Cumulative impacts:
The construction of associated infrastructure including bus bars and towers will increase the cumulative visual impact of the proposed substation upgrade and establishment.
Residual impacts:
N.A.

Nature of Impact:		
The proposed new Phoebus substation and Kwagga expansion are expected to have a moderate visual impact on observers residing in the Soshanguve Extension.		
	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 as the infrastructure will be on site for about 40 years.		
Cumulative impacts:		
The construction of associated infrastructure including bus bars and towers will increase the cumulative visual impact of the proposed substation upgrade and establishment.		
Residual impacts:		
N.A.		

5.3.3. Implications for Project Implementation

» The primary visual impact, namely the appearance and dimensions of the substation infrastructure, is very difficult to mitigate. The functional design of the structures and the dimensions of the substation are unlikely to be changed in order to reduce visual impacts.

» Mitigation of the visual impact though conventional visual impact mitigation measures (i.e. vegetation screening, landscaping or design) is highly unlikely to succeed due to the inherent functional design of the substation structures.
» The site proposed for the Phoebus substation establishment will present a minimal increase in visual exposure. However, the additional infrastructure will compound the visual intrusion of the existing impact that the existing Hangklip substation already has on the surroundings.
» The site proposed for the Kwagga substation expansion will present little or no increase in visual exposure. However, the additional infrastructure will compound the visual intrusion of the existing impact that the existing Kwagga substation already has on the surroundings such as Danville, Kwaggasrand, etc.

5.3.4. Conclusions and Recommendations

From the above viewshed comparison, it is evident that the Kwagga expansion and Phoebus substation establishment will present a minimal increase in visual exposure. In addition, the proposed expansion in Kwagga substation is only expected to increase the viewshed extent marginally, if at all. However, the additional infrastructure will compound the visual intrusion of the existing impact that the existing Hangklip substation already has on the surroundings.

Visual impact absorption through the use of planted vegetation can be an effective and relatively cheap means of reducing the visual impact of a development over time, especially if the duration is intended to be permanent or long-term. Such mitigation measures would be superseded by the need for servitudes for the turn-in lines, and thus the planning and implementation of such measures would require technical considerations as well as aesthetic and functional factors.

5.4. Assessment of Potential Impacts associated with Heritage Resources

The Phase I HIA study for the Kwagga and Phoebus substation sites revealed none of the types and ranges of heritage resources as outlined in Section 3 of the National Heritage Resources Act.

5.4.1. Conclusions and Recommendations

There is consequently no reason from a heritage point of view why the Eskom Project should not proceed. Therefore, no impacts on heritage resources is expected as a result of the proposed development.

5.5. Assessment of Potential Social Impacts

Impacts on the social environment as a result of the proposed substation expansion and establishment is expected to occur during both the construction and operation phases (as well as during the eventual decommissioning of the infrastructure). The construction phase associated with the proposed power lines is expected to last for approximately 24 months.
The Social Impact Assessment (SIA) considers the following:

» Demographic processes (Change in population size, density and/or demographic profile).
» Economic processes (the way in which people make a living and the economic activities in the society)
» Geographic processes (land use patterns)
» Empowerment, institutional and legal processes (the ability of people to be involved and influence decision making process and role and efficiency and operation of governments and other organisations),
» Socio-cultural process (the way in which humans behave, interact and relate to each other and their environment and the belief and value systems which guide these interactions)

Considering all these processes, potential social health impacts were also assessed. A distinction was made between the change process and impacts. A change process is defined as a change that takes place within the receiving environment as a result of a certain intervention. A potential social impact follows as a result of the impact once it is experienced as such by an individual/household/community/organisation on a physical and cognitive level.

The following geographic change processes are likely to occur:

» Change in access to resources that sustain livelihoods; and
» Land acquisition and disposal, including availability of land.

Impact Tables summarising the significance of Social Impacts associated with the transmission power lines.

In order to assess the corridor alternatives in respect of their anticipated social impacts, a distinction is made between the following impacts:
» **Category 1:** Impacts that are not expected to differ between the proposed corridor alternatives, e.g. the number of construction workers that will be needed for the proposed project remains the same.
» **Category 2:** Impacts that are expected to differ depending on the site specific baseline conditions, e.g. the number of households to be resettled

increases if the development traversed densely populated areas as opposed to skirting populated areas.

GEOGRAPHIC CHANGE PROCESSES (KWAGGA AND PHOEBUS SUBSTATIONS)				
Summary of change process: The presence of a larger substation (Kwagga) and/or a new substation (Phoebus) could potentially set a precedent for further land use changes if additional transmission lines have to feed into the extended/new substation in future. Temporary land use changes can also be expected during construction due to the activities associated with the construction process.				
Nature of impact: As Eskom already owns the respective sites for the substations, it is expected that the impact of land use changes on these particular properties will be limited.				
Site characteristics: Both substations sites are characterised by infrastructure of a similar nature, i.e. the existing Kwagga substation and the Hangklip substation at the Phoebus site.				
Mitigation measures: » Even though both sites belong to Eskom, the land around the substations sites should be rehabilitated upon completion of the construction process so that it does not deter from the surrounding area.			**Enhancement measures**: » None.	
Rating Scale	**Kwagga Substation**		**Phoebus Substation**	
	Without Mitigation	**With Mitigation**	**Without Mitigation**	**With Mitigation**
Extent	Site [1]	Site [1]	Site [1]	Site [1]
Duration	Short [2]	Very short [1]	Short [2]	Very short [1]
Magnitude	Low [4]	Minor [2]	Low [4]	Minor [2]
Reversibility	Reversible [1]	n/a	Reversible [1]	n/a
Probability	Improbable [2]	Very improbable [1]	Improbable [2]	Very improbable [1]

Significance	Low [16]	Low [4]	Low [16]	Low [4]
Status	Negative	Neutral	Negative	Neutral
Cumulative impacts: » None.				
Residual impacts: » A precedence for land use change has been set.				
Links: » Impacts due to land use (geographic) change processes links to economic change processes (compensation for servitude), emancipation and empowerment processes (negotiations), and socio-cultural processes (change in sense of place).				

It is expected that the expansion of the Kwagga substation, the construction of the new Phoebus substation will lead to a temporary change in the population size of the affected area and also, possibly, to the composition of the local population. In this regard, the following demographic change processes are expected:

» An influx of construction workers;
» An influx of unemployed job seekers; and
» The relocation of households and/or other structures.

In all probability, the skills required for the construction will not be present in the area, which means that the contractor will make use of his permanent workforce – i.e. 'strangers'- who have to enter the area and who are often viewed as people who 'stole' jobs from the locals. However, a construction team consists of a certain number of people (the size of the team depends largely on the type of construction required) and they enter the area with a very specific purpose. The time they spend in the area is clearly defined and often controlled as such (e.g. construction workers arrive on site in the morning and depart from the area in the evening), and due the nature of their work, their contact with the local community is limited during working hours.

At the peak of construction the number of construction workers on site is estimated to be around 80 people (of which about 80 will be at the substation site and the other 90 will be spread out across the length of the transmission line). The construction workers will in all probability commute to site, and therefore it is expected that the influx of construction workers will have a negligible effect on the host community.

Unlike the regulated circumstances surrounding a construction team, the influx of job seekers is unregulated and often very difficult to control. It is also very difficult to predict how many job seekers to expect and the extent to which they can change the size and composition of the local population, as the intensity of the effect will be influenced by the actual number of job seekers.

DEMOGRAPHIC CHANGE PROCESSES (KWAGGA AND PHOEBUS SUBSTATIONS)

Summary of change process: The full work component will never be on site simultaneously – the biggest team expected at the same time is during foundation and assembly. This will not have a permanent effect on the population size. Job seekers might also enter the area, but usually the number is restricted to individuals.

Nature of impact: Generally speaking, accelerated population growth creates unexpected demands on local resources. However, this will not be the case with the current project, as the size of the construction team is too small and their time spent in the area too limited to have any real effect on the local population size. Individual job seekers will also not contribute to accelerated population growth.

Site characteristics: The local population consists of mostly low to medium income groups. Residents of Soshanguve complained about the irregularity of services during the PPP. I&APs from this area also wanted to know how they would benefit from the project and if jobs will be afforded to locals. The influx of construction workers and job seekers could well lead to conflict in this area.

Mitigation measures:

» Do not create false expectations – inform local job seekers upfront about the skilled nature of the construction and the low likelihood of employing an unskilled and/or inexperienced workforce.

» Also inform local communities that contractors have a permanent workforce and that they will mostly likely make use of this workforce, which will further reduce the possibility of local employment.

» Discourage job seekers to travel to the area by advertising in the local and/or regional press before construction commences to show that all positions have been filled and that there are no further job opportunities available.

Enhancement measures:

» None.

Rating Scale	Kwagga Substation		Phoebus Substation	
	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
Extent	Local [2]	Site [1]	Local [2]	Site [1]

Duration	Short [2]	Very short [1]	Short [2]	Very short [1]
Magnitude	Moderate [6]	Low [4]	High [8]	Moderate [6]
Reversibility	Recoverable [3]	n/a	Recoverable [3]	n/a
Probability	Probable [3]	Improbable [2]	Highly probable [4]	Probable [3]
Significance	Medium [39]	Low [12]	High [60]	Low [24]
Status	Negative	Negative	Negative	Negative

Cumulative impacts:

» The simultaneous influx of construction workers on the transmission power line.

Residual impacts:

» Job seekers who remain in the area despite being unable to secure any employment, increasing the dependency ratio on the local authority.

Links:

» Impacts due to demographic change processes in turn links to institutional and legal change processes (change in housing needs/demands, change in community infrastructure), and socio-cultural processes (dissimilarity in social practices, conflict, and safety and crime impacts).

Economic Change Process

This sub-section deals with the expected economic change processes and resultant impacts that can be expected because of the introduction of the project to the affected environment. The Scoping study identified the following economic change processes as likely to occur:

» Enhanced / reinforced economic opportunities;
» Change in the employment equity of vulnerable groups; and
» Change in occupational opportunities.

In addition to the identified change processes mentioned above, the SIA study also considered enhanced electricity supply and economic growth as an additional change processes on a more macro scale.

The construction phase of the project for the transmission line will create an estimated 490 job opportunities over the length of the contract period. Most of these jobs will have an average contract period of 2-3 months. Due to the skilled nature of the construction processes, only experienced/skilled workers are used, usually in the form of the contractor's own permanent workforce. According to an Eskom official, contractors seldom employ causal workers from the local community, mainly because of the skills levels required, and the sensitive nature of the material used in these installations (i.e. the copper wiring often gets stolen).

