# APPENDIX B

# FLORA AND FAUNA SPECIALIST REPORT

# PROPOSED ESKOM HOLDINGS DWAALBOOM SWITCHING STATION DEVELOPMENT

## ECOLOGICAL SURVEY

Prepared for:

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# Executive Summary.

Nemai Consulting requested a general ecological assessment for the proposed Eskom Holdings Dwaalboom Switching Station near the town of Nonceba in the North West Province. There are three locality options for the proposed development that are situated within close proximity to one another.

The ecological assessment was to focus on ascertaining whether any ecologically sensitive habitat units existed in association with any of the three locality options and to determine if the sites were relevant to any RDL (Red Data Listed) faunal or floral species recorded from the region. Protected flora was also to be identified. An EMP (Environmental Management Plan) was then also to be developed following the outcome of the survey and a recommendation made as to which of the three proposed development localities, if developed, would have the least ecological impact on the surrounding areas and what impact this would have on biodiversity conservation within the region. These various proposed sites were investigated during a field assessment in December 2008 that determined the overall Present Ecological State (PES) for the proposed development sites and adjacent areas.

A desktop study to gain background information on the physical habitat and potential faunal and floral biodiversity lists of the proposed development site and surrounding areas was initially undertaken. These lists included the RDL species applicable to the area and a description of the physical habitat and vegetation types represented within the area. This information was then cross-referenced with the data from the habitat assessments done during the field survey.

**Vegetation type status and general area assessment.**

A desktop study was undertaken to gain background information for the proposed site. The vegetation type falls within a transitional ecotone between *Madikwe Dolomite Bushveld* and *Dwaalboom Thornveld* and therefore all sites showed floral species composition features typical of both of these vegetation units. The area falls within the *Savanna* Biome and *Central Bushveld* Bioregion.

The proposed development area has been subjected to limited infrastructure development in the form of a powerline and associated servitude. The surrounding land use was dominated by agriculture with the land being used for the grazing of livestock (cattle and sheep). The proposed sites were dominated by a savanna bushveld that had retained strong features typical of the

vegetation unit. Some vegetation transformation was evident to a greater or lesser extent that varied from one site to the next.

***Site A*** was regarded as having retained the highest PES and also incorporated the highest density of protected tree species (*Combretum imberbe* and *Sclerocarya birrea* subsp *caffra*). It is therefore not recommended that this site be utilised for the proposed development activities.

***Site B*** was regarded as having the suffered the greatest ecological impacts and subsequently was categorised as having the lowest PES of the three sites. This site also incorporated the least amount of protected tree species. Development within this site is regarded as having the least ecological impact of the three sites.

***Site C*** also had seen a fair amount of ecological degradation through poor veld management and livestock grazing. This site, however, still incorporated a relatively high density of protected tree species and therefore it is recommended that this site take priority as a conserved area over Site B.

No RDL floral species were observed during the field assessments and none are expected to occur in association with any of the three proposed localities.

**Faunal assessment.**

Faunal assessment diversity was assessed initially as a desktop study and then a field assessment through visual observations. No RDL faunal species were observed during the field survey of the proposed development site.

**Table 1: Summary of RDL species status for the proposed development area.**

| Taxon | Total species | Total RDL | RDL category* | | | | | | POC# ≥60% |
|---|---|---|---|---|---|---|---|---|---|
| | | | CE | EN | VU | NT | RA | DD | |
| **Mammals** | 109 | 28 | 0 | 2 | 6 | 9 | 0 | 11 | 2 |
| **Birds** | 390 | 15 | 0 | 0 | 4 | 0 | 5 | 6 | 2 |
| **Reptiles** | 66 | 2 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| **Amphibians** | 21 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| **Totals:** | | **46** | **0** | **2** | **12** | **11** | **6** | **17** | **4** |

*CE-Critically endangered; EN-Endangered; VU-Vulnerable; NT-Near threatened RA-Rare & DD-Data deficient.
#POC – Probability of Occurrence.

The desktop study, when cross-referenced with the data gathered from the field assessment, revealed that the proposed development site and surrounding areas does potentially offer suitable habitat for various RDL faunal species. The most relevant species are presented in Table 1 and Table 2, where the results of the RDSIS (Red Data Sensitivity Index Score) (see Section 7) for fauna are presented.

The RDSIS for RDL faunal species for the proposed development site calculated to 19.2% (see section 7. RDSIS). This is a *low* relevance score, translating into a related degree of potential for supporting RDL faunal species inhabitation. The species that were awarded a POC value of greater or equal to 60% are presented in Table 2.

**Table 2: RDL fauna species summary for species with a POC value of ≥60%.**

| Common name | Species | RDL status | POC |
|---|---|---|---|
| **MAMMALS** | | | |
| *Tatera leucogaster* | Bushveld Gerbil | DD | 70.0 |
| *Elephantulus brachyrhynchus* | Short-snouted Elephant-shrew | DD | 60.0 |
| **BIRDS** | | | |
| *Gyps coprotheres* | Cape Vulture | VU | 70.0 |
| *Polemaetus bellicosus* | Martial Eagle | VU | 65.0 |

**Impact Significance Ratings.**

The perceived impacts appropriate to the proposed development activities are presented in Table 3, where the impacts both before and after application of appropriate mitigation measures are shown. It can be seen that negative ecological impacts can generally be reduced with application of appropriate mitigation measures. See Appendix D for the EMP for the proposed development activities that is aimed at negating the ecological impacts of the activities through the various phases of the development.

