**Photograph 4.1:** Typical grassland patches in the study area

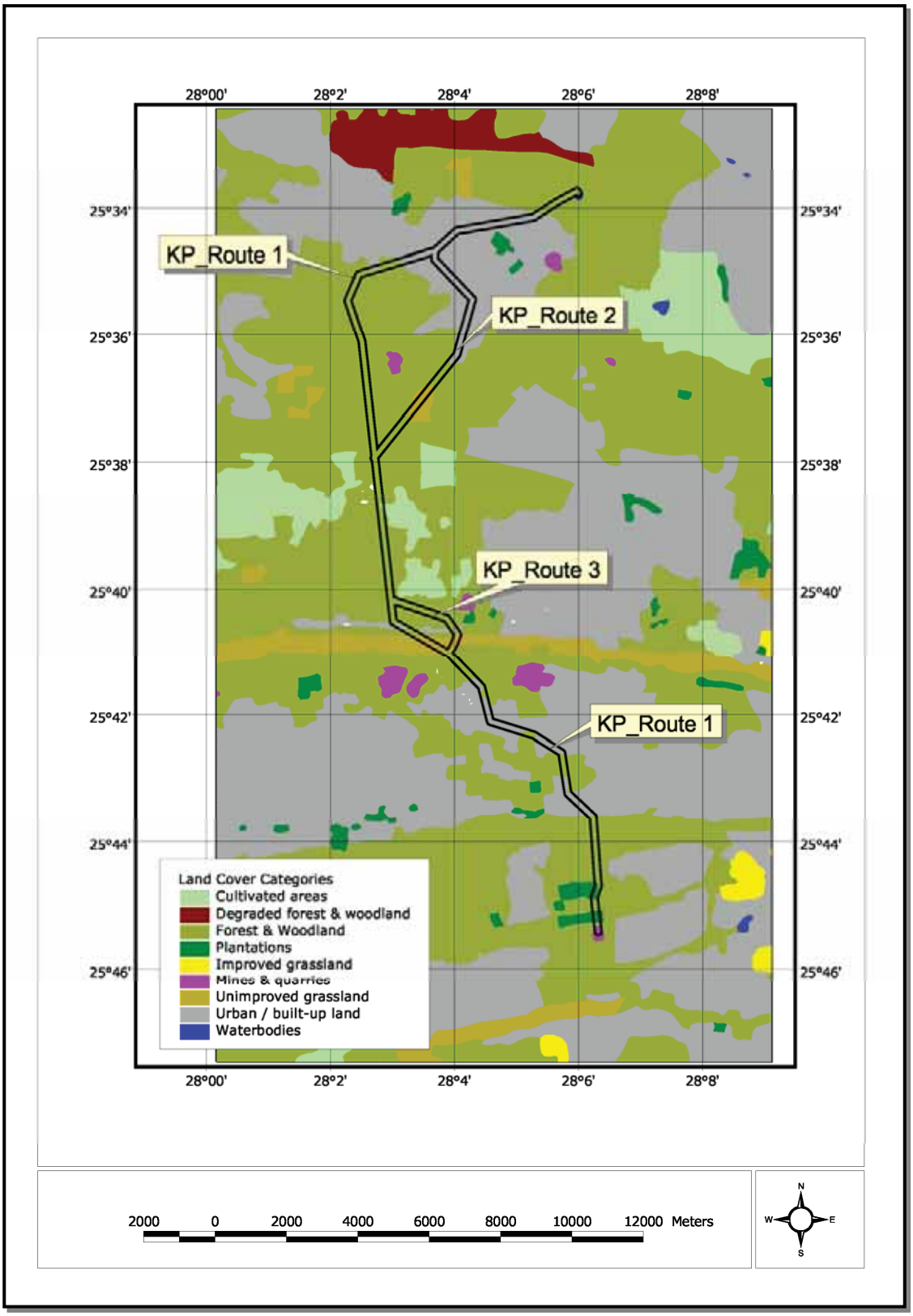


**Figure 4.8:** Habitat types within the study area Robesson (2009).

Avifaunal micro-habitats identified within the study area include:

» **Grassland Patches:** These open areas represent a significant feeding area for many bird species in densely populated areas. Specifically, these open grassland patches typically attract korhaans, storks, and many other power line sensitive species (Secretarybird, Blue Crane and Lanner Falcon). The low reporting rate for these species (Harrison *et al* 1997) is evidence of the impact that the surrounding developments are having on the birds that would, under optimum conditions, inhabit these open areas.

» **Wetlands, rivers and drainage lines:** Wetlands are of particular importance for birds in the study area, as the area is largely urbanized and these represent fragmented habitat "islands" available to the water birds in this area. Examples of the birds that may use this micro-habitat include Greater Flamingoes, Half-collared Kingfisher and African Marsh harrier. Again the low report rate is evidence of how disturbed and degraded the area is.

**Photograph 4.2:** An image showing a degraded stream along the proposed alternative 1.

» **Stands of Eucalyptus trees**: Although stands of Eucalyptus are strictly speaking invader species, these stands have become important refuges for certain species of raptors. In particular, large Eucalyptus trees are used by the migratory Lesser Kestrels for roosting purposes, although no known roost sites exist in the study area.

**Photograph 4.3:** Image showing stands of exotic eucalyptus trees along the proposed route alternative

These micro habitats have been taken into account in identifying the sensitive areas within this study area (refer to Figure 4.10).

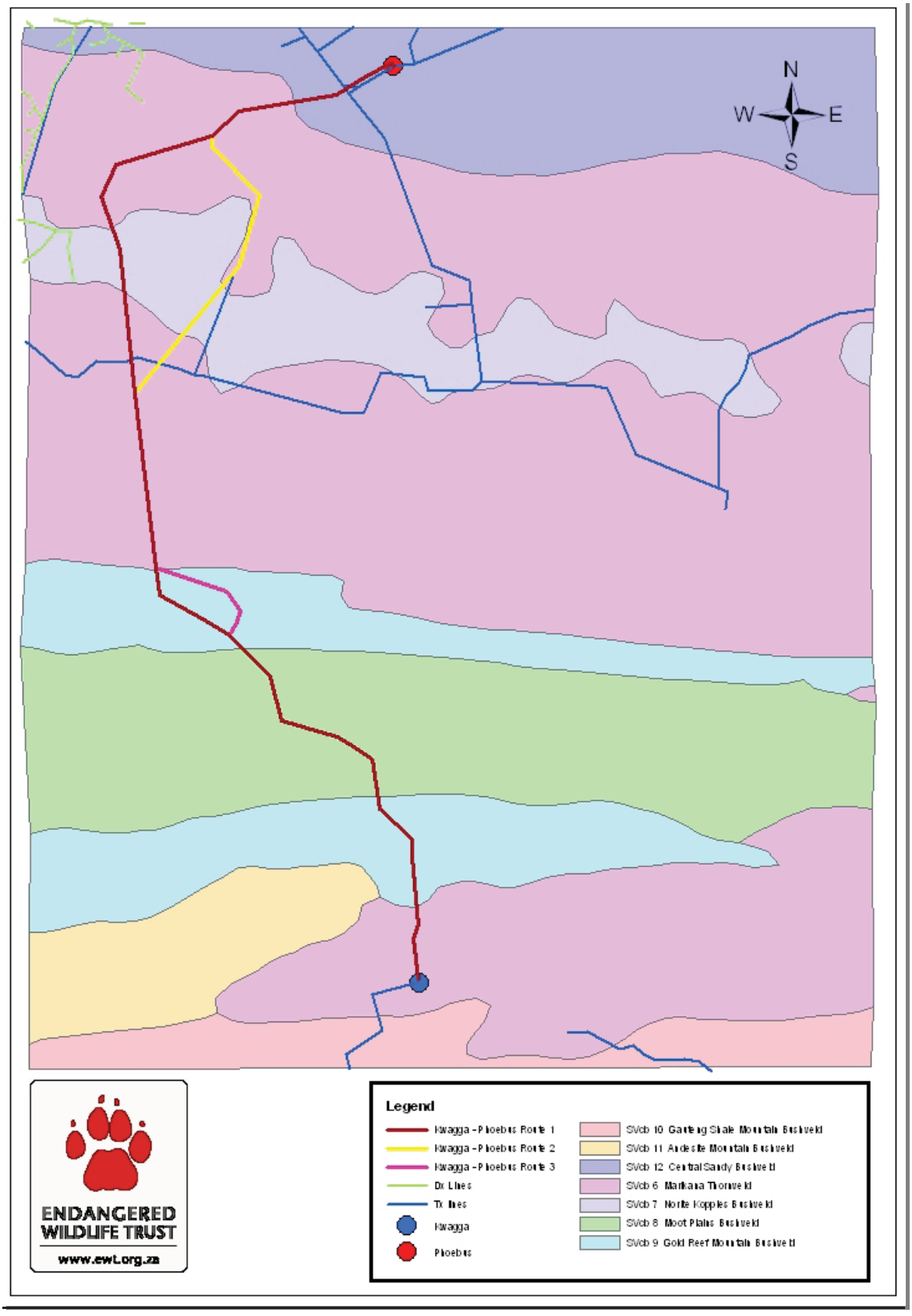


**Figure 4.9:** Position of the proposed Tshwane Strengthening Project Kwagga-Phoebus Transmission lines, relative to the sensitive avifaunal areas (EWT SEA, 2008)