The proposed extensions to the Kwagga substation, the construction and operation of the new Phoebus substation will enhance the electricity supply to the City of Tshwane, which in turn will indirectly stimulate economic growth as the electricity supply can meet the demand, allowing businesses and industries to expand. Growing businesses and industries create additional employment opportunities, which enhance economic growth, permitting a positive economic impact to filter down to a more grassroots level.

<table>
<tr><th colspan="2">ECONOMIC CHANGE PROCESSES (KWAGGA AND PHOEBUS SUBSTATIONS)</th></tr>
<tr><td colspan="2">Summary of change process: Employment enhances economic equities, even if it is over the short-term. . Members of vulnerable groups will have equal opportunity to apply for local positions, but such persons often do not apply as they are ‘trapped’ within their traditional role of housekeeper, caregiver, etc. A change in occupational opportunities is an indirect result of the project as auxiliary services are required during the construction phase, such as shelter, food, etc. A reliable electricity supply stimulates economic growth.</td></tr>
<tr><td colspan="2">Nature of impact: Employment first and foremost has an economic impact on the individual and his/her nuclear family. In addition to securing an income, employment (direct formal or indirect informal) also creates a sense of self-worth and offers the individual the opportunity to extend his/her skills base and to gain some experience – this makes people more ‘marketable’ for future jobs. On a macro scale, the availability of electricity enhances economic growth, which creates more job opportunities with a positive economic impact.</td></tr>
<tr><td colspan="2">Site characteristics: The areas surrounding the substations are characterised by low to medium income groups. There appears to be a high expectation for jobs in Soshanguve (Phoebus substation).</td></tr>
<tr><td>Mitigation measures:
» Regarding informal trade: Make use of a permit system and only allow vendors with a valid permit to supply goods and services. Such a system can also assist in controlling access to and from the construction sites and camp by knowing who the vendors are and who the loiterers are, and it can aid in preventing conflict amongst vendors due to an over-supply of the same product.</td><td>Enhancement measures:
» House construction workers within the local community, where possible. The ‘rent’ paid to the home owner should be a realistic boarding & lodging fee (i.e. according to the rental market in the surrounding area).
» Contractors must be contractually obliged to appoint local labour wherever possible.
» Give preferential treatment to local entrepreneurs and/or subcontractors to supply goods and services.
» Females should be encouraged to apply for positions.
» Individuals with the potential to develop their skills further should be afforded training opportunities, where possible.
» Payment should comply with applicable Labour Law legislation in terms of minimum wages.
» Where required, workers must be registered with any and all official bodies as required by law, e.g. Income Revenue Services, Unemployment Insurance Fund, etc. This will enable the worker to claim from the UIF as a means of continuous financial support when his/her</td></tr>
</table>

	position on the construction team either becomes redundant or once the construction phase comes to an end.

Rating Scale	Kwagga Substation		Phoebus Substation	
	Without Mitigation	**With Mitigation**	**Without Mitigation**	**With Mitigation**
Extent	Site [1]	Local [2]	Site [1]	Local [2]
Duration	Very short term [1]	Short term [2]	Very short term [1]	Short term [2]
Magnitude	Low [4]	Moderate [6]	Low [4]	Moderate [6]
Reversibility	Recoverable [3]	n/a	Recoverable [3]	Recoverable [3]
Probability	Improbable [2]	Probable [3]	Improbable [2]	Probable [3]
Significance	Low [18]	Medium [30]	Low [18]	Medium [30]
Status	Positive	Positive	Positive	Positive

Cumulative impacts:

» Loss of natural habitats and natural grasslands.

Residual impacts:

» Increased capacity on electricity network resulting in a stable network that can facilitate economic growth.

Links:

» Economic change processes link to geographic change processes (change in access to resources that sustain livelihoods), and demographic processes (influx of job seekers to an area with a growing economy).

Institutional and Legal Change Process

Institutional and Legal Change Processes assesses the way in which a development of this nature could change the face of service delivery in the affected area and how this change in turn could affect the quality of life of local residents. The following institutional and legal change processes are likely to occur:

» Change in housing needs / demands; and
» Change in community infrastructure.

If a construction camp is utilised, the contractor identifies a preferred location for the camp, based on the distance from the camp site to the construction site(s) and the proximity of the camp to accessible municipal services. Once the contractor has identified a preferred location, he/she negotiates with the landowner to secure the site, and with the local authority. The Environmental Control Officer (ECO) will inspect the conditions at the construction camp on a regular basis and if a contractor fails to supply sufficient and hygienic living conditions, he/she may be liable to a fine.

Unfortunately, construction camps have earned a certain level of social stigma over the years due to an increase in social problems in the surrounding area for the duration of the camp's presence. Some of the most common problems associated with residential construction camps include the following:

» An increase in prostitution: disempowered and desperate local women often view construction workers as financially well-off and therefore as a source of income to the women who, quite frequently, are the sole breadwinners in the family. Apart from the wilful act of prostitution, other women are willing to enter into sexual relationships with construction workers believing that they will gain financially, which is often not the case. This leads to an increase in pregnancies and teenage pregnancies and more often than not, both woman and child is left behind in the community without any financial support when the construction worker moves out of the area.

» An increase in casual sexual relationships has the obvious health implication of an increase in sexually transmitted infections, including HIV. Human beings are mobile beings which means that these infections are spread further when an infected person enters a new area and engage in a new casual sexual relationship.

» Infrastructure and services (e.g. water and sanitation) that are not managed and maintained properly within a construction camp can lead to waterborne

diseases such as cholera. Within concentrated living conditions, diseases are easily spread within not only the confines of the camp, but also to the surrounding community.

» Construction workers seldom spend their free time in the camp, but would rather venture into town or nearby settlement in search of entertainment, which quite often leads to alcohol abuse. This in turn can lead to an increase in conflict and violence, as well as an increase in risky behaviour, such as drug abuse, unprotected causal sexual encounters, etc.

It is therefore imperative that the position of the construction camp is carefully selected as construction camps are areas where some of the most significant social change processes could take place, as outlined above. On the other hand, housing construction workers in the local community creates economic opportunities for local households, reduces the additional demand on municipal services (see 'change in community infrastructure' below) as additional connections is not required, and minimises the possibility and extent of problems associated with construction camps.

<table>
<tr><th colspan="2">INSTITUTIONAL AND LEGAL CHANGE PROCESSES (KWAGGA AND PHOEBUS SUBSTATIONS)</th></tr>
<tr><td colspan="2">Summary of change process: Construction workers require housing, either within the community or within a construction camp. Municipal services such as water, sanitation, and waste removal will be required at the construction camp. Existing services can be used if construction workers are housed in the local community. Due to the temporary nature of a construction camp, a number of social problems are associated with a camp, including prostitution, unhygienic living conditions, alcohol abuse, and conflict. Most of the problems will be negated if construction workers are housed in the community.</td></tr>
<tr><td colspan="2">Nature of impact: A lack of sanitation and water services intensifies unhygienic living conditions, which impacts on health. Other social ills associated with a construction camp (e.g. prostitution) further impacts on health. Alcohol abuse and conflict increase noise levels and impacts on neighbouring areas' quality of life.</td></tr>
<tr><td colspan="2">Site characteristics: Both substations are located in areas surrounded by residential areas. Experience has shown that communities in Soshanguve are willing to house construction workers, but the same situation might not prevail towards the historically 'white' areas surrounding the Kwagga substation as people in these areas live more isolated from one another and are less 'open' to strangers in their homes.</td></tr>
<tr><td>Mitigation measures:
» Where possible, house construction workers in local communities as this minimises the need for additional municipal connections.
» Contractors must supply and install, at their own cost, the entire infrastructure required to access municipal services, e.g. water and sewerage pipelines – at the construction site(s) and the construction camp, if one is used.
» Sufficient portable toilet facilities must be available on site (and the camp) and must be serviced regularly to ensure hygienic conditions.
» Waste removal containers must be supplied on site (and the camp). These containers must be covered to prevent waste being blown around and must be cleared at least once a week. Waste must be disposed of at an official municipal waste site.
» Prohibit the use of alcohol or other substances on site (and in the construction camp). Any person found to be under the influence of a substance should not be allowed on site (or into the construction camp).
» (Only residents should be allowed inside the construction camp. Any</td><td>Enhancement measures:
» None</td></tr>
</table>

other persons seen loitering at or inside the camp should be requested to leave the area). » (The location of the construction camp should be determined in consultation with the ECO).	

Rating Scale	Kwagga Substation		Phoebus Substation	
	Without Mitigation	**With Mitigation**	**Without Mitigation**	**With Mitigation**
Extent	Local [2]	Site [1]	Local [2]	Site [1]
Duration	Short term [2]	Very short term [1]	Short term [2]	Very short term [1]
Magnitude	High [8]	Moderate [6]	High [8]	Moderate [6]
Reversibility	Recoverable [3]	n/a	Recoverable [3]	n/a
Probability	Probable [3]	Improbable [2]	Probable [3]	Improbable [2]
Significance	Medium [45]	Low [16]	Medium [45]	Low [16]
Status	Negative	Negative	Negative	Negative

Cumulative impacts:

» Increased influx of job seekers and informal settlements.

Residual impacts:

» Contamination of local natural resources, if services were not managed properly during construction.

Links:

» Institutional and legal change processes links to geographic change processes (land acquisition and disposal, including the temporary unavailability of land taken up by the construction camp), economic change processes (change in occupational opportunities as people shift their attention from the

construction sites to the construction camp to deliver services to the camp and construction workers) and socio-cultural change processes (conflict inside the camp and crime and safety impacts – people perceive the construction camp with an increase in crime).

Socio-Cultural Change Process

The construction and operation of the two substations could alter the interactions and relationships within the local community by bringing about a change in the socio-cultural environment.

As per the results of the scoping study, the following socio-cultural change processes are expected:

» Dissimilarity in social practices;
» Alteration in family structure;
» Conflict;
» Safety and crime impacts; and
» Change in sense of place.

Dissimilarity in social practices is more likely to come to the fore if construction workers are housed in a construction camp and if such a camp is located close to existing formal and informal settlements. This is because construction workers spend part of their free time at the construction camp and therefore social and cultural practices will be more evident at the camp than on site.