**Table 3: Significance assessment of the perceived major environmental impacts both before and after mitigation measures that are applicable to the proposed development activities.**

| Potential environmental impact | Project activity or issue | Environmental significance ***before*** mitigation | | | | | | | | Environmental significance ***after*** mitigation as per EMP | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | S | D | I | P | E | R | Conf | SP | S | D | I | P | E | R | Conf | SP |
| **PRECONSTRUCTION & CONSTRUCTION PHASES** | | | | | | | | | | | | | | | | | |
| Habitat destruction | Vegetation removal and soil stripping leading to habitat loss. | 1 | 3 | 3 | 4 | 2 | 2 | High | 26 | 1 | 3 | 3 | 4 | 2 | 2 | High | 26 |
| Biodiversity impacts | Impact on protected tree species. | 2 | 5 | 3 | 5 | 3 | 2 | High | 53 | 2 | 5 | 3 | 5 | 3 | 2 | High | 53 |
| Biodiversity impacts | Habitat destruction that would lead to decreased potential to support biodiversity. | 2 | 3 | 1 | 4 | 2 | 2 | High | 22 | 2 | 3 | 1 | 4 | 2 | 2 | High | 22 |
| Biodiversity impacts | Subsistence hunting & gathering of natural resources by labour. | 2 | 4 | 3 | 3 | 3 | 1 | High | 32 | 2 | 4 | 1 | 1 | 1 | 3 | High | 2 |

| Potential environmental impact | Project activity or issue | Environmental significance *before* mitigation | | | | | | | | Environmental significance *after* mitigation as per EMP | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | S | D | I | P | E | R | Conf | SP | S | D | I | P | E | R | Conf | SP |
| Compaction of soils | Movement of heavy machinery leading to soil compaction. | 1 | 1 | 3 | 4 | 2 | 2 | High | 18 | 1 | 1 | 3 | 4 | 2 | 2 | High | 18 |
| Soil contamination | Pollution of soils due to oil/fuel leaks & wastes. | 2 | 4 | 3 | 2 | 2 | 4 | High | 10 | 2 | 4 | 1 | 1 | 2 | 4 | High | 1 |
| Soil erosion | Stockpiled topsoil & disturbed soils due to vegetation stripping leading to soil erosion. | 2 | 1 | 1 | 2 | 1 | 3 | High | 1 | 2 | 1 | 1 | 2 | 1 | 3 | High | 1 |
| **CONSTRUCTION PHASE** | | | | | | | | | | | | | | | | | |
| Biodiversity impacts | Subsistence hunting & gathering of natural resources by labour. | | | | | | | High | 32 | 2 | 4 | 1 | 1 | 1 | 3 | High | 2 |
| Compaction of soils | Movement of heavy machinery leading to soil compaction. | | | | | | | High | 18 | 1 | 1 | 3 | 4 | 2 | 2 | High | 18 |
| Soil contamination | Pollution of soils due to oil/fuel leaks & wastes. Oil leaks from transformers. | | | | | | | High | 10 | 2 | 4 | 1 | 1 | 2 | 4 | High | 1 |
| **DECOMMISSIONING PHASE** | | | | | | | | | | | | | | | | | |
| Biodiversity impacts | Subsistence hunting & gathering of natural resources by labour. | | | | | | | High | 32 | 2 | 4 | 1 | 1 | 1 | 3 | High | 2 |
| Compaction of soils | Movement of heavy machinery leading to soil compaction. | | | | | | | High | 18 | 1 | 1 | 3 | 4 | 2 | 2 | High | 18 |
| Soil contamination | Pollution of soils due to oil/fuel leaks & wastes. Oil leaks from transformers. | | | | | | | High | 10 | 2 | 4 | 1 | 1 | 2 | 4 | High | 1 |
| Exotic vegetation encroachment. | Exotic vegetation encroachment following decommissioning & lack of ongoing management of exotic vegetation. | | | | | | | High | 45 | 2 | 1 | 1 | 2 | 2 | 3 | High | 3 |

*[Significance of Environmental Impact (SP) = Consequence x Probability (P),*
*where Consequence = {[Spatial extent (S) + Duration (D) + Intensity (I) + Effects on important ecosystems (E)] - Reversibility (R)} X Probability (P).*
*SP ratings: 0-33 (Low), 34-74 (Medium), 75-100 (High)*

## Conclusions & Recommendations.

Field surveys were undertaken during December 2008 to ascertain the ecological state of the three locality options for the proposed Eskom Holdings Dwaalboom Switching Station development. It was found that the proposed development area has suffered general veld transformation and retrogression and that no particularly ecologically sensitive habitat areas were observed. The sites were found to incorporate protected tree species that will need to be considered during the planning and construction phase of the proposed development activities. Specific conclusions and recommendations are listed below:

- Some tree species were observed that will be affected by the proposed development activities (*Combretum imberbe* and *Sclerocarya birrea* subsp *caffra*). These species are protected within South Africa under the National Forests Act (Act 84 of 1998) and therefore application for permits to remove them need to be made to the relevant authority (DWAF) prior to commencement of the proposed development activities;

- No RDL faunal or floral species were noted at any of the proposed localities during the field assessment;
- A desktop review and further field observations showed the proposed development sites to have limited relevance to RDL species conservation within the region;
- Site B was found to have suffered the greatest degree of veld retrogression and also incorporated the lowest density of protected tree species. It is therefore recommended that this site be considered as the most viable locality option from an ecological standpoint;
- An EMP has been proposed and it is recommended that the points outlined therein be adhered to (Appendix D). This will ensure that the proposed development activities will inflict the least amount of negative ecological impact as possible.

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## Glossary of Terms and Acronyms.

*Alien vegetation* – Plants that do not occur naturally within the area but have been introduced either intentionally or unintentionally.

*Biome* – A broad ecological unit representing major life zones of large natural areas – defined mainly by vegetation structure and climate.

*Bush encroachment* – A state where undesirable woody elements gain dominance within a grassland, leading to depletion of the grass component. Typically due to disturbances and transformations as a consequence of veld mismanagement (overgrazing, incorrect burning, etc.).

*Decreaser grass* – Grass abundant in veld in good condition, which decreases when veld is under- or over-utilised.

℃ – Degrees Celsius.

*Ecotone* – An area where one ecological feature gradually transitions to the next due to a change (mainly) in geology, topography or other geophysical feature. A typical example would be where one vegetation type gradually transitions to the next.

*EMP* – Environmental Management Plan.

*Endangered* – Organisms in danger of extinction if causal factors continue to operate.

