BULGE-DORSET 132kV LINE PROJECT

CONSTRUCTION OF A 132kV POWERLINE FROM BULGE RIVER SUBSTATION TO DORSET SUBSTATION

SPECIALIST REPORT
ECOLOGICAL ENVIRONMENT

Texture Environmental Consultants

COMPILED BY

Flori Horticultural Services cc

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1. EXECUTIVE SUMMARY

Eskom is planning the construction of a 132kV powerline from Bulge River Substation, over a distance of approximately 61 to 65km, to the Dorset Substation. A specialist investigation of the floristic and faunal environment was conducted. Sensitive attributes within the study area have been highlighted, along with broad descriptions of the various elements. A desktop study and field investigations were conducted of the surrounding areas and the specific study area. Based on these findings pertinent mitigating actions were recommended and a specific route for the line recommended.

The study area falls within the Savanna Biome. Three vegetation types are encountered in the area. Namely, Central Sandy Bushveld (Mixed Bushveld – Low & Rebelo, 1996; Mixed Bushveld and Sourish Mixed Bushveld – Acocks, 1953); Western Sandy Bushveld (Mixed Bushveld – Low & Rebelo, 1996; Mixed Bushveld - Acocks, 1953) and Waterberg Mountain Bushveld (Waterberg Moist Mountain Bushveld – Low & Rebelo, 1996; Sour Bushveld – Acocks, 1953).

Red data species and protected species found in the area include Camel thorn (*Acacia erioloba*), Leadwood (*Combretum imberbe*) and Marula (*Sclerocarya birrea* subsp. *caffra*). Other protected trees and shrubs that potentially occur in the study area, but that were not observed during field investigations include, Shepherd's tree (*Boscia albitrunca*), Wild pear (*Dombeya rotundifolia* var. *rotundifolia*), Bushveld saffron (*Elaeodendron transvaalense*), Bushveld red balloon (*Erythrophysa transvaalensis*) and Violet tree (*Securidaca longipedunculata*). No threatened or protected mammal, butterfly or amphibian species were observed in the study area, although some are most likely present. These include African rock python (*Python natalensis*), Giant bullfrog (*Pyxicephalus adspersus*), Honey badger (*Mellivora capensis*), Pangonlin (*Manis temmincki*) and Southern African hedgehog (*Atelerix frontalis*).

The soils in the proposed powerline servitude routes and immediate vicinity are predominantly shallow to deep sandy and gravely soils with a low clay content. The

colours of which are generally red to yellowish. A number of highlying areas and slopes have a high presence of large surface and sub-surface rocks. Large areas of the bushveld in the region are undisturbed, with a number of formal nature reserves, private game ranches and lodges. The area is home to the Big Five. Other land-uses in the area include agriculture in the form of pivot-irrigated, cultivated lands and cattle farming. Urbanisation and human development of the immediate region are low.

Floristic and faunal sensitivity calculations were done for the various distinctive units found within the study area. A large percentage of the vegetation in the study area can be viewed as pristine. The vegetation is fairly uniform with no small ecosystems or islands of uniqueness being present. Floristic sensitivity calculations were as follows: Regional vegetation – medium (Go-Slow zone); Rivers – medium/high (Go-But zones); Rocky areas – medium/high (Go-But zones); Camel thorns – high (No-Go zone). Faunal sensitivity calculations were as follows: Regional vegetation – medium (Go-Slow zone); Rivers – medium/high (Go-But zones); Rocky areas – medium/high (Go-But zones); Camel thorns – medium (Go-Slow zone).

The ecological sensitivity of the study area is determined by combining the sensitivity analyses of both the floral and faunal components. The highest calculated value is taken to represent the ecological sensitivity of that unit, whether it is floristic or faunal in nature. The ecological sensitivity analyses produced the following outcomes: Regional vegetation – medium (Go-Slow zone); Rivers – medium / high (Go-But zones); Rocky areas - medium/high (Go-But zones); and the small area of Camel thorns – high (No-Go zone).

A number of mitigating actions where recommended. The proper implementation and management of these measures will ensure that potential impacts on the ecology of the area are reduced and kept to low, acceptable levels. These measures include staying out of No-Go zones (highly sensitive areas such as the camel thorn grove); not placing any pylons closer than 30m from the edge of river banks or 10m from the edge of drainage lines; an ongoing management programme to mechanically control alien plant species that invade the disturbed soils around the newly erected pylons; to inspect the powerline corridor every year (before and after the summer rain

season) for soil erosion and if found to rehabilitate; to not use chemicals in the control of weeds; to use wide spacing of pylons in the rocky areas to limit the physical footprint on the actual ground; and to remove all left over construction materials, rubble etc. upon completion of the project.

Assessment of possible impacts on the various distinctive ecological units in the study area (before and after) mitigating and management measures were deemed to be as follows: Regional vegetation – medium (before), low (after); Rivers – medium, bordering on high (before), low (after); Rocky areas – medium, bordering on high (before), low (after). No rating matrix is given for the small area of camel thorns or the Mokolo River simply because there are no possible mitigating measures to reduce the negative impact and the area must be seen as a “No-Go” zone.

Having taken all aspects of the investigation into account the following line variant is recommended - **Alternative Route 4 (A-B_1-C_2-C_1-D-H-F)**. However, between map points (C_1 – D) both sections of Alternative Routes 4 & 3 are equally ecologically acceptable and either made be used across this section.

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TABLES

2. INTRODUCTION

Eskom is planning the construction of a 132kV powerline from the Bulge River substation to the Dorset substation. The substations and powerline corridors are to the south of Lephalale (Ellisras) and north-east of Vaalwater in the Limpopo Province. The study area is north of the well-known Waterberg mountain range and the Marakele National Park. At the time of the study Dorset Substation was under construction, while work on the Bulge River Substation had not yet started.

Flori Horticultural Services cc, was appointed as independent specialist investigators, to conduct a strategic impact assessment of the floristic and faunal environment that will or could be affected by the proposed development. Field investigations were carried out during December 2010, January 2011 and May 2011.

General grid references for the study area are as follows:
1:50 000 maps – 2327DC; 2327DD; 2328CC; 2427BA; 2427BB; 2428AA.

3. AIMS AND OBJECTIVES

The aim of the impact assessment was to present broad descriptions of floristic and faunal elements encountered within the study area and to highlight sensitive attributes and areas within the environment that might be adversely affected by the proposed development. The impacts were evaluated and pertinent mitigating actions recommended to negate the negative affects on the environment that could arise. Various alternative routes for the proposed powerline were evaluated and recommendations made as to the best line variant to follow in terms of ecological impact.

4. METHODOLOGY

Desktop assessment

A literature review was conducted regarding the main vegetation types and fauna of the general region and of the specific study area. The main references for vegetation types used were those of Mucina & Rutherford (eds) (2006), Low & Rebelo (1996) and Acocks (1988)[1,2,3]. The classification and naming system of Mucina & Rutherford

was used as the standard throughout the report. Background data regarding soils, geology, climate and general ecology where also consulted. These are useful in determining what species of fauna and flora can be expected to be present within the different habitats of the study area, as there is a close relationship between all these parameters.

Lists of plant species for the relevant grids (2327DC; 2327DD; 2328CC; 2427BA; 2427BB; 2428AA), within which the proposed servitudes are situated, were obtained from the South Africa National Biodiversity Institute's (SANBI) database[4]. The lists represent all plant species that have been identified and recorded within the designated grid coordinates. The main aim was to investigate whether any protected species or Red Data species were know to occur in the study area or in the immediate vicinity of the study area.

Red data and protected species listed by the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) were consulted and taken into account. Alien invasive species and their different Categories (1, 2 & 3) as listed by the Conservation of Agricultural Resources Act (Act No. 43 of 1983) and the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) was also consulted.

Field survey

A field survey was conducted, involving a number of field trips during December 2010. Cognisance was taken of the following environmental features and attributes:

- Biophysical environment
- Regional and site specific vegetation
- Habitat ideal for potential red data faunal species
- Red data fauna and flora species
- Protected fauna and flora species

Floristic Sensitivity

The methodology used to estimate the floristic sensitivity is aimed at highlighting floristically significant attributes and is based on subjective assessments of floristic attributes. Floristic sensitivity is determined across the spectrum of communities that

typify the study area. Phytosociological attributes (species diversity, presence of exotic species, etc.) and physical characteristics (human impacts, size, fragmentation, etc.) are important in assessing the floristic sensitivity of the various communities.

Criteria employed in assessing the floristic sensitivity vary in different areas, depending on location, type of habitat, size, etc. The following factors were considered significant in determining floristic sensitivity:

- Habitat availability, status and suitability for the presence of Red Data species
- Landscape and/or habitat sensitivity
- Current floristic status
- Floristic diversity
- Ecological fragmentation or performance.

Floristic Sensitivity Values are expressed as a percentage of the maximum possible value and placed in a particular class or level, namely:

- High: 80 – 100%
- Medium/high: 60 – 80%
- Medium: 40 – 60%
- Medium/low: 20 – 40%
- Low: 0 – 20%

High Sensitivity Index Values indicate areas that are considered pristine, unaffected by human influences or generally managed in an ecological sustainable manner. Nature reserves or even well managed game farms typify these areas.
Low Sensitivity Index Values indicate areas of poor ecological status or importance in terms of floristic attributes, including areas that have been negatively affected by human impacts or poor management.
Each vegetation unit is subjectively rated on a scale of 1 to 10 (Sensitivity Values) in terms of the influence that the particular Sensitivity Criterion has on the floristic status of the plant community. Separate Values are multiplied with the respective Criteria

Weighting, which emphasises the importance or triviality that the individual Sensitivity Criteria have on the status of each community.

Ranked Values are then added and expressed as a percentage of the maximum possible value (Floristic Sensitivity Value) and placed in a particular class or level, namely:

- High: 80% – 100%
- Medium/high: 60% – 80%
- Medium: 40% – 60%
- Medium/low: 20% – 40%
- Low: 0% – 20%

GO, NO - GO criteria

The sensitivity analyses are also expressed in terms of whether the “Go Ahead” has or has not been given for development in a specific area or ecological unit, with regards to the ecological sensitivity along with mitigating measures. The criteria are directly linked to all the other analyses used in the study and can be expressed as follows:

- GO: Areas of low sensitivity

  These would typically be areas where the veld as been totally transformed.

- GO-SLOW: Areas of low to moderate/low sensitivity

  These would typically be areas where large portions of the veld has been transformed and/or is highly infested with alien vegetation and lacks any real faunal component. Few mitigating measures are typically needed, but it is still always wise to approach these areas properly and slowly.

- GO-BUT: Areas of medium to medium/high sensitivity

  These are areas that are sensitive and should generally be avoided if possible. But, with the correct implementation of mitigating and management measures can be entered if need be.

- NO-GO: Areas of high sensitivity

  These are areas of high sensitivity and should be avoided at all cost. In these areas mitigating measures are typically futile in limiting impacts.

The Precautionary Principle is applied throughout this investigation.

Red Data Flora Assessment

Baseline data for the ¼ degree grid ((2327DC; 2327DD; 2328CC; 2427BA; 2427BB; 2428AA) in which the study area is situated were obtained from the SANBI database and was compared to the Interim Red Data List of South African Plant Species (Threatened Species Programme, 2004) to compile a list of Red Data flora species that could potentially occur within the study area.

A snapshot investigation of an area presents limitations in terms of locating and identifying Red Data flora species. Therefore, particular emphasis is placed on the identification of habitat deemed suitable for the potential presence of Red Data plant species by associating available habitat to known habitat types of Red Data flora species. The verification of the presence or absence of these species from the study area are not perceived as part of this investigation as a result of project limitations.

Faunal Sensitivity

Determining the full faunal component of a study area during a short time scale of a few field trips can be highly limiting. Therefore, the different habitats within the study area and nearby surrounding areas were scrutinised for attributes that are deemed to be suitable for high diversity of fauna, as well as for Red Data species. Special consideration was given to habitats of pristine condition and high sensitivity.

Areas of faunal sensitivity were calculated by considering the following parameters:

- Habitat status – the status or ecological condition of the habitat. A high level of habitat degradation will often reduce the likelihood of the presence of Red Data species.
- Habitat linkage – Movement between areas used for breeding and feeding purposes forms an essential part of ecological existence of many species. The connectivity of the study area to surrounding habitats and adequacy of these linkages are evaluated for the ecological functioning of Red Data species within the study area

- Potential presence of Red Data species – Areas that exhibit characteristics that are suitable for the potential presence of Red Data species area considered sensitive.

Red Data Fauna Assessment

Literature was reviewed and relevant experts contacted to determine which Red Data fauna species are present, or likely to be present, in the study area.

A snapshot investigation of an area presents limitations in terms of locating and identifying Red Data fauna species. Particular emphasis was therefore placed on the identification of habitat deemed suitable for the potential presence of Red Data fauna species by associating available habitat to known habitat types of Red Data species. The verification of the presence or absence of these species from the study area is not perceived as part of this investigation as a result of project limitations.

Biodiversity Impact Evaluation

The impact evaluation takes into account the nature, scale and duration of the effects on the environment and whether such effects are positive (beneficial) or negative (detrimental).

A rating/point system is applied to the potential impact on the affected environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each issue the following criteria are used and points awarded as shown:

- Extent: National - 4; Regional – 3; Local – 2; Site – 1.
- Duration: Permanent – 4; Long term – 3; Medium term – 2; Short term – 1.
- Intensity: Very high – 4; High – 3; Moderate – 2; Low – 1.
- Probability of Occurrence: Definite – 4; Highly probable – 3; Possible – 2; Impossible – 1.

Criteria for the classification of an impact

Nature

A brief description of the environmental aspect being impacted upon by a particular action or activity is presented.

Extent (Scale)

Considering the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment phase of a project in terms of further defining the determined significance or intensity of an impact.

- Site: Within the construction site
- Local: Within a radius of 2 km of the construction site
- Regional: Provincial (and parts of neighbouring provinces)
- National: The whole of South Africa

Duration

Indicates what the lifetime of the impact will be.

- Short-term: The impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase.
- Medium-term: The impact will last for the period of the construction phase, where after it will be entirely negated.
- Long-term: The impact will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter.
- Permanent: The only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.

Intensity

Describes whether an impact is destructive or benign.

- Low: Impact affects the environment in such a way that natural, cultural and social functions and processes are not affected.
- Medium: Effected environment is altered, but natural, cultural and social functions and processes continue albeit in a modified way.

- High: Natural, cultural and social functions and processes are altered to extent that they temporarily cease.
- Very high: Natural, cultural and social functions and processes are altered to extent that they permanently cease.

Probability

Describes the likelihood of an impact actually occurring.

- Improbable: Likelihood of the impact materialising is very low.
- Possible: The impact may occur.
- Highly probable: Most likely that the impact will occur.
- Definite: Impact will certainly occur.

Significance

Significance is determined through a synthesis of impact characteristics. It is an indication of the importance of the impact in terms of both the physical extent and the time scale and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

Using the scoring from the previous section, the significance of impacts is rated as follows:

- Low impact: 4-7 points. No permanent impact of significance. Mitigation measures are feasible and are readily instituted as part of a standing design, construction or operating procedure.
- Medium impact: 8-10 points. Mitigation is possible with additional design and construction inputs.
- High impact: 11-13 points. The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/or operational phases. The effects of the impact may affect the broader environment.
- Very high impact: 14-16 points. The design of the site may be affected. Intensive remediation as needed during construction and/or operational

phases. Any activity, which results in a “very high impact”, is likely to be a fatal flaw.

Status

Denotes the perceived effect of the impact on the affected area.

- Positive (+): Beneficial impact.
- Negative (-): Harmful or adverse impact.
- Neutral Impact (0): Neither beneficial nor adverse.

It is important to note that the status of an impact is assigned based on the *status quo.* Therefore not all negative impacts are equally significant. The suitability and feasibility of all proposed mitigation measures will be included in the assessment of significant impacts. This will be achieved through the comparison of the significance of the impact before and after the proposed mitigation measure is implemented.

5. BIOPHYSICAL ENVIRONMENT

Location

The study area is situated in the Limpopo Province, close to the small towns of Vaalwater, Matlabas and Elmeston. With Lephalale (Ellisras) further to the north. The area is south of Lephalale, north of Vaalwater and north of the Waterberg mountain range. It is within the area south and east of the Mokolo Dam and Mokolo Dam Nature Reserve (Hans Strijdom Dam and Hans Strijdom Nature Reserve). The study area runs roughly in a east-west direction.

GPS Coordinates of the study area

The points shown (A-H) correspond to strategic points as highlighted on Map 2.

- Bulge River Substation site (Point A)
  S24^{0}07.060’; E27^{0}40.154’
- Bulge River shop and petrol station
  S24^{0}07.457’; E27^{0}41.405’
- River crossing at Malmaniers River
  S24^{0}07.864’; E27^{0}42.920’
- Road junction (Point B)

S24^{0}08.975'; E27^{0}46.411'

- River crossing at Mokolo River
  S24^{0}06.819'; E27^{0}48.136'
- Site of Camel thorn trees (Protected trees)
  S24^{0}06.822'; E27^{0}48.301'
- Point where line alternatives deviate from each other (Point C)
  S24^{0}06.137'; E27^{0}57.752'
- Road junction (Point G)
  S24^{0}06.096'; E27^{0}59.857'
- Line alternative going north turns sharply east near road junction (Point D)
  S24^{0}02.599'; E27^0 59.175'
- Road junction near point D where line alternatives follow same route
  S24^0 02.625'; E27^0 59.385'
- Point at which line alternatives deviate (Point E)
  S24^0 03.021'; E28^0 05.317'
- Road junction and turning point of line alternative (Point H)
  S24^0 03.755'; E28^0 06.960'
- River crossing at Poer se loop (taken on the sand road)
  S24^0 03.388'; E28^0 07.651'
- Dorset Substation (Point F)
  S24^0 03.860'; E28^0 09.604'

Geology

Geology of the region

Sandstone and mudstone of the Matlabas Subgroup and sandstone, subordinate conglomerate, siltstone and shale of the Kransberg Subgroup (Both Mokolian Waterberg Group) are found in the north. Archaean granite and gneiss of the Swazian Erathem and granite of the Lebowe Granite Suite (Bushveld Igneous Complex) are found in the west and south-east of the region, respectively. This is the typical geology of the Western Sandy Bushveld vegetation type.