At the time of the study, there was no apparent conflict within the local community or between the local community and the project proponent (Eskom) over the proposed substations or the transmission line. The situation is unlikely to change if the project processes proceed in an open and transparent manner.

Sense of place goes hand in hand with place attachment, which is the sense of connectedness a person/community feels towards certain places. Place attachment may be evident at different geographic levels, i.e. site specific (e.g. a house, burial site, or tree where religious gatherings take place), area specific (e.g. a residential area), and/or physiographic specific (e.g. an attachment to the look and feel of an area). The concept of sense of place therefore attempts to integrate the character of a particular setting with the personal emotions, memories, and cultural activities associated with such a setting.

The potential impact on socio-cultural behaviour and the related perception of environmental changes can have either a positive or a negative impact on sense of place (e.g. peace of mind vs. frustration/anger). The introduction of a new project to the area can be viewed as a positive impact if people perceive the project as infrastructural and/or economic development that is not intrusive on their lives and do not cause them immediate danger. Potential negative impacts include the visual impact and the resultant intrusion on sense of place.

SOCIO-CULTURAL CHANGE PROCESSES (KWAGGA AND PHOEBUS SUBSTATIONS)	
Summary of change process: The arrival of people who are not from the area can lead to conflict if there is dissimilarity in social practices and if such differences are not respected. Family structures can be altered where the breadwinner is absent for prolonged periods of time and in cases of HIV transmission, the family structure can further be altered. It is unlikely that the upgrade of the Kwagga substation and the presence of the new Phoebus substation will bring about a change in sense of place, as it is located next to infrastructure of a similar nature.	
Nature of impact: Conflict affects a community's group cohesion and way of life. Apart from the obvious health impacts associated with illnesses such as HIV, it also bears an economic impact when people become too ill to work – on the macro economy as well as the micro economy of the family who loses their source of income, which affects their livelihood. People lose their sense of belonging and place attachment, resulting in a loss of sense of place.	
Site characteristics: Both sites are characterised by infrastructure of a similar nature, i.e. the existing Kwagga substation and the existing Hangklip substation.	
Mitigation measures: » Launch a STI and HIV/AIDS awareness campaign to educate construction team members and the local community on this issue. Identify and train peer educators and provide the necessary resources (posters, information booklets, referral sources for VCT, etc.) to ensure an effective campaign. » Avoid potential conflict situations that can arise from limited employment opportunities by using a fair and transparent recruitment process. Consider implementing the use of a rotary employment scheme, if and where feasible, to extend employment opportunities to more individuals. » Do not allow idle loitering of job seekers, or other individuals who are not involved with the project, at either the construction site or the construction camp. This is to prevent a potential increase in opportunistic crimes. » Implement a project information centre at the site offices where local residents can obtain information on the progress of the construction process and on what to expect in future (for example the types of activities that will take place and when and how these will be executed).	**Enhancement measures**: » None.

Also, display and/or inform local residents of current changes and future possibilities associated with the project. The information centre can also serve as a central point where residents can complain or bring problem areas associated with the construction process under the project manager's attention. The information centre must be easily accessible to the public and can operate on a part-time basis, but the centre's hours of operation must be clearly displayed and/or communicated to the local community.	

Rating Scale	**Kwagga Substation**		**Phoebus Substation**	
	Without Mitigation	**With Mitigation**	**Without Mitigation**	**With Mitigation**
Extent	Local [2]	Site [1]	Local [2]	Site [1]
Duration	Short [2]	Very short [1]	Short [2]	Very short [1]
Magnitude	Moderate [6]	Low [4]	Moderate [6]	Low [4]
Reversibility	Recoverable [3]	n/a	Recoverable [3]	n/a
Probability	Probable [3]	Improbable [2]	Probable [3]	Improbable [2]
Significance	Medium [39]	Low [12]	Medium [39]	Low [12]
Status	Negative	Negative	Negative	Negative

Cumulative impacts:

» None.

Residual impacts:

» An increase in the HIV infection rate.

» Vulnerable families.

Links:

» Socio-cultural change processes links to demographic change processes (population growth and decline), economic change processes, and empowerment and emancipation processes (people are disempowered when they are forced to remain in a destructive cycle).

5.5.1. Conclusions and Recommendations

As could be expected, the construction of the proposed development is characterised by a number of negative social impacts, which is mainly due to the nature of the activities that take place during this phase. Although the expected social impacts associated with the construction phase are mostly negative across all the change processes, these impacts are for the most part only temporary in nature and as such, it is expected to only last over the construction period.

Even though all of the identified social impacts can be mitigated or enhanced successfully, it can only be done if Eskom, or its appointed contractor(s), commit to the responsibility of ensuring that the level of disturbance brought about to the social environment by the more negative aspects of the project, is minimised as far as possible.

Overall, based on the conclusions and findings of this report, the upgrade of the Kwagga substation, the construction and operation of the new Phoebus substation do not pose any social impacts that is deemed irreversible, fatally flawed, or severely detrimental to the social environment. However, this finding is subject to the implementation of, and adherence to, the identified mitigation measures contained in this report, and as recommended for inclusion in the EMP. In addition, the social specialist recommends the following:

» Where possible, accommodate workers in private homes in the surrounding community.
» Ensure that social issues identified during the EIA phase are addressed during construction. This could be done by engaging social specialists where necessary or by ensuring that ECOs used during construction have the necessary knowledge and skills to identify social problems and address these when necessary. Guidelines on managing possible social changes and impacts could be developed for this purpose.
» Always inform landowners on any construction activity to start on their property. Prepare them on the number of people that will be on the property and on the activities they will engage in.
» Ensure that Eskom employees are aware of their responsibility in terms of Eskom's relationship with landowners and communities surrounding power lines. Implement an awareness drive to relevant sections to focus on respect, adequate communication and the 'good neighbour principle.'
» Incorporate all mitigation measures in the SIA that are relevant to the construction phase in the EMP to ensure these are adhered to by Eskom and the contractor.

5.6. Assessment of Potential Impacts associated with Agricultural Potential

The proposed Phoebus substation is to be located immediately to the north of the existing Hangklip substation, near Soshanguve. 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 metres (or shallower, if a restricting layer such as rock was encountered), and topsoil and subsoil samples were collected at two locations for analysis (refer to Appendix K). The study refers to soil potential, with prevailing climatic conditions taken into account.

5.5.2. Conclusions and Recommendations

These were observed more or less throughout the area, so that even where the soil happened to be deep enough for theoretical cultivation (>750 mm or so), the presence of the boulders close by (< 10 m in some cases) would render the area unsuitable for cultivation.

Thus, the whole area (substation sites and power line route) will be classed as having **low potential** for arable agriculture, suited for grazing at best.

ASSESSMENT OF IMPACTS: KWAGGA-PHOEBUS 400KV POWER LINES CONSTRUCTION CHAPTER 6

Although much of the information in this chapter is identical to the information in the previous chapter, every effort was made not to make any unnecessary repetition and over duplication. This chapter serves to assess the identified potentially significant environmental impacts associated with the proposed 400kV power line from Kwagga to the proposed Phoebus substation, nominate a preferred corridor and to make recommendations for the management of these impacts for inclusion in the draft Environmental Management Plan (refer to Appendix O).

6.1. Assessment of Potential Impacts on Ecology

Please note that impacts are only assessed for habitat types that were ascribed an ecological sensitivity of Medium or higher (refer to Figure 6.1).

6.1.1. Anticipated Impacts

Impacts resulting from the construction and operation of power lines on ecological attributes of the study area are largely restricted to the physical impacts on biota or the habitat in which they occur. Direct impacts, such as habitat destruction and modifications, are usually regarded immediate, long-term and of high significance, particularly in high sensitivity areas. These impacts are mostly measurable and fairly easy to assess as the effects thereof is immediately visible and can be determined to an acceptable level of certainty. In contrast, effects of indirect impacts are not immediately evident and can consequently not be measured to an acceptable level of certainty. A measure of subjective estimation is therefore necessary in order to evaluate this type of impact. Lastly, impacts of a cumulative nature places direct and indirect impacts of this projects into a regional and national context, particularly in view of similar or resultant developments and activities. Impacts are rated upon the background of biodiversity sensitivities as determined in previous chapters.

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:
  - Faunal interactions with structures, servitudes and personnel;
  - Impacts on surrounding habitat/ species;

» Cumulative Impacts:
  - Impacts on local and national conservation obligations & targets;
  - Increase in local and regional fragmentation/ isolation of habitat; and
  - Increase in environmental degradation.

These are described in more detail within the specialist biodiversity study (refer to Appendix I) and are assessed below for each identified power line corridor. 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. The proposed power line corridors were comparatively assessed by means of visual observations and GIS analysis of available data, as well as visual observations from ground truthing.