For the majority of the proposed alternatives, most of the soils are shallow (<400 mm), often on rock, with much surface rock outcropping. However, in parts, the route crosses areas of deeper, usually reddish-yellow soils, especially close to Soshanguve in the north and in parts of the Moot, immediately to the south of the Magaliesberg. Much of Alternative 2 passes through a wetland, where hydromorphic (wet) soils occur. Each of the mapping units from the PWV survey was allocated to a class of broad agricultural potential, mainly using a combination of depth, texture, soil form and rockiness. The results of this exercise are shown in Table 4.6 below and the colours used correspond to the colours used in the map in Figure 4.11.

**Table 4.6:** Agricultural Potential

| Agricultural Potential Class | Soil Mapping Units | Effective Depth (mm) |
|---|---|---|
| ***HIGH*** | Deep to moderately deep Hutton & Avalon soils; no or few physical limitations | 600-1200 |
| **MODERATE** | Moderately deep or variable depth soils; limited depth and occasionally heavy texture | 300-1200 |
| **LOW** | Shallow, gravelly soils, often with some rock; severe depth limitation | <600 |
| **ROCKY** | Significant rock outcropping (>40%), usually shallow soils with severe depth limitation | <300 |
| **WET AREAS** | Low-lying areas, soils prone to seasonal waterlogging or flooding | <300 |
| **WASTE** | Industrial waste areas, such as mine dumps or slimes dams etc | - |
| **URBAN** | Housing, industrial, mining, commercial areas etc; not surveyed | - |

**Phoebus Substation Site**

The proposed Phoebus substation is to be located immediately to the north of the existing Hangklip substation, near Soshanguve. The co-ordinates are approximately 25° 33' 40" S 28° 05' 58" E, and the site is gently sloping, with a slope angle towards the south of approximately 3%.

The area was investigated in some detail, with a 100 x 100 m grid of investigation. A hand-held soil auger was used to auger to a maximum depth of 1.2 m (or shallower, if a restricting layer such as rock was encountered), and

topsoil and subsoil samples were collected at two locations for analysis. These results are given in Table 4.7 and Figure 4.11 below.

**Table 4.7:** Soil analyses

| **Sample site** | | **S 1** | | **S 2** | |
|---|---|---|---|---|---|
| **Co-ordinates (Lat/Long)** | | 25° 33′ 38.9″ S 28° 05′ 59.4″ E | | 25° 33′ 45.4″ S 28° 05′ 55.8″ E | |
| **Soil Form** | | Hu | | Hu | |
| **Horizon** | | A1 | B1 | A1 | B1 |
| **Depth (mm)** | | 0-300 | 300-900 | 0-250 | 250-550 |
| **Sa** | % | 75.9 | 60.0 | 71.5 | 63.6 |
| **Si** | | 10.1 | 22.0 | 14.5 | 18.4 |
| **Cl** | | 14 | 18 | 14 | 18 |
| | | | | | |
| **Na** | cmol $kg^{-1}$ | 0.001 | 0.018 | 0.013 | 0.009 |
| **K** | | 0.243 | 0.251 | 0.247 | 0.253 |
| **Ca** | | 0.858 | 0.349 | 1.052 | 0.733 |
| **Mg** | | 0.603 | 0.565 | 0.673 | 0.883 |
| **CEC** | | 7.052 | 5.328 | 8.669 | 5.533 |
| | | | | | |
| **P (ppm)** | | 20.71 | 2.36 | 4.09 | 0.85 |
| **pH ($H_2O$)** | | 6.30 | 5.44 | 5.93 | 5.70 |
| **Org. C** | % | 0.66 | 0.46 | 0.74 | 0.52 |

The soils occurring on the site (see map in Figure 4.11) are red (occasionally yellow-brown), weakly structured, sandy loam soils on rock or cemented ferricrete. When the soil depth is sufficient to allow for the development of a topsoil and subsoil, the soil belongs to the Hutton (Hu) form (and occasionally Clovelly (Cv) form, where the colour is yellow-brown), while where the soil is shallow, so that only a topsoil has formed (total soil depth to rock generally <350 mm), then the soil belongs to either the Hutton (Hu) form (on rock) or Dresden form (on ferricrete).

On the map in Figure 4.8, the soils occurring are shown, with the soil form abbreviations of Hutton (**Hu**), Clovelly (**Cv**) and Dresden (**Dr**). The prefixes used indicated depth to underlying rock/ferricrete as follows: **s** = shallow (<350 mm); **m** = moderately deep (500-750 mm); **d** = deep (>900 mm).