The southern and eastern parts of the Central Sandy Bushveld veldtype are predominantly underlain by granite of the Lebowe Granite Suite, with some

granophyre of the Rashoop Granophyre Suite. Both are part of the Bushveld Complex, Vaalian. The sedimentary rocks of the Waterberg mountains or Waterberg Group (Mokolian Erathem) to the south of the study area, are an important part of the geology of the region. Specifically the sandstone, conglomerate and siltstone of the Vaalwater Formation[1].

The Waterberg Mountain Bushveld is present in the region. The geology of this veldtype is predominantly sandstone, subordinate conglomerate, siltstone and shale of the Kransberg Subgroup. As well as medium- to coarse-grained sandstone, conglomerate, trachytic lava and quartz porphyry of the Swaershoek Formation (Nylstroom Subgroup). Both subgroups are of the Mokolian Waterberg Group[5].

Geology of the study area

Coarse, sandy soils, which are typically shallow, overlay granite, quartzite or shale. Sandstone, conglomerate and siltstone also form and important part of the geology of the study area. Shales, along with coarse-grained sandstone, conglomerate, trachytic lava and quartz porphyry are present in parts of the study area where it enters the Waterberg Mountain vegetation unit.

Soils

Soils of the region

The soils are freely draining of the plinthic, catena, eutrophic and red-yellow apedal types. Certain areas contain high base status Huton and Clovelly soils with some Glenrosa and Mispha soil forms. Several areas of the Western Sandy Bushveld tend to have less sandy soils than those of the Central Sandy Bushveld.

Within the Central Sandy Bushveld vegetation type the soils are typically well drained. Hutton or Clovelly soils are present. Often with a catenary (U-shape or bowl-shaped) sequence of Hutton at the top to Clovelly on the lower slopes. Shallow, skeletal Glenrosa soils are also found in the region.

The soils of the Waterberg Mountain Bushveld region are typically dystrophic, acidic sandy, loamy to gravely soils. Of the Glenrosa and Mispah Forms[1,5,].

Soils specific to the study area

The soils of the study area are mostly coarse, sandy soils that are shallow in some places and deep in others. They are typically well-drained and red to yellowish in colour. There are areas of loamier soils, which are ideal for numerous agricultural crops. In general, the clay content of the soils in the study area is low to very low. Areas of rockiness occur. Areas of acidic soils from the Waterberg Mountain Bushveld which can be sandy, loamy or gravely also occur in the study area. However, they are not as widespread as those of the soils from the Sandy Bushveld vegetation units.

Land capability

General land capability of the region

Basic criteria have been used to determine the land capability of the region and are summarised below in Table 1.

Table 1: Land capability criteria

Land Capability	Criteria
Arable Land	It does not qualify as wetland. The soil is readily permeable to a depth of 750 mm. Has a pH value of between 4.0 and 8.5. Has a low salinity content. Has less than 10% by volume rocks or pedocrete fragments larger than 100 mm in the upper 750 mm. Has a slope (in per cent) and erodibility factor (K) such that their product is <2.0. Occurs under a climate of crop yields that are at least equal to the current national average for these crops.
Grazing Land	It does not qualify as wetland or arable land. Has soil or soil-like material, permeable to roots of native plants, that is more than 250 mm thick and contains less than 50% by volume of rocks or pedocrete fragments larger than 100 mm diameter. Supports, or is capable of supporting a stand of native or introduced grass

	species or other forage plants utilisable by domesticated livestock or game animals on a commercial basis.
Wilderness Land	Land, which does not qualify as wetland, arable land or grazing land. As described in the COM guidelines for the rehabilitation of strip mines, however not involving the replacement of any soil material. Involves suitable vegetation cover in accordance with industry norms and standards to prevent wind and water erosion. Land not necessarily suitable for grazing or other agricultural use.

The land capabilities of the immediate surrounding areas within which the proposed servitudes fall are fairly limited. Most of the sandy soils are too shallow or nutrient-poor for high-yield crop production. Certain areas with heavier soils are suited for arable land. However, due to the dry winter periods irrigation would be necessary. The climate is generally favourable for year-round production of crops in open-field cultivation.

The veld carrying capacity is relatively low although many sweet grasses are present. Cattle farming does occur in the area but suitably large areas for grazing are needed. The suitability for grazing land is there but needs to be carefully managed.

The general land capability is highly suited to wilderness land. This is already a major form of land use in the region with numerous nature reserves, a biosphere reserve, private game farms and lodges. Including the Marakele National Park.

Land Use

General land use of the region

The lands in the region or surrounding areas are used for agriculture such as the cultivation of maize (mielies) and sunflower and for grazing of cattle. There are also a number of settlements and townships in the region although small in comparison to other major metropolitan areas in the country and Limpopo Province. Mining is a significant and potentially dominant land use activity in the greater region. Especially closer towards Lephalale (Ellisras). Other uses include infrastructure such as roads.

An important land use in the region is that of wildlife areas. These areas include statutory nature reserves, dam and numerous private game reserves or lodges. As well as the Waterberg Biosphere Reserve.

Specific land use within the study area

Most of the land within the study area is private game reserves. Within these areas are a number of old, cultivated lands, which have been rehabilitated or left to return to bushveld. The region is therefore predominantly unspoilt, natural bushveld. There are however, a few human settlements (shops, farm houses, etc.) in the study area, as well as lands presently under cultivation.

Topography

General topography of the region

The general topography of the surrounding bushveld region is flat to low undulating plains. With the vegetation varying from tall open woodland to low woodland. These low, undulating areas are sometimes between mountains such as the Waterberg range, or those surrounding the Mokolo Dam. The Savanna Biome (in which the surrounding region and study areas fall) does not typically occur at high altitudes and is found mostly below 1500m. Small areas extend to 1800m on parts of the Highveld mainly along the southern most edges of the Central Bushveld[6,7].

The topography within the mountainous areas of the Mokolo Dam region and the Waterberg itself can be rugged with the varying vegetation and rockiness.

Topography of the study area

The proposed alternative routes for the powerline are dominated by relatively flat to low undulating plains of mixed bushveld. The general gradient along the corridors is low (typically 1-2%), with steeper gradients (3-4%) sometimes been encountered, such as in the vicinity of the Mokolo River. Rocky outcrops (koppies) are rare in the study area.

A few small drainage lines cut across the demarcated servitudes. These are only active during the summer rainfall period. Four small to medium sized rivers are found

in the study area. Namely, the Bulge, Malmanies, Mokolo and Poer-se-loop. There are no wetlands within the demarcated servitudes or in the immediate proximity of the servitudes.

Surface water within the study area

There are four perennial to semi-perennial rivers / streams within the powerline corridors of the study area. There are also no wetlands present within the servitudes or in the areas immediately neighbouring the servitudes. The area comprises of flat to low undulating plains with a general sloping gradient from south to north. There are a few seasonal drainage routes that run across and through the servitudes. During the summer rainy season these are intermittently active. Due to the sandiness and drainage properties of the soils in the area, as well as the lack of high rainfall, there are no permanent or semi-permanent wetlands.

The drainage routes (or lines) are not seen as being of any threat to the powerline, but they should be kept in mind during construction and care should be taken to avoid them. Concrete foot supports should not be placed directly in or on the banks of these drainage furrows. Neither drainage nor erosion are seen to be significant threats as long as the proper mitigating measures are implemented. There were no signs of erosion along the investigated routes.

Climate

General climate of the region

The region falls within the summer rainfall areas of South Africa. The Savanna Biome is characterised by lower altitudes (mostly below 1500m) and temperatures are therefore higher than those of the adjacent Grassland Biome. The winters are typically very dry. The winter temperatures are mostly moderate to cool with little occurrence of frost. The climate is usually hot and dry from mid August to October, with a hot, wet season from November to April. Mean Average Precipitation (MAP) ranges from 500-700mm. Mean monthly maximum and minimum temperatures for Goedehoop (in the northern part of the Central Sandy Bushveld) are $35,5^0$C (November) and $-3,1^0$C (June), respectively. The MAP for the Western Sandy Bushveld varies from 450mm to 650mm, making it generally slightly drier than the

Central Sandy Bushveld. Mean monthly maximum and minimum temperatures for Thabazimbi are 36^{0}C (February) and -3,7^{0}C (June), respectively[6,8].

The MAP in the Waterberg mountains and associated veldtype varies from 500mm (in the lower lying areas) to around 750mm (at higher altitudes). Frost may occur frequently during the winter months in these mountainous areas[1].

Table 2: Climatic figures from selected weather stations

STATIONS	TEMPERATURES (^{0}C)		PRECIPITATION (mm)	RELATIVE HUMIDITY (%)	
	Maximum	Minimum	Annual Average	Maximum	Minimum
Lephalale	29,1	11,9	606,3	-	-
Thabazimbi	28,0	11,9	413,1	-	-
Vaalwater	26,5	11,1	601,9	82,1	28,3

Flora of the region

Biome

Nearly all of the Limpopo Province (95%+) falls within the Savannah Biome with its associated Bushveld vegetation. There are a few scant areas that are part of the Grassland Biome very much due to their high elevations and associated higher rainfalls.

The Savannah Biome is the largest biome in South Africa and covers approximately 33% of South Africa[1,2]. It is characterised by a grassy ground layer, with a distinct upper layer of woody plants. The environmental factors shaping the biome are complex. Rainfall varies from 235mm to 1 000mm per annum and frost occurs in regions of the biome, anything from 0 days to 120 days per year. Almost every major soil type and geological type are found within this biome.

Summer rainfalls assist in keeping the grasses dominant, along with grazing and fairly frequent veldfires running through the region. For this reason the biome has probably been shaped over long periods of time. As can be expected, most plant

species present are able to survive fires, usually with less than 10% of all plants been destroyed.

Floral Regions

Except for a small area in the extreme south-west of the Limpopo Province, the entire province falls within the Sudano-Zambesian Floral Region. This floral region incorporates the grasslands and savannas (bushveld) of the north and north-east of South Africa and is the southern extent of the vast Sudano-Zambesian Floral Region. This is the largest floral region on the African continent and includes most of sub-Saharan Africa, with the exceptions of the tropical forests of West and Central Africa. This region has a rich and diverse flora with a not-surprisingly equally rich and diverse fauna[9].

General vegetation of the region

The vegetation of the general region falls within the Savanna Biome and more specifically within the vegetation types (veld types) known as Central Sandy Bushveld, Western Sandy Bushveld, Waterberg Mountain Bushveld and Limpopo Sweet Bushveld. Recently researchers have adapted the vegetation maps of Low and Rebelo (published by the National Botanical Institute in 1996) to create ecozones. Under this classification system the vegetation of the region is within the ecozones known as Central Mountains (which consists mainly of the Waterberg Mountains) and Mixed Bushveld.

There are numerous classification and naming systems used for vegetation types. It is the preference of the researches to use the latest and more detailed system of Mucina and Rutherford. However, two other very important classification works are those of Acocks and Low & Rebelo and their veldtype names into which the above mentioned Mucina &Rutherford names fall are shown in the table below:

Table 3: Comparison of veldtype names

Mucina & Rutherford (2006)	Acocks (1953)	Low & Rebelo (1996)

Central Sandy Bushveld	Mixed Bushveld (44%) Sourish Mixed Bushveld (32%)	Mixed Bushveld (73%)
Western Sandy Bushveld	Mixed Bushveld (58%)	Mixed Bushveld (75%)
Waterberg Mountain Bushveld	Sour Bushveld (73%)	Waterberg Moist Mountain Bushveld (83%)
Limpopo Sweet Bushveld	Arid Sweet Bushveld (74%)	Sweet Bushveld (65%)

The vegetation and landscape features of Central Sandy Bushveld are of low undulating areas and sandy plains. Sometimes between mountains as in the case of the greater study area. These areas predominantly support tall *Terminalia sericea* (Silver Clusterleaf) and *Burkea africana* (Burkea; Red Syringa) woodland on deep sandy soils; and low, broad-leaved *Combretum* (Bushwillow) woodland on shallow rocky or gravely soils. Species of Acacia (thorn trees), *Ziziphus* (Buffalo thorn) and *Euclea* (Guarri) are found on flats and lowers slopes on eutrophic sands and certain less sandy soils.

The vegetation and landscape features of Western Sandy Bushveld vary from tall, open woodland to low woodland. With broad-leaved as well as microphyllous (small, compound leaves) trees prominent. The dominant species include *Acacia erubescens* (Blue thorn, Blue acacia) on flat areas; *Combretum apiculatum* (Red bushwillow) on shallow soils of gravely upland sites and *Terminalia sericea* (Silver clusterleaf) on deep sands. The landscape is typically flat or slightly undulating plains[1,10].

The landscape features associated with Waterberg Mountain Bushveld is that of rugged mountains with vegetation changing from *Faurea saligna – Protea caffra* Bushveld (on higher slopes) to broad-leaved deciduous bushveld dominated by *Diplorhynchus condylocarpon* (on rocky mid- and footslopes); to *Burkea affricana – Terminalia sericea* savanna (in the lower-lying valleys and on deeper sands of the plateaus). The grass layer can be moderately or well-developed.

The Limpopo Sweet Bushveld features undulating or irregular plains, traversed by several tributaries of the Limpopo River. The vegetation is short, open woodland, but in disturbed areas almost impenetrable thickets occur, dominated by *Acacia* species and *Dichrostachys cinerea* (Sicklebush)[1,2].

The study area is predominantly Western Sandy Bushveld, with a portion in the vicinity of the Mokolo Dam (Hans Strijdom Dam) being Central Sandy Bushveld. The veldtypes of Waterberg Mountain Bushveld and Limpopo Sweet Veld are mentioned in the study because they are in the immediate vicinity and often times elements of these veldtypes can be observed in transitional zones or within the main veldtypes discussed.

Vegetation of the study area

Strategic sampling was undertaken within the specific corridors for the powerline. Special cognisance was taken of areas that exhibit sensitive biophysical attributes. These included areas of surface water (rivers, wetlands, floodplains) and areas of high slopes (ridges, rocky outcrops, koppies).

The vegetation of the inspection site is predominantly that of Central Sandy Bushveld, with the most westerly section falling within the vegetation unit of Western Sandy Bushveld. Small areas in the vicinity of the Dorset substation are typical of Waterberg Mountain Bushveld. The alternative powerline corridors from Bulge River substation (up to approximately where they cross over the Mokolo River) are typical Western Sandy Bushveld. This area is predominantly bushveld (5-6m high) with trees such as *Acacia erubescens* (Blue thorn), *Acacia nigrescens* (Knob thorn), *Acacia mellifera* subsp. *detinens* (Black thorn), *Acacia nilotica* (Scented-pod), *Acacia tortilis* (Umbrella thorn), *Combretum apiculatum* (Red bushwillow), *Combretum zeyheri* (Large-fruited bushwillow), *Peltophorum africanum* (African weeping wattle) and *Terminalia sericea* (Silver clusterleaf) observed to be common.

From east of the Mokolo River to Dorset substation the powerline corridors run mainly within the Central Sandy Bushveld. The change in veldtype is especially

evident by the very noticeable increase in the widespread presence of *Burkea africana* (Burkea) and *Ochna pulchra* (Peeling plane, Peeling bark ochna).

The following Red data and protected tree species were found in the study area: *Sclerocarya birrea* subsp. *caffra* (Marula), *Combretum imberbe* (Leadwood) and *Acacia erioloba* (Camel thorn).

Tree and shrub species observed in the study area

Acacia ataxacantha (Flame-pod acacia); *Acacia burkei* (Black monkey thorn); *Acacia caffra* (Common hook thorn); *Acacia erubescens* (Blue thorn); *Acacia galpinii* (Monkey thorn); *Acacia karroo* (Sweet thorn); *Acacia mellifera* subsp. *detinens* (Black thorn); *Acacia nigrescens* (Knob thorn); *Acacia nilotica* (Scented-pod); *Acacia tortilis* (Umbrella thorn); *Acacia robusta* (Robust thorn); *Bauhinia pertersiana* (Kahlahari bauhinia); *Boscia foetida* (Bushveld shepherd's tree); *Burkea africana* (Burkea); *Combretum apiculatum* (Red bushwillow); *Combretum imberbe* (Leadwood): *Combretum molle* (Velvet bushwillow): *Combretum zeyheri* (Large-fruited bushwillow); *Commiphora mollis* (Velvet-leaved corkwood); *Croton gratissimus* (Lavender croton); *Dichrostachys cinerea* (Sicklebush); *Diplorhynchus condylocarpon* (Horn-pod tree); *Englerophytum magalismontanum* (Stamvrug, Stamvrug milkplum); *Euclea crispa* (Blue guarri); *Gardenia volkensii* (Transvaal gardenia); *Grewia bicolour* (White-leaved raisinbush); *Grewia flava* (Wild raisin); *Grewia monticola* (Grey raisin, silver raisinbush); *Lannea discolour* (Live long lannea); *Peltophorum africanum* (African weeping wattle); *Gymnosporia polyacantha* (Synonym: *Maytenus polyacantha*) (Hedge spikethorn); *Ochna pulchra* (Peeling plane, Peeling bark ochna); *Rhus lancea* (Karee); *Rhus leptodictya* (Mountain karee); *Rhus pyroides* (Common wild currant); *Sclerocarya birrea* subsp. *caffra* (Marula); *Spirostachys africana* (Tamboti); *Terminalia sericea* (Silver clusterleaf); *Ziziphus mucronata* (Buffalo thorn);

Three red data and/or protected species were observed. Namely, *Sclerocarya birrea* subsp. *caffra* (Marula), *Combretum imberbe* (Leadwood), *Spirostachys africana* (Tamboti) and *Acacia erioloba* (Camel thorn).

