MOKOPANE INTEGRATION PROJECT

VISUAL IMPACT ASSESSMENT
TRANSMISSION LINE AND SUBSTATION ALTERNATIVES

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Lourens du Plessis from MetroGIS (Pty) Ltd undertook the visual impact assessment in his capacity as a visual assessment and Geographic Information Systems specialist. Lourens has been involved in the application of Geographical Information Systems (GIS) in Environmental Planning and Management since 1990. He has extensive practical knowledge in spatial analysis, environmental modelling and digital mapping, and applies this knowledge in various scientific fields and disciplines. His GIS expertise are often utilised in Environmental Impact Assessments, State of the Environment Reports and Environmental Management Plans.

Savannah Environmental (Pty) Ltd appointed MetroGIS (Pty) Ltd as an independent specialist consultant for the visual impact assessment. Neither the author, nor MetroGIS will benefit from the outcome of the project decision-making.

1. INTRODUCTION AND BACKGROUND

Eskom Holdings Limited is proposing to construct a new substation in the Mokopane area and to connect the proposed substation with the Delta substation, the Medupi Power Station (near Lephalale) and the Witkop substation (south of Polokwane) by means of the construction of two 400kV transmission power lines.

The transmission line alternatives (Corridors 1, 2, 4, 5, 6, 7, 8 and 8a) and the three substation options (Alternatives 1, 3 and 4) identified for investigation in the EIA phase of the project are indicated on Figure 1 below. The scoping study for this project originally examined four alternative substation sites (i.e. it included an Alternative 2) and eight alternative transmission line development corridors (i.e. including Alternative 3). Since the completion of the scoping report one substation alternative and one transmission line development corridor were withdrawn on the basis of technical feasibility. A deviation (Alternative 8a) was proposed for the Alternative 8 development corridor since the inception of the EIA phase of the project and will be addressed in the report.

This report sets out to identify and assess the possible visual impacts related to the proposed Mokopane Integration Project as mentioned above, as well as offer potential mitigation measures, where required.