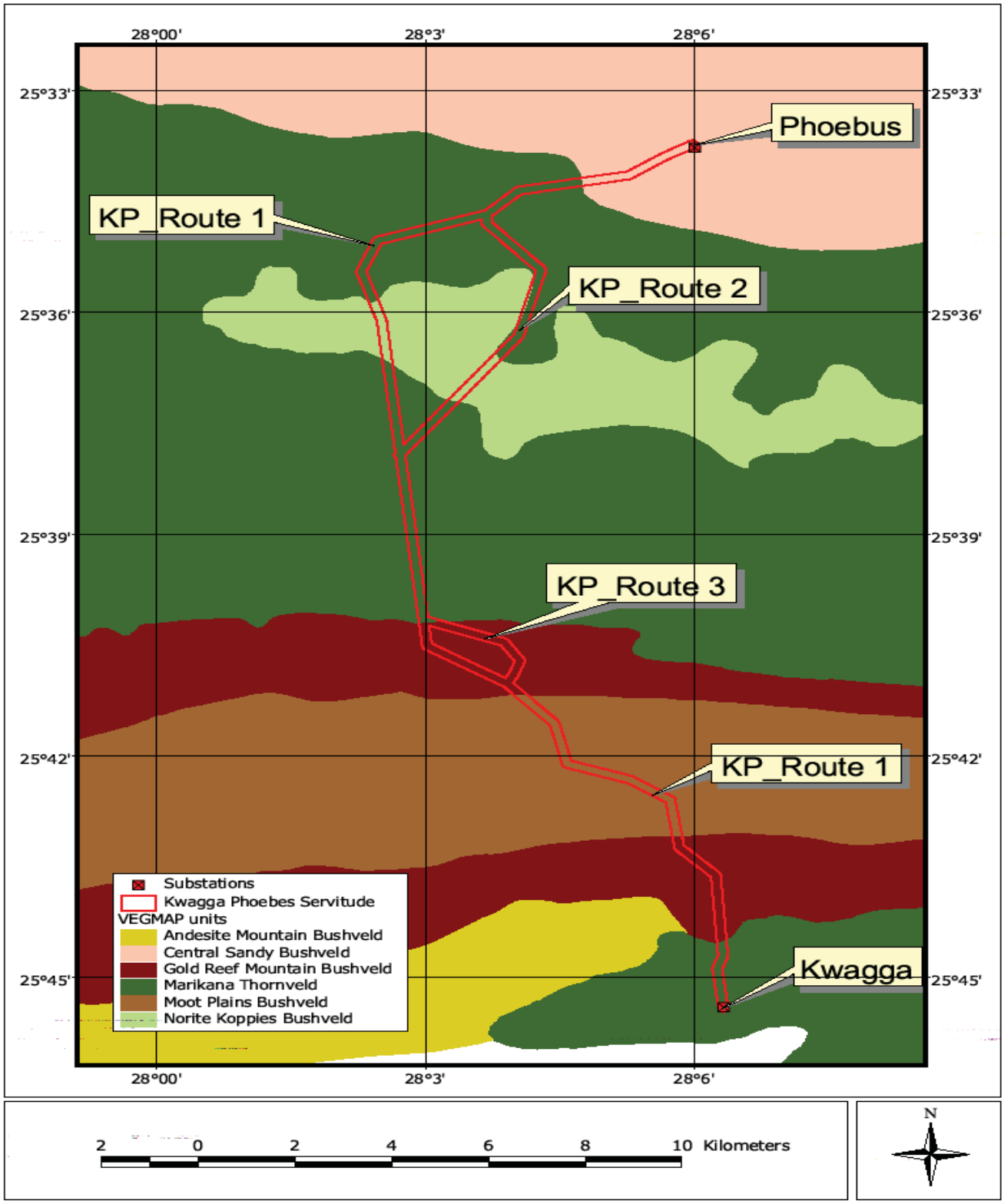

Figure 6.1: Vegetation map of the study area

The habitat types include:

» Natural Woodland - Central Sandy Bushveld;
» Natural Woodland - Gold Reef Mountain Bushveld;
» Natural Woodland - Marikana Thornveld;
» Natural Woodland - Norite Koppies Bushveld;
» Ridge Habitat Types; and
» Wetland Habitat Types.

6.1.2. Nature of Impacts

6.1.2.1. 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.

Red Data species are particularly sensitive to changes in their environment, having adapted to a narrow range of specific habitat requirements. Habitat changes, mostly a result of human interferences and activities, are one of the greatest reasons for these species having a threatened status. Surface transformation activities within habitat types that are occupied by flora species of conservation importance will definitely result in significant and permanent impacts on these species and their population dynamics. Effects of this impact are usually permanent and recovery or mitigation is generally not perceived as possible.

One of the greatest drawbacks in terms of limiting this particular impact is that extremely little information is available in terms of the presence, distribution patterns, population dynamics and habitat requirements of Red Data flora species in the study area. In order to assess this impact an approach it is therefore necessary to assess the presence/ distribution of habitats frequently associated with these species. Furthermore, by applying ecosystem conservation principles to this impact assessment and subsequent planning and development phases, resultant impacts will be limited to a large extent.

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.

6.1.2.2. 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.

6.1.2.3. Destruction of Sensitive/ Pristine Regional Habitat Types

The loss of pristine natural regional habitat represents loss of habitat and biodiversity on a regional scale. Sensitive habitat types include ridges, koppies, wetlands, rivers, streams and localised habitat types of significant physiognomic variation and unique species composition. These areas represent centres of atypical habitat and contain biological attributes that are not frequently encountered in the greater surrounds. A high conservation value is attributed to the floristic communities and faunal assemblages of these areas as they contribute significantly to the biodiversity of a region. Furthermore, these habitat types are generally isolated and are frequently linear in nature, such as rivers and ridges. Any impact that disrupts this continuous linear nature will risk fragmentation and isolation of existing ecological units, affecting the migration potential of some fauna species adversely, pollinator species in particular.

The importance of regional habitat types is based on the conservation status ascribed to vegetation types. However, the actual impact of the construction and operation of power lines in grassland habitat is generally low since extremely little impacts result on the structure of the vegetation. Impacts within grassland

habitat are mostly restricted to the footprint areas of the pole structures, which is extremely small. Visual observations within existing servitudes revealed very little variation in the species composition between areas in- and outside the power line servitude.

6.1.2.4. 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.

6.1.2.5. 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.

6.1.2.6. Impacts on Local and National Conservation Obligations & Targets

This impact is regarded a cumulative impact since it affects the status of conservation strategies and targets on a local as well as national level and is viewed in conjunction with other types of local and regional impacts that affects conservation areas. Impacts that could potentially affect the status of protected

areas are regarded unacceptable and should be avoided at all costs. Also, aligning the servitudes in proximity to conservation areas as a mitigation measure against impacting on the conservation areas is not always a good solution as it places a limitation on the future expansion of conservation areas. This will only be a solution in selected cases where extensive transformed habitat is available for the use of servitudes. Natural habitat in the general surrounds of conservation areas do act as a buffer for these areas, also as a potential source of genetic variability, particularly in the case of relative small conservation areas.

6.1.2.7. 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 type 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. One factor that will be taken into consideration is the presence of existing power lines in the study area. Habitat fragmentation will not be increased significantly when new power lines are placed adjacent to existing lines or other types of linear structures, such as roads. In contrast, constructing new power lines through areas of unfragmented habitat, the adverse effects of habitat fragmentation and isolation will be maximised. Therefore, where potential servitudes are presented with similar sensitivities, a potential alignment with an existing servitude might result in one being more suitable for the proposed development than an option affecting an area of largely untransformed habitat. Unfortunately this is not always a clear-cut case as it is heavily dependent on the local and regional sensitivity of the existing line, which might be located in areas of high sensitivity, while a line going through untransformed habitat might represent impacts of lower significance in terms of other types of impacts.

6.1.2.8. 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.**

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

Construction Phase

Nature	**Impacts of power lines within the Central Sandy Bushveld Variation**	
	Without Mitigation	**With Mitigation**
Extent	2 (Local)	1 (Local)
Duration	4 (Long term)	3 (Medium, 3-15 years)
Magnitude	2 (Low)	1 (Minor)
Reversibility	2 (Recoverable, requires human input)	1 (Reversible, regenerates naturally)
Consequence	11	6
Probability	2 (Low probability)	1 (Low probability)
Significance	**22 (Low)**	**6 (Low)**
Status	Negative	Negative
Irreplaceable loss of resources?	No	
Can impacts be mitigated	Yes	
Mitigation	Minimise impact to transformed areas	
Cumulative Impacts	Increase in habitat degradation	
Residual Impacts	Species changes, degraded habitat	

Nature	**Impacts of power lines within the Gold Reef Mountain Bushveld Variation**	
	Without Mitigation	**With Mitigation**
Extent	1 (Local)	1 (Local)
Duration	3 (Long term)	2 (Short term)
Magnitude	3 (Moderate)	2 (Low)
Reversibility	3 (Recoverable, requires human input)	3 (Recoverable, requires human input)
Consequence	10	8
Probability	3 (Medium probability)	2 (Low probability)
Significance	**30 (Moderate)**	**16 (Low)**
Status	Negative	Negative
Irreplaceable loss of resources?	No	
Can impacts be mitigated	Yes	
Mitigation	Contain construction impacts to transformed areas and comply with EMP	
Cumulative Impacts	Increase in habitat degradation, habitat fragmentation, habitat isolation	
Residual Impacts	Species changes as a result of degraded habitat	

Nature	**Impacts of power lines within the Marikana Thornveld Variation**	
	Without Mitigation	**With Mitigation**
Extent	2 (Local)	1 (Local)
Duration	3 (Long term)	2 (Short term)
Magnitude	3 (Moderate)	2 (Low)
Reversibility	3 (Recoverable, requires human input)	3 (Recoverable, requires human input)
Consequence	11	8
Probability	3 (Medium probability)	2 (Low probability)
Significance	**33 (Moderate)**	**16 (Low)**
Status	Negative	Negative
Irreplaceable loss of resources?	No	
Can impacts be mitigated	Yes	
Mitigation	Medium	
Cumulative Impacts	Increase in habitat degradation, habitat fragmentation, habitat isolation, conservation targets	
Residual Impacts	Species changes, degraded habitat	

Nature	**Impacts of power lines within the Norite Koppies Bushveld Variation**	
	Before Mitigation	**After Mitigation**
Extent	1 (Local)	1 (Local)
Duration	3 (Long term)	2 (Long term)
Magnitude	2 (Minor)	1 (Low)
Reversibility	3 (Recoverable)	3 (Recoverable, requires human input)
Consequence	9	7
Probability	3 (Medium probability)	2 (Low probability)
Significance	**27 (Low)**	**14 (Low)**
Status	Negative	Negative
Irreplaceable loss of resources?	No	
Can impacts be mitigated	Yes	
Mitigation	Medium	
Cumulative Impacts	Increase in habitat degradation, habitat fragmentation, habitat isolation	
Residual Impacts	Species changes, degraded habitat	

Nature	**Impacts of power lines within the Ridge Habitat Type**	
	Before Mitigation	**After Mitigation**
Extent	3 (Regional)	3 (Regional)
Duration	5 (Long term)	4 (Long term)
Magnitude	4 (High)	3 (Moderate)
Reversibility	5 (Irreversible)	3 (Recoverable, requires human input)
Consequence	17	13
Probability	4 (High probability)	3 (Medium probability)
Significance	**68 (High)**	**39 (Moderate)**
Status	Negative	Negative
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated	No	
Mitigation	Low	
Cumulative Impacts	Increase in habitat degradation, habitat fragmentation, habitat isolation, conservation targets	
Residual Impacts	Species changes, degraded habitat	

