low	Low	Low
Cumulative Impact	Medium	Medium	Zero	Zero
Degree to which the impact can be avoided	Low		Medium	
Degree to which the impact can be managed	Medium		Medium	
Degree to which the impact can be mitigated	Medium		Medium	

Mitigation

1. All mitigation measures that apply for "Loss of habitat".
2. It is a legal requirement to obtain a flora permit for any protected plants that will be lost due to construction of the project, as per the Northern Cape Nature Conservation Act No. 9 of 2009 (listed in Appendix 1), the National Environmental Management: Biodiversity Act, Act 10 of 2004 (listed in Appendix 2), and the National Forests Act, No. 84 of 1998 (listed in Appendix 3).
3. A detailed pre-construction walk-through survey by an ecological / botanical specialist will be required during a favourable season to locate any individuals of protected plants, as well as for any populations of threatened plant species. This survey must cover the footprint of all approved infrastructure, including internal access roads (final infrastructure layout). The best season is early to late Summer, but dependent on recent rainfall and vegetation growth.
4. Implement plant rescue measures in line with the EMPr.

Assessment of impacts: Operation Phase

Possible impacts during the construction phase are as follows:

1. Invasion by alien invasive plant species as a result of disturbance (equal risk for both options).

These are assessed below (Table 8).

Impact 6: Invasion by alien invasive plant species: both technology options

The extent of the impact is "site specific" since it takes place on site or within 100 m of the proposed activity. At this scale, alien invasion in previously disturbed areas could possibly cause notable to severe localised alteration in natural functions and processes within the assessment area (corridor). This is especially true for dense invasion by *Prosopis* species, which can form dense thickets that exclude all other vegetation and completely alter ecosystem structure and function. The duration

of the impact is potentially permanent, but there is no assessment category for this, so it is scored as "long-term".

Table 8: Assessment of impact: "Invasion by alien invasive plant species".

	Proposed project		"No go"	
	Without Mitigation	With mitigation	Without Mitigation	With mitigation
Nature	Negative	Negative	Negative	Negative
Extent	Site specific	Site specific	Site specific	Site specific
Magnitude	Medium	Low	Low	Low
Duration	Long Term	Long Term	Long Term	Long Term
Consequence	Moderate	Slight	Slight	Slight
Significance	Very Low	Very Low	Very Low	Very Low
Probability	Probable	Possible	Possible	Possible
Confidence	High	High	High	High
Reversibility	Medium	High	High	High
Irreplaceable loss of resources	Medium	Medium	Medium	Medium
Cumulative Impact	Medium	Medium	Zero	Zero
Degree to which the impact can be avoided	Medium		Medium	
Degree to which the impact can be managed	Medium		Medium	
Degree to which the impact can be mitigated	Medium		Medium	

Mitigation

1. Implement alien invasive management according to the EMPr.
2. Rehabilitate disturbed areas, as per the EMPr.

Assessment of impacts: Decommissioning Phase

It is difficult to predict circumstances that will be prevalent at the time of decommissioning. The worst-case scenario is that the impacts will be the same as during the Construction Phase. For the purposes of this assessment, it should be treated as such.

Summary of monitoring recommendations

The following are recommendations for inclusion in the EMPr:

Alien Invasive Species:

- Monitor for early detection, to find species when they first appear on site. This should be annual, and should be conducted by an experienced botanist. Early detection should provide a list of species and locations where they have been detected.
- Monitor for the effect of management actions on target species, which provides information on the effectiveness of management actions. Such monitoring depends on the management actions taking place. It should take place after each management action.
- Monitor for the effect of management actions on non-target species and habitats.

Rescued plants:

- The location of all transplanted rescued plants must be recorded, along with the identity of the plant.
- The health / vigour of each transplanted individual should be monitored annually for a minimum of three years.
- As a scientific control, an equal number of non-transplanted individuals of the same species, within similar habitats, should be monitored in the same way as the transplanted specimens. This will provide comparative data on the survival of wild populations relative to transplanted plants.