*Endemic species* – Species that are only found within a pre-defined area. There can therefore be sub-continental (e.g. southern Africa), national (South Africa), provincial, regional or even within a particular mountain range.

*Exotic vegetation* – Vegetation species that originate from outside of the borders of the biome. Usually international in origin.

*Ex situ conservation* – Where a plant (or community) cannot be allowed to remain in its original habitat and is removed and cultivated to allow for its ongoing survival.

*Extrinsic* – Factors that have their origin outside of the system.

*GDACE* – Gauteng Department of Agriculture, Conservation and Environment

*ha* – Hectares.

*Indigenous vegetation* – Vegetation occurring naturally within a defined area.

*Increaser 1 grass* – Grass species that increase in density when veld is underutilised.

*Increaser 2 grass* – Grass species that increase in density in over utilised, trampled or disturbed veld.

*Increaser 3 grass* – Grass species that increase in density in over and under-utilised veld.

*In situ conservation* – Where a plant (or community) is allowed to remain in its natural habitat with an allocated buffer zone to allow for its ongoing survival.

*Karoid vegetation* – A shrub-type vegetation that dominates in grasslands that have seen historical disturbances. Mainly due to over-grazing and mismanaged burning regimes. The shrubby vegetation eventually becomes dominant and out-competes the grassy layer.

*m* – Metres.

*mm* – Millimetres.

MAMSL – Metres above mean sea level.

*MAP* – Mean annual precipitation.

*MAPE* – Mean annual potential for evaporation.

*MASMS* – Mean annual soil moisture stress.

*MAT* – Mean annual temperature.

*NWDACE* – North West Province Department of Agriculture, Conservation and Environment.

*Orange Listed* – Species that are not Red Data Listed, but are under threat and at risk of becoming RDL in the near future. Usually allocated to species with conservation status of *Near threatened, Rare* and *Data Deficient*.

*PES* – Present Ecological State.

*POC* – Probability of occurrence.

*PRECIS* – Pretoria Computer Information Systems – the plant species lists recorded for the QDS.

*Pioneer species* – A plant species that is stimulated to grow after a disturbance has taken place. This is the first step in natural veld succession after a disturbance has taken place.

*QDS* – Quarter degree square (1:50,000 topographical mapping reference).

*Rare* – Organisms with small populations at present.

*RDL (Red Data listed) species* – Organisms that fall into the *Extinct, Critically endangered, Endangered, Vulnerable* categories of ecological status.

*RDSIS* – Red data sensitivity index score.

*SANBI* – South African National Biodiversity (formerly *Botanical*) Institute.

*Veld retrogression* – The ongoing and worsening ecological integrity state of a veld.

# 1. Introduction & Terms of Reference.

Nemai Consulting requested EnviRoss CC to undertake an ecological study to assess, and to propose mitigation measures to negate, the potential negative ecological impacts identified with the *Construction, Operation* and *Decommissioning* phases associated with the proposed Eskom Holdings Limited Dwaalboom Switching Station. The faunal and floral survey was also to focus on the possible occurrences of various RDL (Red Data Listed) species that would potentially be affected by the proposed development activities.

The switching station is required to ensure that the Dwaalboom PPC plant receives a constant supply of electricity during normal and 132kV line outages. The switching station itself will be 50m x 50m and will have a 100m x 300m footprint, which will contain the switching station itself as well as all secondary plant infrastructure.

The switching station would contain a small 15m x 15m control room, a communications mast, 132kV-six bay double busbar, a floodlight, an auxiliary 132/33kV 10MVA transformer and an oil dam. The switching station will be fenced for security and safety reasons. Secondary infrastructure will be housed within the control room. Two high steel towers will be required to supply the Dwaalboom Switching Station off the Spitskop-Segoditshane 132kV line (eastern line). Two more towers will be required to take electricity out of the switching station and connect to the Spitskop-Segoditshane line. These four towers are known as terminal towers.

There are three proposed switching station sites. These sites are on the farm *De Paarl 246KP* in the Moses Kotane Municipality within the north-eastern area of North West Province (Figure 1). Site C is located approximately 3.5km from the small town of Nonceba and is represented on the eastern edge of the *2426DC Dwarsberg (1984)* 1:50,000 QDS topographical map. Sites A and B are located approximately 8km to the east of Site C and are represented on the *2426DD Drieviersboom (1984)* 1:50,000 QDS topographical map. All the sites can be accessed via the D112 (gravel road), which is an extension of the R565.

The proposed development sites are located in association with existing powerline servitudes as well as agricultural areas that have largely been utilised for grazing of livestock. The region is typified by open bushveld and therefore the area is dominated by open savanna bushveld with many of the trees having been retained. Some disturbances of the proposed development localities were therefore evident due to the historical land uses.