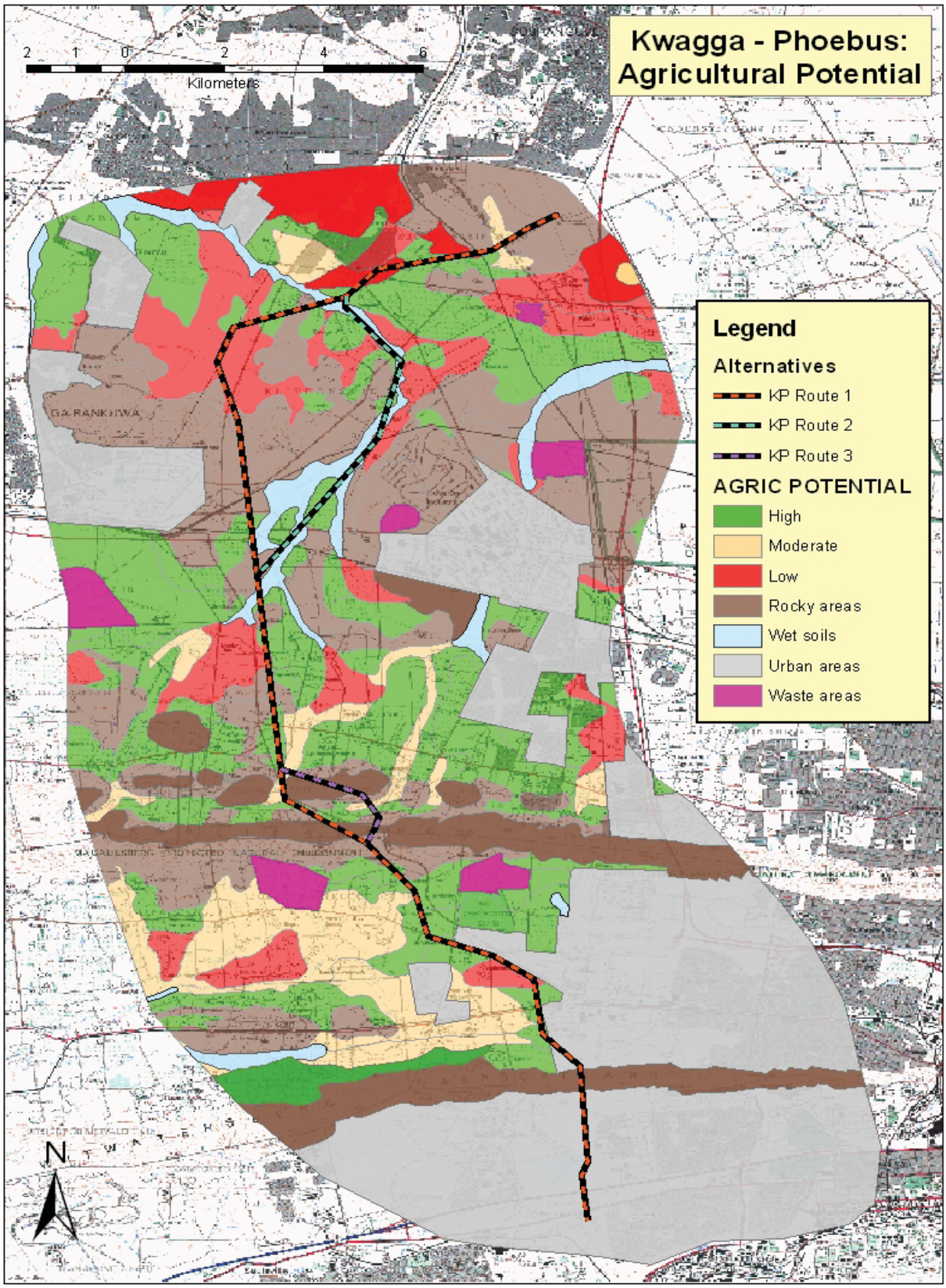


**Figure 4.10:** Soil Map of the proposed Kwagga-Phoebus power lines

However, one of the clear characteristics of the area is not only the restricted soil depth of many of the soil observations that were made, but also the occurrence of many large rocks (and ferricrete boulders) outcropping at the surface. These were observed more or less throughout the area, so that even where the soil happened to be deep enough for theoretical cultivation (approximately >750 mm or so), the presence of the boulders close by (< 10 m in some cases) would render the area unsuitable for cultivation.

Thus, most of the area will be classed as having **low potential** for arable agriculture, suited for grazing at best (refer to Figure 4.11 and 4.12).

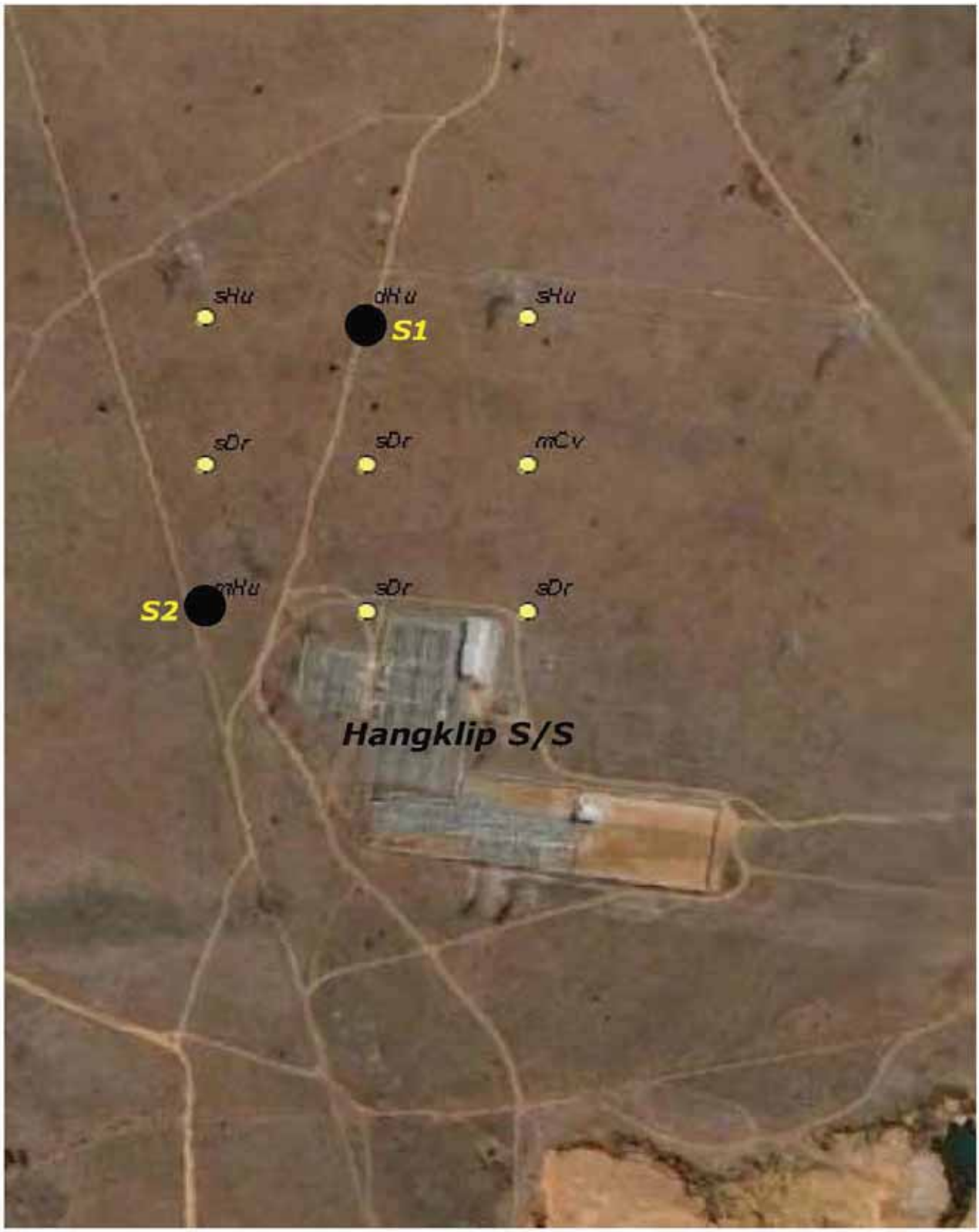


**Figure 4.11:** Soil Map of the proposed Phoebus substation

# ASSESSMENT OF IMPACTS: KWAGGA SUBSTATION EXTENSION & PHOEBUS SUBSTATION ESTABLISHMENT CHAPTER 5

In order to strengthen the supply of electricity to the Pretoria region, Eskom proposes the construction and operation of a number of new substations and transmission power lines within the Tshwane municipal area with the aim to reinforce the existing electricity supply, primarily to this municipal area. This proposal forms part of the **City of Tshwane Electricity Supply Plan Scheme** (CTESPS), and includes the construction and operation of the proposed Phoebus and the expansion of existing Kwagga substation and the construction of a 400kV transmission power line between the two (Kwagga and Phoebus) substations. Eskom envisages that these developments will meet the metropolitan area's increased demand for electricity, whilst at the same time alleviating the current pressure on the existing Minerva and Apollo substations.

This chapter serves to assess the identified potentially significant environmental impacts associated with the proposed sites for the development of the new Phoebus substation and extension of the Kwagga substation, and to make recommendations for the management of these impacts for inclusion in the draft Environmental Management Plan (refer to Appendix O). Impacts associated with the proposed 400kV power line are assessed within Chapter 6 of this report.

## 5.1. Assessment of Potential Impacts on Ecology

Both the Kwagga and Phoebus substation sites are indicated to be located in a land cover category termed 'Forest and Woodland'. Local areas were however found to be relatively degraded. Land transformation is mostly the result of urban developments and nearby settlements.

» Kwagga Substation Site is located within the Marikana Thornveld Vegetation Type (Endangered); and
» Phoebes Substation Site is located within the Central Sandy Bushveld Vegetation Type (Vulnerable).

While a medium-high biophysical status is ascribed to remaining natural habitat around the Kwagga Substation, the current status of untransformed habitat is not adequately captured in available databases. The degraded nature of habitat in the immediate surrounds of Kwagga Substation therefore results in a medium-low status ascribed to remaining natural habitat at the Kwagga Substation site. Aspects of importance in the immediate surrounds include all wetland related habitat. Impacts within these parts should be avoided and the proposed

development should therefore be situated towards the south of the existing substation.

A medium status is ascribed to remaining natural habitat at the proposed Phoebes substation site. Low levels of transformation and degradation are reflected in available databases, but new development affects the status of natural habitat adversely and is not yet captured on available databases.

Sensitivities in the immediate surrounds of the Kwagga substation site include perennial and non-perennial rivers (refer to Figure 5.1). These areas were found to be severely compromised by surrounding urban developments. A high biophysical sensitivity is nonetheless ascribed to all wetland habitat types as part of the biophysical sensitivity analysis. No C-PLAN sensitivities are indicated for the Phoebus substation site. Neither of the two substation sites is located on a classified ridge area.