Rehabilitated areas:

- All management actions associated with rehabilitation must be recorded after each management action has taken place.
- All rehabilitated areas should be monitored to assess vegetation recovery. For each monitoring site, an equivalent comparative site in adjacent undisturbed vegetation should be similarly monitored. Monitoring data collection should include the following:
 - total vegetation cover and height, as well as for each major growth form;
 - species composition, including relative dominance;
 - soil stability and/or development of erosion features;
 - representative photographs should be taken at each monitoring period.
- Monitoring of rehabilitated areas should take place annually for a minimum of three years, or until vegetation stability has been achieved.

CONCLUSIONS

- The regional vegetation type that occurs on site and in surrounding areas (Northern Upper Karoo) is not listed or of conservation concern.
- The corridor is partially within a Critical Biodiversity Area 2 and partially within an Ecological Support Area (ESA), the latter of which extends across vast distances in all areas close to De Aar. There are therefore no options outside of this ESA for the project, and the CBA2 area is the location of the associated solar PV project, which has already been authorised.
- Impacts of the proposed project components are relatively insignificant in comparison to the variety of approved solar PV projects within the immediate surroundings.
- An impact assessment identified the following impacts as potentially of concern for the project:
 - Loss and/or fragmentation of indigenous natural vegetation (low significance after mitigation for all infrastructure components/alternatives);
 - Loss of individuals of listed or protected plant species (medium significance after mitigation);
 - Establishment and spread of declared weeds and invader plants (low significance after mitigation).
- There are two technology alternatives for the powerline, monopole self-supporting structure and lattice towers. The lattice towers will have a larger overall footprint per tower, but the overall difference is not much relative to the overall project. Either option is therefore feasible.
- The grid connection project, including the switching station, is deemed to be acceptable from a Terrestrial Ecology perspective, as no fatal flaws or highly sensitive / 'no-go' areas were identified which would prevent construction in this area.
- Various mitigation measures are proposed to minimise identified impacts. This includes pre-construction walk-through surveys for specific flora and fauna species of concern that may occur on site.

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APPENDICES:

Appendix 1: Flora protected under the Northern Cape Nature Conservation Act No. 9 of 2009.

SCHEDULE 1: SPECIALLY PROTECTED SPECIES

As per the Northern Cape Nature Conservation Act, No. 9 of 2009, Schedule 1

Family: AMARYLLIDACEAE	
<i>Clivia mirabilis</i>	Oorlofskloof bush lily / Clivia
<i>Haemanthus graniticus</i>	April fool
<i>Hessea pusilla</i>	
<i>Strumaria bidentata</i>	
<i>Strumaria perryae</i>	
Family: ANACARDIACEAE	
<i>Ozoroa</i> spp.	All species
Family: APIACEAE	
<i>Centella tridentata</i>	
<i>Chamarea snijmaniae</i>	
Family: APOCYNACEAE	
<i>Hoodia gordonii</i>	
<i>Pachypodium namaquanum</i>	Elephant's trunk
Family: ASPHODOLACEAE	
<i>Aloe buhrii</i>	
<i>Aloe dichotoma</i>	
<i>Aloe dichotoma</i> var. <i>rumosissima</i>	Maiden quiver tree
<i>Aloe dabenorisana</i>	
<i>Aloe erinacea</i>	
<i>Aloe meyeri</i>	
<i>Aloe pearsonii</i>	
<i>Aloe pillansii</i>	
<i>Trachyandra prolifera</i>	
Family: ASTERACEAE	
<i>Athanasia adenantha</i>	
<i>Athanasia spathulata</i>	
<i>Cotula filifolia</i>	
<i>Euryops mirus</i>	
<i>Euryops rosulatus</i>	
<i>Euryops virgatus</i>	
<i>Felicia diffusa</i> subsp. <i>khamiesbergensis</i>	
<i>Othonna armiana</i>	
Family: CRASSULACEAE	
<i>Tylecodon torulosus</i>	
Family: DIOSCORACEAE	
<i>Dioscorea</i> spp.	Elephant's foot, all species
Family: ERIOSPERMACEAE	
<i>Eriospermum erinum</i>	
<i>Eriospermum glaciale</i>	
Family: FABACEAE	
<i>Amphithalea obtusiloba</i>	
<i>Lotononis acutiflora</i>	