Grass and reed species (Graminoids) observed in the study area

Aristida bipartita (Rolling grass); *Aristida transvaalensis* (Rock three-awn grass, Klipgras); *Chloris virgata* (Feathertop grass); *Eragrotis gummiflua* (Gum grass); *Eragrotis lehmanniana* (Lehmann's love grass); *Heteropogon contortus* (Spear grass); *Hyparrhenia hirta* (Common thatching grass); *Rhynchelytrum repens* (Natal red top); *Setaria sphacelata* var. *sericea* (Golden bristle grass); *Themeda triandra* (Red grass); *Trachypogon spicatus* (Giant spear grass).

Herbs, Forbs and other plant species observed in the study area

Aloe greatheadii var. *davyana* (Transvaal aloe)*; Aloe marlothii* (Mountain aloe); *Asclepias meliodora*; *Asparagus setaceus* (Asparagus fern); *Felicia fascicularis; Gladiolus crassifolius* (sword lily); *Helichysum acutatum* (Sticky everlasting); *Helichrysum coriaceum* (Everlasting); *Helichrysum nudifolium* (Hottentot's tea); *Hibiscus calyphyllus* (Large yellow wild hibiscus); *Hibiscus trionum* (Bladder hibiscus); *Hibiscus vitifolius* (Vine-leaved hibiscus); *Indigofera filipes; Leonotis intermedia* (Synonym: *Leonotis dysophylla*); *Psammotropha myriantha*.

No red data species were observed.

Aquatic plants observed in the study area

Cyperus sexangularis (cyperus, matjiesgoed); *Eleocharis acutangula* (Sedge); *Ludwigia adsendens* (Willow-herb); *Phragmites australis* (Common reed); *Phragmites mauritianum* (Thatching reed); *Typha capensis* (Bulrush).

No red data species were observed.

Dominant alien plants (weeds) observed in the study area

The dominant alien plant species encountered in the study area are recorded, along with their category rating, in Table 4[11,12,13].

Table 4: Dominant alien plants (weeds) observed in the study area

BOTANIAL NAME	COMMON NAME	CARA CATEGORY
Arundo donax	Giant reed	1

Bidens pilosa	Blackjacks	-
Campuloclinium macrocephalum	Pompom weed	1
Ipomoea purpurea	Morning glory	3
Jacaranda mimosifolia	Jacaranda	3
Melia azedarach	Syringa	3
Populus x canescens	Grey poplar	2
Salix babylonica	Weeping willow	2
Sesbania punicea	Red sesbania	1
Solanum elaeagnifolium	Silverleaf bitter apple	1
Solanum mauritiana	Bugweed	1
Solanum panduriforme	Poison apple	-
Tagetes minuta	Khakibos, kahki weed	-
Verbena bonariensis	Wild verbena	-
Xanthium strumarium	Large cocklebur	1

Note: CARA = Conservation of Agricultural Resources Act (43 of 1983)

Fauna of the region

Human population density and proximity to the habitat have significant impacts on the presence of most fauna species, especially larger mammals and reptiles. The Bulge River and Dorset substations and powerline corridors between the two lay within a very beautiful and relatively undisturbed area, with low levels of human impact. Probably of far greater significance is the growing enthusiasm to preserve and rehabilitate the region. This has resulted in the development of numerous private game lodges, ranches, nature reserves and the Waterberg Biosphere Reserve. This area stretches from Mokopane (Potgietersrus), Mookgophong (Naboomspruit) and Modimolle (Nylsvlei) in the east, to Thabazimbi and Lephalale (Ellisras) in the west. Within the biosphere reserve are nature reserves such as Marakele National Park in the Waterberg and the Mokolo Dam and Nature Reserve. Many game farms have also introduced or re-established large mammals onto their farms, resulting in the region being home to the Big Five.

The largest extent of the faunal assemblages of any region is typically encountered in the more dominant and common habitat type. In the case of the study area this habitat falls within the Savanna Biome, which is fairly well represented in the greater region of the biome. Due to the situation of the servitudes the presence of indigenous fauna is considered to be high.

During site visits numerous mammals, birds, small reptiles and insects were observed in and surrounding the study site. These included the following mammals: Vervet monkey (*Chlorocebus aethiops*); plains zebra (*Equus burchellii*); impala (*Aepyceros melampus*); elephant (*Loxodonta Africana*); black-backed jackal (*Canis* mesomelas); warthog (*Phacochoerus africanus*); blesbok (*Damaliscus dorcas phillipsi*); banded mongoose (*Mungos mungo*); impala (*Aepyceros melampus*); giraffe (*Giraffa camelopardalis*); baboon (*Papio ursinus*); tree squirrel (*Paraxerus cepapi*) and evidence of porcupine (*Hystrix africaeaustralis*).

Birds identified on field trips were the following: Cinnamon breasted bunting (*Emberiza tahapisi*); Klass's cuckoo (*Chrysococcyx klaas*); African fish eagle (*Haliaeetus vocifer*); Diderick cuckoo (*Chrysococcyx caprius*); Black-chested snake-eagle; Jacobin cuckoo (*Oxylophus jacobinus*); Red-chested cuckoo (*Cuculus solitarius*); Black-shouldered kite (*Elanus caeruleus*); helmeted guineafowl (*Numida meleagris*); ostrich (*Struthio camelus*); yellow-fronted canary (*Serinus mozambicus*); European bee-eater (*Merops apiaster*); barn swallow (*Hirundo rustica*); forked-tailed drongo (*Dicrurus adsimilis*); pied kingfisher (*Ceryle rudis*); greater-stripped swallow (*Hirundo cucullata*); African paradise flycatcher (*Terpsiphone viridis*); yellow-fronted tinkerbird (*Pogoniulus chrysoconus*); Cape glossy starling (*Lamprotornis nitens*); Cape turtle dove (*Streptopelia capicola*); laughing dove (*Streptopelia senegalensis*); feral pigeon (*Columba livia*); and house sparrow *(Passer domesticus*). The presence of many of these bird species indicate that the general condition of the veld is good and that there is adequate open, undisturbed veld in which they can feed, nest and breed.

A number of butterfly species were observed which also tends to show that there is sufficient, undisturbed vegetation for them to breed and flourish, eventhough some

are migratory species. Species noted include Acraea species (*Acraea* spp.); African monarch (*Danaus chrysippus*); Brown-veined white (*Belenois aurota aurota*); Bushveld orange tip (*Colotis pallene*); Broad-bordered grass yellow (*Eurema* brigitta); African clouded yellow (*Colias electo electo*); Citrus swallowtail (*Papilio demodocus*); and Yellow pansy (*Junonia hierta*); Veined orange (*Colotis vesta argillaceus*). According to certain reports the endangered Roodepoort copper (*Aloeides dentatis*) could possibly occur in the region[14]. However, according to correspondence with experts from Conservation of Butterflies in South Africa (CBISA) there are no known records of endangered butterfly or moth species in the servitudes or immediate area[15].

The area surveyed contains a number of small farm dams, rivers and the comparatively large Mokolo Dam in the nearby region, but no permanent or seasonal wetlands. Numerous seasonal drainage lines are present, which typically run after heavy rains and dry out again quickly due to the sandy soils and their low holding capacity of surface water. No amphibians were observed during site visits. However, due to the good quality of the river and dam water, with ideal habitat for various amphibians they undoubtedly will be present. It is also possible that the threatened Giant bullfrog (*Pyxicephalus adspersus*) occurs in the general area, although not observed during field trips[16].

A number of Yellow-throated plated lizards (*Gerrhosaurus flavigularis*) and gecko species (Gekkonidae) were observed in the vicinity of rocky areas, but no snakes. Numerous “important” insects such as dung beetles and dragonflies were observed as well. The presence of these species is often an indication of good veld and environmental conditions.

Despite the rich diversity and presence of fauna in the study area it is expected that all disturbed and displaced fauna will not be adversely affected or destroyed and that they will return to the area of construction within the short-term once rehabilitation has taken place and mitigating procedures have been strictly adhered to. This is directly due to the nature of the project, which effectively does not leave a significant

footprint on the actual ground of the study area. Fauna most adversely affected by the presence of the powerlines will be large avian raptors.

Two animals that could potentially create concern for the powerline and substation, namely elephant and giraffe, do not occur in the study area.

Potential Red Data species in the study area

Flora

During site investigations in the study area three Red Data and/or protected flora species were observed. These were *Sclerocarya birrea* subsp. *caffra* (Marula), *Combretum imberbe* (Leadwood) and *Acacia erioloba* (Camel thorn). Other trees and shrubs that potentially occur in the study area, but that were not observed include, *Boscia albitrunca* (Shepperd's tree), *Dombeya rotundifolia* var. *rotundifolia* (Wild pear), *Elaeodendron transvaalense* (Bushveld saffron), *Erythrophysa transvaalensis* (Bushveld red balloon) and *Securidaca longipedunculata* (Violet tree).

Fauna

During site visits no Red Data fauna species where encountered in the study area. However, due to the habitats and veldtypes in the area there remains the high potential for certain Red Data species, as listed in Table 5, to be present[17,18].

Table 5: Red Data fauna species most likely to occur in the study area

BIOLOGICAL NAME	COMMON NAME	RED DATA STATUS	HABITAT TYPE	HABITAT RESTRICTIONS
FROGS				
Pyxicephalus adspersus	Giant bullfrog	Threatened	Grassland; savanna	Temporary floodplains, pans
MAMMALS				
Atelerix frontalis	SA hedgehog	Near threatened	Most, broad	Broad
Manis temmincki	Pangolin (Scaly anteater)	Vulnerable	Grassland, savanna	Woody savanna, ants, termites
Mellivora	Honey badger	Near	Most, broad	Broad

capensis	(Ratel)	threatened		
Pipistrellus rusticus	Rusty bat	Near threatened	Most, broad	Woody savanna, large trees
SNAKES				
Python natalensis	Southern African python	Vulnerable	Ridges, wetlands	Rocky areas; open water

Conservation

Central Sandy Bushveld

This vegetation type is considered vulnerable. Less than 3% is statutorily conserved and this is spread thinly across a number of reserves such as Foorndraai Dam and Skuinsdraai Nature Reserve. The Mokolo Dam Nature Reserve, which borders directly on the study area falls within this veldtype. An additional 2% is conserved in SANDF property (Wallmansthal) and a grouping of private reserves and game farms, which includes the Nylsvlei freshwater wetlands. Approximately 24% is transformed, which includes agriculture (19%) and urbanisation (4%)[1]. Erosion is very low to high depending on the area in question. However, within the study are it is low, although the same concern regarding development and erosion exists in the view of the authors.

According to the South African National Biodiversity Institute (SANBI) the ecosystem (Central Sandy Bushveld) in which the study area falls is not threatened[19]. SANBI has put together maps (VEGMAP) which also highlight the threatened, or conservation, status of the various vegetation types. The status of the vegetation type (Central Sandy Bushveld) in which the study area falls are shown in Table 6.

Western Sandy Bushveld

According to Mucina & Rutherford (2006) this veldtype is least threatened. There is a general target to protect 19% of the veldtype, while at present approximately 6% is statutorily conserved. Just over half of which falls within the Marakele National Park. Around 4% of veldtype is totally transformed, mainly by agriculture, some of which is presently being rehabilitated in game farms and conservation areas. Although soils

are mostly sandy erosion is generally low to very low due to the veld cover and lack of steep gradients. However, it is the opinion of the authors that erosion is a potential threat in certain areas with regard to development.

According to the South African National Biodiversity Institute (SANBI) the ecosystem (Western Sandy Bushveld) in which the study area falls is not threatened.

Waterberg Mountain Bushveld

Almost 6% of this veldtype is statutorily protected, with a further 3% conserved in other reserves, such as private game farms. The ultimate target for conservation is 19%. The veldtype has a "least threatened" status. Approximately 18% of the vegetation unit has been transformed, predominantly by cultivation, with very little resulting from urbanisation and built-up areas. Erosion is low to high with the area mostly been used for game ranching. The conservation status of the vegetation types in which the study area falls are shown in Table 6[1].

Table 6: Conservation status of vegetation types

Vegetation type	Transformed	Conserved	Target to conserve	Ecosystem status	Protection level
Central Sandy Bushveld	24%	3%	19%	Vulnerable	Low
Waterberg Mountain Bushveld	18%	9%	19%	Least threatened	Moderate
Western Sandy Bushveld	4%	6%	19%	Least threatened	Moderate

Note: The percentage of the original area currently under protection was calculated based on Type 1 protected areas only. The biodiversity target refers to the percentage of the original areas required to capture 75% of the species occurring in each vegetation type. Ecosystem status is based on the percentage of the original area remaining untransformed in relation to the biodiversity target and a threshold for ecosystem functioning. Protection level is based on the % of the biodiversity target conserved in Type 1 protected areas.

Erosion in the study area is very low to low. Alien plant infestation in the study area is very low and tends to be localised to disturbed areas such as human settlements; agricultural fields; old, unused lands and river systems.

6. SENSITIVE FLORISTIC HABITAT TYPES

Rocky outcrops

Rocky outcrops (koppies) are regarded as sensitive. The association of rocky outcrops and mountains with Red Data and threatened plant species has been proven extensively. There were no typical rocky outcrops found in the study area. These rocky outcrops are mainly as a result of atypical habitat conditions created by rockiness, high slopes, lack of grazing and fire damage. There are a few areas of rockiness along the powerline corridors, but these should not be confused with rocky outcrops (koppies) or rocky ridges. Notwithstanding, these rocky areas, although not highly sensitive, should still be viewed as sensitive and approached with care. These rocky regions are considered suitable habitat for the presence of Red Data flora species such as *Dombeya rotundifolia* var. *rotundifolia* (Wild pear) and protected tree species such as *Sclerocarya birrea* (Marula). However, no Red Data species were observed.

Gradients and elevations of the study site

The study area consists mainly of flat and low undulating plains, with a lack of steep or sudden gradients. The highest elevation is at the Dorset Substation site (1554m) and the lowest elevation around the Mokolo River (949m). The Bulge River Substation site is at an elevation above sea level of 1080m. From the lowest elevation (Mokolo River) the powerline corridors climb gradually over a distance of approximately 13km (as the crow flies) to the Bulge River Substation site. This gives a low gradient of only 1% over that distance. The corridor running up to the Dorset Substation site, over a distance of about 35km (as the crow flies), is steeper. However, the gradient is still low at only 1,7%.

Rivers and Wetlands

Rivers and wetlands, along with their associated vegetation should all be viewed as sensitive. Even where these bodies of water might be degraded or infested with alien vegetation. Two main rivers or streams fall within and/or cross the powerline corridors. Namely, the Mokolo River and Poer se Loop. The proper implementation

and management of mitigating measures are crucial. A number of drainage lines move across the powerline corridors and also need to be avoided.
No wetlands were found to be present in the study area.

Camel thorn grove

There are a few camel thorn (*Acacia erioloba*) trees growing just east of the Mokolo River and both sides of the sand road (D1882). Camel thorns are protected trees and this small grove should be viewed as a "No-Go" zone and totally avoided.
GPS coordinates taken from the road: S24^{0}06.822'; E27^{0}48.301'.

7. SENSITIVE FAUNAL HABITAT TYPES

Rocky outcrops

Atypical habitat types, such as koppies (rocky outcrops and ridges) generally represent sensitive faunal habitat, although not always containing a high diversity of species. These micro-habitats are highly suitable for the presence of Red Data species. No rocky outcrops occur in the study. The rocky regions should however be viewed as sensitive although not as "No-Go" zones. Proper implementation of mitigating measures is essential.

Open plains

The dominant vegetation types of the inspection site are those of Central Sandy Bushveld and Western Sandy Bushveld. Most of the site is undulating plains. These plains are not seen as sensitive habitat types and most potentially occurring Red Data species are associated with either wetlands or rocky ridges. However, Red Data species such as the Pangolin (Scaly anteater) (*Manis temmincki*), Southern African hedgehog (*Atelerix frontalis*), Honey badger (Ratel) (*Mellivora capensis*) are not specifically linked to restricted habitats and do occur in savanna habitat. Due to the pristine nature of much of the bushveld in the study area it is likely that some of these species do occur in the area.

8. FLORISTIC SENSITIVITY ANALYSIS

A large percentage of the vegetation in the study area can be viewed as pristine. However, the vegetation is fairly uniform with no small ecosystems or islands of uniqueness being present. For the greater part the vegetation of the study area is therefore seen as moderately sensitive. This excludes the localised area of Camel thorn trees (*Acacia erioloba*) in the vicinity of the Mokolo River, which is viewed as highly sensitive. The rocky areas within the powerline corridors are viewed as sensitive, but not as "No-Go" zones. The Mokolo River and Poer se Loop are seen as being sensitive.

Floristic sensitivity calculation

CRITERIA	PLANT COMMUNITY DESCRIPTION			
	Regional vegetation	Rivers	Rocky Areas	Camel thorns
Red Data Species	5	4	8	10
Habitat Sensitivity	5	10	8	10
Floristic Status	5	6	6	10
Floristic Diversity	6	7	7	7
Ecological Fragmentation	4	4	4	4
Sensitivity Index	50%	62%	66%	82%
Sensitivity Level	MEDIUM	MEDIUM / HIGH	MEDIUM / HIGH	HIGH
Development Go Ahead	GO-SLOW	GO-BUT	GO-BUT	NO-GO

Criteria are rated on an increasing sensitivity level using a scale of 1-10.