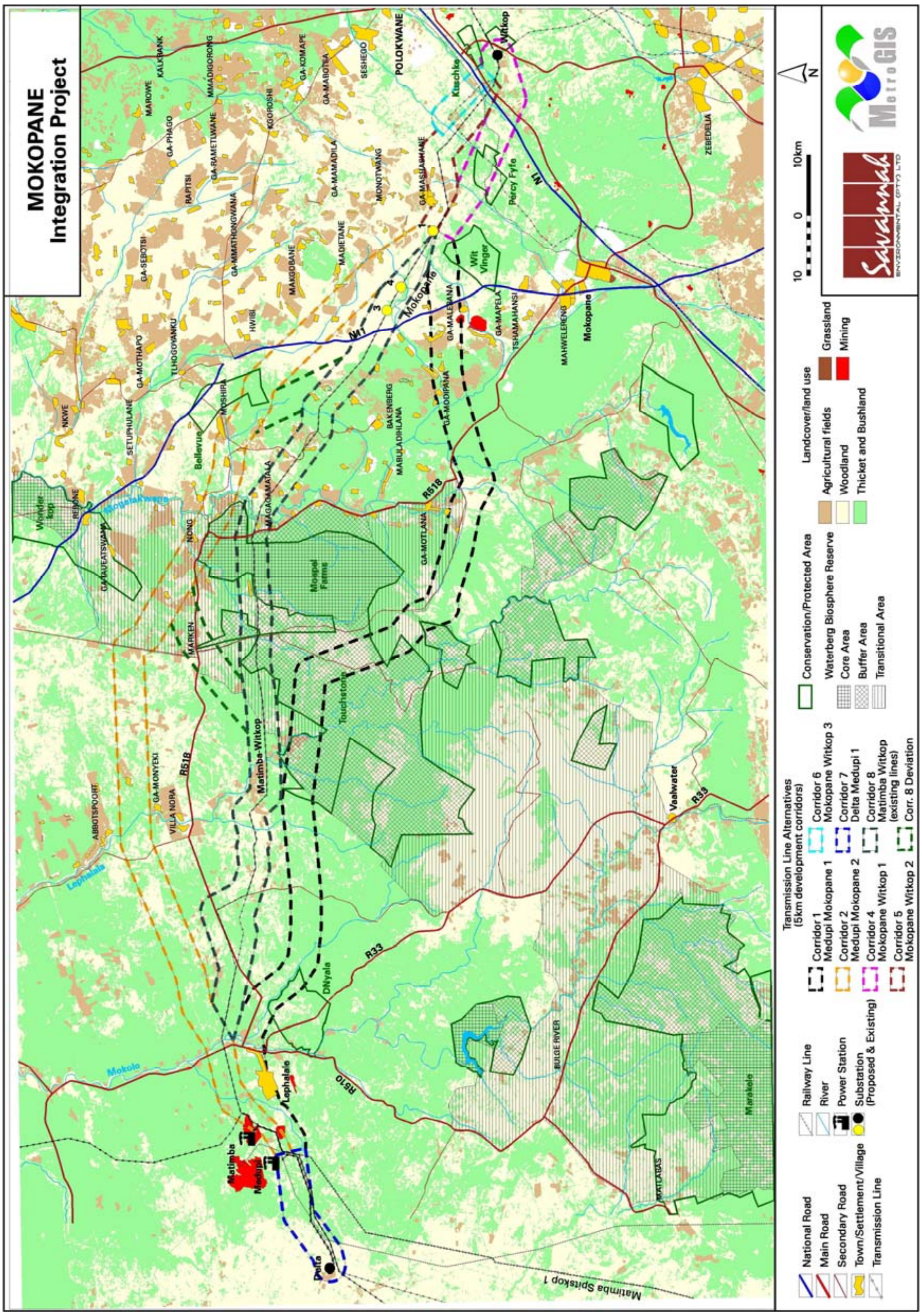

Figure 1: Land use/land cover map indicating the proposed transmission line and substation alternatives.