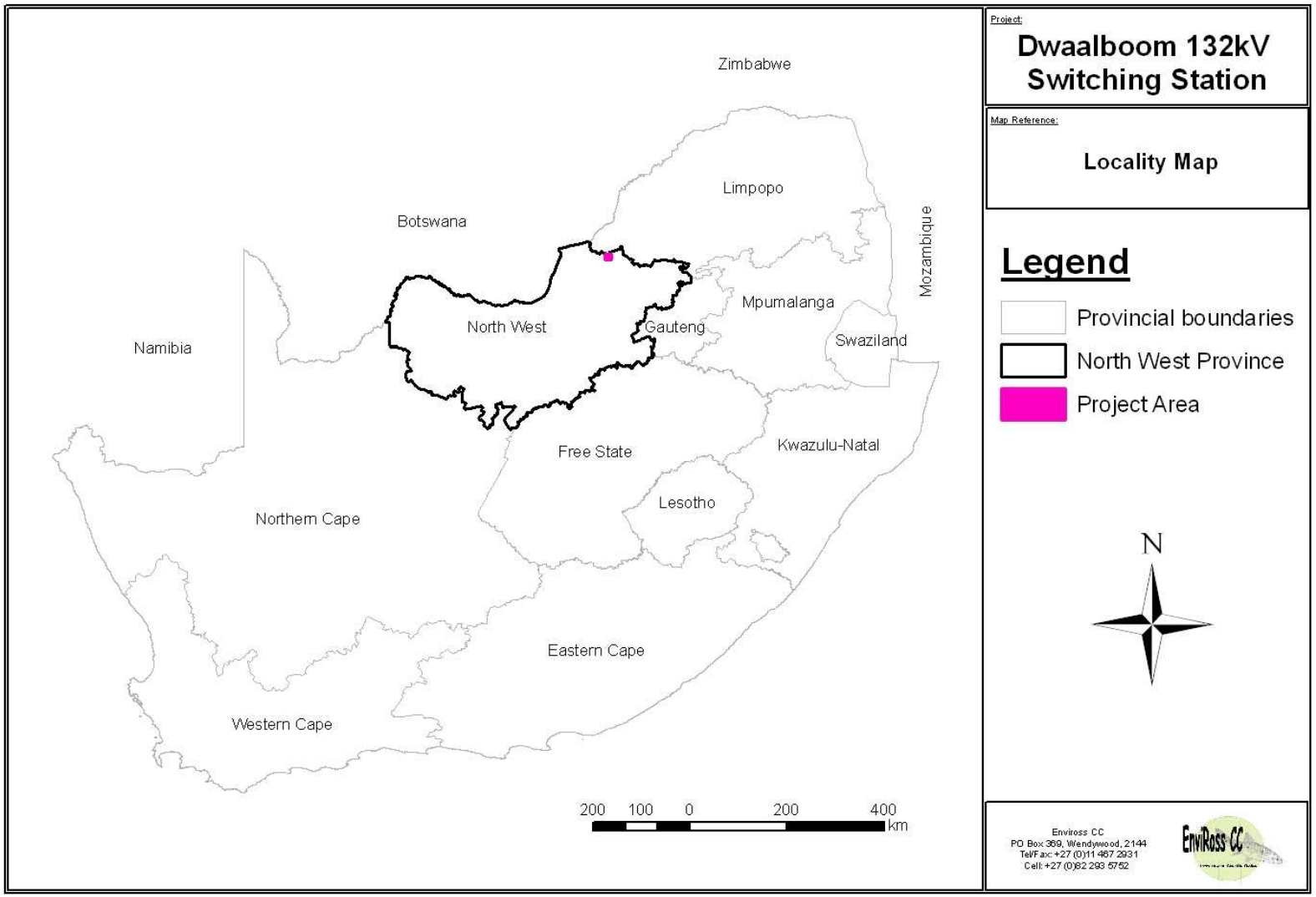


**Figure 1: Locality of the proposed development area.**

The proposed development activities would entail the following aspects:

- Site preparation - *Preconstruction phase*;
- Earthworks, construction of infrastructure, followed by site reinstatement and landscaping - *Construction phase*;
- Maintenance and management of the switching station - *Operations phase;* and
- Closing down of the switching station following the end of its lifespan - *Decommissioning phase*.

# 2. Scope of Work.

The scope of work for the proposed development activities was to initially undertake a desktop study of the proposed development area to gain potential biodiversity species lists and to determine which of these species are listed as being of conservational concern (RDL) for the region. A field survey for each of the three proposed development localities was then to be undertaken in order to make recommendations as to which of the proposed development localities would impinge the least on the overall ecological integrity and RDL species conservation within the area. Mitigation measures were then to be proposed in order to potentially negate the negative ecological impacts associated with the proposed development activities in the form of an impact ratings and significance assessment and Environmental Management Plan (EMP).

# 3. Methods of Investigation.

## 3.1 Desktop Study.

Initially a desktop study was undertaken to gather background information regarding the site and its surrounding areas. All relevant authorities were consulted regarding conservational species lists as well as all the latest available literature, digital (GIS databases) and topographical mapping utilised to gain a thorough understanding of the area and its surrounding habitats. This information (included in the introductory chapters above) and further literature reviews were then used to determine the potential biodiversity lists for the proposed development site and surrounding areas. This information incorporated (amongst others) data on vegetation types, habitat units, habitat suitability and biodiversity potential coupled to this information.

## 3.2 Site Descriptions and Assessments.

Site visits were undertaken during December 2008 to determine the ecological status of the proposed development sites and the surrounding area. A reconnaissance general 'walkabout'

survey was undertaken to determine the general habitat types found throughout the study area, where special emphasis was placed on potential areas that may support RDL species. Sites were investigated on foot to identify the occurrence of the *dominant* plant species and habitat diversities. Statutorily protected tree species (National Forests Act 84 of 1998) were also noted and marked using a handheld GPS (Garmin *GarMap 60CSx*). The presence of any faunal inhabitants of the property was also assessed through direct visual observation or identifying them through calls, tracks, scats and burrows, with emphasis being placed on determining if any RDL species occur within the study area.

## 3.3. Red Data Sensitivity Index Scoring.

### 3.3.1. Probability of Occurrence (POC).

A desktop study was undertaken prior to the field assessment. This included the acquisition of the RDL species lists (including invertebrate lists) for North West Province. These lists were cross-referenced to the specific grid reference of the site to establish the historic distribution of each of the species concerned. This information was then used to generate applicable RDL species flora and faunal lists for the site. The specific information of each applicable species was then referenced to determine whether the habitats present at the site were suitable to potentially sustain viable populations of these species. This information was used to supplement the determination of food availability for each species at the site where possible. These three criteria (known historical distribution ranges, habitat suitability and food availability (where possible)) were given a percentage potential score. The average of these scores then gave a value known as the "Probability of Occurrence" (POC) for each species. These values were then categorised as follows:

- 0-20% - LOW;
- 21-40% - LOW-MEDIUM;
- 41-60% - MEDIUM;
- 61-80% - MEDIUM-HIGH;
- 81-100% - HIGH.