9. FAUNAL SENSITIVITY ANALYSIS

A faunal sensitivity calculation of the rocky areas in the study area renders these parts sensitive. This is due mainly to these sites been ideal habitat for red data fauna

species, as well as the relatively pristine nature of the vegetation. The regional vegetation of the study area is considered moderately sensitive due to the percentage of pristine areas. Within the regional vegetation are a number of actively cultivated lands and fallow lands that are viewed as having a low sensitivity value. Keep in mind that a number of these fallow lands have been incorporated into reserves and ranches and are slowly rehabilitating.

Faunal sensitivity calculation

CRITERIA	ANIMAL COMMUNITY DESCRIPTION			
	Regional vegetation	Rivers	Rocky Areas	Camel thorns
Red Data Species	5	6	8	4
Habitat Sensitivity	5	10	9	5
Faunal Status	5	6	6	6
Faunal Diversity	6	7	7	6
Ecological Fragmentation	4	4	4	4
Sensitivity Index	50%	66%	68%	50%
Sensitivity Level	MEDIUM	MEDIUM / HIGH	MEDIUM / HIGH	MEDIUM
Development Go Ahead	GO-SLOW	GO-BUT	GO-BUT	GO-SLOW

Criteria are rated on an increasing sensitivity level using a scale of 1-10.

10. ECOLOGICAL SENSITIVITY ANALYSIS

The ecological sensitivity of the study area is determined by combining the sensitivity analyses of both the floral and faunal components. The highest calculated unit is

taken to represent the sensitivity of that ecological unit, whether it is floristic or faunal in nature.

Ecological sensitivity of the study area

COMMUNITY	FLORISTIC SENSITIVITY	FAUNAL SENSITIVITY	ECOLOGICAL SENSITIVITY	DEVELOPMENT GO AHEAD
Regional vegetation	Medium	Medium	Medium	GO-SLOW
Rivers	Medium / High	Medium / High	Medium / High	GO-BUT
Rocky areas	Medium / High	Medium / High	Medium / High	GO-BUT
Camel thorns	High	Medium	High	NO-GO

11. IMPACT EVALUATION

Nature of impacts

No proposed impacts on the ecology of the environment were identified as beneficial. However, due to the physical nature of the powerlines, their impact will be minimal over the medium- to long-term. The impact of the substations will be greater over the long-term especially with regards to fauna returning to the immediate area. Trees and shrubs growing directly under the powerlines will be cleared and kept permanently so. This has a massive impact on the floral diversity directly within this corridor. However, due to the good condition of the veld and the low negative impacts in the immediate vicinity, the impact, when viewed on the larger scale, is minimal with regards to species destruction.

Please note that this report looks at impacts and sensitivities solely from an ecological point of view. It does not consider other impacts such as on agriculture, human settlements or even that of a visual nature.

Significance of impacts

Regional vegetation

Surface changes within the regional vegetation of the undulating plains will result in the loss of some biophysical attributes, albeit slight. These effects are for the most

part permanent, especially within the corridor of the powerlines and substation sites. However, the impacts are likely to have a low negative affect on sensitive species or Red Data species. Representative habitat is still widely present in the surrounding regions and in good condition and diversity. The implementation of mitigating measures would suffice in limiting localised impacts, as well as allowing for effective control and reduction of impacts.

Rivers

Rivers and wetlands are always seen as sensitive and should be avoided at all cost. In this instance there is no other choice but to cross over two such water courses. Namely, the Mokolo River and Poer se Loop. Mitigating measures are necessary, the implementation of which will ensure that almost no negative impact in terms of the ecological environment are felt.

Rocky areas

Surface changes within the rocky areas will result in greater loss of biophysical attributes than in those of the regional vegetation of the undulating plains. Fortunately the rocky areas encountered in the powerline corridors area spread over a large area and area not as sensitive, or unique, with regard to species diversification as would be the case of isolated rocky outcrops or ridges. Effects are mostly permanent and the significance of these impacts is therefore deemed high. Implementation of mitigating measures is considered necessary.

Camel thorns

Immediately east of the Mokolo River is a small grove of camel thorn trees (*Acacia erioloba*), which should be considered highly sensitive, due to the conservation status of the tree species and not the uniqueness of the micro ecosystem. This area needs to be handled as a “No-Go” area and avoided. For this reason, no mitigating measures are seen as been able to reduce the impact on the site, save the one of total avoidance.

Rating Matrixes for Assessing Impacts

Regional vegetation

Impact – Destruction of sensitive habitat & areas of high biodiversity	
Criteria	**Rating**
Extent	2
Duration	4
Intensity	3
Probability of occurrence	1
Total	**10**
This is rated as a MEDIUM negative impact before the implementation of mitigating and management measures	
Impact AFTER Mitigating and Management Measures	
Criteria	**Rating**
Extent	1
Duration	3
Intensity	1
Probability of occurrence	1
Total	**7**
This is rated as a LOW negative impact after the successful implementation of all mitigating and management measures	

Rivers

Impact – Destruction of sensitive habitat & areas of high biodiversity	
Criteria	**Rating**
Extent	2
Duration	4
Intensity	2
Probability of occurrence	2
Total	**10**
This is rated as a MEDIUM (bordering on HIGH) negative impact before the implementation of mitigating and management measures	
Impact AFTER Mitigating and Management Measures	

Criteria	Rating
Extent	1
Duration	3
Intensity	1
Probability of occurrence	1
Total	**6**
This is rated as a LOW negative impact after the successful implementation of all mitigating and management measures	

Rocky areas

Impact – Destruction of sensitive habitat & areas of high biodiversity	
Criteria	**Rating**
Extent	2
Duration	3
Intensity	2
Probability of occurrence	3
Total	**10**
This is rated as a MEDIUM (bordering on HIGH) negative impact before the implementation of mitigating and management measures	
Impact AFTER Mitigating and Management Measures	
Criteria	**Rating**
Extent	1
Duration	3
Intensity	1
Probability of occurrence	2
Total	**7**
This is rated as a LOW negative impact after the successful implementation of all mitigating and management measures	

Camel thorns

No rating matrix is given. There are no possible mitigating measures and the area must be approached as a “No-Go” area.

Summary of general impacts as determined from site investigations

Issue	Significance rating before and after mitigation	
	Before	**After**
Farming related issues		
Access to properties	Medium	Low
Access roads (damage to)	Low	Low
Loss of agricultural potential	Low	Low
Impacts on seasonal activities	Low	Low
Natural environment		
Erosion	Low	Low
Impact on flora	Medium	Low
Impact on fauna	Medium	Low
Importation of alien vegetation	Medium	Low
Impact of herbicides	Medium	Low
Impact on conservation areas	Medium	Low

12. MITIGATION OF IMPACTS

Powerline corridors

Plains of the regional habitat

- Due to the long (almost 65km) distance covered by the powerline corridors between Bulge River Substation and Dorset Substation it may be necessary to set up temporary storage and accommodation facilities along the route. If so, areas of flat, open lands should be selected. This need to be old, previously cultivated lands that are open and not wooded. No area should be selected where it would be necessary to cut down any trees or clear any shrub land whatsoever. Any selected temporary site still needs to be within the 100m powerline corridor. All mitigating and management measures as laid out for temporarily facilities under “Bulge River Substation” need to be adhered to.
- No site within a rocky area or within 300m of a river or stream may be used for temporary accommodation or storage.
- Positioning of the foundation slabs for the pylons must be a minimum of 10m away from the edge of all drainage lines.
- No trees outside of the powerline corridor of 8m to be removed.
- Disturbed surface areas in the construction phase to be rehabilitated. No open trenches to be left. No mounds of soils created during construction to be left.
- The sandy nature of the soils in the area makes it susceptible to soil erosion by water once disturbed, especially in steeper areas. The ground around all foundation slabs for the pylons need to be inspected before and after the summer rainy season for erosion. Any erosion found needs to be fixed and preventative measures put in place to prevent a reoccurrence of the situation.
- An ongoing programme to be implemented to mechanically control alien plant species that invade the disturbed soils around the newly erected pylons. This should be done in such as way as to allow the natural grasses and pioneer plants to colonise the disturbed areas.
- Mechanical control of alien species to be implemented within two months of completion of construction of the powerline. Thereafter ever six months.

- Surface area under powerlines to be mowed and not ploughed.
- No chemical control (herbicides) to be used in the control of alien plants or indigenous plants, except on tree and bush stumps in 8m corridors directly under powerlines.
- Removal of all construction material and equipment after construction.
- Removal of all waste construction material to an approved waste disposal site.

Rocky area

- A few rocky areas have been identified along the proposed servitude routes. These areas are considered moderately sensitive and should be approached with caution.
- The area is not seen as a “No-Go” area, but care should still be taken to avoid any unnecessary disturbance of veld or soil. Removal of trees, shrubs and other vegetation should be kept strictly to within the 8m corridor under the powerlines.
- Only a single, basic vehicle track to be constructed as an access road under pylons moving through the rocky area.
- Access roads need to be kept to an absolute minimum.
- No trees to be cut down or roads to be created to access the powerline corridor from the public road by vehicle. Or to create shortcuts into this region. Any vehicles needing to access the powerlines running through the rocky area will need to do so from out of the less sensitive plains along the corridor itself.
- No temporary storage facilities, toilets, dwellings, etc. of any kind to take place within this rocky area. Not even within the demarcated powerline corridor.
- The longest possible distance between pylons should be used in an effort to limit the footprint size on the rocky area.
- The powerline must run as straight as possible through and over rocky areas. This in an effort to limit sharp turns that literally create a larger physical footprint on the ground.

- Great care and thought must be taken into the actual positioning and construction of the foundation slabs. The soils are sandy and this area has the steepest gradient of the study site. There is therefore a real danger of soil erosion and resulting veld degradation in this area.
- The sandy nature of the soils in the area makes it susceptible to soil erosion by water once disturbed, especially in steeper areas. The ground around all foundation slabs for the pylons need to be inspected before and after the summer rainy season for erosion. Any erosion found needs to be fixed and preventative measures put in place to prevent a reoccurrence of the situation.
- Disturbance of the soils must be kept to an absolute minimum to limit the potential introduction of alien plants. This area is pristine with little to no alien infestation. Alien plants generally get a foothold in an area where the soils have been disturbed.
- Mechanical control of alien species must be implemented within two months of completion of construction of the powerline. Thereafter ever six months.
- No chemical control of alien plant species to be used.

Rivers and seasonal streams

- Two major water courses (Mokolo River and Poer se Loop) along with a few seasonal streams and drainage lines cross the corridors for the powerlines. These need to be completely avoided and no pylons may be placed directly within any one of these water courses.
- No temporary or other construction facilities to be erected or stored within 200m of the banks of the Mokolo River or the Poer se Loop stream.
- Positioning of any pylons need to be a minimum of 30m from the edge of the river banks or outside of the 1 in 100 year floodline.
- Positioning of the foundation slabs for the pylons must be a minimum of 10m away from the edge of all drainage lines.
- Under no circumstances may a pylon be placed directly in the bed of a river or drainage line.
- No temporaray ablution facilities to be placed within 200m of the banks of any of the rivers or seasonal streams.

- No temporary ablution facilites to be placed within 200m of any drainage line, even if they are dry.
- Only proper portable, chemical ablution facilities to be used and these to be positioned only within the 31m powerline servitudes.
- Portable ablution facilities only to be serviced by registered companies and on a regular basis. Under no circumstances may any effluent or sewage to be dumped in the open veld.
- Proper water facilities need to be installed and maintained for construction workers. No water from out of the rivers may be used for drinking, washing or cooking purposes.

13. GENERAL RECOMMENDATIONS

Construction phase

- Camp site, storage facilities and other necessary temporary structures to be erected within the immediate area demarcated for the Bulge River substation and the Dorset substation. With the possibility of another one (maximum two) temporary sites within the powerline corridors due to the distance between the substations.
- No open fires to be allowed outside of the Bulge River and Dorset substations sites.
- Collection of wood for fires and cooking from out of the surrounding veld is prohibited.
- In the campsite a designated area for camp fires and cooking needs to be made. Should open fires be used then an area of at least 2m by 2m needs to be cleared of any flammable materials such as grass. This
- No open fires to be allowed in the powerline corridors or adjacent areas.
- No material or machinery to be stored or placed in the open veld outside the designated area of the powerline corridors.
- Proper and adequate containers (rubbish bins) to be put in campsites for the temporary disposal of food waste and general litter generated by construction workers. These containers need to close securely to avoid items (eg. Paper and plastic) been blown into the veld, or been pushed over and rummaged

through by wild animals such as monkeys. Proper waster management is essential.

- Containers for food and general waste to be removed weekly to avoid bins overflowing their capacity.
- Under no circumstances may any sewage, waste food or general litter be dumped in the veld.
- No camp sites or other temporary structures to be erected outside the designated areas of the powerline corridors.
- No concrete to be allowed to be mixed in the veld.
- All construction activities and movement of people and machinery to remain within the designated powerline corridor.
- Temporary access roads for vehicles carrying equipment, materials, etc. into the powerline corridors need to be kept to an absolute minimum. No of these accesss roads may cross through sensitive areas.
- Work corridor to be limited to 20 metres along the route of the servitudes.

Completion phase

- Removal of all leftover construction material and equipment after construction needs to be done. This within 3 months of completion of the project.
- Removal of all waste construction material to an approved waste disposal site only.
- Proper and complete removal of all temporary accommodation sites including all litter needs to take place.
- All disturbed sites and surfaces to be rehabilitated.
- No unused sand, soil or construction materials of any kind whatsoever to be left behing in the powerline corridors.

Maintenance phase

- Mechanical control of alien plants around disturbed areas to be implemented within two months of completion of construction. Thereafter every six months. These areas are predominantly around the erected pylons. Mechanical

control to be of such a nature as to allow local grasses and other pioneers to colonise the previously disturbed areas, thereby keeping out alien invasives.

- No chemical control (herbicides) of alien plants to be used. These chemicals will have a detrimental effect on the surrounding vegetation and habitats.
- Vegetation under pylons and next to pylons to be mowed and not ploughed.
- Area around foundation slabs to be check before and after the summer rainy season for signs of soil erosion due to water run-off. Such sites need to be modified and rehabilitated to prevent ongoing erosion.
- Two of the impacts of greatest concern on the environment are the introduction of alien plants and soil erosion. As already mentioned these impacts need to be monitored and managed on an ongoing basis.

14. LINE VARIANT RECOMMENDATIONS

Line variant recommendations are made on the strength of all the impacts and mitigating actions. As well as the sensitivities of the various biophysical features and vegetation types encountered in the study area.

Comparison of the number of ecologically sensitive units alternative routes potentially impact on

Ecologically sensitive criteria	Alternative Route 1					Alternative Route 2				
	A-B	B-C	C-D	D-E	E-F	A-B	B-G	G-D	D-H	H-F
Areas of high sensitivity	0	1	0	0	0	0	1	0	0	0
No-Go areas	0	1	0	0	0	0	1	0	0	0
Rivers and streams	2	1	0	0	1	2	1	0	0	1
Rocky outcrops	0	1	0	0	1	0	1	0	0	1
Wetlands	0	0	0	0	0	0	0	0	0	0
Sub-Total	2	4	0	0	2	2	4	0	0	2
Total	**8**					**8**				

Ecologically sensitive criteria	Alternative Route 3					Alternative Route 4				
	A-B_1	**B_1-C_1**	**C_1-D**	**D-H**	**H-F**	**A-B_1**	**B_1-C_2**	**C_2-C_1**	**C_1-D**	**D-F**
Areas of high sensitivity	0	1	0	0	0	0	1	0	0	0
No-Go areas	0	1	0	0	0	0	1	0	0	0
Rivers and streams	1	1	0	0	1	1	1	0	0	1
Rocky outcrops	0	1	0	0	1	0	1	0	0	1
Wetlands	0	0	0	0	0	0	0	0	0	0
Sub-Total	1	4	0	0	2	1	4	0	0	2
Total	**7**					**7**				

When the alternative powerline routes are compared with each other regarding the possible number of ecological sensitive regions they could impact on, the results are the same for Routes 1 & 2 (both with a total of 8). Alternative Routes 3 & 4 have lower impact assessments on sensitive areas, with both having the same total count of 7. The fundamental difference making Alterantive Route 4 the preferred alternative is found on the route deviation C_2-C_1 (see ecological sensitivity maps). It is along this section of the proposed powerline routes that the other alternative routes move through much rockier areas, while the corridor of Route 4 is less rocky, more open and moves through more flat areas. The rockiness of the area increases to the north side of the public sand road (D1882). Keep in mind that rocky areas (not to be confussed with rocky outcrops or rocky ridges) have a medium/high sensitivity rating prior to mitigating measures been implemented and that they need to be avoided wherever possible.

The alternative routes also differ slighlty across the route section A-B (see ecological sensitivity maps). Here Routes 1&2 are the same, crossing over two rivers (Bulge and Malmanies) and potentially obstructing entrances to game and other farms.

While Routes 3&4 follow another route which only crosses one major river (Bulge) and doesn't potentially impact on entrances to game and other farms. For these reasons Routes 3&4 have lower ecological impact ratings over this section of the route.

The section of Alternative Route 1 (E-E_1) near the Dorset Substation, is seen as having a greater impact on the environment than the other three routes that follow the more disturbed route along the road (E-H-F), on their way to the Dorset Substation (F).

Between map points C_1 and D (see ecological sensitivity maps) Alternative Routes 3 & 4 take different routes, albeit through the same general terrein. Across this specific section there is no significant difference in the potential ecological impact of Routes 3 & 4. In other words, across this specific section the ecological recommendation is that either route is acceptable and other factors need to be taken into consideration in determining the final route (eg. Cost of construction; agreements with landowners, etc.).