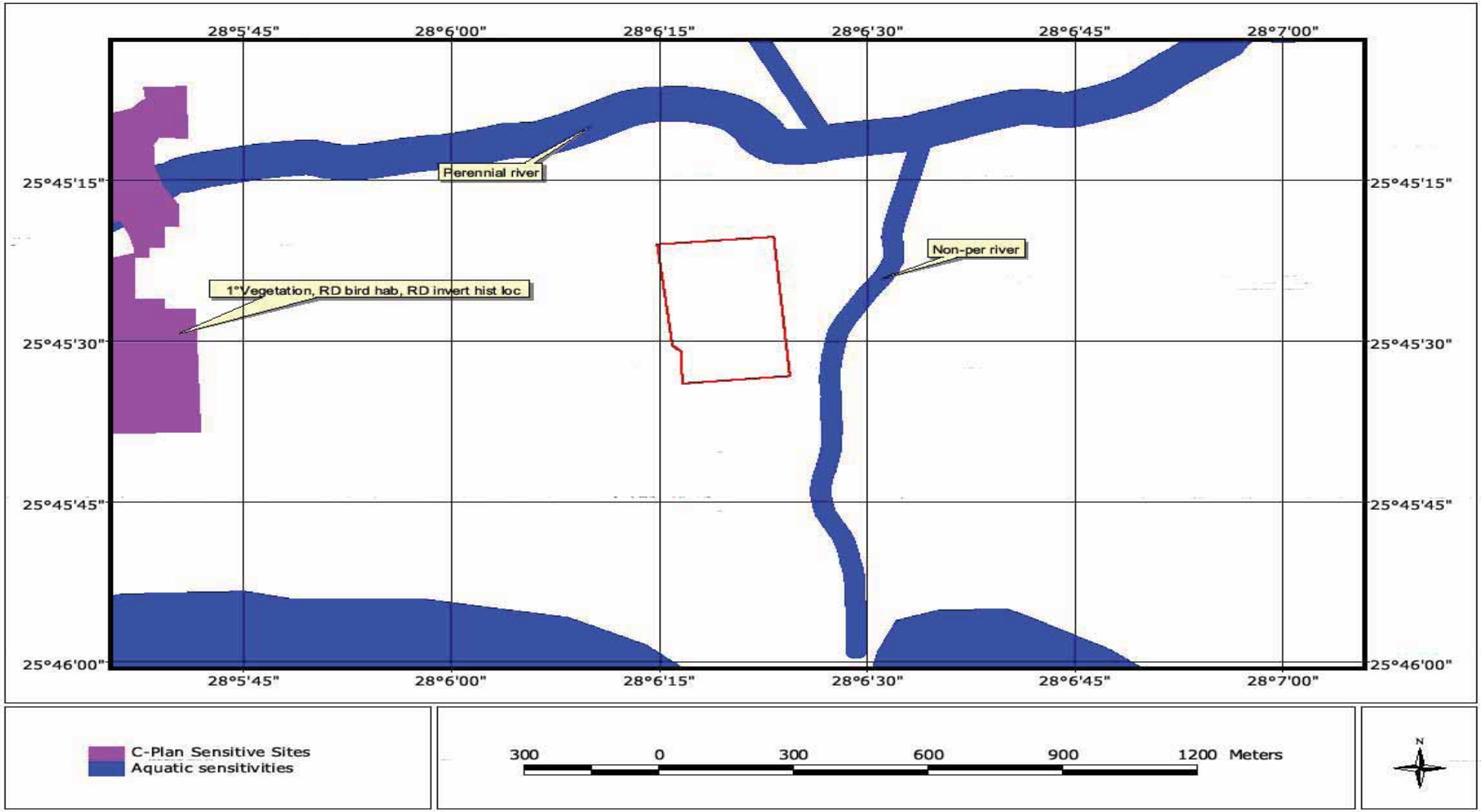


**Figure 5.1:** Sensitive areas within the study area of the Kwagga substation

### 5.1.1. Anticipated Impacts

No impacts were identified that could lead to a beneficial impact on the identified habitat type within the study area since the proposed development is largely destructive. Impacts resulting from the construction and operation of a substation on ecological attributes of the study area are largely restricted to the physical impacts on biota or the habitat in which they occur. Potential impacts include the following, but are not necessarily limited to:

» Direct impacts:
  - Destruction of threatened flora & fauna species & associated habitat;
  - Direct impacts on common fauna species;
  - Destruction of sensitive/ pristine regional habitat types;
» Indirect Impacts:
  - Impacts on surrounding habitat/ species;
» Cumulative Impacts:
  - Increase in local and regional fragmentation/ isolation of habitat; and
  - Increase in environmental degradation.

Expected impacts at both the sites are mostly as a result of the physical disturbance of surface areas during the construction period. Since available habitat is not regarded sensitive in terms of biophysical, floristic or faunal attributes, the significance of likely impacts are rated as low. The implementation of generic mitigation measures are expected to prevent any potentially significant impacts within the surrounding areas (refer to Figure 5.2 and 5.3 below).

Impacts during the operational phase of the project are mostly restricted to the maintenance procedures on the perimeter of substation sites. Since available habitat is not regarded sensitive in terms of biophysical, floristic or faunal attributes, the significance of likely impacts are rated as low. The implementation of generic mitigation measures are expected to prevent any potentially significant impacts within the surrounding areas.

These are described in more detail within the specialist biodiversity study (refer to Appendix I) and are assessed below for each associated power station.