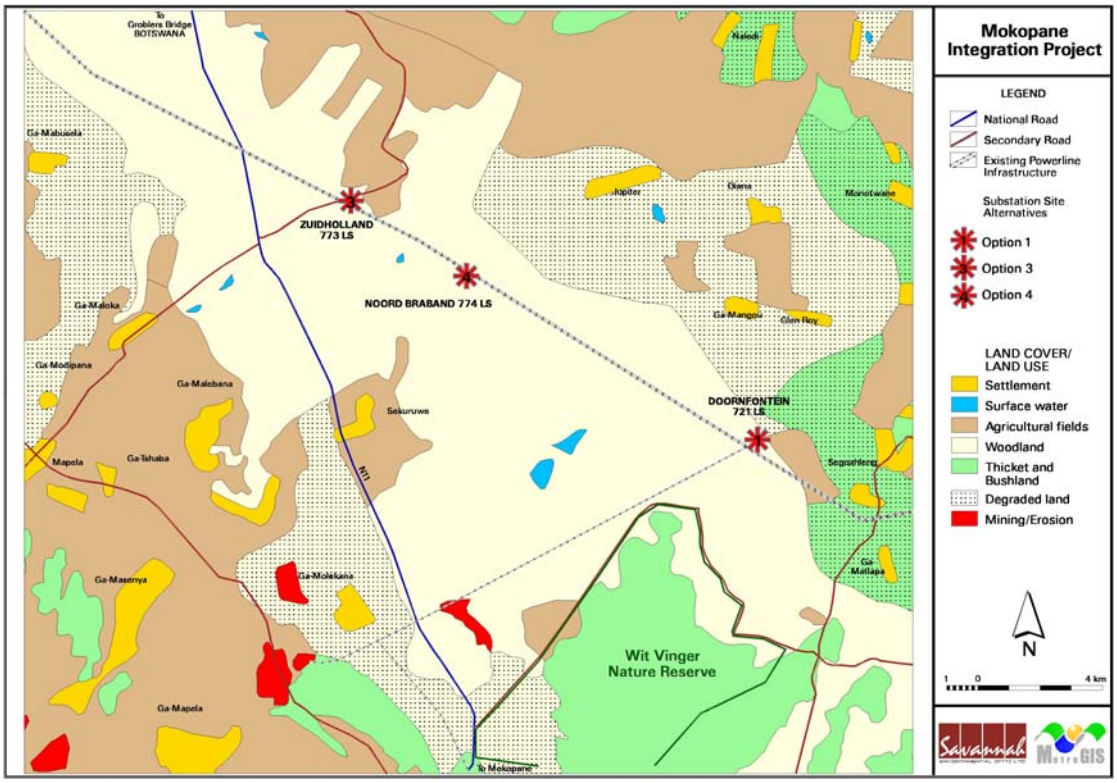

Figure 2: Land use/land cover map indicating the proposed substation alternatives.

2. SCOPE OF WORK

The study area for the Mokopane Integration Project covers an area of approximately 25 000km^2 in the Limpopo Province from Lephalale in the west to Polokwane in the east. The (overlapping) study area for the proposed Mokopane substation covers and area of 700km^2 north of Mokopane with three potential site options identified along the existing Matimba-Witkop transmission lines, east of the N11 national road.

The scope of work includes the determination of the potential visual impacts in terms of nature, extent, duration, magnitude, probability and significance of the construction and operation of the proposed infrastructure. In this regard specific issues related to the visual impact were identified during a site visit to the affected environment. Issues related to the proposed Mokopane Integration Project include:

- Visual distance/observer proximity to the proposed infrastructure (apply the principle of reduced impact over distance)
- Viewer incidence/viewer perception (identify areas with high viewer incidence and negative viewer perception)
- Landscape character/land use character (identify conflict areas in terms of existing and proposed land use)
- Visually sensitive features (scenic features or attractions)
- General visual quality of the affected area
- Visual absorption capacity of the natural vegetation

- Potential visual impact of lighting (after hours operations and security) of the proposed substation

- Potential mitigation measures

3. METHODOLOGY

3.1. General

The study was undertaken using Geographic Information Systems (GIS) software as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed infrastructure. A detailed Digital Terrain Model (DTM) for the study area was created from 20m interval contours supplied by the Surveyor General.

Site visits were undertaken to source information regarding land use, vegetation cover, topography and general visual quality of the affected environment. It further served the purpose of verifying the results of the spatial analyses and to identify other possible mitigating/aggravating circumstances related to the potential visual impact.

The methodology utilised to identify issues related to the visual impact included the following activities:

- The creation of a detailed digital terrain model of the potentially affected environment.

- The sourcing of relevant spatial data. This included cadastral features, vegetation types, land use activities, topographical features, site placement, etc.

- The identification of sensitive environments upon which the proposed infrastructure could have a potential impact.

- The creation of viewshed analyses from the proposed development area in order to determine the visual exposure and the topography's potential to absorb the potential visual impact. The viewshed analyses take into account the dimensions of the proposed structures.

3.2. Potential visual exposure

The visibility or visual exposure of any structure or activity is the point of departure for the visual impact assessment. It stands to reason that if the proposed infrastructure, or evidence thereof, weren't visible, no impact would occur.

Viewshed analyses of the proposed infrastructure, based on a 20m contour interval digital terrain model of the study area, indicate the potential visual exposure (i.e. areas from where the infrastructure could theoretically be visible). The visibility analyses were undertaken at an offset of 20m (for the substation alternatives) above average ground level and at 35m (for the transmission line alternatives) in order to simulate a worst-case scenario. The viewshed analyses do not include the visual absorption capacity of natural vegetation in the study area. The visual absorption capacity of the vegetation is however addressed as a separate issue within this report and does form part of the visual impact assessment criteria.