<i>Lotononis polycephala</i>	
<i>Lessertia</i> spp.	
<i>Sceletium toruosum</i>	
<i>Sutherlandia</i> spp.	Cancer Bush, all species
<i>Wiborgia fusca</i> subsp. <i>macrocarpa</i>	
Family: GERANIACEAE	
<i>Pelargonium</i> spp.	Pelargonium, all species
Family: HYACINTHACEAE	
<i>Drimia nana</i>	
<i>Ornithogalum bicornutum</i>	
<i>Ornithogalum inclusum</i>	
Family: IRIDACEAE	
<i>Babiana framesii</i>	
<i>Ferraria kamiesbergensis</i>	
<i>Freesia marginata</i>	
<i>Geissorhiza subrigida</i>	
<i>Hesperantha minima</i>	
<i>Hesperantha oligantha</i>	
<i>Hesperantha rivulicola</i>	
<i>Lapeirousia verecunda</i>	
<i>Moraea kamiesensis</i>	
<i>Moraea namaquana</i>	
<i>Romulea albiflora</i>	
<i>Romulea discifera</i>	
<i>Romulea maculata</i>	
<i>Romulea rupestris</i>	
Family: MOLLUGINACEAE	
<i>Hypertelis trachysperma</i>	
<i>Psammotropha spicata</i>	
Family: ORCHIDACEAE	
<i>Corycium ingeanum</i>	
<i>Disa macrostachya</i>	Disa
Family: OXALIDACEAE	
<i>Oxalis pseudo-hirta</i>	Sorrel
Family: PEDALIACEAE	
<i>Harpagophytum</i> spp.	Devils' claw
Family: POACEAE	
<i>Prionanthium dentatum</i>	
<i>Secale strictum</i> subsp. <i>africanum</i>	Wild rye
Family: PROTEACEAE	
<i>Leucadendron meyerianum</i>	Tolbos
<i>Mimetes</i> spp.	All species
<i>Orothamnus zeyheri</i>	
Family: ROSACEAE	
<i>Cliffortia arborea</i>	Sterboom
Family: SCROPHULARIACEAE	
<i>Charadrophila capensis</i>	Cape Gloxinia
Family: STANGERIACEAE	
<i>Stangeria</i> spp.	Cycads, all species
Family: ZAMIACEAE	
<i>Encephalartos</i> spp.	Cycads, all species

SCHEDULE 2: PROTECTED SPECIES

As per the Northern Cape Nature Conservation Act, No. 9 of 2009, Schedule 2

Family: ACANTHACEAE	
Barleria paillosa	
Monechme saxatile	
Peristrophe spp.	All species
Family: ADIANTHACEAE	
Adiantum spp.	Maidenhair Fern, all species
Family: AGAPANTHACEAE	
Agapanthus spp.	All species
Family: AIZOACEAE	All species
(MESEMBRYANTHEMACEAE)	
Family: AMARYLLIDACEAE	All species except those listed in Schedule 1
Family: ANTHERICACEAE	All species
Family: APIACEAE	All species except those listed in Schedule 1
Family: APOCYNACEAE	All species except those listed in Schedule 1
Family: AQUIFOLIACEAE	All species
Ilex mitis	
Family: ARACEAE	
Zantedeschia spp.	Arum lilies, all species
Family: ARALIACEAE	
Cussonia spp.	Cabbage trees, all species
Family: ASPHODOLACEAE	All species except those listed in Schedule 1 and the species Aloe ferox
Family: ASTERACEAE	
Helichrysum jubilatum	
Felicia deserti	
Gnaphalium simii	
Lopholaena longipes	
Senecio albo-punctatus	
Senecio trachylaenus	
Trichogyne lerouxiae	
Tripteris pinnatiflobata	
Troglophyton acocksianum	
Vellereophyton lasianthum	
Family: BURMANNIACEAE	
Burmannia madagascariensis	Wild ginger
Family: BURSERACEAE	
Commiphora spp.	All species
Family: CAPPARACEAE	
Boscia spp.	Shepherd's trees, all species
Family: CARYOPHYLLACEAE	
Dianthus spp.	All species
Family: CELASTRACEAE	
Gymnosporia spp.	All species
Family: COLCHICACEAE	
Androcymbium spp.	All species
Gloriosa spp.	All species
Family: COMBRETACEAE	
Combretum spp.	All species