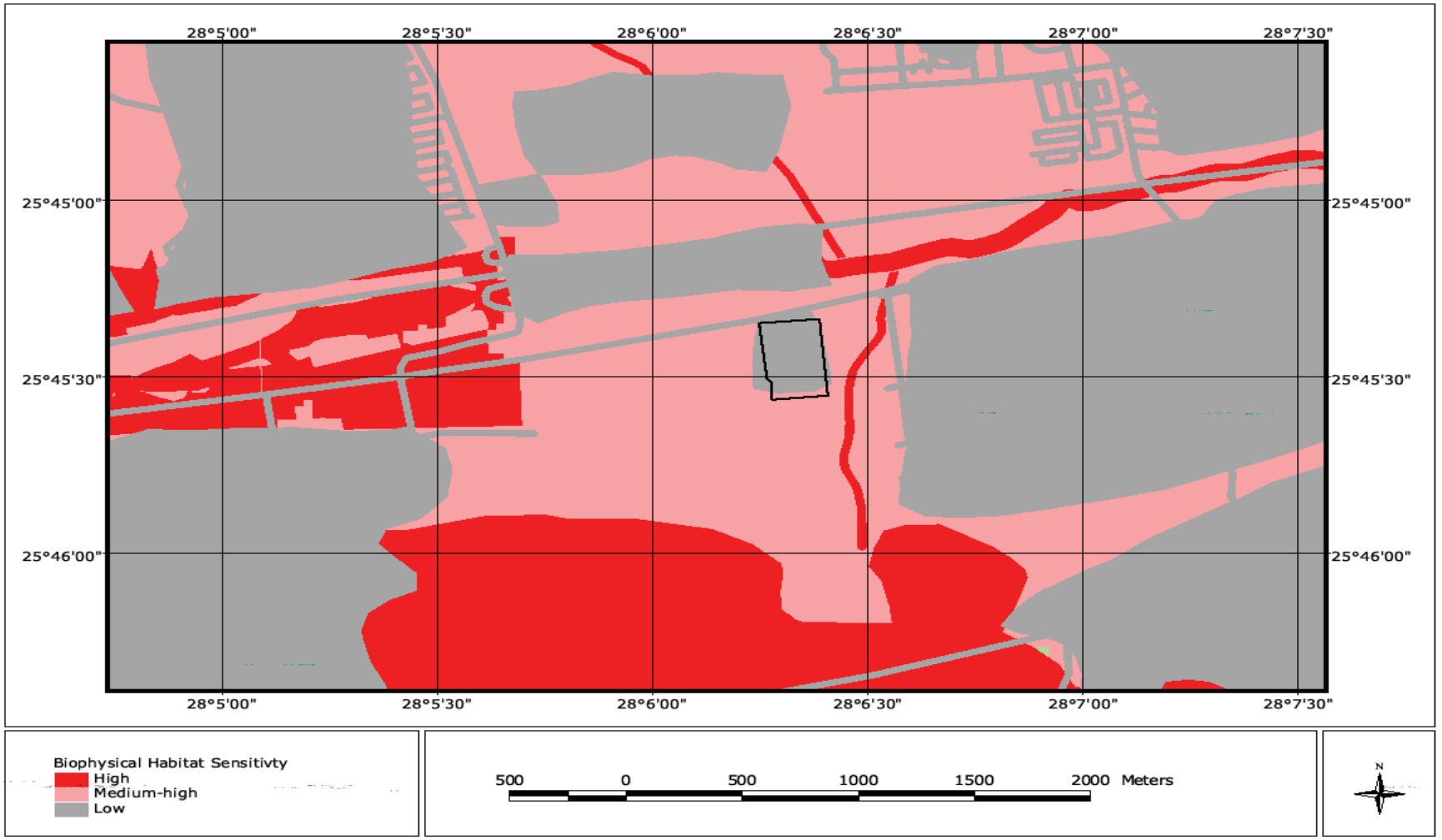


**Figure 5.2:** Biophysical habitat sensitivity within the Kwagga substation site

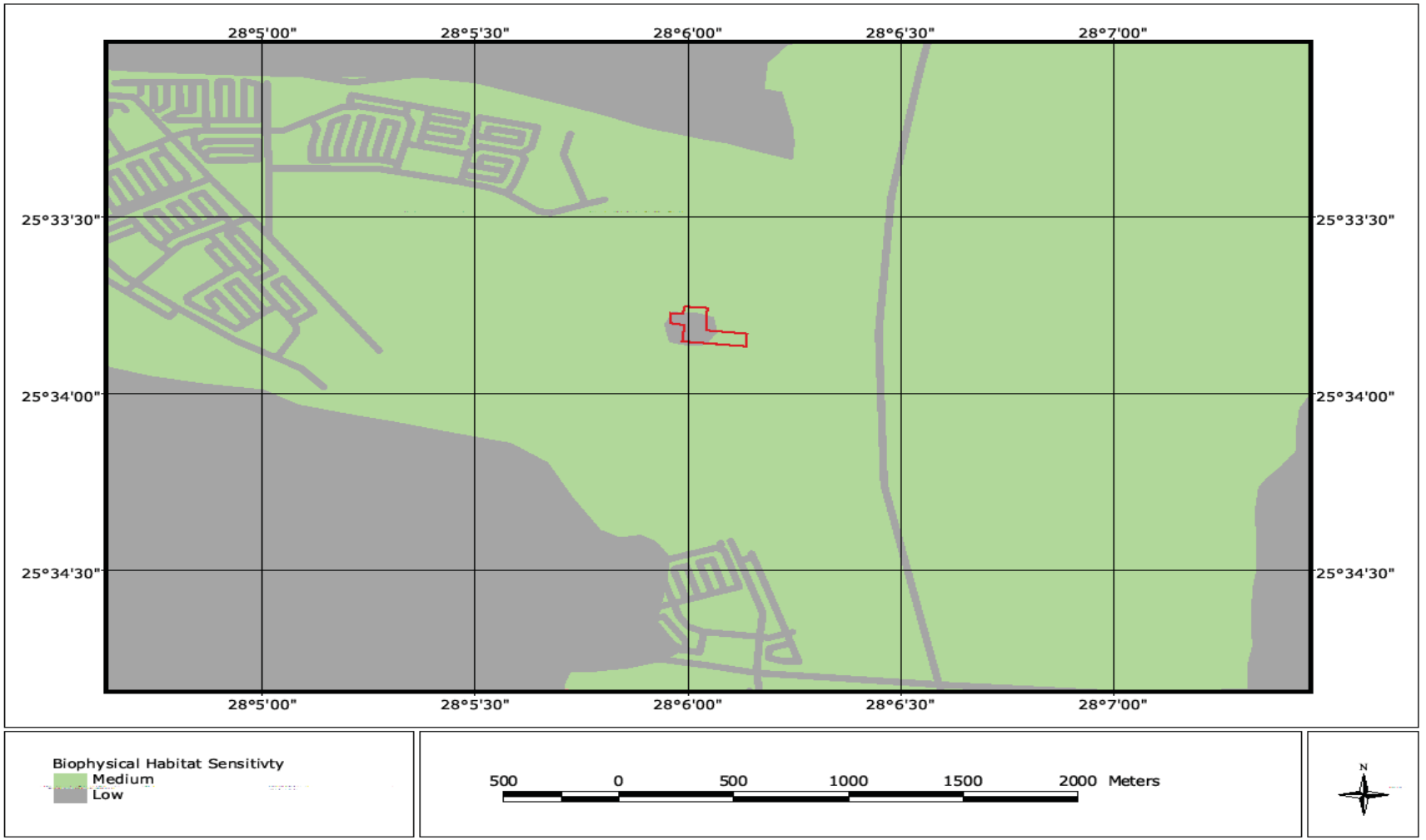


**Figure 5.3:** Biophysical habitat sensitivity within Phoebus substation site

### 5.1.2. Nature of Impacts

#### *5.1.2.1. Destruction of Threatened Flora & Fauna Species & Associated Habitat*

The loss of Red Data or Threatened species or areas that are suitable for these species is a significant impact on the biodiversity of a region. Threatened species, in most cases, do not contribute significantly to the biodiversity of an area in terms of sheer numbers as there are generally few of them, but a high ecological value is placed on the presence of such species in an area as they are frequently an indication of pristine habitat conditions. Conversely, the presence of pristine habitat conditions can frequently be accepted as an indication of the potential presence of species of conservation importance.

Direct threats to threatened fauna species is regarded low in probability, mainly as a result of the ability of fauna species to migrate away from areas where impacts occur. Probably the only exception to this statement will be in the event where extremely localised habitat that are occupied by threatened fauna species are impacted by construction and operational activities to the extent that the habitat no longer satisfy the habitat requirements of the particular species. It should also be noted that threatened fauna species potentially occurring in the study area have relatively wide habitat preferences and ample suitable habitat is presently available throughout the study area. To place this aspect into context it is estimated that habitat loss and transformation resulting from non-invasive and often overlooked impacts, such as overgrazing, infestation by invasive shrubs and selective hunting probably contributes more to impacts on certain threatened fauna species than power line developments ever will.

#### *5.1.2.2. Direct Impacts on Common Flora & Fauna Species*

The likelihood of this impact affecting common fauna species is relatively low as a result of the ability of animal species to migrate away from direct impacts. The tolerance levels of common animal species occurring in the study area is of such a nature that surrounding areas will suffice in habitat requirements of species forced to move from areas of impact.

Likely, common flora species are widespread and occur abundantly in other, adjacent habitat. The possibility of this proposed power line affecting common flora species to the extent that their conservation status might change is regarded highly unlikely.

#### *5.1.2.3. Faunal Interactions with Structures, Servitudes & Personnel*

It should be noted that animals generally avoid contact with human structures, but do grow accustomed to structures after a period. While the structures are usually visible as a result of clearance around tower footprints, injuries and death of animals do occur sporadically as a result of accidental contact. Large mammals are mostly prone to this type of impact. In particular, primate species such as baboons and monkeys are known to climb pole structures. Alteration of habitat conditions within the servitudes does not necessarily imply a decrease in faunal habitation. These areas are frequently preferred by certain fauna species. The establishment of a dominant grass layer generally results in increased presence of grazer species, which might lead to an unlikely, but similar increase in predation within these areas.

The presence of personnel within the servitude during construction and maintenance periods will inevitably result in contact with animals. While most of the larger animal species are likely to move away from human contact, dangerous encounters with snakes, scorpions and possibly larger predators always remain likely. Similarly, the presence of humans within areas of natural habitat could potentially result in killing of animals by means of snaring, poaching, road kills, poisoning, trapping, etc.

#### *5.1.2.4. Impacts on Surrounding Habitat/ Species*

Surrounding areas and species present in the direct vicinity of the study area could be affected by indirect impacts resulting from construction and operation activities. These impacts could include all of the above impacts, depending on the sensitivity and status of surrounding habitat and species as well as the extent of impact activities. This impact also includes the floristic species changes that could potentially occur as a result of the alteration of habitat physiognomy, particularly in woodland areas.

#### *5.1.2.5. Increase in Local & Regional Fragmentation/ Isolation of Habitat*

Uninterrupted habitat is a precious commodity for biological attributes in modern times, particularly in areas that are characterised by moderate and high levels of transformation. The loss of natural habitat, even small areas, implies that biological attributes have permanently lost that ability of occupying that space, effectively meaning that a higher premium is placed on available food, water and habitat resources in the immediate surrounds. This, in some instances might mean that the viable population of plants or animals in a region will decrease proportionally with the loss of habitat, eventually decreasing beyond a viable population size. The danger in this type of cumulative impact is that effects are

not known, or is not visible; with immediate effect and normally when these effects become visible they are beyond repair. Linear types of developments affect the migratory success of animals in particular.