Substation site alternatives

Three feasible alternative sites have been identified as potential locations for the construction of the Mokopane transmission substation and turn-in line infrastructure. The three options are situated north of Mokopane and include the farms Doornfontein 721 LS (Option 1), Zuidholland 773 LS (Option 3) and Noord Braband 774 LS (Option 4). The proposed sites are all located in close proximity to the Matimba-Witkop 400kV transmission lines in order to allow for turn-in line infrastructure from one of these lines to the substation.

Option 1 is located north of the Wit Vinger Nature Reserve approximately 3.3km (line of sight) west of the Segoahleng settlement.

Figure 3: General environment near Option 1 (Note: Wit Vinger Nature Reserve and hills south of the proposed site).

Option 1 has a relatively scattered pattern of visual exposure due to the undulating nature of the topography and will potentially be visible from Segoahleng, Ga-Mangou and Glen Roy.

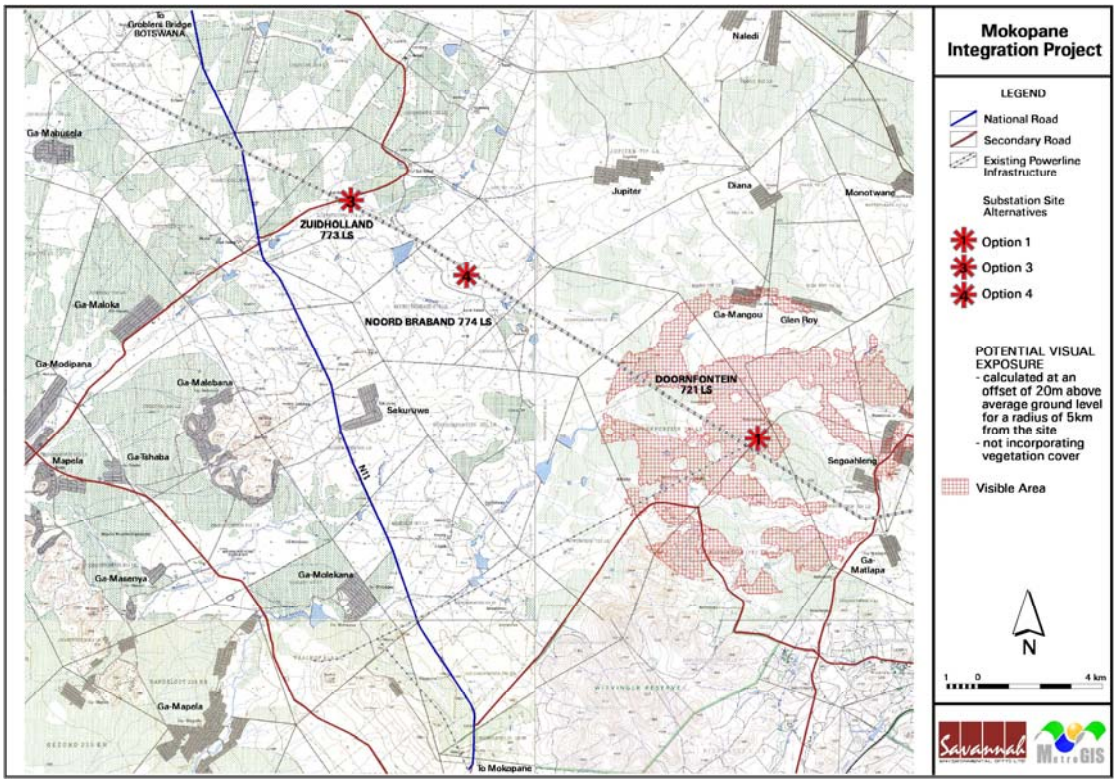

Figure 4: Potential visual exposure - substation Option 1.

Option 3 is located along the Matimba-Witkop 400kV transmission lines at a distance of approximately 3km from the N11 national road.

Figure 5: General environment near Options 3 (Note: The proposed substation site is located on the right-hand side of the road).

The core area of visual exposure for Site **Option 3** is indicated on Figure 6. This option is not expected to be visible from any major villages or settlements but it will potentially be visible from the N11 national road at a distance of 3km at the closest.