Nature	Impacts of power lines within Wetland Habitat Types	
	Before Mitigation	**After Mitigation**
Extent	3 (Regional)	3 (Regional)
Duration	4 (Long term)	3 (Medium, 3-15 years)
Magnitude	3 (Moderate)	2 (Low)
Reversibility	3 (Recoverable, requires human input)	3 (Recoverable)
Consequence	13	11
Probability	3 (Medium probability)	2 (Low probability)
Significance	**39 (Moderate)**	**22 (Low)**
Status	Negative	Negative
Irreplaceable loss of resources?	No	
Can impacts be mitigated	Yes	
Mitigation	Medium	
Cumulative Impacts	Increase in habitat degradation, habitat fragmentation, habitat isolation	
Residual Impacts	Species changes, degraded habitat	

Operational Phase

Nature	Impacts of power lines within the Central Sandy Bushveld Variation	
	Without Mitigation	**Without Mitigation**
Extent	1 (Local)	1 (Local)
Duration	4 (Long term)	4 (Long term)
Magnitude	2 (Low)	1 (Minor)
Reversibility	3 (Reversible, needs input)	1 (Recoverable, regenerates naturally)
Consequence	10	7
Probability	2 (Low probability)	1 (Low probability)
Significance	**20 (Low)**	**7 (Low)**
Status	Negative	Negative
Irreplaceable loss of resources?	No	
Can impacts be mitigated	Yes	
Mitigation	Medium-high	
Cumulative Impacts	Increase in habitat degradation	
Residual Impacts	Species changes, degraded habitat	

Nature	**Impacts of power lines within the Gold Reef Mountain Bushveld Variation**	
	Without Mitigation	**With Mitigation**
Extent	1 (Local)	1 (Local)
Duration	4 (Long term)	3 (Medium, 3-15 years)
Magnitude	2 (Low)	1 (Minor)
Reversibility	3 (Reversible, needs input)	1 (Recoverable, regenerates naturally)
Consequence	10	6
Probability	3 (Moderate probability)	2 (Low probability)
Significance	**30 (Moderate)**	**12 (Low)**
Status	Negative	Negative
Irreplaceable loss of resources?	No	
Can impacts be mitigated	Yes	
Mitigation	Medium-high	
Cumulative Impacts	Increase in habitat degradation, habitat fragmentation, habitat isolation	
Residual Impacts	Species changes, degraded habitat	

Nature	**Impacts of power lines within the Marikana Thornveld Variation**	
	Without Mitigation	**With Mitigation**
Extent	1 (Local)	1 (Local)
Duration	4 (Long term)	3 (Medium term)
Magnitude	2 (Low)	1 (Minor)
Reversibility	3 (Reversible, requires human input)	3 (Reversible, requires human input)
Consequence	10	8
Probability	3 (Medium)	2 (Low probability)
Significance	**30 (Moderate)**	**16 (Low)**
Status	Negative	Negative
Irreplaceable loss of resources?	No	
Can impacts be mitigated	Yes	
Mitigation	Medium	
Cumulative Impacts	Increase in habitat degradation, habitat fragmentation, habitat isolation, conservation targets	
Residual Impacts	Species changes, degraded habitat	

Nature	**Impacts of power lines within the Norite Koppies Bushveld Variation**	
	Without Mitigation	**With Mitigation**
Extent	1 (Local)	1 (Local)
Duration	3 (Medium)	2 (Short-term)
Magnitude	3 (Moderate)	2 (Low)
Reversibility	3 (Reversible, requires human input)	2 (Recoverable, regenerates naturally)
Consequence	10	7
Probability	3 (Medium probability)	2 (Low probability)
Significance	**30 (Moderate)**	**14 (Low)**
Status	Negative	Negative
No	No	
Yes	Yes	
Mitigation	Medium	
Increase in habitat degradation, habitat fragmentation, habitat isolation	Increase in habitat degradation, habitat fragmentation, habitat isolation	
Species changes, degraded habitat	Species changes, degraded habitat	

Nature	**Impacts of power lines within the Ridge Habitat Type**	
	Before Mitigation	**After Mitigation**
Extent	2 (Local)	2 (Local)
Duration	4 (Long term)	3 (Medium term)
Magnitude	3 (Moderate)	2 (Low)
Reversibility	3 (Reversible, needs input)	3 (Reversible, needs input)
Consequence	12	10
Probability	3 (Moderate probability)	2 (Low probability)
Significance	**36 (Moderate)**	**20 (Low)**
Status	Negative	Negative
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated	No	
Mitigation	Low	
Cumulative Impacts	Increase in habitat degradation, habitat fragmentation, habitat isolation, conservation targets	
Residual Impacts	Species changes, degraded habitat	

Nature	Impacts of power lines within Wetland Habitat Types	
	Without Mitigation	**With Mitigation**
Extent	2 (Local)	2 (Local)
Duration	4 (Long term)	3 (Medium term, 3-15 years)
Magnitude	3 (Moderate)	2 (Low)
Reversibility	3 (Reversible)	3 (Reversible)
Consequence	12	10
Probability	3 (Medium probability)	2 (Low probability)
Significance	**36 (Moderate)**	**20 (Low)**
Status	Negative	Negative
Irreplaceable loss of resources?	No	
Can impacts be mitigated	Yes	
Mitigation	Medium	
Cumulative Impacts	Increase in habitat degradation, habitat fragmentation, habitat isolation	
Residual Impacts	Species changes, degraded habitat	

6.1.3. Comparison of alternative corridors

The results show that two of the alternatives are equal from an biodiversity impact perspective and as such either may be used with some deviations. These are alternative 1 and 3. It must be stressed though that both these alternatives cross ridges; hence their impact on biodiversity is inevitable. Alternative 2 is a 'least preferred/no-go' alternative from a biodiversity perspective, hence is not preferred.

6.1.4. 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 ridge habitat type is regarded to be highly significant and severe mitigation measures need to be put into practice in areas where unavoidable impacts will occur in order to minimise adverse impacts on sensitive biodiversity attributes.

Impacts within the remainder of the area are regarded to be of moderate nature and the implementation of generic mitigation measures is expected to minimize likely impacts within these environments.

Impacts during the operational phase of the project are mostly restricted to the maintenance procedures within the servitudes as well as latent effects of habitat alteration, particularly in the woodland areas. Impacts are generally regarded to be of a moderate nature and the implementation of generic mitigation measures are expected to decrease the significance of impacts to a benign status.

Results of the ecological integration of the biophysical, i.e. floristic and faunal habitat sensitivity calculations indicate the following:

High Impact Area 1	Localised riparian habitat. Habitat within this part of the study area is relative degraded and the implementation of generic mitigation measures is recommended. No geographic alternative to this part of the corridor is available. Footprints should be placed outside delineated wetland habitat, limit clearance of woody vegetation to a minimum.
High Impact Area 2	Extensive wetland areas. This corridor section is indicated to run parallel to the perennial river for an extensive distance, which is not ideal. Although the vegetation within these parts is not regarded pristine, a relative high probability of impacts on Red Data species could occur. Mitigation of impacts is expected to result only in limited success. The use of Section 2 is preferred.
High Impact Area 3	Localised ridge habitat. A relative high probability of impacts on Red Data species and sensitive habitat types is estimated. Deviate proposed corridor around the ridge habitat, preferably to the west alongside the road. It should be noted that extensive ridge areas are also located to the west and east of this high impact area, impacts within these areas should be avoided at all costs.
High Impact Area 4	Localised riparian habitat. Habitat within this part of the study area is relative degraded and the implementation of generic mitigation measures is recommended. No geographic alternative to this part of the corridor is available. Footprints should be placed outside delineated wetland habitat, limit clearance of woody vegetation to a minimum.
High Impact Area 5	Extensive ridge habitat. Deviate proposed corridor around this habitat, align proposed corridor with existing power line servitudes and low sensitivity areas, this will ultimately reduce the significance of impacts within this part of the corridor extensively.
High Impact Area 6	Extensive ridge habitat. The use of this section (6) is not recommended; 1) impacts are of low mitigation potential, 2) mitigation of impacts in section 5 is regarded mitigatable and will ultimately be of lower

	significance, and 3) impacts within this section is regarded to be of higher significance than section 6.
High Impact Area 7	Extensive ridge habitat. Impacts within this part of the corridor are unavoidable. Align proposed corridor with existing lines of transformation and degradation (existing servitudes and roads).
High Impact Area 8	Extensive ridge habitat. Impacts within this part of the corridor are unavoidable. Align proposed corridor with existing lines of transformation and degradation (existing servitudes and roads).
High Impact Area 9	Localised riparian habitat. No geographic alternative to this part of the corridor is available. Footprints should be placed outside delineated wetland habitat, limit clearance of woody vegetation to a minimum. Lines should cross riparian habitat perpendicular to the stream.

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:

» 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, destabilizing 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;

- Limit damage/ pruning/ cutting of indigenous trees to a minimum in accordance to Eskom guidelines;
- The pruning of the woody layer is recommended instead of complete removal of all woody plants. Leaving a significant portion of the woody structure intact will prevent the establishment of an atypical habitat, limiting adverse impacts to a large extent;
- Ensure offsite storage of hazardous materials, chemicals, fuels, oils, etc. in order to prevent accidental spillage, contamination or pollution;
- Develop emergency maintenance operational plan to deal with any event of contamination, pollution or spillages, particularly in sensitive areas;
- Provide temporary on-site sanitation, litter and waste management and hazardous materials management facilities;
- Ensuring surface restoration and resloping in order to prevent erosion, taking cognisance of local contours and landscaping;
- Rehabilitation of disturbed areas subsequent to construction activities, taking cognisance of factors such as topsoil replacement, removal of introduced materials, local environmental factors;
- Removal of dismantled structures, rubble, litter, refuse, temporary infrastructures, sanitation equipment, etc. subsequent to construction and rehabilitation; and
- Final inspection in order to ensure adherence to EMP guidelines, completion of localised/ remaining areas of impact, monitoring of rehabilitation success, etc.
- Conduct on-foot inspections in areas where access for vehicles are not possible/ feasible;
- Prohibit construction of new access roads in areas of high environmental sensitivity. Use should be made of existing roads, ensuring proper maintenance/ upgrade. Alternative methods of construction/ access to sensitive areas is recommended;
- Construction of new/ temporary bridges as part of access roads across non-perennial streams and larger rivers is regarded a prohibited activity, use should be made of existing crossings, ensuring proper maintenance/ upgrade;
- Ensure proper substrate anchorage, provide 'dummy pole' in order to prevent damage/ injury of mammals as a result of direct contact with pole structures;
- Ensure that riparian areas are spanned/ pole structures are not placed within proximity to rivers, streams. Ensure placement of footprints outside 1:100 year flood lines. Crossing of riparian systems is only permitted at existing/ approved crossing points, taking due care to prevent additional/ new impacts;
- Prevent impacts on any surface water as a result of hazardous materials, contamination, unnecessary crossing by vehicles or personnel, extraction, drinking or other human uses, construction and maintenance activities; and
- Remove invasive and alien vegetation, particularly in vicinity of riparian zones where alien and invasive trees are known to occur. The implementation of a

monitoring programme in this regard is recommended, being the responsibility of the ECO/ ecologist.