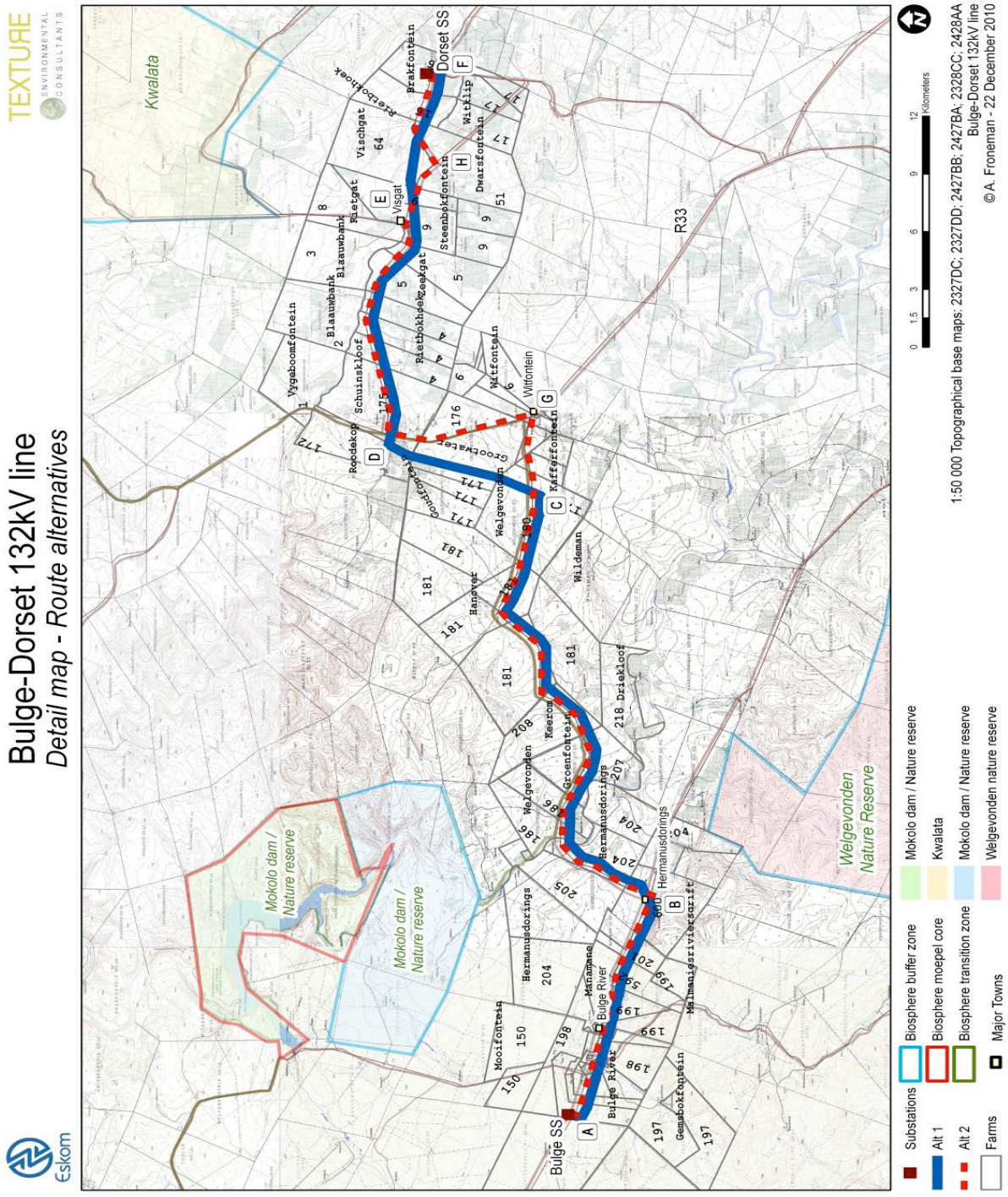
All the alternative routes cross over drainage lines en route. These have been investigated during field trips, but have not been mentioned in determining the recommended route due to the fact that they balance out between the alternative routes and therefore carry no decisive weight in the descision process. Obviously, relevent mitigating measures need to be implemented when such drainge lines are encountered during the construction phase and ongoing inspection of the powerlines.

Other factors have also been taken into account during investigations. Such as the number of sharp turns a route takes compared to a straight line between the two end points and the actual surface area in the 8m powerline corridor that potentially needs to be totally cleared of any trees or shrubs. Sharp turns are significant because the actual footprint on the ground at a turn in a powerline is much larger than along a straight line. Generally speaking the shorter and straighter a corridor is able to be constructed the better.

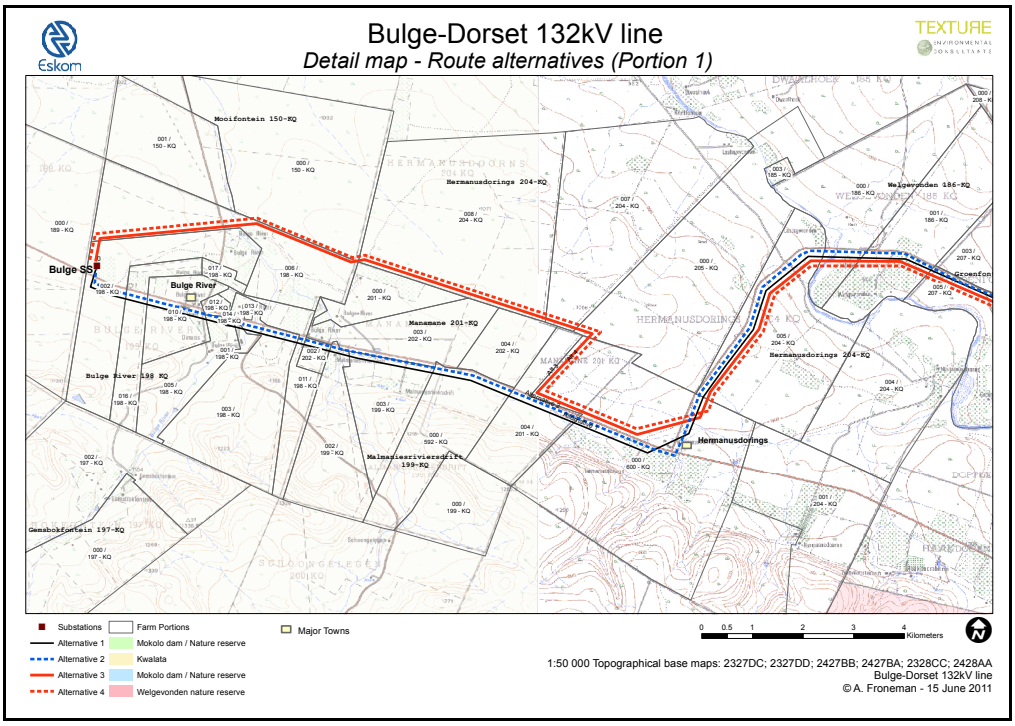
For all of the above reasons, **Alternative Route 4 (A-B_1-C_2-C_1-D-H-F)** is the ecologically recommended alternative. However, between map points (C_1 – D) both sections of Alternative Routes 4 & 3 are ecologically acceptable and either made be used.

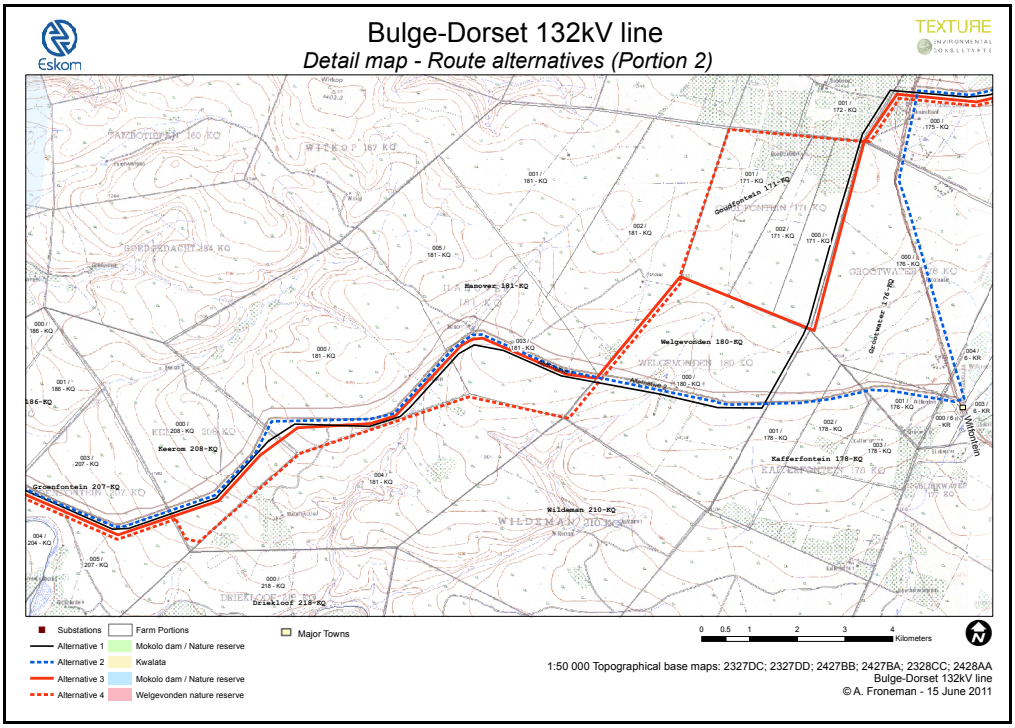
15. MAPS

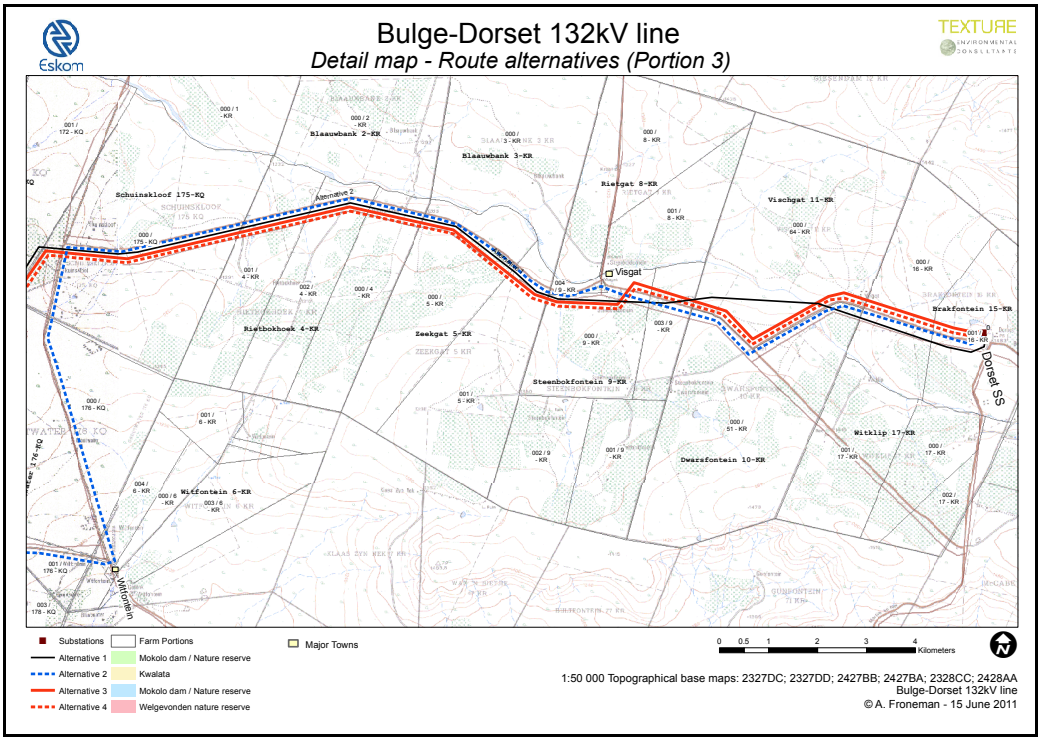
1. Location of the study area



Location of study area showing map detail (Portions 1,2 & 3)