### 3.3.2. Red Data Sensitivity Index Score (RDSIS).

Only the species with a POC of more than 60% (*medium-high* and above) were then used in the analysis. A factor was assigned to weight the different IUCN categories, giving species with a higher conservation status, a higher score. The factors assigned to the various categories are as follows:

- *Data Deficient* – 0.2;
- *Rare* – 0.5;
- *Near Threatened* – 0.7;
- *Vulnerable* – 1.5;
- *Endangered* – 1.7 and
- *Critically Endangered* – 1.8.

This factor was then multiplied with the POC to calculate the *Species' Scores* (Total) for each species. The average *Species Score* from all of the species was then calculated that could potentially occur at the site (Total *Species scores*/No. of species). The average of all the *Threatened* taxa (*Vulnerable, Endangered and Critically Endangered)* species' scores is then also calculated. The average of these two scores was then calculated to add more weight to threatened taxa with a more than 60% POC. The percentage of species with a POC of 60% or higher of the total number of *Red Data Listed species* listed for the area was then calculated. The average of these two scores then gives the RDSIS for the area investigated (See section *7. Red Data Sensitivity Index Scoring*).

# 4. Ecological Descriptions and Ecological Processes for the Proposed Development Site.

Figure 2 presents the major ecological processes associated with the proposed development site and immediate surrounding areas. Those identified include the vegetation type (including climate and geology and soil information), ridges, wetlands and further topographical and ecological features (if applicable) to the site that may have influence on the biodiversity potential of the area.

## 4.1. Vegetation type.

The North West Province is represented by a rich floral diversity and vegetation types due to topographical, geological and climatic variation throughout the province. There are 43 vegetation types (Mucina & Rutherford, 2006) identified within the province that are made up of grasslands, savanna, forests, freshwater wetlands and inland saline vegetation (salt pans). It is dominated by the *Savanna* biome. It also includes endemic vegetation units such as Pilanesberg Mountain Bushveld (Figure 2).

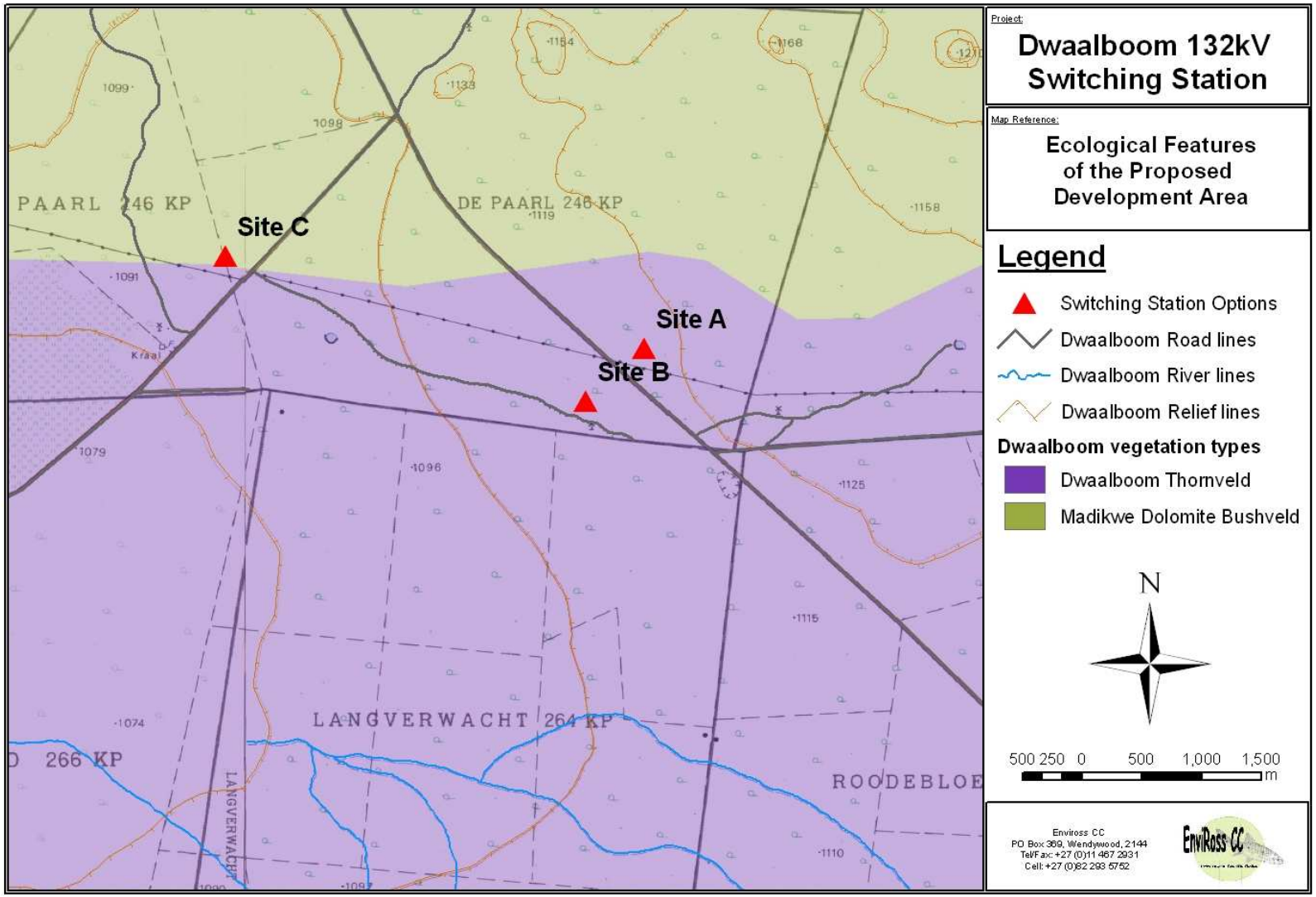


**Figure 2: Ecological processes associated with the proposed development area.**

The surrounding area of the various proposed development locations forms part of the *Savanna* biome and *Central Bushveld* bioregion, with the dominant vegetation type being *Dwaalboom Thornveld* (Mucina & Rutherford, 2006). The sites fall within the transitional zones of this vegetation type and *Madikwe Dolomite Bushveld* and therefore features representative of both these units were observed at all the sites. The area in which the proposed development falls is also described by Acocks (1988) as being dominated by *Sourish Mixed Bushveld* (incorporating Site B and C) and *Other Turf Thornveld* (incorporating Site A). The area is further described as being dominated by *Mixed Bushveld* by Low & Rebelo (1998). The most recent and comprehensive vegetation descriptions by Mucina & Rutherford (2006) will be used to assess the proposed development areas.