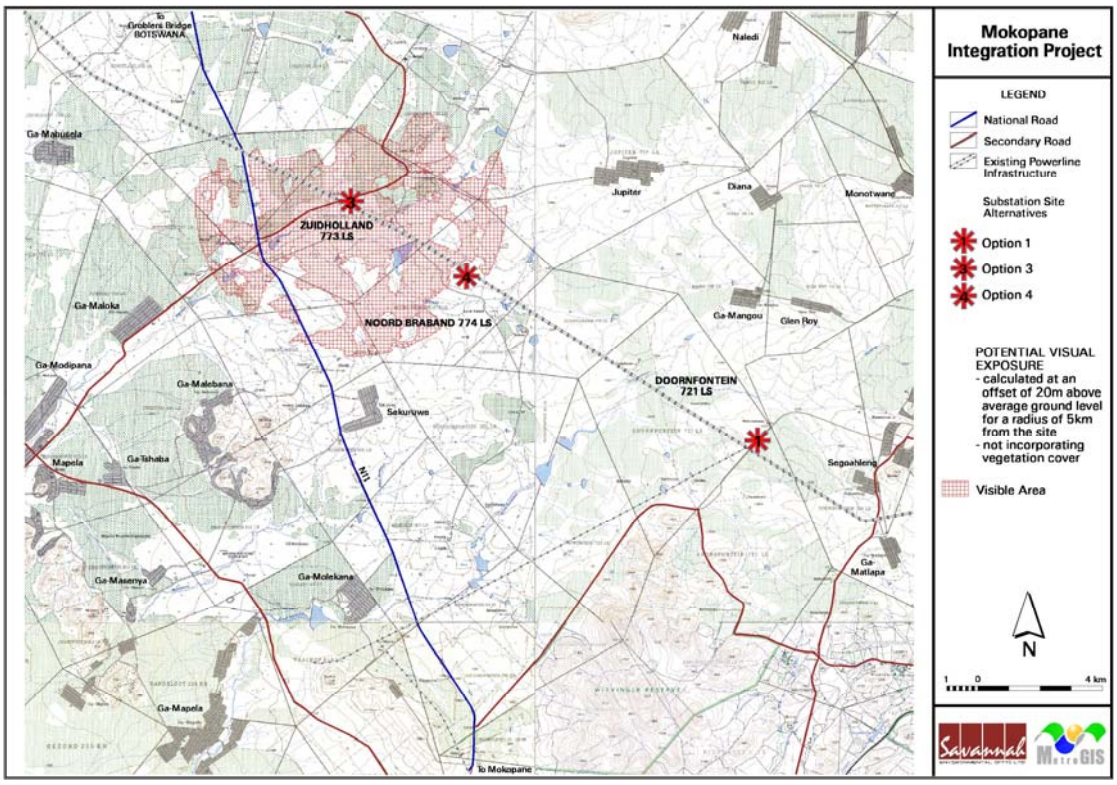

Figure 6: Potential visual exposure - substation Option 3.

Option 4 is located 4.4km south-east of Option 3. It is 5.7km from the N11 and the closest major settlement, Sekuruwe, is about 5km south-west of the proposed site.

Option 4 is not expected to be visible, or have a significant visual influence on observers travelling along the N11 (located beyond 5km from the proposed site). It is also not in close proximity to any major settlements within the core area of visual exposure.