An important mitigation measure in this regard is to utilise existing causal factors of habitat fragmentation. Existing levels of habitat fragmentation are not expected to increase as the proposed developments will be located to existing substations.

#### *5.1.2.6. Increase in Environmental Degradation*

Impacts associated with this type of development that will lead to initial, incremental or augmentation of existing types of environmental degradation include impacts on the air, soil and water present within available habitat. Pollution of these elements might not always be immediately visible or readily quantifiable, but incremental or fractional increases might rise to levels where biological attributes could be affected adversely on a local or regional scale. In most cases are these effects are not bound and is dispersed, or diluted over an area that is much larger than the actual footprint of the causal factor.

Similarly, developments in untransformed and pristine areas are usually not characterised by visibly significant environmental degradation and these impacts are usually most prevalent in areas where continuous and long-term impacts have been experienced.

Impacts are assessed prior to the implementation of any mitigation measures as well as subsequent to the implementation of all required and recommended mitigation measures in order to indicate the expected efficiency of proposed measures. Significance of impacts is rated as **high, moderate,** or **low**. The consequence is the sum of the values of the extent, duration, magnitude and reversibility of the impact.

***Impact tables summarising the significance of power lines impacts on ecology (with and without mitigation) during construction and operation phase of the substation sites.***

| **Nature of Impact** | **Impacts on terrestrial biodiversity during construction of the existing Kwagga Substation Site** | |
|---|---|---|
| | **Before Mitigation** | **After Mitigation** |
| Extent | 1 (Local) | 1 (Local) |
| Duration | 5 (Long-term) | 5 (Long-term) |
| Magnitude | 1 (Minor) | 1 (Minor) |
| Reversibility | 3 (Recoverable, requires human | 3 (Recoverable, requires |

| | | |
|---|---|---|
| | input) | human input) |
| Consequence | 10 | 10 |
| Probability | 2 (Low probability) | 1 (Low probability) |
| **Significance** | **20 (Low)** | **10 (Low)** |
| Status | Negative | Negative |
| Irreplaceable loss of resources? | No | |
| Can impacts be mitigated | Yes | |
| Mitigation | Limit development within the substation area | |
| Cumulative Impacts | Adding to local transformation, degradation | |
| Residual Impacts | Local species changes | |

| **Nature of Impact** | **Impacts on terrestrial biodiversity during construction of the new Phoebes Substation Site** | |
|---|---|---|
| | **Before Mitigation** | **After Mitigation** |
| Extent | 1 (Local) | 1 (Local) |
| Duration | 5 (Long-term) | 5 (Long-term) |
| Magnitude | 2 (Low) | 1 (Minor) |
| Reversibility | 3 (Recoverable, requires human input) | 3 (Recoverable, requires human input) |
| Consequence | 11 | 10 |
| Probability | 2 (Low) | 1 (Low) |
| **Significance** | **22 (Low)** | **10 (Low)** |
| Status | Negative | Negative |
| Irreplaceable loss of resources? | No | |
| Can impacts be mitigated | Yes | |
| Mitigation | Limit development within the substation area | |
| Cumulative Impacts | Adding to local transformation, degradation | |
| Residual Impacts | Local species changes | |

## Operational Phase

| **Nature of Impact** | **Impacts on terrestrial biodiversity during operation of the existing Kwagga Substation Site** | |
|---|---|---|
| | **Before Mitigation** | **After Mitigation** |
| Extent | 1 (Local) | 1 (Local) |
| Duration | 2 (Short-term) | 1 (Short-term) |
| Magnitude | 2 (Low) | 1 (Minor) |
| Reversibility | 3 (Recoverable, requires human input) | 3 (Recoverable, requires human input) |
| Consequence | 8 | 6 |
| Probability | 2 (Low) | 1 (Low) |
| **Significance** | **16 (Low)** | **6 (Low)** |
| Status | Negative | Negative |
| Irreplaceable loss of resources? | No | |

| | |
|---|---|
| Can impacts be mitigated | Yes |
| Mitigation | Planting with indigenous vegetation and rehabilitation of the site |
| Cumulative Impacts | Adding to local transformation, degradation |
| Residual Impacts | Local species changes |

| **Nature of Impact** | **Impacts on terrestrial biodiversity during operation of the new Phoebes Substation Site** | |
|---|---|---|
| | **Before Mitigation** | **After Mitigation** |
| Extent | 1 (Local) | 1 (Local) |
| Duration | 2 (Short-term) | 1 (Short-term) |
| Magnitude | 2 (Low) | 1 (Minor) |
| Reversibility | 3 (Recoverable, requires human input) | 3 (Recoverable, requires human input) |
| Consequence | 8 | 6 |
| Probability | 2 (Low) | 1 (Low) |
| **Significance** | **16 (Low)** | **6 (Low)** |
| Status | Negative | Negative |
| Irreplaceable loss of resources? | No | |
| Can impacts be mitigated | Yes | |
| Mitigation | Planting with indigenous vegetation and rehabilitation of the site | |
| Cumulative Impacts | Adding to local transformation, degradation | |
| Residual Impacts | Local species changes | |

### *5.1.3. Conclusions and Recommendations*

Expected impacts are mostly as a result of the physical disturbance of surface areas and clearance of servitudes during the construction period.

Impacts within the remainder of the area are regarded to be of low nature and the implementation of generic mitigation measures is expected to minimise likely impacts within these environments. Impacts during the operational phase of the project are mostly restricted to the maintenance procedures as well as latent effects of habitat alteration. Impacts are generally regarded to be of a low nature and the implementation of generic mitigation measures are expected to decrease the significance of impacts to a benign status.

Mitigation measures are required to be implemented in order to eliminate or reduce the significance of potential impacts on biodiversity. For this reason, mitigation specified in the specialist biodiversity study (refer to Appendix F) are mainly aimed at limiting the effects of construction and servitude maintenance.

Generic mitigation measures and recommendations with regards to the impacts on biodiversity are included within the draft EMP (refer to Appendix L). Specific mitigation measures include the following:

» Appoint Environmental Control/ Site Officer. Appointment prior to start of construction, responsibilities should include, but not limited to ensuring adherence to EMP guidelines, guidance of activities, planning, reporting;
» Compile and implement an environmental monitoring programme, the aim of which should be ensuring long-term success of rehabilitation and prevention of environmental degradation.
» Identify areas that will be suitable for access roads, ensuring proper upgrade/ construction/ maintenance in order to limit erosion, proliferation of weeds, etc.
» Limit construction, maintenance and inspection activities to dry periods in order to curb occurrence/ augmentation of erosion in areas of existing erosion, destabilising of substrate in areas of high slopes, riparian zones, etc;
» Demarcate construction areas in order to control movement of personnel, vehicles, providing boundaries for construction sites in order to limit dilution or spread of peripheral impacts.
» Remove and store topsoil separately in areas where excavation/ degradation takes place. Topsoil should be used for rehabilitation purposes in order to facilitate regrowth of species that occur naturally in the area.
» Compile an education programme for all contractors and subcontractors/ workers to ensure compliance to all aspects of EMP as well as educating personnel in the safe and proper conduct within areas of natural habitat.
» Prevent open fires, provide demarcated fire-safe zones, facilities and fire control measures.
» Ensure off-site storage of hazardous materials, chemicals, fuels, oils, etc. in order to prevent accidental spillage, contamination or pollution during both construction and implementation.
» Develop an emergency maintenance operational plan to deal with any event of contamination, pollution or spillages.
» Provide temporary on-site sanitation, litter and waste management and hazardous materials management facilities.
» Ensure surface restoration and resloping in order to prevent erosion, taking cognisance of local contours and landscaping.
» Rehabilitate of disturbed areas subsequent to construction activities, taking cognisance of factors such as topsoil replacement, removal of introduced materials, local environmental factors.
» Remove of dismantled structures, rubble, litter, refuse, temporary infrastructures, sanitation equipment, etc subsequent to construction and rehabilitation.

» Final inspection in order to ensure adherence to EMP guidelines, completion of localised/ remaining areas of impact, monitoring of rehabilitation success, etc.