### 4.1.1. Dwaalboom Thornveld.

*Dwaalboom Thornveld* is distributed in Limpopo and North West Provinces within flats north of the Dwarsberge and associated ridges mainly west of the Crocodile River in the Dwaalboom area but including a patch around Sentrum. South of the ridges it extends eastwards from the Nietverdiend area, north of the Pilanesberg to the Northam area at an altitude range of between 900 and 1,200m AMSL.

Its main vegetation and landscape features include plains with a layer of scattered, low to medium high, deciduous microphyllous trees and shrubs with a few broad-leaved tree species. There is almost a continuous herbaceous layer dominated by grass species. *Acacia tortilis* and *Acacia nilotica* dominate on the medium clays (at least 21% clay in the upper soil horizon but high in the lower horizons). On particularly heavy clays (>55% clay in all horizons) most other woody plants are excluded and the diminutive *Acacia tenuispina* dominates at a height of less than 1m above ground. On the sandy clay loam soils (with not more than 35% clay in the upper horizon but high in the lower horizons) *Acacia erubescens* is the most prominent tree. The alternation of these substrate types creates a mosaic of patches typically 1-5km across, for example in the unit west of Thabazimbi (Mucina & Rutherford, 2006). The dominant and diagnostic floral species for the vegetation type are presented in Table 4.

**Table 4: Dominant and typical floristic species of *Dwaalboom Thornveld* (Mucina & Rutherford, 2006).**

| Tree/Shrub Species | Forb/Herbs species | Grasses/Sedges/Reeds |
|---|---|---|
| Small trees:<br>*Acacia erioloba*<br>*Acacia erubescens*<br>*Acacia nilotica*<br>*Acacia tortilis* subsp *heteracantha*<br>*Acacia fleckii* | *Heliotropium ciliatum*<br>*Kohautia caespitosa* subsp *brachyloba*<br>*Nidorella hottentotica* | *Aristida bipartita*<br>*Bothriochloa insculpta*<br>*Digitaria eriantha* subsp *eriantha*<br>*Ischaemum afrum*<br>*Panicum maximum*<br>*Cymbopogon pospischilii* |

| Tree/Shrub Species | Forb/Herbs species | Grasses/Sedges/Reeds |
|---|---|---|
| *Acacia mellifera* subsp *detinens*<br>*Combretum imberbe*<br>*Rhus lancea*<br>*Ziziphus mucronata*<br><br>Tall shrubs:<br>*Acacia hebeclada* subsp *hebeclada*<br>*Combretum hereroense*<br>*Diospyros lycioides* subsp *lycioides*<br>*Euclea undulata*<br>*Grewia flava*<br>*Tarchonanthus camphoratus*<br><br>Low shrubs:<br>*Acacia tenuispina*<br>*Abutilon austro-africanum*<br>*Aptosimum elongatum*<br>*Hirpicium bechuanense*<br>*Pavonia burchellii*<br>*Solanum delagoense*<br><br>Succulent shrubs:<br>*Kalanchoe rotundifolia*<br>*Talinum caffrum*<br><br>Herbaceous climber:<br>*Rhynchosia minima* | | *Eragrostis curcula*<br>*Sehima galpinii*<br>*Setaria incrassata* |

**(*(d) – Dominant species for the vegetation type; (c) – Common species for the vegetation type.)**

*Dwaalboom Thornveld* is classified as *Least Threatened*, with a target conservation value of 19%. Only about 6% is statutorily conserved, mainly within the Madikwe Game Reserve in the west. Approximately 14% is transformed mainly by cultivation. Erosion is very low to low. The main use for the vegetation unit is extensive cattle grazing (Mucina & Rutherford, 2006).

### 4.1.2. Madikwe Dolomite Bushveld.

*Madikwe Dolomite Bushveld* is distributed in Limpopo and North West Provinces where it extends along the low ridge from the international border at Ramotswa in the west via the Rand Van Tweede Poort, Tlhapitse and Maakane to Modimong in the east. It is also found on dolomite hills between Asses and Northam. It has an altitude range of approximately 1,000 to 1,300m AMSL.

Its main vegetation and landscape features include gentle ridge and low hills up to about 100 to 150m above the surrounding plains. Tree and shrub layers are often not clearly distinct, especially on steeper slopes; they are dominated by deciduous trees, particularly *Combretum apiculatum* and *Kirkia wilmsii* (especially in the east). The herbaceous layer is continuous and dominated by grasses (Mucina & Rutherford, 2006). The dominant and diagnostic floral species for the vegetation type are presented in Table 5.

**Table 5: Dominant and typical floristic species of *Madikwe Dolomite Bushveld* (Mucina & Rutherford, 2006).**

| Tree/Shrub Species | Forb/Herbs species | Grasses/Sedges/Reeds |
|---|---|---|
| Tall tree:<br>*Sclerocarya birrea* subsp *caffra*<br><br>Small trees:<br>*Combretum apiculatum*<br>*Kirkia wilmsii*<br>*Ozoroa paniculosa*<br>*Rhus lancea*<br>*Combretum imberbe*<br>*Rhus leptodictya*<br>*Ximenia americana*<br>*Ziziphus mucronata*<br><br>Tall shrubs:<br>*Grewia flava*<br>*Tarchonanthus camphorates*<br>*Vitex zeyheri*<br>*Clerodendrum glabrum*<br>*Grewia bicolor*<br>*Grewia monticola* | *None dominate or are particular to the vegetation unit.* | *Enneapogon scoparius*<br>*Heteropogon contortus*<br>*Aristida congesta Panicum coloratum*<br>*Panicum maximum* |

**(*(d) – Dominant species for the vegetation type; (c) – Common species for the vegetation type.)**

*Madikwe Dolomite Bushveld* is classified as *Least Threatened*, with a target conservation value of 19%. Some 17% is statutorily conserved, mainly within the Madikwe Game Reserve. Only 1% is transformed mainly by cultivation. Erosion is low to very low (Mucina & Rutherford, 2006).