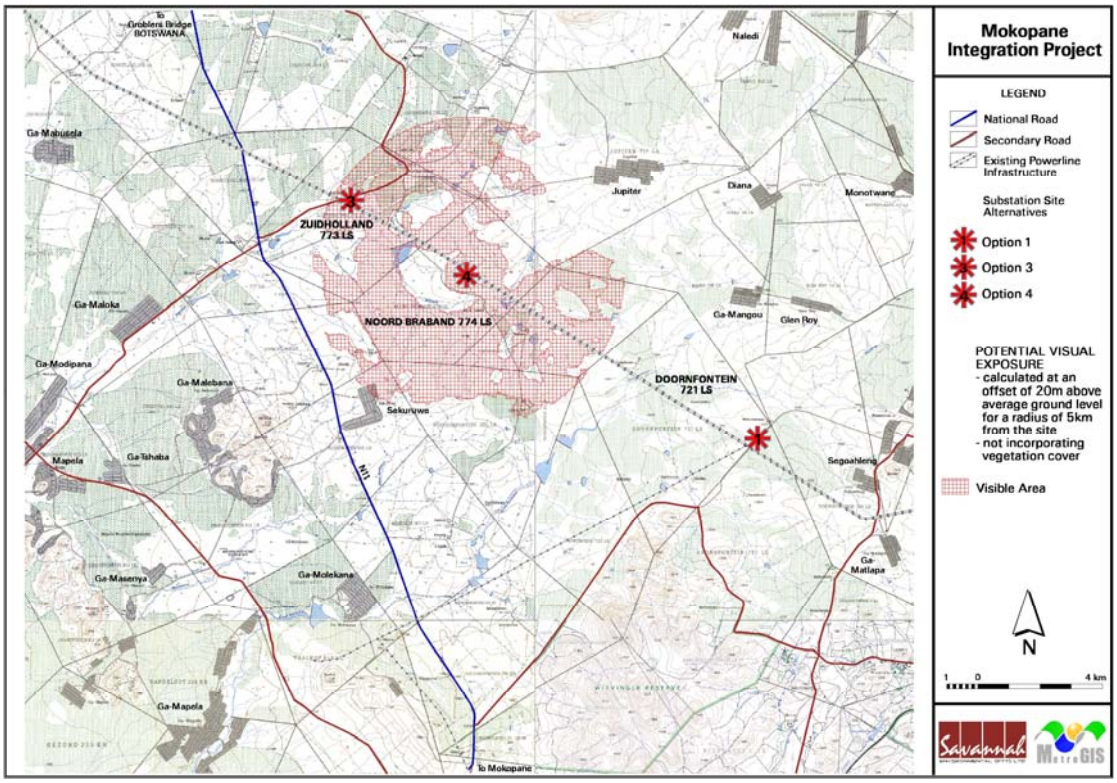

Figure 7: Potential visual exposure - substation Option 4.

Transmission line alternatives

Seven feasible transmission line development corridors and one deviation were identified in order to link the Delta substation with the Medupi Power Station and the Witkop substation. Four of these alternatives (Corridors 1, 2, 8 and 8a) function as a link between the Medupi Power Station and the proposed Mokopane substation, and three alternatives (Corridors 4, 5 and 6) function as a link between the proposed substation and the Witkop substation. Only one transmission line development corridor (Corridor 7) is proposed for the Delta-Medupi section of the Mokopane Integration Project.

The first corridor (**Corridor 1**) leaves the Medupi Power station in an easterly direction south of Lephalale before traversing north of the D'Nyala Nature Reserve. It crosses the Waterberg plateau, Waterberg Biosphere Reserve buffer zone (Touchstone Nature Reserve) before spanning across the escarpment and dropping down towards the R518. It steers east for another 50km before joining the Matimba-Witkop transmission lines. The length of the first corridor is 172km.