These site specific mitigation measures are in addition to the recommended realignments presented in Figure 6.2.

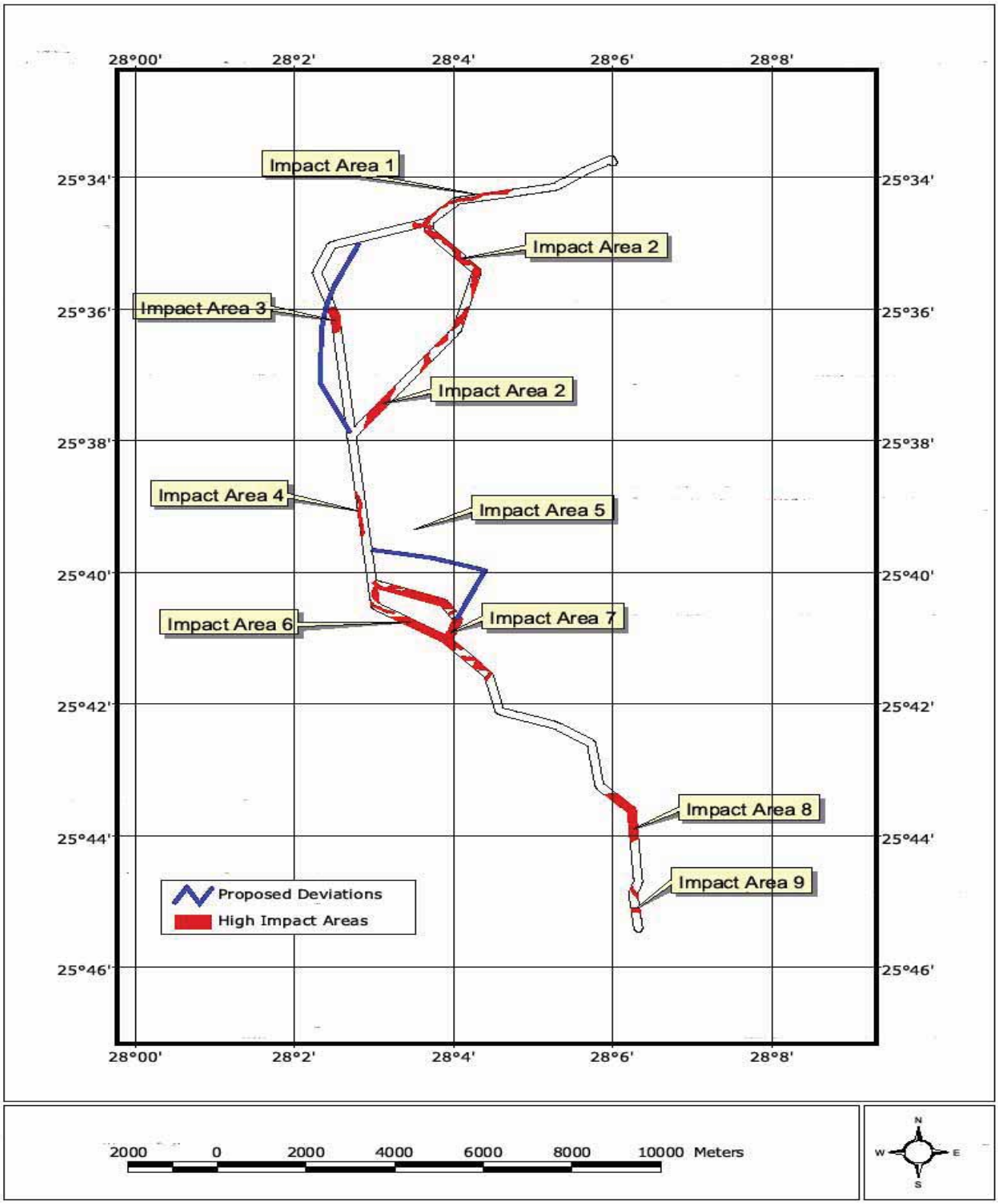

Figure 6.2: Recommended deviations for Kwagga-Phoebus power lines

6.2. Assessment of Potential Impacts on Avifauna

Power lines can impact avifauna through various forms including the following:

- » electrocutions,
- » collisions,
- » habitat destruction and
- » disturbance of avifauna.

The following tables summarise the significance of the potential impacts that the power lines pose on avifauna.

Electrocution

Electrocutions are possible within the power line corridor 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.

Habitat destruction

During the construction phase and maintenance of power line servitude, 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 servitude, through the modification of habitat.

Disturbance

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 the relatively high levels of disturbance already present.

Impact Tables summarising the significance of Avifaunal Impacts associated with the proposed 400kV power line between Kwagga and Phoebus substations.

Nature: Electrocutions on the Transmission lines		
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 (Medium-term)	4 (Medium-term)
Magnitude	0	0
Probability	0	0
Significance	**0**	**0**
Status	Not possible	Not Possible
Reversibility	-	-
Irreplaceable loss of resources	-	-
Can impacts be mitigated	-	-
Mitigation: -		
Cumulative impacts:-		
Residual impacts: -		

Nature: Collisions with the Transmission lines		
Relevant to this study, the earth wire for the 400kV power lines will be the bigger risk from a bird collision perspective. Birds in flight tend to see the bundled conductors, and then gain height to avoid them. In the process, the much thinner earth wire is not noticed and the birds may then collide with it.		
	Without mitigation	With mitigation
Extent	1 (Local)	1 (Local)
Duration	4 (Medium-term)	4 (Medium-term)
Magnitude	3 (Moderate)	2 (Low)
Probability	3 (Probable)	2 (Improbable)
Significance	**39 (Moderate)**	**24 (Low)**
Status	Negative	Negative
Reversibility	5	5
Irreplaceable loss of resources	Yes	Yes
Can impacts be mitigated	Yes	Yes
Mitigation: Mark identified spans with suitable anti-collision marking devices in areas specified in the avifauna specialist report.		
Cumulative impacts: Marginal impacts		

Residual impacts: Medium

Nature: Habitat Destruction

During the construction and maintenance of the power line infrastructure, 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. With the vast tracts of natural vegetation including threatened species along the Darspoort and the Magaliesburg Ridge, it is likely that certain avifauna species in this area will be affected.

	Without mitigation	With mitigation
Extent	1 (Local)	1 (Local)
Duration	2 (Short-term)	2 (Short-term)
Magnitude	3 (Medium)	2 (Low)
Probability	3 (Probable)	2 (Improbable)
Significance	**27 (Low)**	**16 (Low)**
Status	Negative	Negative
Reversibility	3	3
Irreplaceable loss of resources	Yes	Yes
Can impacts be mitigated	Yes	Yes

Mitigation: Existing roads should be used and minimal habitat destruction must occur in or near any water courses and the ridge. Vegetation under the new power line must be left intact wherever possible and no large scale clearing of servitudes must be undertaken.

Cumulative impacts: Marginal

Residual impacts: Medium

Nature: Faulting-business impact (Impact of birds on quality of supply)

There are a number of mechanisms through which birds are able to cause electrical faults on power lines. In the case of a bird streamer induced fault, the fault is caused by the bird releasing a 'streamer' of faeces which can constitute an air gap intrusion between the conductor and the earthed structure. The fault appears to flash across the air gap (i.e. between the live conductor and the tower steel work which is earthed) and does not follow an insulator creepage path as observed on pollution faults. Bird species capable of producing large or long streamers are more likely to cause streamer faults.

Bird pollution is a form of pre-deposit pollution. A flashover occurs when an insulator string gets coated with a pollutant, which could comprise the insulation properties of the string. When the pollutant is wetted, the coating becomes conductive, insulation breakdown occurs and flashover results. Since this involves a build up of bird faeces or bird pollution and not a once off event such as a streamer, the size of the bird is less important, although still a

factor. Obviously the more an insulator string becomes coated with faeces; the more likely it is that the fault will occur. Larger birds and congregation of birds are likely to result in heavy pollution of insulator strings. Bird nests may also cause faults through nest material protruding and constituting an air gap intrusion.

Relevant to this EIA study, faulting associated with streamers and faecal pollution is possible on the self-supporting towers of the proposed 400kV power lines, particularly those towers that are located in close proximity to water courses.

	Without mitigation	With mitigation
Extent	1 (Local)	1 (Local)
Duration	4 (Medium-term)	4 (Medium-term, 3-15 year period)
Magnitude	2 (Low)	1 (Minor)
Probability	2 (Improbable)	1 (Improbable)
Significance	**20 (Low)**	**9 (Low)**
Status	Negative for business	Negative for business
Reversibility	3	3
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	Yes
Mitigation: Fit bird guards on self support and guyed V towers only if required.		
Cumulative impacts: Negligible		
Residual impacts: Low		

6.2.1. Comparison of Transmission Power Line Corridors

The results show that two of the alternatives are equal from an avifaunal impact perspective and as such either may be used. These are alternative 1 and 3. It must be stressed though that both these alternatives cross ridges; hence their impact on avifauna is inevitable. Alternative 2 would result in impacts of high significance and is not preferred.

6.2.2. Conclusions and Recommendations

The proposed power line corridors cross two sets of ridges. These could be important micro-habitats for certain bird species. In particular, raptors flying along the ridges are more susceptible to potential impacts of the proposed development. These ridges are also "islands" of undisturbed habitat and as such are an important micro habitat for bird species in this area.

In order to mitigate impacts in identified sensitive areas (ridges and water courses), it will be necessary to mark the proposed line with anti-collision devices within these areas. Once the final alignment of the power line is known (following authorisation from DEA and the negotiation process), a map should be compiled to highlight the exact areas to be marked. These anti-collision marking devices will help to mitigate for the impact of collision around the ridges and to bring the potential impact to acceptable levels for avifauna. Habitat destruction and disturbance are two further impacts that are expected and special care must be taken in and around the ridges to mitigate for these impacts.