## 5.2. Assessment of Potential Impacts on Avifauna

Substations can impact avifauna through electrocutions, habitat destruction or disturbance.

» Electrocution
» Habitat destruction
» Disturbance

These potential impacts are discussed and assessed in the tables below.

Electrocutions are possible within the substation yard during operation and this is caused by live phases that are close together being bridged by a birds extremities. Substations are generally lit and this can attract certain species however most species impacted on by substations are the less sensitive species and therefore of less concern.

During the construction phase and maintenance of substations, some habitat destruction and alteration inevitably takes place. These activities have an impact on birds breeding, foraging and roosting in or in close proximity to the servitude, through the modification of habitat.

During the construction and maintenance of electrical infrastructure, a certain amount of disturbance results. For shy, sensitive species this can impact on their usual daily activities, particularly whilst breeding. In general terms, one would expect that any species already existing in the study area must have adapted to relatively high levels of disturbance as a result of the existing infrastructure and the high levels of development on the study area.

***Impact tables summarising the significance of Substation Impacts on Avifauna (with and without mitigation)***

| ***Nature: Electrocutions on the Substations***<br>Electrocutions can have a negative impact on avifauna within the substation yards. However this negative impact will almost certainly be limited to non-sensitive species and thus will be of little concern. | | |
|---|---|---|
| | Without mitigation | With mitigation |
| Extent | 1 (Local) | 1 (Local) |
| Duration | 4 (Long-term) | 4 (Long-term) |

| | | |
|---|---|---|
| Magnitude | 0 | 0 |
| Probability | 0 | 0 |
| Significance | **0** | **0** |
| Status | NA | NA |
| Reversibility | - | - |
| Irreplaceable loss of resources | - | - |
| Can impacts be mitigated | - | - |
| Mitigation: - | | |
| Cumulative impacts:- | | |
| Residual impacts: - | | |

***Nature: Habitat Destruction***

During the construction and maintenance of the substations, some habitat destruction and alteration inevitably takes place. This happens with the construction of access roads and the levelling of substation yards. These activities have an impact on birds breeding, foraging and roosting in or in close proximity to the power line servitude associated with the turn-in lines, through the modification of habitat.

| | Without mitigation | With mitigation |
|---|---|---|
| Extent | 1 (Local) | 1 (Local) |
| Duration | 2 (Short-term) | 2 (Short-term) |
| Magnitude | 3 (Moderate) | 2 (Low) |
| Probability | 3 (Probable) | 2 (Low probability) |
| Significance | **27 (Low)** | **16 (Low)** |
| Status | Negative | Negative |
| Reversibility | 3 (Recoverable, requires human input) | 3 (Recoverable, requires human input) |
| Irreplaceable loss of resources | Yes | Yes |
| Can impacts be mitigated | Yes | Yes |
| Mitigation: Any indigenous vegetation adjacent to the substation area must be left intact wherever possible. | | |
| Cumulative impacts: Marginal | | |
| Residual impacts: Medium | | |

***Nature: Disturbance of avifauna***

During the construction and maintenance of electrical infrastructure, a certain amount of disturbance occurs.

| | Without mitigation | With mitigation |
|---|---|---|
| Extent | 1 (Local) | 1 (Local) |
| Duration | 2 (Short-term) | 2 (Short-term) |

| | | |
|---|---|---|
| Magnitude | 2 (Low) | 1 (Minor) |
| Probability | 3 (Probable) | 2 (Improbable) |
| Significance | **18 (Low)** | **10 (Low)** |
| Status | Negative | Negative |
| Reversibility | 1 (Recoverable) | 1 (Recoverable) |
| Irreplaceable loss of resources | No | No |
| Can impacts be mitigated | Yes | Yes |
| Mitigation: Minimal amount of machinery must be used around any sensitive areas and near any water courses. | | |
| Cumulative impacts: Marginal | | |
| Residual impacts: Low | | |

### *5.2.1. Conclusions and Recommendations*

*Electrocutions*
Electrocutions can have a negative impact on avifauna within the substation yards, however this negative impact will almost certainly be limited to non-sensitive species and thus will be of little concern. Should it be found during operation that this is not the case a suitably qualified ornithologist must be appointed to provide solutions in dealing with this impact. As such, electrocutions are not seen as a significant impact for the two substations.

*Habitat destruction*
As most of both study areas (Kwagga expansion and proposed Phoebus substation sites) are transformed and slightly degraded due to existing infrastructure, hence this is not seen as a significant impact.

*Disturbance*
Again this impact is likely to be very low considering the area and the level of disturbance already present.

In conclusion the proposed Phoebus substation can be established and Kwagga substation be upgraded with minimal impact on avifauna. The two areas are already disturbed and transformed and as such the proposed activities will have no significant impact. In addition, the existing and the proposed residential development and light industry within the vicinity of the substation area renders any avifaunal impact negligible.

## 5.3. Assessment of Potential Visual Impacts

The construction of transmission infrastructure such as the proposed substations in populated areas will always be problematic from a visual impact perspective. The higher density residential areas such as Soshanguve extension, Danville, Kwaggasrand etc are often less affected by the project infrastructure as compared to lower density residential areas such as agricultural smallholdings. This is due to the fact that the higher occurrence of structures and visual clutter within high-density residential areas tend to absorb the visual impact.

### *5.3.1. Potential Visual Impacts associated with the Construction and Decommissioning Phases of the two (Kwagga and Phoebus) Substation*

The construction phase of the substations will see an increase in activities at the substation sites. During this time heavy vehicles will frequent the roads in these areas and may cause, at the very least, a visual nuisance to other road users and landowners in close proximity to the construction activities. In the event of decommissioning of the infrastructure, impacts are expected to be similar to those experienced during the construction phase (i.e. as a result of increased activities on site).

Visual impacts associated with the construction phase (and eventual decommissioning phase), albeit temporary, should be managed according to the following principles:

» Reduce the construction/decommissioning period through careful planning and productive implementation of resources.
» Restrict the activities and movement of construction/decommissioning workers and vehicles to the immediate construction/decommissioning site(s).
» Ensure that the general appearance of construction activities, construction camps (if required) and lay-down areas are maintained by means of the timely removal of rubble and disused construction materials.
» Restrict construction activities to daylight hours (if possible) in order to negate or reduce the visual impacts associated with lighting.

### *5.3.2. Potential Visual Impacts associated with the Operational Phase of the Kwagga and Phoebus Substations*

Most of the land within the study area for the Kwagga and Phoebus substations has been permanently altered by extensive urbanisation in the region. Although most of the area is covered by residential areas or agricultural holdings, one heavy industrial zone, Rosslyn, falls entirely within the study area. Several

unoccupied open spaces also occur in the vicinity of both the Phoebus and Kwagga substations.

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 5m 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 25m above ground level (the typical height of communications mast) in order to simulate a worst-case scenario of the tallest structure of a substation. The viewshed analysis does 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.