### 4.1.3. Geology and Soils.

*Dwaalboom Thornveld* is dominated by vertic black ultramafics clays which developed from norite and glabbro also feature locally in small depressions along streams. Some areas have less clay. Some areas have a high base status and eutrophic red soils. The underlying geology is an Archaean granite-gneiss terrane of the Swazian Erathem that is covered in parts by the mainly clastic as well as chemical sediments and volcanics of the Rayton and Silverton Formation, both of the Pretoria Group (Transvaal Supergroup). Mafic intrusive rocks of the Rustenburg Layered Suite, Bushveld Igneous Complex (Late Vaalian) are present in the east and include the Bierkraal Manetite Gabbro. Bronzite, harzburgite, norite and anorthosite are the major mafic rocks of the Rustenburg Suite. Land types are mainly Ea and Ae (Mucina & Rutherford, 2006).

*Madikwe Dolomite Bushveld* is dominated by stony, shallow soils of the Glenrosa and Mispah forms underlain mainly by dolomite, subordinate chert, minor carbonaceous shale, limestone and quartzite of the Malmani Subgroup (Chuniespoort Group, Transvaal Supergroup, Vaalian Erathem). Land type is mainly Fa (Mucina & Rutherford, 2006).

### 4.1.4. Climate.

*Dwaalboom Thornveld* falls within a summer rainfall area with very dry winters, with a MAP (Mean annual precipitation) range of approximately 500-600mm. This vegetation unit has the highest mean annual potential evaporation of savanna vegetation units outside of the two Kalahari bioregions. Frost is fairly frequent in winter.

*Madikwe Dolomite Bushveld* falls within a summer rainfall area with very dry winters, with a MAP (Mean annual precipitation) of approximately 520 in the west to 650mm in the east. Frost is fairly frequent in winter. Table 6 presents the climatic information for the various vegetation units as well as the overall climatic information for the region.

**Table 6: General climatic information for the region of the proposed development area (Mucina & Rutherford, 2006).**

| Bioregion | Vegetation types | Altitude (m) | MAP* (mm) | MAT* (℃) | MAPE* (mm) | MASMS* (%) |
|---|---|---|---|---|---|---|
| Central Bushveld | Dwaalboom Thornveld | 900-1,200 | 551 | 19.4 | 2,504 | 79 |
| Central Bushveld | Madikwe Dolomite Bushveld | 1,000-1,300 | 575 | 18.8 | 2,484 | 79 |
| Averages: | | | 563 | 19.1 | 2,494 | 79 |

***MAP – Mean annual precipitation; MAT – Mean annual temperature; MAPE – Mean annual potential evaporation; MASMS – Mean annual soil moisture stress (% of days when evaporative demand was more than double the soil moisture supply).**

It can be seen that the region is a relatively water stressed area and therefore conservation of the surface (and ground) waters within the region are imperative to the ongoing conservation of biodiversity within the region. This component should be viewed as a critical component at the forefront of decision-making for all aspects of development activities within the area.

## 5. Site Descriptions.

There are three locality options proposed for the Eskom Holdings Dwaalboom Switching Station. The three localities are in relatively close proximity to one another and are all associated with an existing powerline and associated servitude. The vegetation unit has largely retained the basic structure and community species composition to still be regarded as being representative of the vegetation types. Surrounding land use is dominated by agriculture and the land is utilised mainly for the grazing of livestock. Consequently, some transformation of the vegetation structure has taken place to a greater or lesser extent for the three proposed localities. All three sites are located within the transitional ecotone between two vegetation types, namely Dwaalboom Thornveld and Madikwe Dolomite Bushveld. They therefore bear resemblance in species

composition and community structure to both of these vegetation types. Various degrees of utilisation and veld management, as well as varying topographical features that differ from one site to the next have influenced the species community structure from one site locality to the next. All three sites showed very similar floral species composition. The structure of the floral community structures differed slightly, which showed the varying degrees of agricultural utilisation and management. These differences will be described in more detail under the relevant sections below.

## 5.1. Locality option 1: Site A.

Site A is located to the north of where the Spitskop-Segoditshane 132kV line crosses the D112 roadway. The proposed development area is therefore already marginally impacted by an existing powerline servitude. The actual site area is typical of the vegetation type, being an open bushveld savanna. Trees and shrubs were well represented throughout the site, with grasses dominating the understory. The actual powerline servitude is typically void of trees and tall shrubs and is dominated by pioneering grass species and smaller shrubs. Figure 3 presents various views of Site option A.

**Figure 3: Various views of Site locality option A.**

This site showed a relatively high density of nationally protected tree species as well as other larger and well-established trees. Two species in particular, namely *Combretum imberbe* (Leadwood) and *Sclerocarya birrea* subsp *caffra* (Marula) are protected under the National Forests Act 84 of 1998 and therefore application to the DWAF would have to be made in order to remove these trees prior to the commencement of any construct activities.

**Figure 4: *Combretum imberbe* (Leadwood) (left) and *Sclerocarya birrea* subsp *caffra* (Marula) (right) that were observed to be commonly-occurring throughout the site (Site A).**

There is a higher density of these protected tree species within this proposed site in relation to the other two construction site options (Sites B and C). Therefore it is recommended that the other two site options (Sites B or C) be considered over this one from an ecological perspective. The localities within the local area of these protected tree species were marked with a GPS during the field survey. These localities are presented in Figure 5. The dominant species observed within this habitat unit are presented in Table 7.