6.3. Assessment of Impacts associated with Agricultural Potential

A summary of the various classes of agricultural potential, based on the soils and/or rock occurring in each land type and soil analysis undertaken in the specialist Agricultural Potential report (Refer to Appendix K). The study refers to soil potential, with prevailing climatic conditions taken into account.

6.3.1. Conclusions and Recommendations

From the desktop soil analysis undertaken, Alternative 2 is **not recommended**, since most of the soils along this portion of the route are either of high potential, or are wetland/hydromorphic soils, with a significant seasonal flooding hazard, which should be conserved, and not developed.

Alternative 3 crosses similar soils to the adjoining portion of Alternative 1, and therefore there is no real difference between the two alternatives.

6.4. Assessment of Potential Visual Impacts

The construction of transmission infrastructure such as the proposed 400kV power line in natural and populated areas will always be problematic from a visual impact perspective. The Tshwane Strengthening Project EIA highlighted this through certain concerns received from landowners, stakeholders and residents within the study area. The lower density residential areas (agricultural holdings), with a decidedly more rural character, will be more affected by the project infrastructure than the high-density residential areas. 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.

6.4.1. Potential Visual Impacts associated with the Construction Phase of the Transmission Lines

The construction phase of the proposed 400kV power line is expected to extend over a 24 month period. This is obviously dependent on a number of external factors that may not always be controlled by either Eskom or the preferred contractors. During this time, heavy vehicles will frequent along the transmission line corridor and 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.

Visual impacts associated with the construction 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.

6.4.2. Potential Visual Impacts associated with the Operational Phase of the Transmission Lines

The construction of the proposed 400kV transmission power line will impose a visual impact on the surrounding area. The number of observers and their perception of the structure determine the concept of visual impact. If there are no observers or if the visual perception of the structure is favourable to all the observers, there would be no visual impact.

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 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.

The sensitivity analysis comprises an indexed combination of three different data sets. Firstly, the landuse dataset for the study area is either acquired from an external source or captured from aerial photography or satellite imagery. Landuse types are then categorised and subcategorised depending on visual sensitivity and assigned an index value accordingly. A suitable range of proximity buffers from each alternative is also generated and assigned a similar index value since visual impact decreases with increasing distance. The landuse index is combined with the proximity index to give an overall sensitivity value. Areas where the features are not visible are then clipped out using the viewshed analysis since no visual impact will occur where the features are not visible.

An increased frequency of visual receptors would occur where the proposed alignments cross or are in close proximity to **main arterial roads**. Within the study area, these were identified as the N4, the R513, the R514, and the R566.

All three alignment options traverse significantly large areas of **residential** zones and/or agricultural holdings. The wider area and less frequent visual incidence necessitates a different assessment of these receptors although the impact is expected to be roughly similar throughout the study area depending on proximity to the actual power line towers.