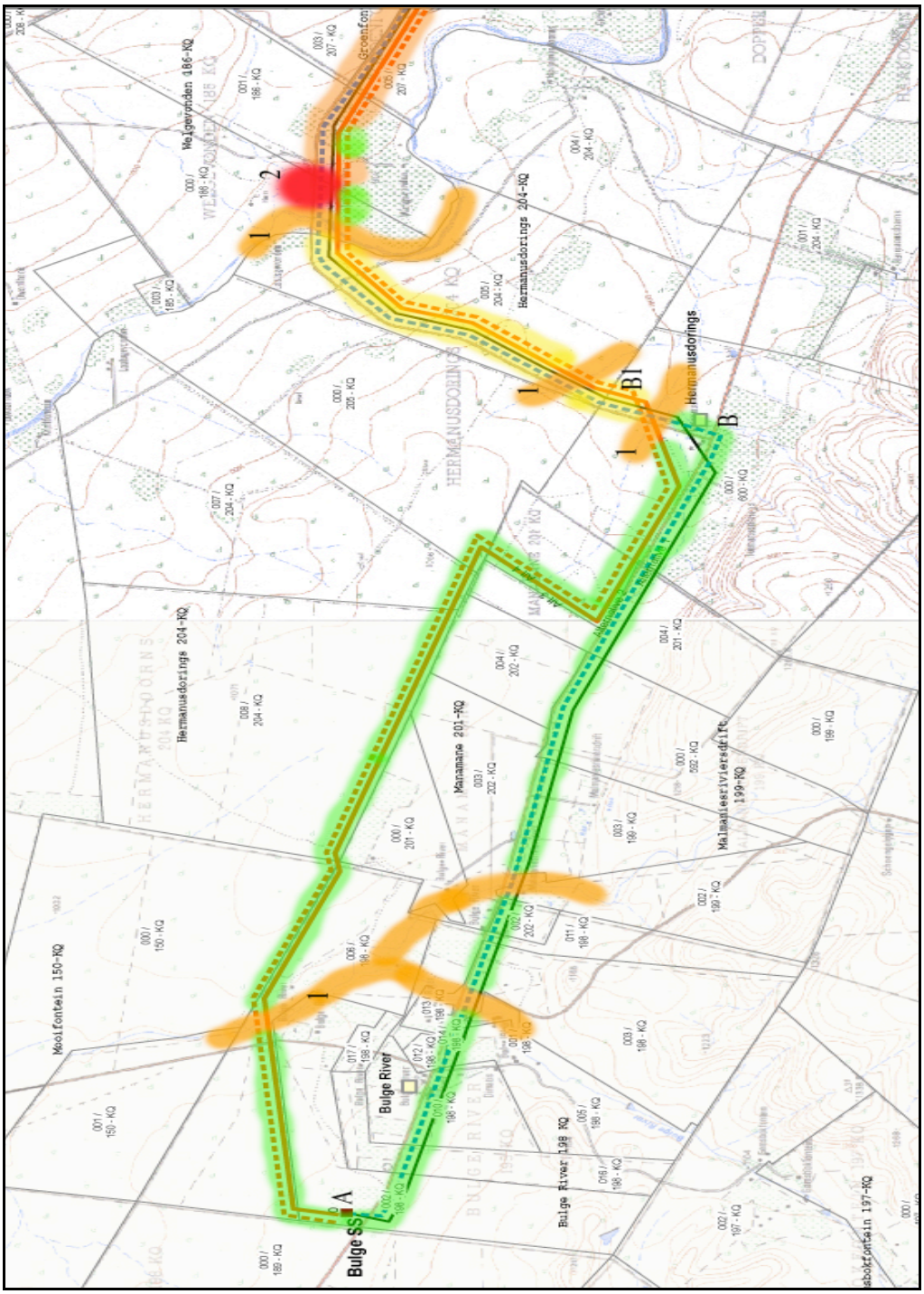




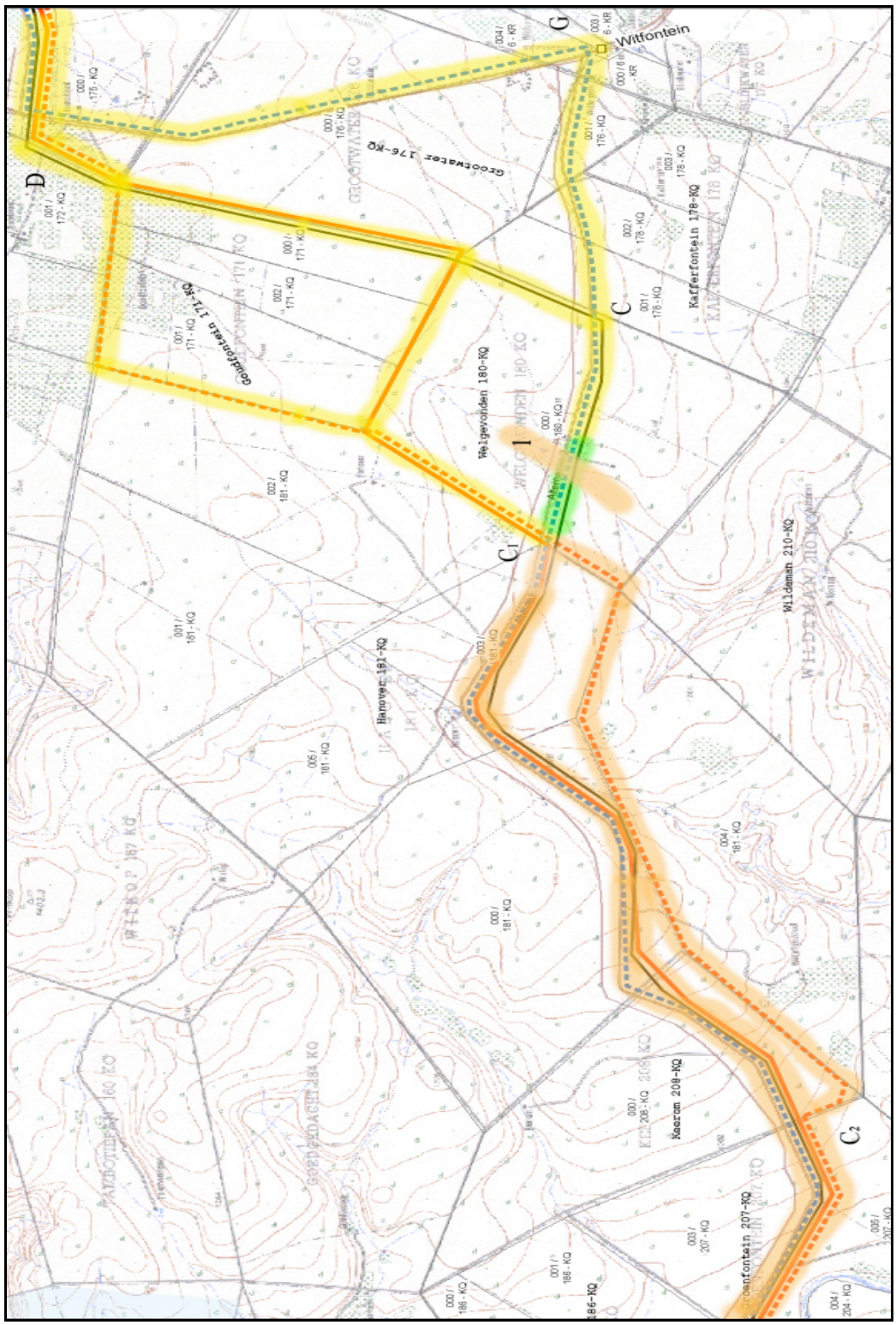

Bulge-Dorset 132kV line
Detail map - Route alternatives (Portion 3)
Eskom
TEXTURE
Schuinskloof 175-KQ
Blaauwbank 2-KR
Blaauwbank 3-KR
Rietgat 8-KR
Vischgat 11-KR
Alternative 2
Visgat
Brakfontein 15-KR
Rietbokhoek 4-KR
Zeekgat 5-KR
Steenbokfontein 9-KR
Dorset SS
Witklip 17-KR
Dwarsfontein 10-KR
Witfontein 6-KR
Witfontein
Substations
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Farm Portions
Mokolo dam / Nature reserve
Kwalata
Mokolo dam / Nature reserve
Welgevonden nature reserve
Major Towns
0 0.5 1 2 3 4
Kilometers
1:50 000 Topographical base maps: 2327DC; 2327DD; 2427BB; 2427BA; 2328CC; 2428AA
Bulge-Dorset 132kV line
© A. Froneman - 15 June 2011

2. Ecological Sensitivity of Alternative Routes

Map Detail – Route alternatives (Portion 1 of 3)



Map Detail – Route alternatives (Portion 2 of 3)



Map Detail – Route alternatives (Portion 3 of 3)

Legend to Map Detail – Route Alternatives (Portions 1,2 & 3)

Areas of High ecological sensitivity. No-Go areas.

Areas of Medium / High ecological sensitivity. Go-But areas.

Areas of Medium ecological sensitivity. Go-Slow areas.

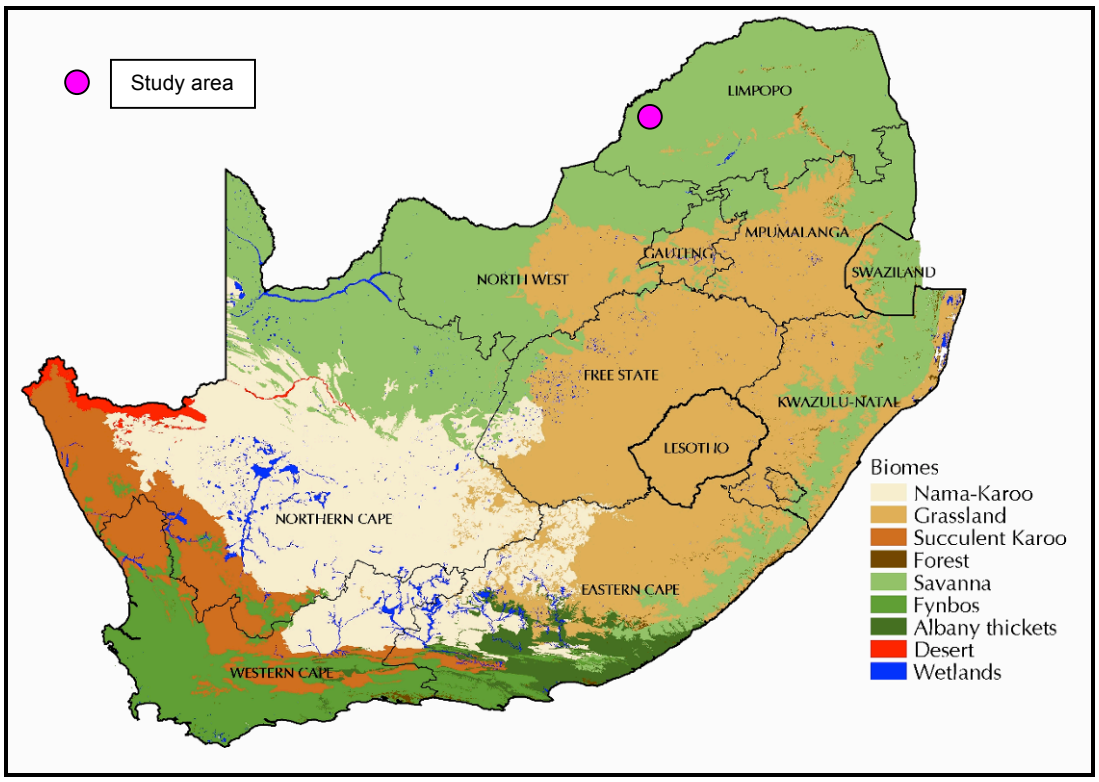
Areas of Low to Medium / Low ecological sensitivity. Go areas.

1 Rivers, streams and major drainage lines.

2 “No-Go” zone of Camel thorn trees (*Acacia erioloba*)

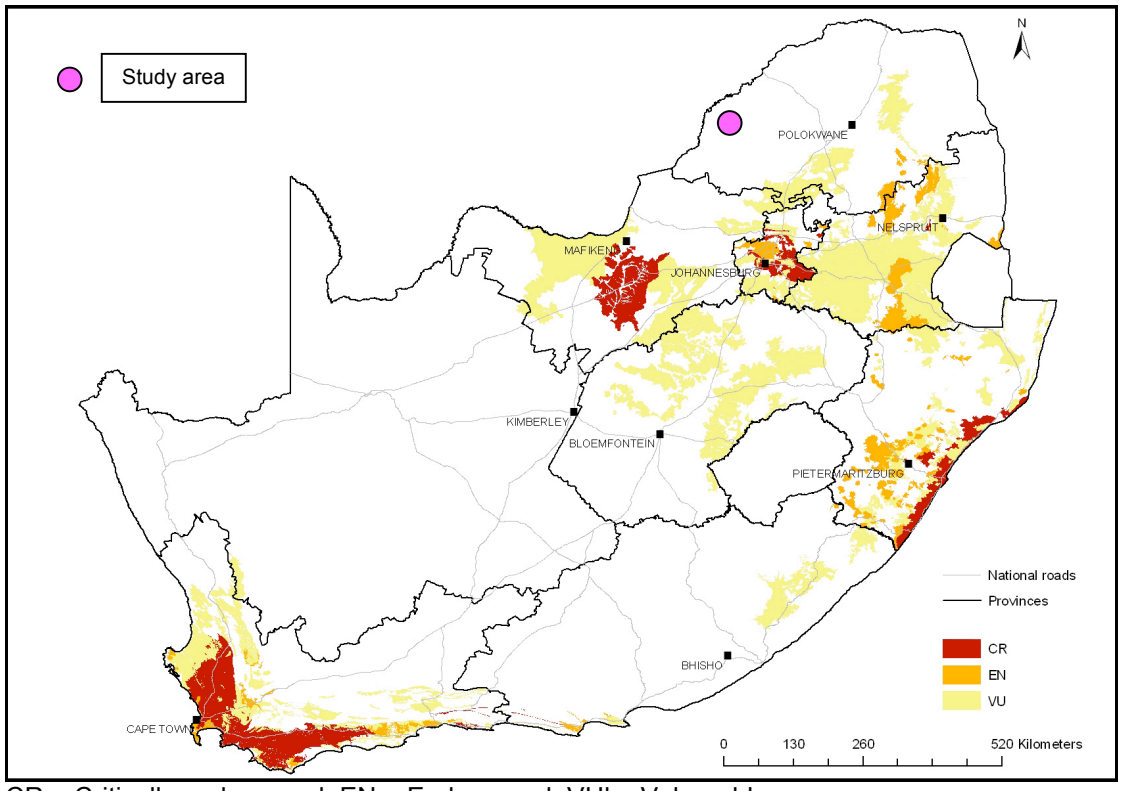
3. Biomes of South Africa

The study area falls within the Savanna Biome. Also known as the Bushveld Biome[19,20].



4. Status of biomes

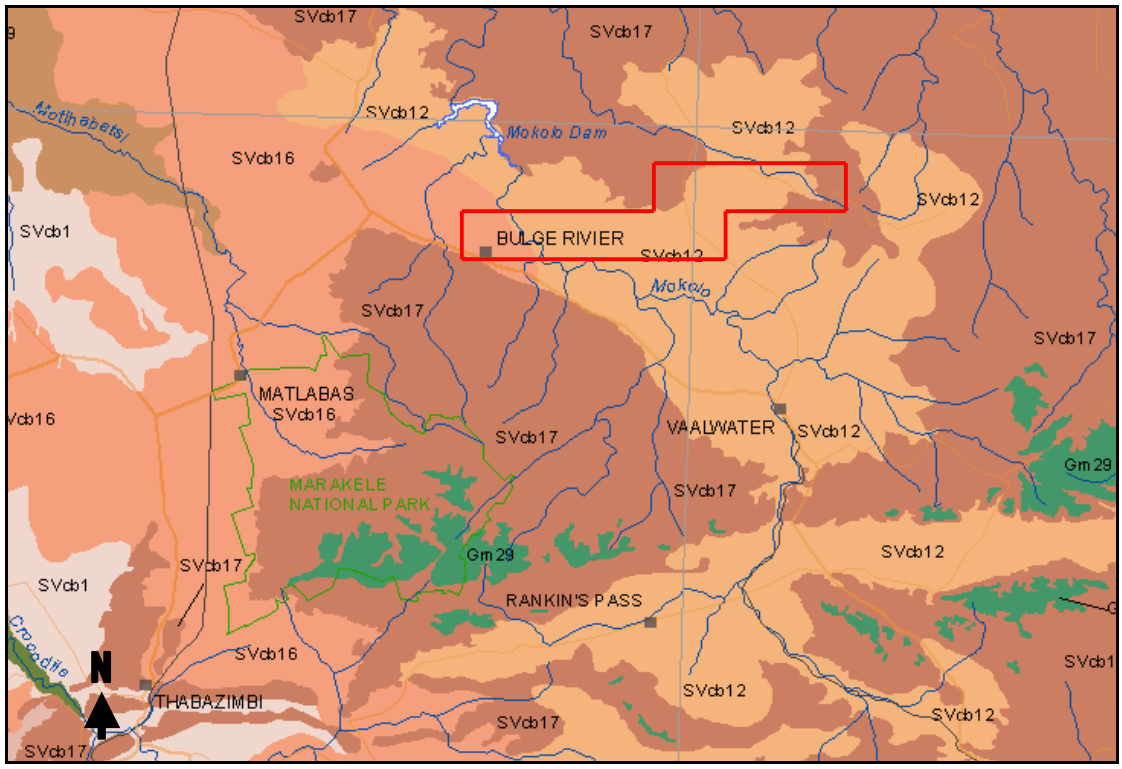
According to SANBI[19], the study area is not in an ecosystem of vulnerable status.



CR = Critically endangered; EN = Endangered; VUl = Vulnerable

5. Vegetation types of the region and study area

Based on the classification used by the South African National Botanical Institute (SANBI) (Mucina & Rutherford, 2006), the study area falls within the Savanna Biome. There study area spreads over two veldtypes. Namely, Western Sandy Bushveld and Central Sandy Bushveld. With possible elements from two close by veldtypes of Limpopo Sweet Bushveld and Waterberg Mountain Bushveld present in the study area[21].



Study area

Key to veldtypes of the region and study area

SVcb12 – Central Sandy Bushveld

SVcb16 – Western Sandy Bushveld

SVcb17 – Waterberg Mountain Bushveld

SVcb1 – Dwaalboom Thornveld

GM29 – Waterberg – Magaliesberg Summit Sourveld

16. PHOTOGRAPHS

Figure 1. Typical Central Sandy Bushveld of study area with Burkea (back-right); Silver clusterleaf (front-right); and peeling bark ochna (front middle) (Dec.2010)

Figure 2. Site of Bulge River Substation showing typical Western Sandy Bushveld with a mix of Acacia thorn trees and silver clusterleaf (Dec.2010)

Figure 3. Typical view of study area from sand road (D1882) (Dec.2010. North)

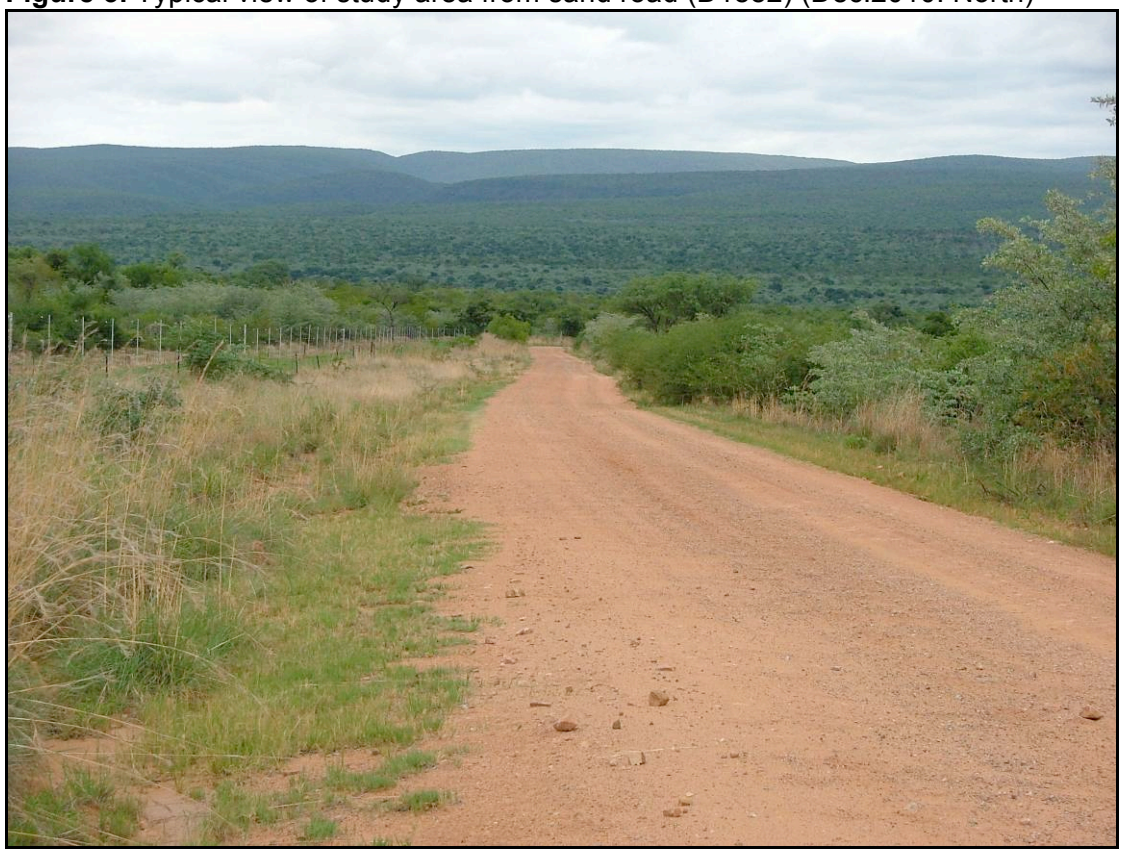


Figure 4. Areas of more open bushveld such as in the photo below are common in the study area (Dec.2010)

Figure 5. Mokolo River which runs through the study area. With a mix of natural bushveld and pivot-irrigated lands common in the region (Dec.2010)