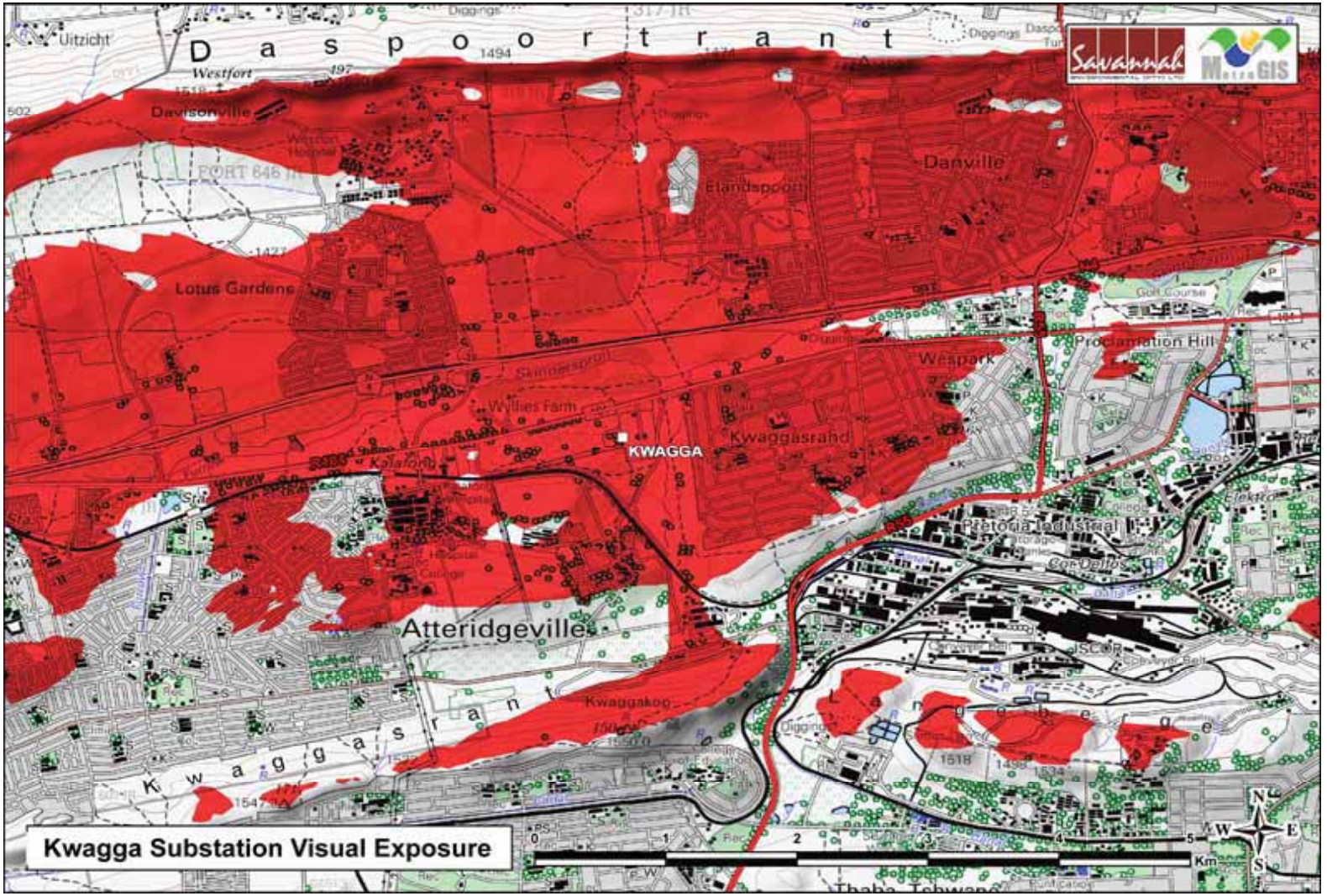


**Figure 5.4:** existing potential visual exposure of the Kwagga substation.

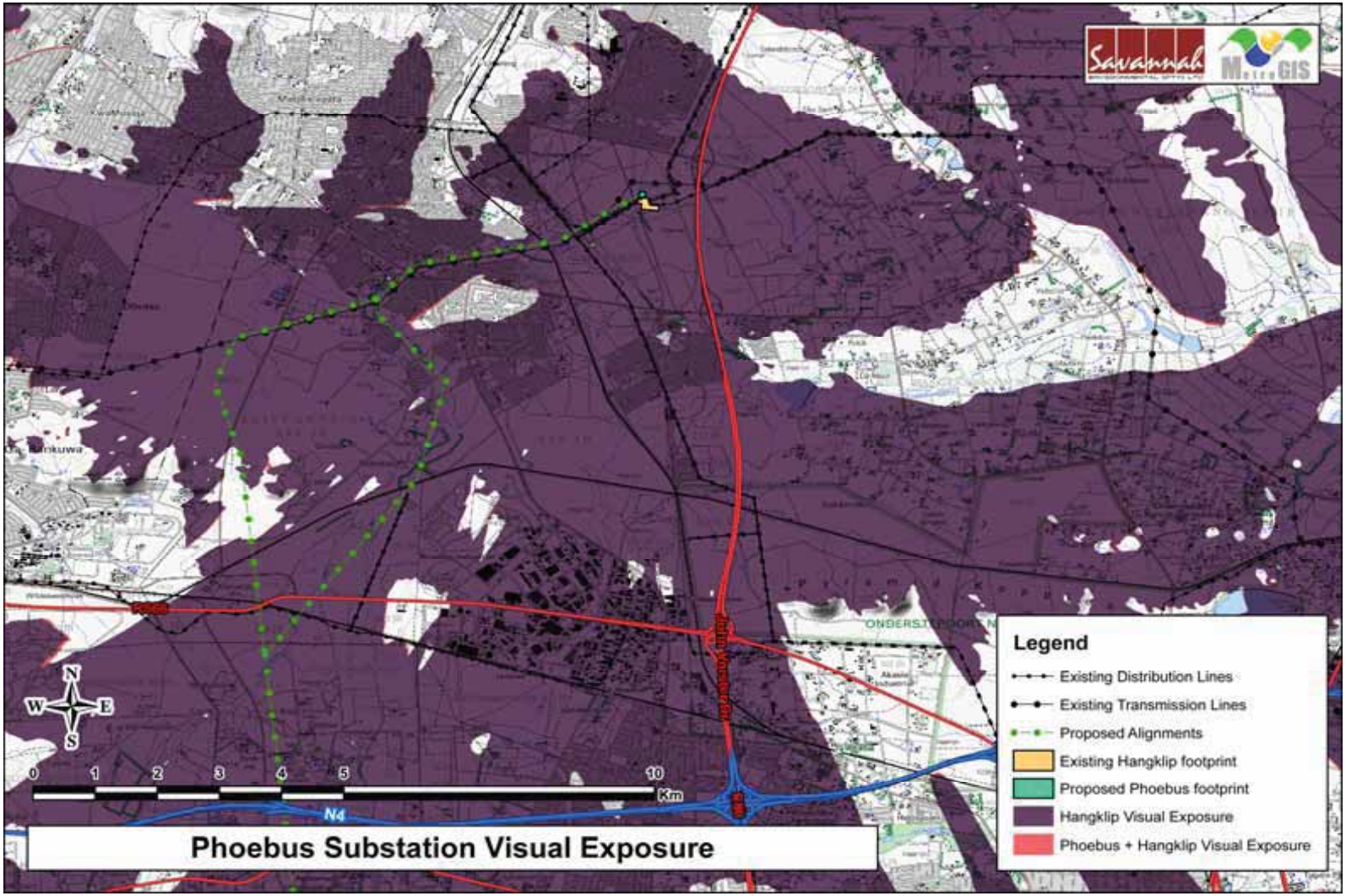


**Figure 5.5:** Viewshed overlay of existing Hangklip substation and new Phoebus footprint.

The comparison of the visual impact index for the existing Hangklip and the proposed Phoebus substations indicates an area of **moderate** visual impact within a 500m radius of the proposed Phoebus substation site. The highway (Mabopane Highway) to the east also represents an area of **moderate** visual impact where observers travelling along this highway will have a short distance view of the Phoebus substation.

*Please note that due to the declining visual impact over distance, the **extent** (or spatial scale) rating is reversed (i.e. a localised visual impact has a higher value rating than a national or regional value rating). This implies that the visual impact is highly unlikely to have a national or international extent, but that the local or site-specific impact could be of high significance[10].*

***Impact tables summarising the significance of visual impacts associated with the operation of the proposed substation***

| ***Nature of Impact:*** The proposed Phoebus substation is expected to have a moderate to low visual impact on observers travelling along Mabopane Highway. In addition, the proposed extension to Kwagga substation is expected to have low visual impact on viewers travelling along Church street. The occurrence of high density residential township of Soshanguve Extension and Danville west and south-east of the site, respectively, is expected to mitigate any potential visual impact to a large degree. | | |
|---|---|---|
| | **Kwagga Substation** | **Phoebus Substation** |
| ***Extent*** | Local **(4)** | Local **(4)** |
| ***Duration*** | Long term **(4)** | Long term **(4)** |
| ***Magnitude*** | Minor **(1)** | Minor **(1)** |
| ***Probability*** | High probability **(4)** | High probability **(4)** |
| ***Significance*** | Moderate **(48)** | Moderate **(48)** |
| ***Status (positive or negative)*** | Negative | Negative |
| ***Reversibility*** | Recoverable **(3)** | Recoverable **(3)** |
| ***Irreplaceable loss of resources?*** | No | No |
| ***Can impacts be mitigated during operational phase?*** | No | No |
| ***Mitigation:*** Decommissioning: No mitigation measure proposed because the infrastructure will be on site for about 40 years. | | |

[10] This is only applicable to the visual impact assessment study