Family: CRASSULACEAE	All species except those listed in Schedule 1
Family: CUPPRESSACEAE	
Widdringtonia spp.	Wild cypress, all species
Family: CYATHEACEAE	
Cyathea spp.	Tree ferns, all species
Cyathea capensis	Tree Fern
Family: CYPERACEAE	
Carex acocksii	
Family: DROSERACEAE	
Drosera spp.	Sundews, all species
Family: DRYOPTERIDACEAE	
Rumohra spp.	Seven Weeks Fern, all species
Family: ERICACEAE	Erica, all species
Family: EUPHORBIACEAE	
Alchornea laxiflora	Venda Bead-string
Euphorbia spp.	All species
Family: FABACEAE	
Aspalathus spp.	Tea Bush, all species
Erythrina zeyheri	Ploughbreaker
Argyrolobium petiolare	
Caesalpinia bracteata	
Calliandra redacta	
Crotalaria pearsonii	
Indigofera limosa	
Lebeckia bowieana	
Pohillia involucrate	
Rhynchosia emarginata	
Wiborgia humilis	
Family: HYACINTHACEAE	
Daubenya spp.	
Lachenalia spp.	Daubenya, all species
Veltheimia spp.	Viooltjie, all species
Eucomis spp.	Pineapple flower, all species
Neopatersonia namaquensis	
Ornithogalum spp.	All species
Family: IRIDACEAE	All species except those listed in Schedule 1
Family: LAURACEAE	
Ocotea spp.	Stinkwood, all species
Family: MESEMBRYANTHEMACEAE	All species
Family: MELIACEAE	
Nymanina capensis	Chinese Lantern
Family: OLEACEAE	
Olea europea subsp. africana	Wild olive
Family: ORCHIDACEAE	Orchids, all species except those listed in Schedule 1
Family: OROBANCHACEAE	
Harveya spp.	Harveya, all species
Family: OXALIDACEAE	
Oxalis spp.	Sorrel, all species except those listed in Schedule 1
Family: PLUMBAGINACEAE	
Afrotilimon namaquanum	

Family: POACEAE	
Brachiaria dura var. dura	
Dregeochloa calviniensis	
Pentaschistis lima	
Family: PODOCARPACEAE	
Podocarpus spp.	Yellowwoods, all species
Family: PORTULACACEAE	
Anacampseros spp.	All species
Avonia spp.	All species
Portulaca foliosa	
Family: PROTEACEAE	All species except those listed in Schedule 1
Family: RESTIONACEAE	All species
Family: RHAMNACEAE	
Phyllica spp.	All species
Family: RUTACEAE	
Agathosma spp.	Buchu, all species
Family: SCROPHULARIACEAE	
Diascia spp.	All species
Halleria spp.	All species
Jamesbrittenia spp.	All species
Manulea spp.	All species
Nemesia spp.	All species
Phyllopodium spp.	All species
Polycarena filiformis	
Chaenostoma longipedicellatum	
Family: STRELITZIACEAE	
Strelitzia spp.	All species
Family: TECOPHILACEAE	
Cyanella spp.	All species
Family: THYMELAEACEAE	
Gnidia leipoldtii	
Family: ZINGIBERACEAE	
Siphonochilus aethiopicus	Wild ginger

Appendix 2: Flora and vertebrate animal species protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)

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

CRITICALLY ENDANGERED SPECIES

Flora

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

Reptilia

Loggerhead sea turtle
Leatherback sea turtle
Hawksbill sea turtle

Aves

Wattled crane
Blue swallow
Egyptian vulture
Cape parrot

Mammalia

Riverine rabbit
Rough-haired golden mole

ENDANGERED SPECIES

Flora

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

Reptilia

Green turtle
Giant girdled lizard
Olive ridley turtle
Geometric tortoise

Aves

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

Mammalia

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

VULNERABLE SPECIES

Flora

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

Aves

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

Mammalia

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

PROTECTED SPECIES

Flora

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

Amphibia

Giant bullfrog

African bullfrog

Reptilia

Gaboon adder

Namaqua dwarf adder

Smith's dwarf chameleon

Armadillo girdled lizard

Nile crocodile

African rock python

Aves

Southern ground hornbill

African marsh harrier

Denham's bustard

Jackass penguin

Mammalia

Cape clawless otter

South African hedgehog

White rhinoceros

Black wildebeest

Spotted hyaena

Black-footed cat

Brown hyaena

Serval

African elephant

Spotted-necked otter

Honey badger

Sharpe's grysbok

Reedbuck

Cape fox

Appendix 3: List of protected tree species (National Forests Act, 1998).