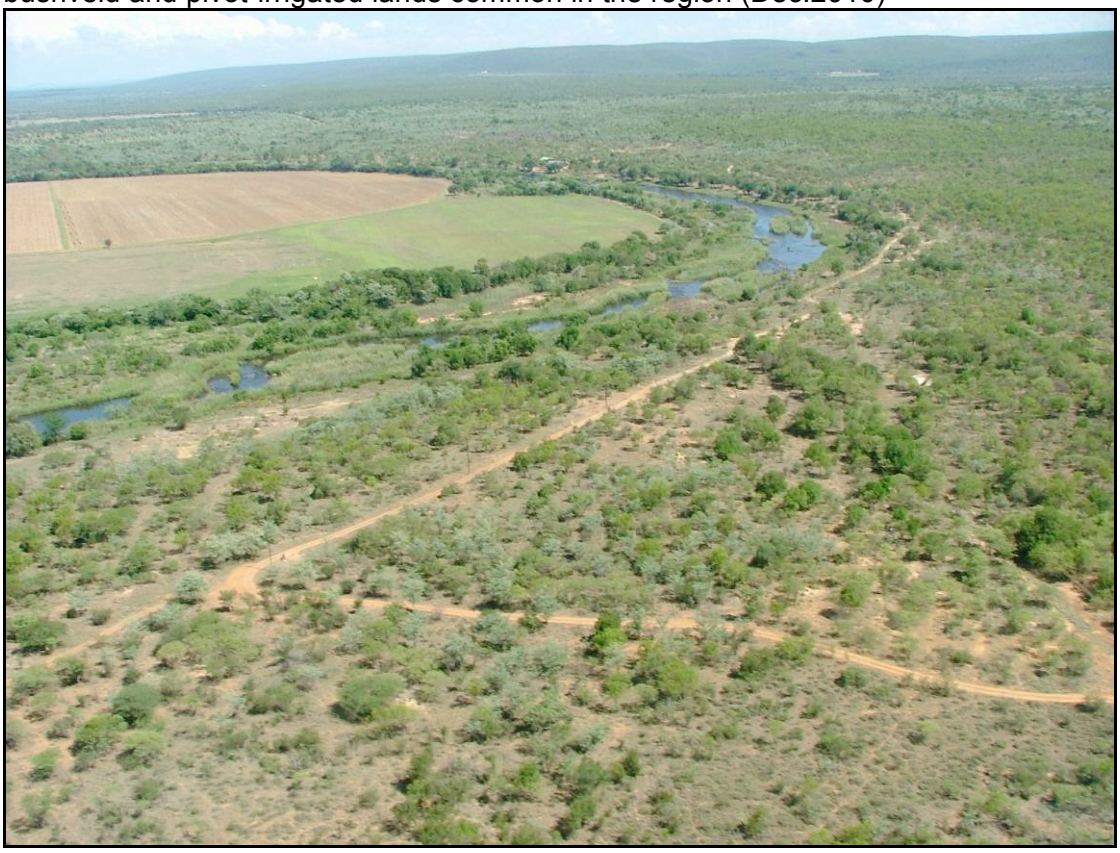


Figure 6. Rocky area east of the Mokolo River along the D1882 sand road, especially the northside. The area is viewed as fairly sensitive (Dec.2010)

Figure 7. The veld south of the sand road (D1882) tends to be less rocky in areas, compared to the north, as shown here. (June 2011. South)

Figure 8. Bushveld of the study area and surrounding region. With the Dorset Substation construction site in the upper right (Dec.2010. North)

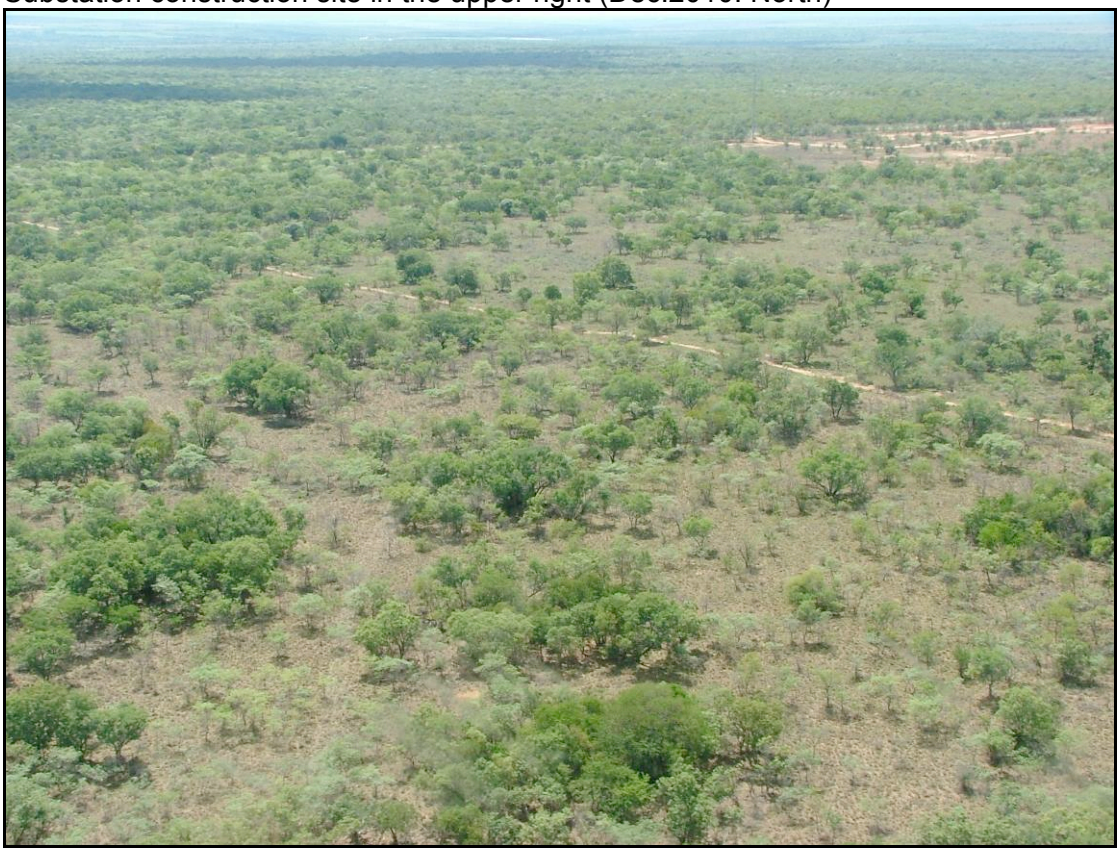


Figure 9. Dorset Substation construction site photographed from a helicopter (Dec.2010)

Figure 10. Mix of dense woodland and open areas of old farm lands typical of areas within the study site (Dec.2010)

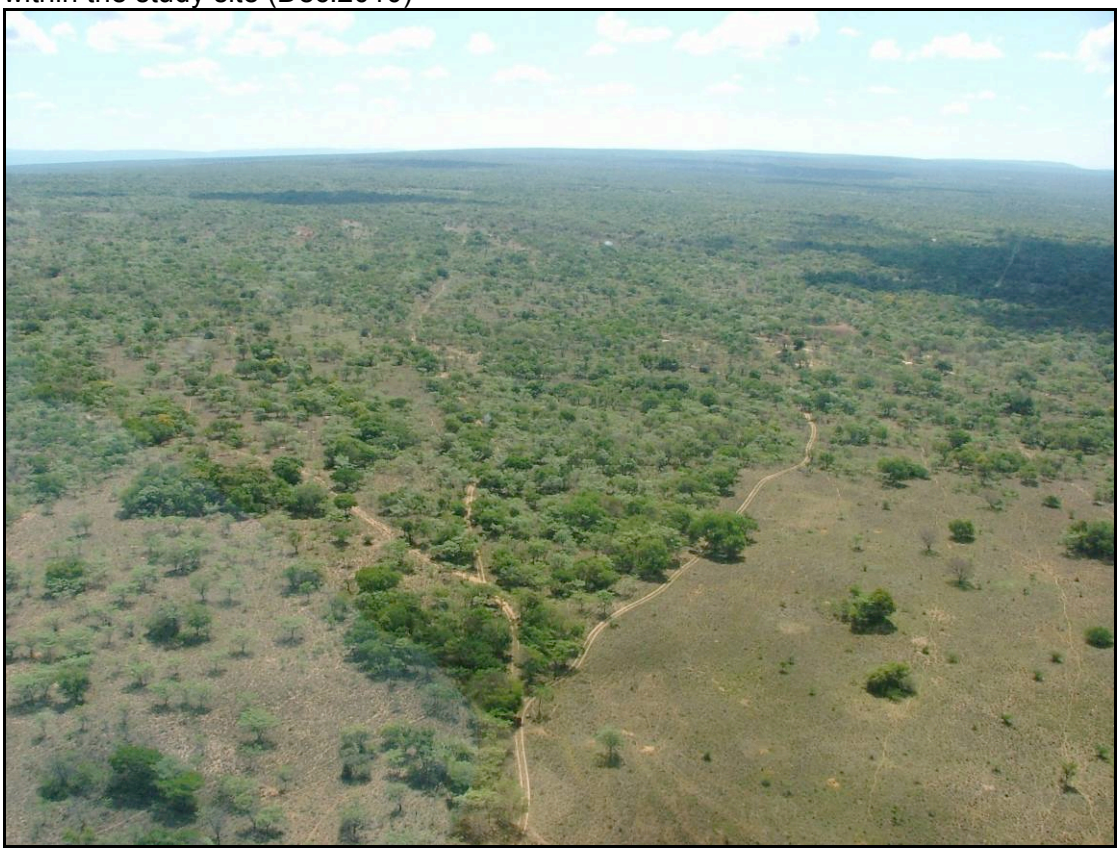


Figure 11. Dense bushveld within the study area typically found along roads (D1005 & D1162). (Dec.2010. South-west)

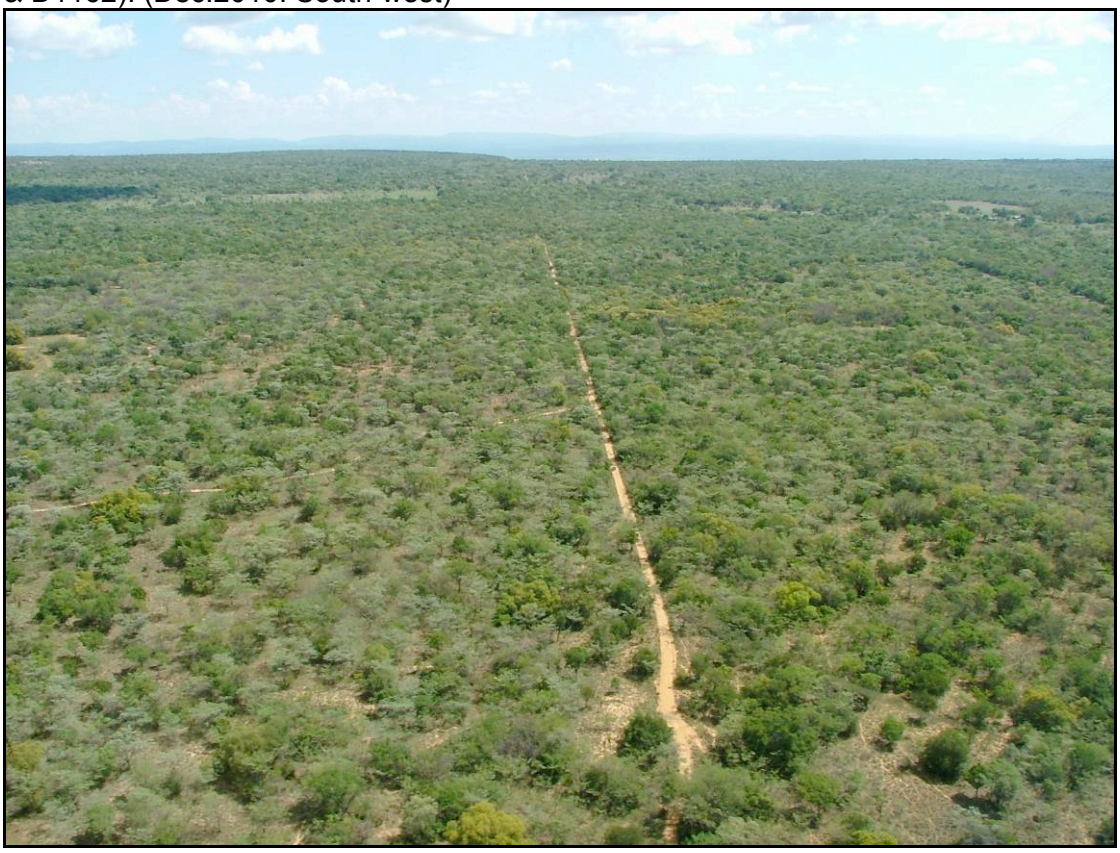


Figure 12. Large wildlife, such as impala, are common in the general region in which the study area falls due to the numerous reserves and game ranches (Dec.2010).

Figure 13. Game lodge and bushveld typical of the region in which the study area falls (Dec.2010. Lodge close to the Mokolo dam)

Figure 14. A number of cattle and other farming activities can be found in the region of the study area (Dec.2010.Farm west of Dorset Substation)

Figure 15. Bulge River shop and filling station. Just east of Bulge River Substation site (Dec.2010)

17. APPENDICES

List of plants previously recorded in the region (Tabled per grid reference)

Grid: 2327DC	
Abrus laevigatus	Exormotheca holstii
Adansonia digitata	Ficus ingens
Albizia tanganyicensis subsp. tanganyicensis	Fuirena pubescens var. pubescens
Aristida canescens subsp. canescens	Gardenia volkensii subsp. spatulifolia
Aristida congesta subsp. barbicollis	Geigeria elongata
Aristida congesta subsp. congesta	Gloriosa rigidifolia
Aristida spectabilis	Gomphocarpus tomentosus
Asparagus aggregatus	Grewia flavescens
Asparagus buchananii	Harpagophytum zeyheri subsp. zeyheri
Asparagus nelsii	Hibiscus micranthus var. micranthus
Asparagus suaveolens	Hibiscus sidiformis
Barleria lancifolia subsp. lancifolia	Hibiscus waterbergensis
Barleria saxatilis	Huernia quinta var. quinta
Bauhinia petersiana subsp. macrantha	Indigofera bainesii
Blepharis maderaspatensis	Indigofera pongolana
Bothriochloa radicans	Indigofera torulosa var. torulosa
Brachiaria nigropedata	Ipomoea gracilisepala
Brachylaena huillensis	Ipomoea holubii
Bryum argenteum	Justicia flava
Cenchrus ciliaris	Kirkia acuminata
Chamaecrista absus	Kyphocarpa angustifolia
Cleome hirta	Lobelia erinus
Cleome monophylla	Lotononis listii
Combretum hereroense	Maerua edulis
Commelina africana var. krebsiana	Mimusops zeyheri
Commelina eckloniana	Mundulea sericea subsp. sericea
Commiphora marlothii	Ochna natalitia
Commiphora mollis	Ochna pretoriensis
Crinum buphanoides	Ophioglossum polyphyllum
Crinum stuhlmannii	Ornithogalum seineri

Croton gratissimus var. gratissimus	Panicum maximum
Croton gratissimus var. subgratissimus	Pavonia transvaalensis
Croton pseudopulchellus	Peristrophe transvaalensis
Cyperus fastigiatus	Phyllanthus pentandrus
Cyperus solidus	Piriqueta capensis
Dalechampia capensis	Rhynchosia totta var. totta
Denekia capensis	Riccia okahandjana
Dicerocaryum eriocarpum	Riccia rosea
Dicoma galpinii	Senecio barbertonicus
Digitaria eriantha	Sida dregei
Dipcadi gracillimum	Sida ovata
Diplorhynchus condylocarpon	Spirostachys africana
Enneapogon scoparius	Sporobolus ioclados
Eragrostis gummiflua	Stylosanthes fruticosa
Eragrostis superba	Syzygium guineense subsp. guineense
Erythrophysa transvaalensis	Syzygium intermedium
Euclea crispa subsp. crispa	Terminalia sericea
Euphorbia transvaalensis	Tetradenia riparia
Euphorbia waterbergensis	Thunbergia neglecta
Triumfetta pentandra var. pentandra	Tylosema fassoglense
Vitex pooara	Xanthocercis zambesiaca
Vitex rehmannii	Xenostegia tridentata subsp. angustifolia
Wahlenbergia undulata	
Grid: 2327DD	
Abutilon angulatum var. angulatum	Combretum petrophilum
Acacia burkei	Combretum zeyheri
Acacia erioloba	Commelina africana var. krebsiana
Acacia erubescens	Commelina africana var. lancispatha
Acacia karroo	Commelina eckloniana
Acalypha glabrata var. pilosa	Commelina erecta
Adenia glauca	Commiphora glandulosa
Adenia gummifera var. gummifera	Corchorus kirkii
Alectra orobanchoides	Crassula lanceolata subsp. denticulata
Alistilus bechuanicus	Croton gratissimus var. subgratissimus

Andropogon schirensis	Cryptolepis cryptolepidioides
Anthocleista grandiflora	Cucumis metuliferus
Aristida spectabilis	Cyperus cyperoides subsp. cyperoides
Asparagus angusticladus	Cyperus tenuispica
Barleria affinis	Dactyloctenium giganteum
Barleria crossandriformis	Dalechampia capensis
Barleria galpinii	Dicerocaryum senecioides
Barleria lancifolia subsp. lancifolia	Dichrostachys cinerea subsp. Africana
Barleria pretoriensis	Dicoma galpinii
Barleria saxatilis	Digitaria eriantha
Barleria spinulosa	Dioscorea retusa
Bauhinia petersiana subsp. petersiana	Diospyros lycioides subsp. guerkei
Berchemia discolor	Diospyros whyteana
Blainvillea gayana	Diplorhynchus condylocarpon
Blepharis breyeri	Dolichos pratensis
Bothriochloa radicans	Dombeya rotundifolia var. rotundifolia
Brachiaria deflexa	Ekebergia capensis
Brachiaria nigropedata	Elephantorrhiza burkei
Brachiaria serrata	Elephantorrhiza goetzei subsp. goetzei
Brachylaena rotundata	Enneapogon pretoriensis
Bridelia mollis	Enteropogon macrostachyus
Burkea africana	Eragrostis rigidior
Ceratotheca triloba	Eragrostis superba
Chamaecrista absus	Eriosema psoraleoides
Chamaecrista mimosoides	Eriospermum porphyrovalve
Chloris virgata	Erythrina lysistemon
Chorisochora transvaalensis	Euclea linearis
Cleome hirta	Euclea natalensis subsp. angustifolia
Cleome maculata	Eugenia capensis
Clerodendrum glabrum	Euphorbia espinosa
Coccinia variifolia	Euphorbia neopolycnemoides
Combretum apiculatum subsp. apiculatum	Eustachys paspaloides
Combretum moggii	Evolvulus alsinoides
Combretum molle	Faurea saligna
Felicia mossamedensis	Melhania acuminata var. acuminata