**Table 7: Dominant floral species observed throughout the site option A locality. Exotic species are indicated with *.**

| Grasses/Sedges/Reeds | Trees/Shrubs | Forbs |
|---|---|---|
| *Aristida congesta*<br>*Aristida scabrivalvis*<br>*Bothriochloa insculpta*<br>*Cynodon dactylon*<br>*Digitaria eriantha*<br>*Eragrostis curvula*<br>*Eragrostis superba*<br>*Heteropogon contortus*<br>*Panicum maximum*<br>*Pogonarthria squarrosa*<br>*Schizachyrium sanguineum*<br>*Setaria sphacelata*<br>*Setaria verticillata*<br>*Trachypogon spicatus*<br>*Urochloa mossambica* | *Acacia ataxacantha*<br>*Acacia caffra*<br>*Acacia erubescens*<br>*Acacia karroo*<br>*Acacia mellifera*<br>*Acacia nilotica*<br>*Acacia tenuispina*<br>*Acacia tortilis*<br>*Aloe greatheadii* var. *davyana*<br>*Aloe marlothii*<br>*Asparagus laricinus*<br>*Combretum hereroense*<br>*Combretum imberbe*<br>*Combretum zeyheri*<br>*Dichrostachys cinerea*<br>*Dombeya rotundifolia*<br>*Elephantorrhiza elephantina*<br>*Euclea undulata*<br>*Grewia flava*<br>*Grewia monticola*<br>*Maytenus polyacantha*<br>*Mundulea sericea*<br>*Ozoroa paniculosa*<br>*Peltophorum africanum*<br>*Rhus lancea*<br>*Rhus leptodictya*<br>*Rhus pyroides*<br>*Sclerocarya birrea* subsp *caffra*<br>*Sida rhombifolia**<br>*Vitex zeyheri*<br>*Ziziphus mucronata*<br>*Solanum panduriforme**<br>*Datura stramonium** | *Bidens pilosa**<br>*Portulaca kermesina*<br>*Schkuhria pinnata**<br>*Tagetes minuta**<br>*Heliotropium ciliatum* |

The vegetation community structure has been retained at this site and the overall PES of the site was considered to be *Good*. This further reiterates the recommendation that either of the other sites (options B or C) be considered as being more viable over option A from an ecological perspective. It is perceived that development at this site would have the greatest ecological impact relative to the other site alternatives.

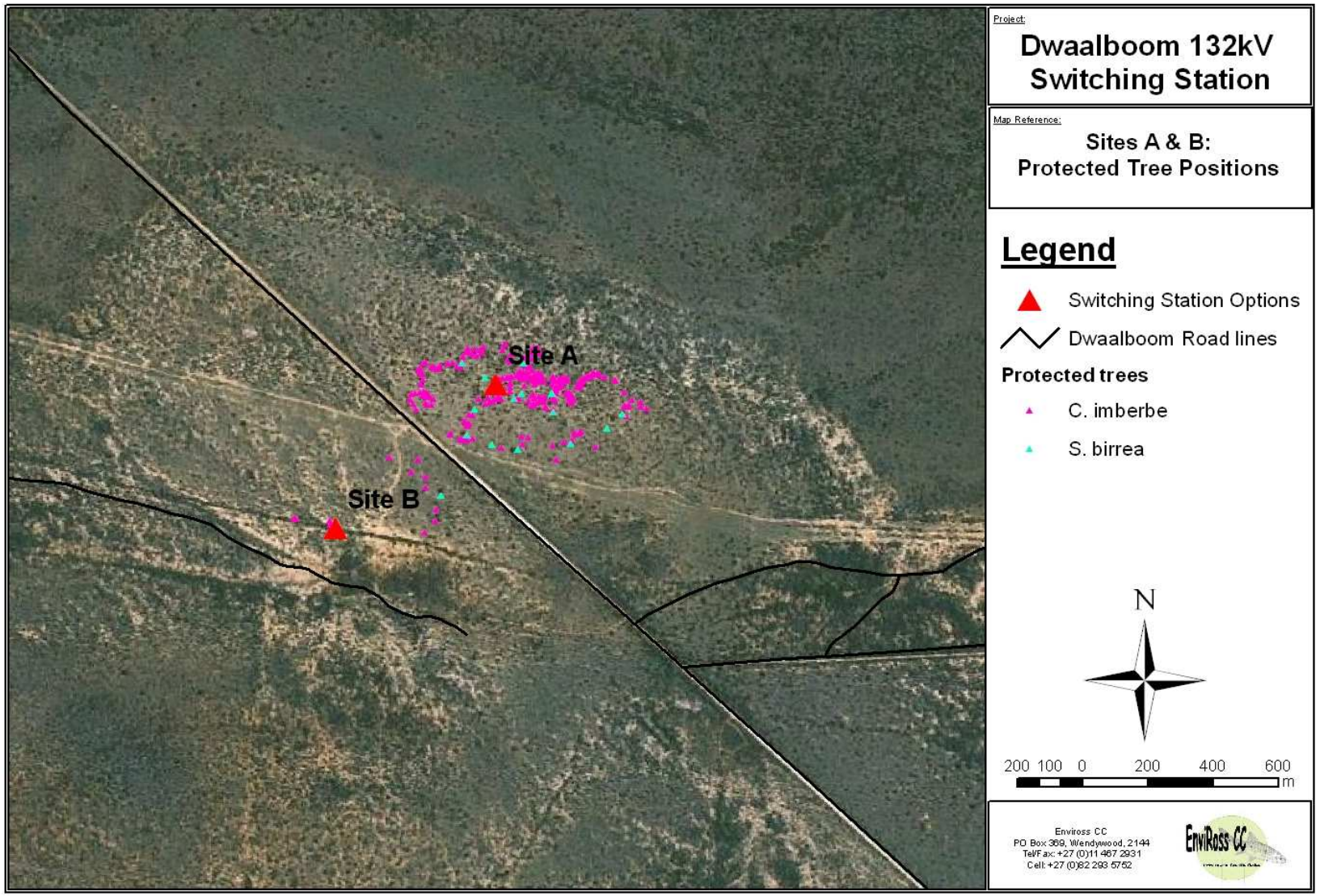


**Figure 5: Dwaalboom Switching Station site locality options A and B showing the localities of the protected tree species.**