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

SCHEDULE A

Botanical name	English common names	Other common names Afrikaans (A), Sepedi (P), Sesotho (S), Setswana (T), Tshivenda (V), isiXhosa (X), isiZulu (Z), Xitsonga (XT)	National tree number
<i>Acacia erioloba</i>	Camel thorn	Kameeldoring (A)/Mogohlo (NS)/Mogoŋho (T)/	168
<i>Acacia haematoxylon</i>	Grey camel thorn	Vaalkameeldoring (A)/Mokholo (T)	169
<i>Adansonia digitata</i>	Baobab	Kremetart (A)/Seboi (NS)/Mowana (T)/Ximuwu (XT)	467
<i>Azelia quanzensis</i>	Pod mahogany	Peulmahonie (A)/Mutokota (V)/Inkehli (Z)	207
<i>Balanites</i> subsp. <i>maughamii</i>	Torchwood	Groendoring (A)/Ugobandlovu (Z)	251
<i>Barringtonia racemosa</i>	Powder-puff tree	Poeierkwasboom (A)/Iboqo (Z)	524
<i>Boscia albitrunca</i>	Shepherd's tree	Witgat (A)/Mohlōpi (NS)/Motlhoŋpi (T)/Muvhombwe (V)/Umgqomogqomo (X)/Umvithi (Z)	122
<i>Brachystegia spiciformis</i>	Msasa	Msasa (A)	198.1
<i>Breonadia salicina</i>	Matumi	Mingerhout (A)/Mohlome (NS)/Mutulume (V)/Umfomfo (Z)	684
<i>Bruguiera gymnorrhiza</i>	Black mangrove	Swartwortelboom (A)/isiKhangati (X)/IsiHlobane (Z)	527
<i>Cassipourea swaziensis</i>	Swazi onionwood	Swazi-uehout (A)	531.1
<i>Catha edulis</i>	Bushman's tea	Boesmanstee (A)/Mohlatse (NS)/Igqwaka (X)/Umhlwazi (Z)	404
<i>Ceriops tagal</i>	Indian mangrove	Indiese wortelboom (A)/isinkaha (Z)	525
<i>Cleistanthus schlechteri</i> var. <i>schlechteri</i>	False tamboti	Bastertambotie (A)/Umzithi (Z)	320
<i>Colubrina nicholsonii</i>	Pondo weeping thorn	Pondo-treurdoring (A)	453.8