Ficus ingens	Melinis repens subsp. grandiflora
Flueggea virosa subsp. virosa	Melinis repens subsp. repens
Fuirena leptostachya	Merremia pinnata
Fuirena pubescens	Mollugo nudicaulis
Gisekia africana var. africana	Monopsis decipiens
Gloriosa rigidifolia	Myrothamnus flabellifolius
Grewia bicolor var. bicolor	Nuxia congesta
Grewia flava	Ochna inermis
Grewia flavescens	Ochna natalitia
Grewia flavescens	Ochna pulchra
Grewia monticola	Ocimum gratissimum subsp. gratissimum
Grewia rogersii	Ozoroa paniculosa var. paniculosa
Grewia subspathulata	Pavonia burchellii
Gymnosporia polyacanthus	Pogonarthria squarrosa
Gymnosporia tenuispina	Polycarpaea corymbosa var. corymbosa
Harpagophytum zeyheri subsp. zeyheri	Pseudognaphalium luteo-album
Hermannia grisea	Pseudognaphalium oligandrum
Hermbstaedtia odorata var. aurantiaca	Pseudolachnostylis maprouneifolia
Heteropogon contortus	Psiadia punctulata
Heteropyxis natalensis	Pterocarpus rotundifolius
Hexalobus monopetalus var. monopetalus	Pycreus pumilus
Hibiscus calyphyllus	Rhynchosia atropurpurea
Hibiscus engleri	Rhynchosia totta
Hibiscus lunarifolius	Rotheca myricoides
Hibiscus meyeri subsp. transvaalensis	Schizachyrium sanguineum
Hibiscus micranthus var. micranthus	Schrebera alata
Hibiscus platycalyx	Sclerochiton ilicifolius
Hibiscus vitifolius subsp. vulgaris	Searsia leptodictya
Hibiscus waterbergensis	Searsia tumulicola var. tumulicola
Hypoxis angustifolia var. angustifolia	Senecio polyanthemoides
Ilex mitis var. mitis	Sesamum alatum
Indigofera pongolana	Sida pseudocordifolia
Indigofera trita subsp. subulata	Sida rhombifolia subsp. rhombifolia
Ipomoea albivenia	Sphedamnocarpus pruriens subsp. pruriens
Ipomoea holubii	Spirostachys africana

Ipomoea magnusiana	Sporobolus panicoides
Jatropha erythropoda	Sterculia rogersii
Jatropha zeyheri	Stomatostemma monteiroae
Justicia heterocarpa subsp. dinteri	Striga asiatica
Kirkia acuminata	Stylosanthes fruticosa
Kirkia wilmsii	Syzygium cordatum subsp. cordatum
Lannea discolor	Syzygium guineense subsp. guineense
Ledebouria luteola	Tephrosia longipes subsp. longipes
Leucas glabrata	Tephrosia rhodesica var. rhodesica
Limeum viscosum subsp. viscosum	Terminalia sericea
Lipocarpha rehmannii	Tinospora fragosa
Lobelia erinus	Triaspis glaucophylla
Loudetia flavida	Tricholaena monachne
Maerua parvifolia	Trochomeria macrocarpa subsp. macrocarpa
Marsdenia sylvestris	Turraea obtusifolia
Tylosema fassoglense	Xanthocercis zambesiaca
Vitex pooara	Xenostegia tridentata subsp. angustifolia
Vitex rehmannii	Ximenia caffra var. caffra
Waltheria indica	Ziziphus mucronata
Wrightia natalensis	Zornia linearis
2328CC	
Acalypha indica var. indica	Euphorbia neopolycnemoides
Acalypha villicaulis	Gnidia capitata
Acanthospermum glabratum	Grewia rogersii
Albizia tanganyicensis subsp. tanganyicensis	Gymnosporia tenuispina
Albuca abyssinica	Harpagophytum zeyheri subsp. zeyheri
Aristida congesta subsp. congesta	Hermannia boraginiflora
Aristida spectabilis	Hermannia stellulata
Aristida stipitata subsp. stipitata	Hexalobus monopetalus
Asparagus aggregatus	Hexalobus monopetalus var. monopetalus
Asparagus flavicaulis subsp. setulosus	Hibiscus waterbergensis
Asparagus racemosus	Hyparrhenia filipendula var. pilosa
Barbula eubryum	Hyperthelia dissoluta
Barleria mackenii	Ipomoea magnusiana

Barleria pretoriensis	Kalanchoe brachyloba
Bauhinia galpinii	Lantana camara
Brachymenium acuminatum	Limeum viscosum subsp. transvaalense
Bryum argenteum	Lophiocarpus tenuissimus
Bryum capillare	Melhania acuminata var. acuminata
Ceratotheca triloba	Monsonia angustifolia
Cheilanthes viridis var. glauca	Ochna inermis
Citrullus lanatus	Pavetta zeyheri subsp. zeyheri
Clerodendrum ternatum	Peristrophe transvaalensis
Combretum nelsonii	Perotis patens
Combretum zeyheri	Piriqueta capensis
Commelina africana var. lancispatha	Pogonarthria squarrosa
Coptosperma supra-axillare	Polycarpaea corymbosa var. corymbosa
Crassula swaziensis	Pseudolachnostylis maprouneifolia
Crinum stuhlmannii	Riccia atropurpurea
Crotalaria distans subsp. distans	Riccia congoana
Croton gratissimus var. gratissimus	Securidaca longepedunculata
Cyperus obtusiflorus var. obtusiflorus	Setaria lindenbergiana
Dicoma galpinii	Sporobolus conrathii
Digitaria eriantha	Striga gesnerioides
Diheteropogon amplectens var. amplectens	Tephrosia longipes subsp. longipes
Diplorhynchus condylocarpon	Terminalia sericea
Dyschoriste fischeri	Thesium resinifolium
Enneapogon pretoriensis	Trachyandra saltii var. secunda
Eragrostis chloromelas	Tylosema fassoglense
Eragrostis nindensis	Vahlia capensis subsp. vulgaris
Eragrostis pallens	Viscum combreticola
Erpodium coronatum subsp. transvaaliense	Xyris capensis Thunb.
Euclea crispa subsp. crispa	Zornia milneana
Euclea natalensis subsp. angustifolia	
Grid: 2427BA	
Acacia erubescens	Grewia bicolor var. bicolor
Acacia luederitzii var. retinens	Grewia flava
Agathisanthemum bojeri subsp. bojeri	Grewia flavescens

Alectra vogelii	Habenaria nyikana subsp. nyikana
Andropogon schirensis	Helichrysum callicomum
Anthospermum welwitschii	Helichrysum kraussii
Aristida aequiglumis	Hermannia lancifolia
Aristida congesta subsp. congesta	Hilliardiella aristata
Asparagus buchananii	Hyparrhenia filipendula var. pilosa
Bewsia biflora	Hyparrhenia newtonii var. newtonii
Brachiaria serrata	Hypericum lalandii
Bridelia mollis	Indigofera mollicoma
Buchnera reducta	Indigofera spicata var. spicata
Bulbostylis burchellii	Ipomoea albivenia
Cenchrus ciliaris	Ipomoea obscura var. obscura
Chamaecrista comosa	Ischaemum afrum
Cleome monophylla	Jamesbrittenia burkeana
Combretum apiculatum subsp. apiculatum	Justicia anagalloides
Corchorus kirkii	Kirkia wilmsii
Crassula lanceolata subsp. transvaalensis	Kohautia virgata
Cucumis humifructus	Kyllinga alba
Cynodon dactylon	Lantana rugosa
Cyperus albostriatus	Ledebouria inquinata
Cyperus cyperoides subsp. pseudoflavus	Ledebouria marginata
Cyperus obtusiflorus var. obtusiflorus	Leonotis ocymifolia var. schinzii
Cyperus sphaerospermus	Lippia wilmsii
Dianthus transvaalensis	Loudetia simplex
Dichanthium annulatum var. papillosum	Monsonia angustifolia
Dichapetalum cymosum	Mundulea sericea subsp. sericea
Dicoma galpinii	Nuxia congesta
Enneapogon cenchroides	Oldenlandia herbacea var. herbacea
Enneapogon scoparius	Oxalis latifolia
Eragrostis capensis	Oxalis obliquifolia
Eragrostis gummiflua	Panicum maximum
Eragrostis hierniana	Panicum natalense
Eragrostis pallens	Panicum stapfianum
Eragrostis racemosa	Parmotrema austrosinense
Eragrostis stapfii	Pentanisia angustifolia

Eragrostis trichophora	Perotis patens
Eriosema psoraleoides	Phyllanthus incurvus
Euclea natalensis subsp. angustifolia	Pogonarthria squarrosa
Fadogia homblei	Pollichia campestris
Felicia muricata subsp. muricata	Pycnostachys reticulata
Gazania krebsiana subsp. serrulata	Rhoicissus revoilii
Gisekia africana var. pedunculata	Schizachyrium sanguineum
Gladiolus elliotii	Schmidtia pappophoroides
Schoenoplectus muricinux	Striga asiatica
Scleria bulbifera	Tarchonanthus parvicapitulatus
Searsia leptodictya	Teramnus labialis subsp. labialis
Securidaca longepedunculata	Thunbergia atriplicifolia
Seddera suffruticosa	Trachypogon spicatus
Selago lacunosa	Trichostomum brachydontium
Senecio venosus	Triumfetta sonderi
Solanum lichtensteinii	Vernonia galpinii
Spermacoce senensis	Vernonia staehelinoides
Sphedamnocarpus pruriens	Vitex pooara
Sporobolus panicoides	Vitex rehmannii
Sporobolus pectinatus	Wahlenbergia undulata
Stachys natalensis var. galpinii	Xenostegia tridentata subsp. angustifolia
Stipagrostis uniplumis var. uniplumis	
Grid: 2427BB	
Acacia erubescens	Harpagophytum zeyheri subsp. zeyheri
Alistilus bechuanicus	Helichrysum callicomum
Andropogon chinensis	Helichrysum kraussii
Aneilema hockii	Helichrysum setosum
Aristida spectabilis	Hermannia grisea
Blepharis breyeri	Hermannia stellulata
Bryum capillare	Hibiscus engleri
Bulbostylis burchellii	Hibiscus waterbergensis
Bulbostylis hispidula subsp. pyriformis	Indigofera adenoides
Campylopus pyriformis	Indigofera melanadenia
Cenchrus ciliaris	Indigofera spicata var. spicata

Cheilanthes viridis	Indigofera vicioides var. vicioides
Chlorophytum galpinii var. galpinii	Ipomoea coptica
Chorisochora transvaalensis	Ipomoea transvaalensis
Cissus cactiformis	Isolepis costata
Combretum kraussii	Justicia minima
Commelina africana var. lancispatha	Ledebouria revoluta
Crotalaria virgultalis	Lipocarpha chinensis
Croton gratissimus var. subgratissimus	Lotononis listii
Cyperus albostriatus	Mundulea sericea subsp. sericea
Cyperus capensis	Nymphaea nouchali var. caerulea
Cyperus denudatus var. denudatus	Ocimum angustifolium
Cyperus sphaerospermus	Oxalis depressa
Cyphostemma puberulum	Pachystigma triflorum
Drimia altissima	Pearsonia uniflora
Drimiopsis burkei subsp. burkei	Pegolettia tenuifolia
Eleocharis acutangula	Phyllanthus incurvus
Eragrostis pallens	Phyllanthus pentandrus
Eriosema pauciflorum var. pauciflorum	Polygala sphenoptera var. sphenoptera
Erlangea misera	Polygala uncinata
Eulophia angolensis	Pupalia lappacea var. lappacea
Fimbristylis dichotoma subsp. dichotoma	Pycreus flavescens
Fuirena pubescens var. pubescens	Pycreus macranthus
Gladiolus elliotii	Pycreus nitidus
Grewia flavescens var. olukondae	Rhynchosia totta var. totta
Riccia congoana	Strychnos madagascariensis
Riccia okahandjana	Stylosanthes fruticosa
Schotia brachypetala	Syncolostemon canescens
Sclerochiton ilicifolius	Tephrosia longipes subsp. longipes
Selaginella dregei	Tephrosia purpurea subsp. leptostachya
Senecio inaequidens	Terminalia sericea
Sesbania bispinosa	Tribulus zeyheri subsp. zeyheri
Sida cordifolia subsp. cordifolia	Triraphis schinzii
Sida dregei	Triumfetta angolensis
Solanum catombelense	Triumfetta annua
Solanum coccineum	Vahlia capensis

Spermacoce senensis	Vernonia poskeana subsp. botswanica
Sphedamnocarpus pruriens	Xyris congensis
Stachys natalensis var. natalensis	Ziziphus zeyheriana
Strychnos cocculoides	Zornia glochidiata

2428AA	
Acacia burkei	Dichapetalum cymosum
Acacia caffra	Dicoma anomala subsp. gerrardii
Acacia karroo	Digitaria debilis
Acacia robusta subsp. robusta	Digitaria eriantha
Agathisanthemum bojeri subsp. bojeri	Diospyros lycioides subsp. guerkei
Argyrolobium transvaalense	Diplorhynchus condylocarpon
Aristida aequiglumis	Dombeya rotundifolia
Aristida canescens subsp. canescens	Dombeya rotundifolia var. rotundifolia
Aristida congesta subsp. congesta	Eragrostis chloromelas
Aristida scabrivalvis subsp. scabrivalvis	Eragrostis gummiflua
Aristida stipitata subsp. graciliflora	Eragrostis lehmanniana var. chaunantha
Asystasia schimperi	Eragrostis nindensis
Barleria rehmannii	Eragrostis rigidior
Berchemia zeyheri	Eragrostis stapfii
Blepharis maderaspatensis	Eragrostis superba
Brachiaria nigropedata	Eragrostis trichophora
Bryum capillare	Euphorbia ingens
Bulbostylis hispidula subsp. pyriformis	Euphorbia neopolycnemoides
Burkea africana	Evolvulus alsinoides
Carissa bispinosa	Faurea saligna
Ceropegia crassifolia var. crassifolia	Felicia mossamedensis
Ceropegia turricula	Ficus thonningii
Chamaecrista absus	Gloriosa rigidifolia
Chlorophytum galpinii var. norlindhii	Gnidia microcephala
Clematis oweniae	Grewia occidentalis var. occidentalis
Cleome maculata	Hyparrhenia quarrei
Clutia pulchella var. pulchella	Hypericum lalandii
Combretum molle	Hyperthelia dissoluta
Combretum nelsonii	Indigofera melanadenia

Combretum zeyheri	Ipomoea ommanneyi
Commiphora africana var. africana	Ischaemum fasciculatum
Commiphora glandulosa	Justicia betonica
Commiphora mollis	Justicia petiolaris subsp. incerta
Commiphora schimperi	Justicia protracta subsp. protracta
Crabbea hirsuta	Kalanchoe paniculata
Cussonia spicata	Kirkia acuminata
Cymbopogon pospischilii	Leucas martinicensis
Cyperus esculentus var. esculentus	Limeum fenestratum var. fenestratum
Cyperus fastigiatus	Miscanthus junceus
Cyperus rupestris var. rupestris	Myriophyllum aquaticum
Ocimum americanum var. americanum	Searsia pallens
Olea europaea subsp. africana	Searsia pyroides var. pyroides
Ozoroa paniculosa var. paniculosa	Setaria sphacelata var. torta
Panicum natalense	Sporobolus pyramidalis
Panicum repens	Striga elegans
Pavonia transvaalensis	Strychnos spinosa subsp. spinosa
Pentarrhinum insipidum	Tephrosia lupinifolia
Pittosporum viridiflorum	Themeda triandra
Plantago major	Thunbergia neglecta
Plectranthus cylindraceus	Trachypogon spicatus
Pogonarthria squarrosa	Tragia rupestris
Pollichia campestris	Trichoneura grandiglumis
Pterocarpus rotundifolius subsp. rotundifolius	Tylosema fassoglense
Pupalia lappacea var. lappacea	Urochloa brachyura
Rhoicissus tridentata subsp. cuneifolia	Vitex rehmannii
Rhynchosia totta var. totta	Wahlenbergia denticulata var. transvaalensis
Rotheca louwalbertsii	Wahlenbergia krebsii
Schmidtia pappophoroides	Xenostegia tridentata subsp. angustifolia
Schotia brachypetala	Zornia capensis subsp. capensis
Searsia leptodictya forma leptodictya	

Legislation on weeds and invasive plants in South Africa

The present legislation forms part of the Conservation of Agricultural Resources Act, 1983 (Act No 43 of 1983) (CARA). Regulations 15 and 16 under this Act, which concerns problem plants, were amended during March 2001. CARA is currently in the process of being revised[11,12,22].

Under this legislation, landowners are responsible for the control of invasive alien plants (IAP) on their properties. IAPs are divided into three categories as follows:

Category 1: Species (e.g. Triffid Weed, Lantana) which are generally the worst offenders. As declared weeds, they may not occur on any land or on any inland water surface throughout South Africa. No person may sell, advertise, exhibit, transmit, send, deliver for sale, exchange or dispose of any weed. It is also illegal to cause or permit the dispersal of any weed from one place to another.

Category 2: Species (such as pine and gum) which are also problematic, but are more commonly grown for commercial purposes or any viable and beneficial function, such as woodlots, fire belts, building material, animal fodder and soil stabilization.

Category 3: Species (such as Syringa and Morning Glory) which are generally ornamental plants and may be retained, but no new planting or trade or propagating of these plants is permitted. If weeds or invader plants occur contrary to the provisions of these regulations, the land user must control them by means of any of the control methods that are appropriate for the species concerned. Any action taken to control weeds or invader plants must be executed with caution and in a manner that will have minimal environmental impact.

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