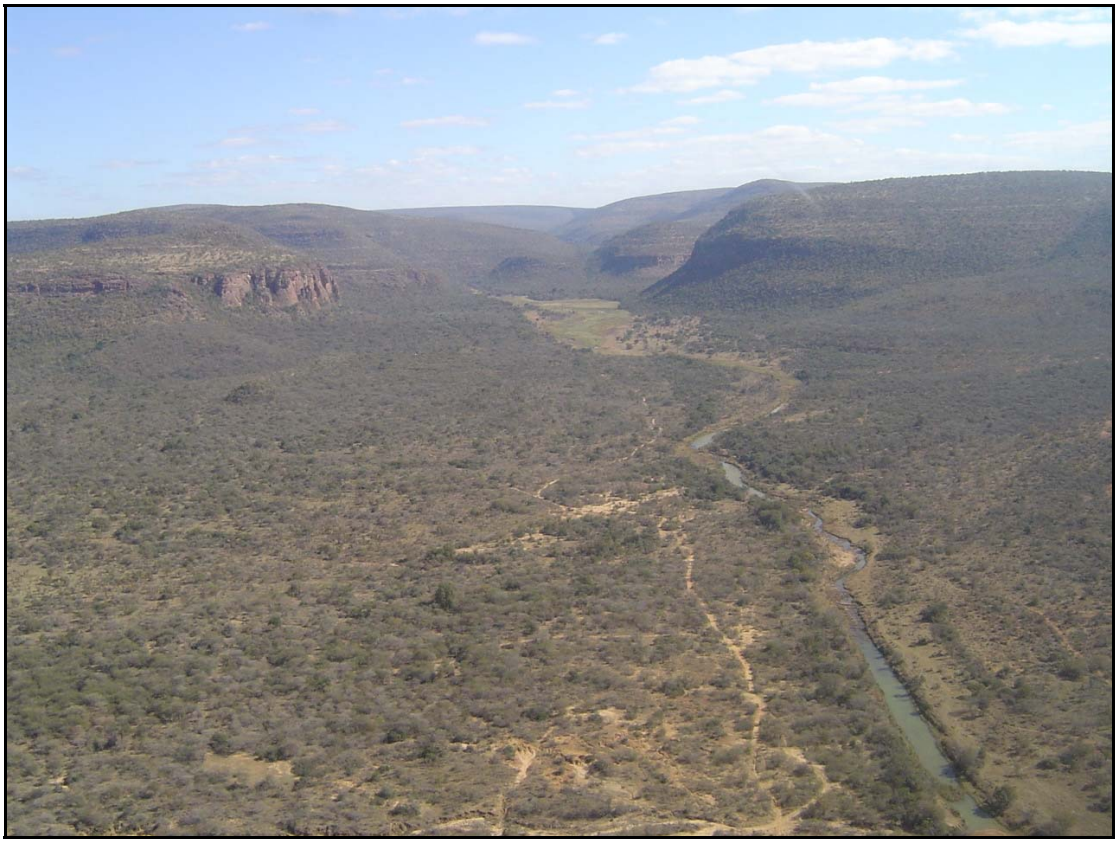

Figure 8: The Waterberg Mountains eastern escarpment.

Corridor 2 originates at the Medupi Power Station and proceeds in a north-easterly direction for approximately 30km before veering east for 85km. It traverses the Waterberg Biosphere Reserve's transitional zone before it turns south-east, crossing the southern section of the Bellevue Nature Reserve. It continues for roughly 40km before joining the Matimba-Witkop power lines near the proposed Mokopane substation site. The total length of the transmission line corridor is 180km.

Figure 9: Settlements along the eastern section of Corridor 2 (Note: the absence of natural woodland, thicket and bushland).

Corridor 8 (the existing Matimba-Witkop transmission line corridor) originates at the Matimba Power Station and travels east for approximately 29km before reaching the R518. The lines split at this point and the northern section traverses adjacent to this road for almost 9km while the southern section crosses between two hills. The two lines meet up shortly thereafter and continue eastward for 30km before entering the Waterberg Biosphere Reserve's transitional, buffer (Touchstone) and core areas (Moepel Farms). After 32km it crosses the escarpment and continues another 58km to the proposed Mokopane substation site. The Matimba-Witkop transmission line covers a distance of over 182km from Matimba to the proposed substation site.

The **Corridor 8a** deviation has as its purpose the circumvention of the Waterberg Biosphere Reserve's buffer and core areas as well as the Waterberg Mountain and eastern escarpment. The deviation occurs south-west of Marken where the proposed corridor deviates in a north-eastern direction, continuing south-east of Marken, for approximately 25km before joining the Corridor 2 alternative. It follows this alternative for roughly 30km before veering south-east for approximately 20km before joining with the existing Matimba-Witkop power line corridor.