<i>Combretum imberbe</i>	Leadwood	Hardekool (A)/Mohwelere-tšhipi (NS)/Motswiri (T)/Impondondlovu (Z)	539
<i>Curtisia dentata</i>	Assegai	Assegai (A)/Umgxina (X)/Umagunda (Z)	570
<i>Elaeodendron transvaalensis</i>	Bushveld saffron	Bosveld-saffraan (A)/Monomane (T)/Ingwavuma (Z)	416
<i>Erythrophysa transvaalensis</i>	Bushveld red balloon	Bosveld-rooiklapperbos (A)/Mofalatsane (T)	436.2
<i>Euclea pseudebenus</i>	Ebony guarri	Ebbeboom-ghwarrie (A)	598
<i>Ficus trichopoda</i>	Swamp fig	Moerasvy (A)/Umvubu (Z)	54
<i>Leucadendron argenteum</i>	Silver tree	Silwerboom (A)	77
<i>Lumnitzera racemosa</i> var. <i>racemosa</i>	Tonga mangrove	Tonga-wortelboom (A)/isiKhahanesibomvu (Z)	552
<i>Lydenburgia abbottii</i>	Pondo bushman's tea	Pondo-boesmanstee (A)	407
<i>Lydenburgia cassinoides</i>	Sekhukhuni bushman's tea	Sekhukhuni-boesmanstee (A)	406
<i>Mimusops caffra</i>	Coastal red milkwood	Kusrooimelkhou (A)/Umthunzi (X)/Umkhakhayi (Z)	583
<i>Newtonia hildebrandtii</i> var. <i>hildebrandtii</i>	Lebombo wattle	Lebombo-wattel (A)/Umfomothi (Z)	191
<i>Ocotea bullata</i>	Stinkwood	Stinkhout (A)/Umhlungulu (X)/Umnukane (Z)	118
<i>Ozoroa namaquensis</i>	Gariep resin tree	Gariep-harpuisboom (A)	373.2
<i>Philenoptera violacea</i>	Apple-leaf	Appelblaar (A)/Mphata (NS)/Mohata (T)/isiHomohomo (Z)	238
<i>Pittosporum viridiflorum</i>	Cheesewood	Kasuur (A)/Kgalagangwe (NS)/Umkhwenkwe (X)/Umfusamvu (Z)	139
<i>Podocarpus elongatus</i>	Breede River yellowwood	Breeëriviergeelhout (A)	15
<i>Podocarpus falcatus</i> (<i>Afrocarpus falcatus</i>)	Outeniqua yellowwood	Outniekwageelhout (A)/Mogōbagōba (NS)/Umkhoba (X)/Umsonti (Z)	16
<i>Podocarpus henkelii</i>	Henkel's yellowwood	Henkel se geelhout (A)/Umsonti (X)/Umsonti (Z)	17
<i>Podocarpus latifolius</i>	Real yellowwood	Regte-geelhout (A)/Mogōbagōba (NS)/Umcheya (X)/Umkhoba (Z)	18
<i>Protea comptonii</i>	Saddleback sugarbush	Barberton-suikerbos (A)	88
<i>Protea curvata</i>	Serpentine sugarbush	Serpentynsuikerbos (A)	88.1
<i>Prunus africana</i>	Red stinkwood	Rooistinkhout (A)/Umkhakhase (X)/Umdomezulu (Z)	147
<i>Pterocarpus angolensis</i>	Wild teak	Kiaat (A)/Morōtō (NS)/Mokwa (T)/Mutondo (V)/Umvangazi (Z)	236
<i>Rhizophora mucronata</i>	Red mangrove	Rooiwortelboom (A)/isiKhangathi (X)/Umhlume (Z)	526
<i>Sclerocarya birrea</i> subsp. <i>caffra</i>	Marula	Maroela (A)/Morula (NS)/Morula (T)/Unganu (Z) /Nkanyi (XT)	360
<i>Securidaca longepedunculata</i>	Violet tree	Krinkhout (A)/Mmaba (T)	303

<i>Sideroxylon inerme</i> subsp. <i>inerme</i>	White milkwood	Witmelkhout (A)/Ximafana (X)/Umakhwelafingqane (Z)	579
<i>Tephrosia pondoensis</i>	Pondo poison pea	Pondo-gifertjie (A)	226.1
<i>Warburgia salutaris</i>	Pepper-bark tree	Peperbasboom (A)/Molaka (NS)/Mulanga (V)/isiBaha (Z)	488
<i>Widdringtonia cedarbergensis</i>	Clanwilliam cedar	Clanwilliamseder (A)	19
<i>Widdringtonia schwarzii</i>	Willowmore cedar	Baviaanskloofseder (A)	21
<i>Berchemia zeyheri</i> (RHAMNACEAE) LC	Red ivory Pink ivory	Rooi-ivoor (A) / Rooihout (A) / Monee (S) / umNeyi (SW) / umNini (Z, X) / Xiniyani (TS) / Moye (T) / Munia-niane (V)	450
<i>Diospyros mespiliformis</i> (EBENACEAE) LC	Jackal berry	Jakkalsbessie (A) / Musuma (V) / Muntoma (TS) / Mgula (TS)	606
<i>Schinziophyton rautanenii</i>	Manketti / Mongongo	Mankettiboom (A) / Monghongho (T) / Makongwa (T)	337
<i>Umtiza listeriana</i>	Umtiza	Umtiza (X) / Omtisa (A)	205

Boscia albitrunca has a geographical distribution that is close to the study area.