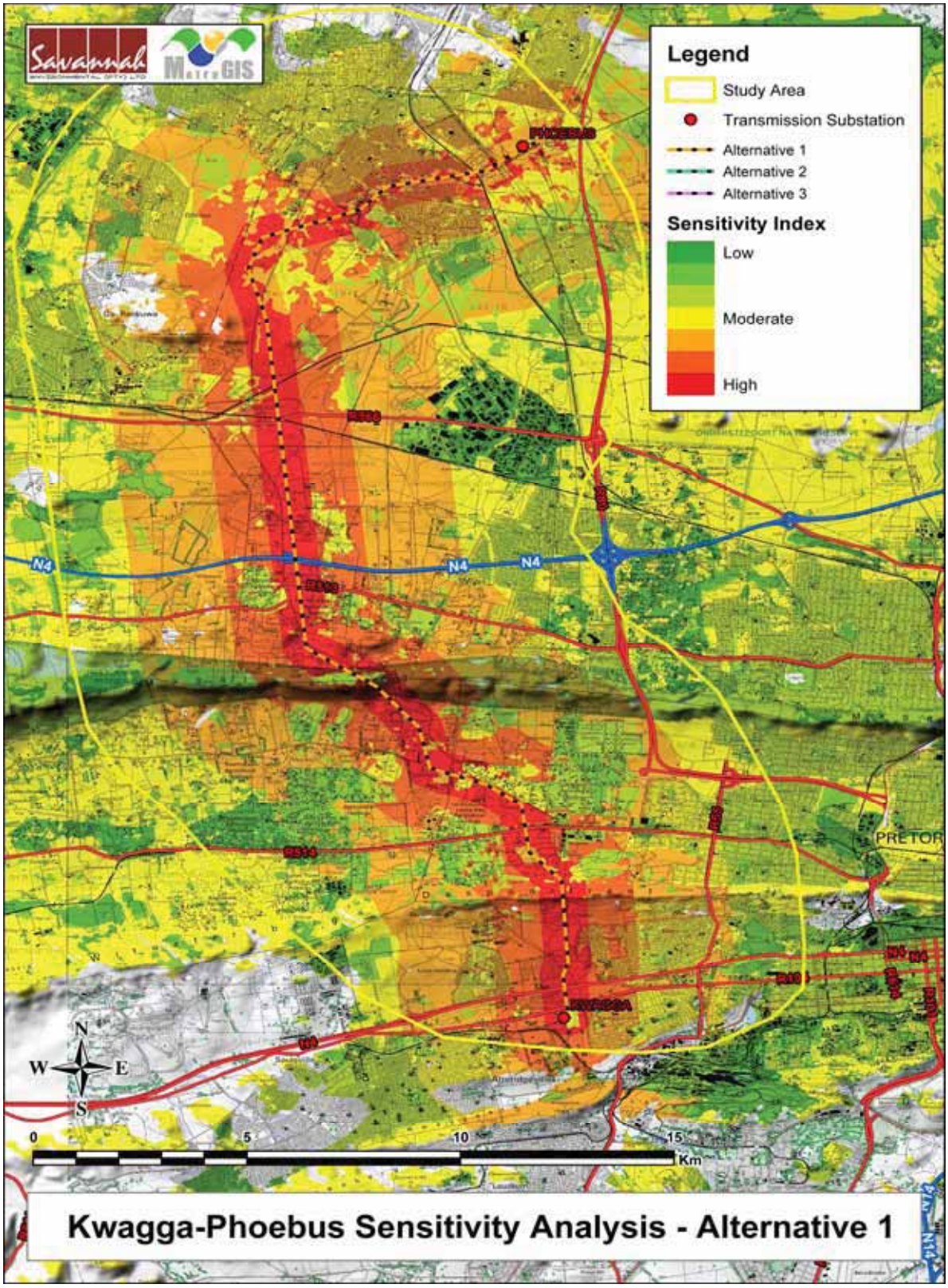

Figure 6.3: Visual Impact Index - Power Line Alternative 1

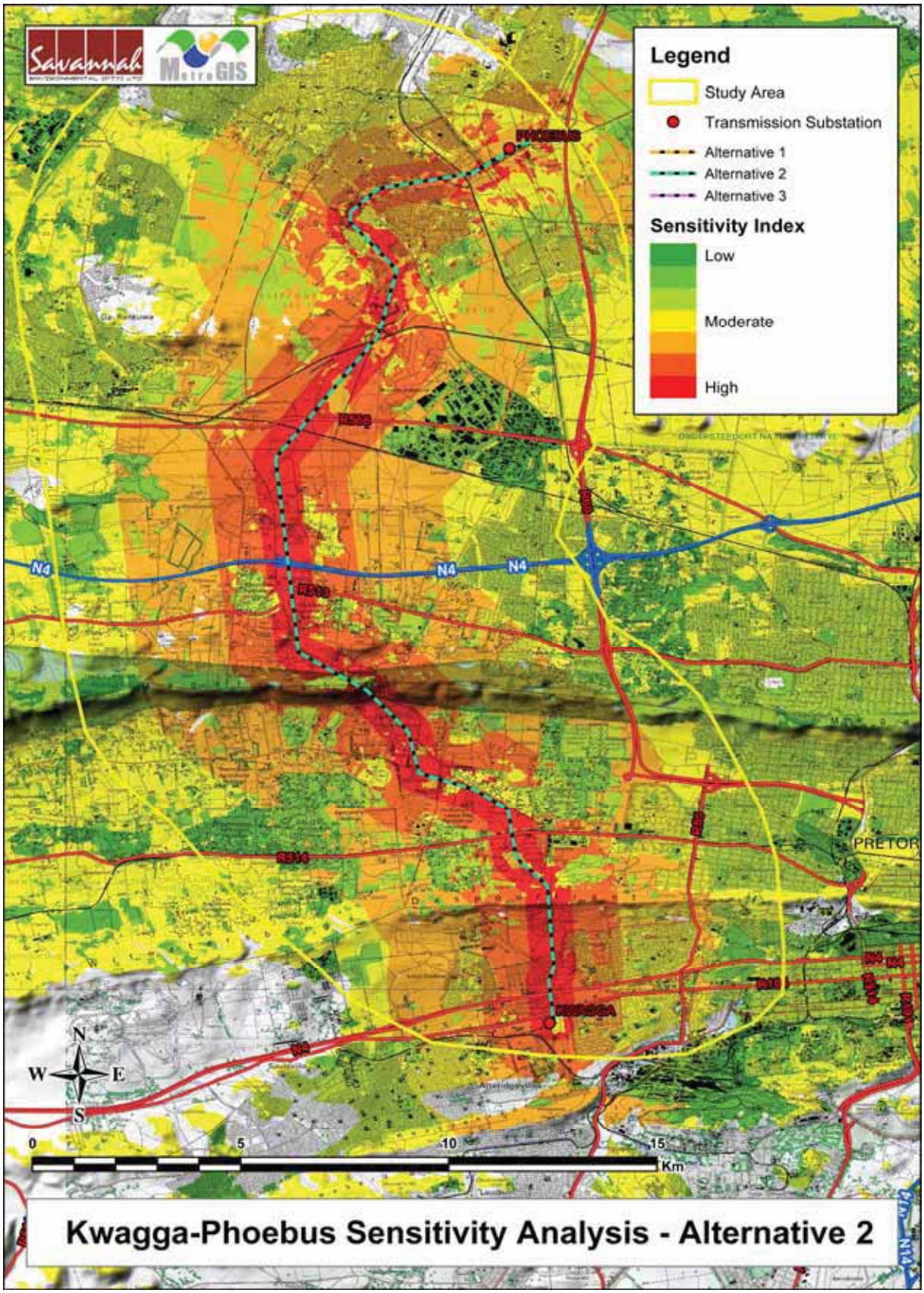

Figure 6.4: Visual Impact Index - Power line Alternative 2

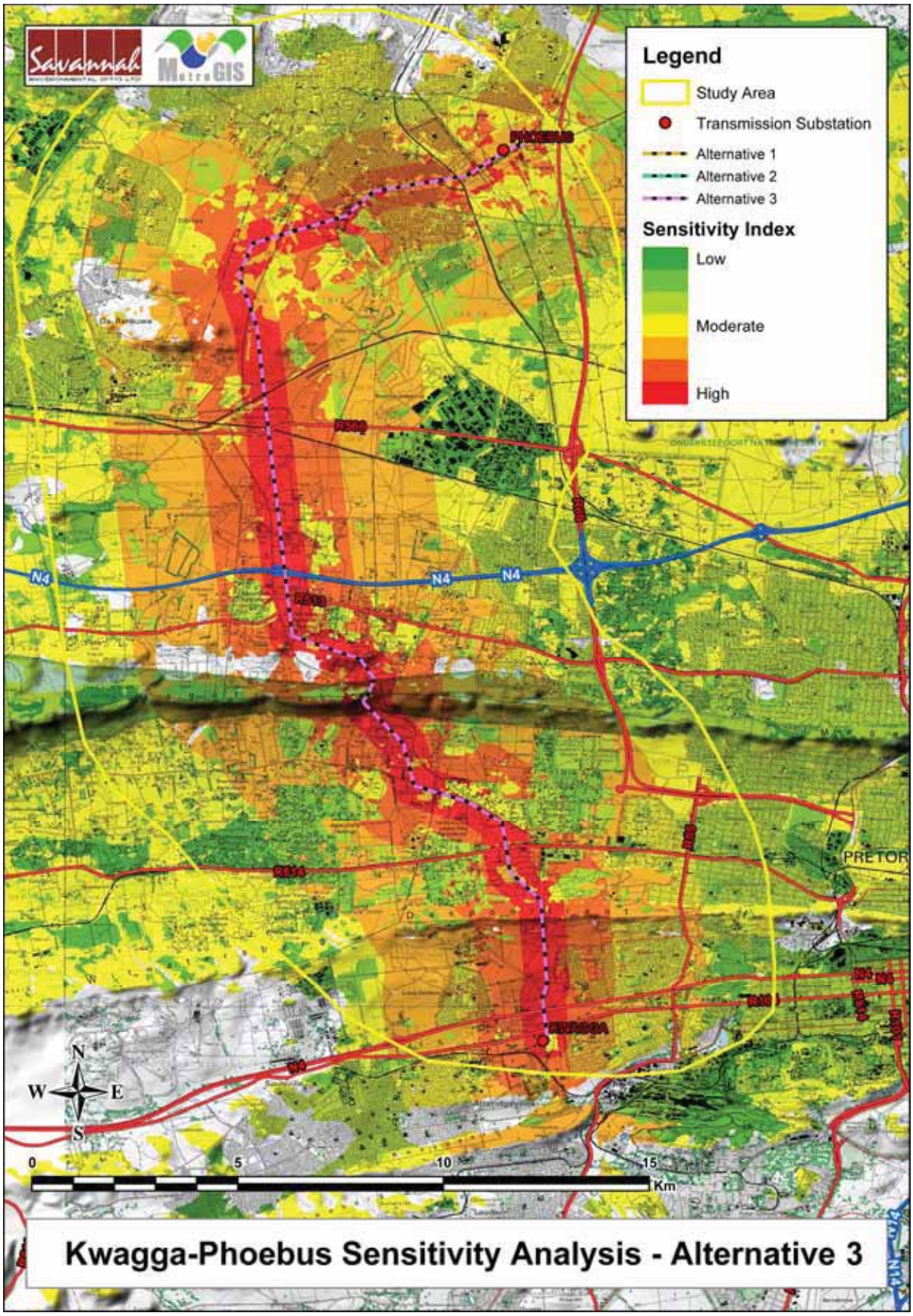

Figure 6.5: Visual impact index – Power line Alternative 3

From the sensitivity analyses above, it is clear that the difference in visual impact of the three alternatives is marginal due to the relative flatness of the topography and commonality of paths. The alternatives may thus be considered equally in terms of visual exposure and significance. The fact that all proposed alignments impact unavoidably on a declared protected natural environment (MPNE) does not necessarily render the project undevelopable because there are no fatal flaws from a visual impact perspective because of the existing similar power line infrastructure in the study area. The table below indicates the difference in area calculations of each alignment alternative and each impact category.

From the table below, it is evident that there is only a marginal difference in area covered by each sensitivity category.

Table 6.1: Comparative Impact Category Area Calculations

Sens Index	Alternative 1	Alternative 2	Alternative 3
Low	12 547.38	11 601.08	11 798.38
	11 839.97	11 217.53	10 744.70
	19 368.23	19 066.59	17 488.65
Moderate	45 673.92	43 983.47	41 712.57
	8 055.21	8 042.62	7 845.81
	3 788.20	3 771.03	3 698.30
High	2 148.52	2 042.61	2 164.11

Impact tables summarising the significance of visual impacts associated with the operation of the proposed power line corridors

*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*[11].

Nature of Impact: Potential visual impact on receptors within the Magaliesberg Protected Natural Environment			
	Alignment 1	Alignment 2	Alignment 3
Extent	Local **(4)**	Local **(4)**	Local **(4)**
Duration	Long term **(4)**	Long term **(4)**	Long term **(4)**
Magnitude	Moderate **(3)**	Moderate **(3)**	Moderate **(3)**
Probability	High **(4)**	High **(4)**	High **(4)**
Significance	Moderate **(48)**	Moderate **(48)**	Moderate **(48)**
Status (positive or negative)	Negative	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No	No
Can impacts be mitigated during operational phase?	No	No	No
Mitigation: Mitigation is not possible.			
Cumulative impacts: The construction of numerous towers will increase the cumulative visual impact of existing power lines that traverse the study area.			
Residual impacts: N.A.			

Nature of Impact: Potential visual impact on users of these roads. The proposed power line corridor 1 is expected to have a high visual impact on observers travelling along the Hornsnek Road (M17), while corridor 2 and 3 could potentially have a visual impact on N4, R513, R514 and R566. However, the occurrence of dense vegetation cover south of Alternative 3 is expected to mitigate this corridor's visual impact to a large degree.			
	Alignment 1	Alignment 2	Alignment 3
Extent	Local **(4)**	Local **(4)**	Local **(4)**
Duration	Long term **(4)**	Long term **(4)**	Long term **(4)**
Magnitude	Minor **(1)**	Minor **(1)**	Minor **(1)**

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

Probability	High **(4)**	High **(4)**	High **(4)**
Significance	Moderate **(48)**	Moderate **(48)**	Moderate **(48)**
Status (positive or negative)	Negative	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No	No
Can impacts be mitigated during operational phase?	No	No	No
Mitigation: Mitigation is not possible.			
Cumulative impacts: The construction of numerous towers will increase the cumulative visual impact of existing power lines that traverse the study area.			
Residual impacts: N.A.			

Nature of Impact: Potential visual impact on receptors within these residential areas. Alternative corridor 1 is expected to have a high visual impact on observers residing in the Soshanguve Extension and some parts of Garankuwa. Alternative corridor 3 is expected to have a moderate visual impact on the residents within the agricultural holdings south-east of the Magaliesburg and Daarsport Ridges.			
	Alignment 1	Alignment 2	Alignment 3
Extent	Local **(4)**	Local **(4)**	Local **(4)**
Duration	Long term **(4)**	Long term **(4)**	Long term **(4)**
Magnitude	Low **(2)**	Low **(2)**	Low **(2)**
Probability	High **(4)**	High **(4)**	High **(4)**
Significance	Moderate **(32)**	Moderate **(32)**	Moderate **(32)**
Status (positive or negative)	Negative	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No	No
Can impacts be mitigated during operational phase?	No	No	No
Mitigation: Mitigation is not possible.			

Cumulative impacts:
The construction of numerous towers will increase the cumulative visual impact of existing power lines that traverse the study area.
Residual impacts:
N.A.

6.4.3. Comparison of Alternatives

If the highest and second highest categories are merged to represent where the alignment would have the greatest impact, i.e. in relatively close proximity to areas considered visually sensitive, alternative 2 (5813.64 ha) would have been preferred on the basis of least overall area of high impact, followed by alternative 3 (5862.61 ha) and alternative 1 (5936.72 ha). However, **alternative 3 is preferred** on the basis that it is the deviation that follows an existing power line that already crosses the MPNE, thus confining the cumulative impact with existing power lines to one area.

Although it is preferable for a new proposal to be placed adjacent to a structure of similar impact to minimise cumulative impacts by concentrating additional impacts to one place, the fact that the proposed Kwagga-Phoebus alignments traverse an area declared as protected should be given special attention. From a visual standpoint, the MPNE cannot be considered a fatal flaw to the project as a new transmission line would not prevent the continued functioning of the area as a protected environment. However, the nature of the project does run directly contrary to the purpose of the Magaliesberg Protected Natural Environment (MPNE). Any infrastructure development within its boundaries would conflict with and undermine its continued status as a protected natural environment.

6.4.4. Implications for Project Implementation

» The primary visual impact, namely the appearance and dimensions of the power line infrastructure, is very difficult to mitigate. The functional design of the structures and the dimensions of the power line towers are unlikely to be changed in order to reduce visual impacts.
» Mitigation of the visual impact though conventional visual impact mitigation measures (i.e. vegetation screening, landscaping or design) is highly unlikely to succeed due to the inherent functional design of the substation structures.
» The corridors proposed for the placement of the Kwagga-Phoebus 400kV power line are located adjacent to sensitive visual receptors that may experience night time visual impacts in the form of glare or light trespass. The mitigation of secondary visual impacts, such as security and functional

lighting, construction activities, decommissioning activities, etc. may be possible and should be implemented and maintained on an on-going basis.

6.4.5. Conclusions and Recommendations

The construction of power line infrastructure in natural areas with potential conflicting land uses will always be problematic from a visual impact point of view. Power line towers are the most visually intrusive features of a transmission line that are numerous and traverse long distances. Visual obstruction from intervening topography or vegetation is incidental and varies hugely depending on the landscape. This means that the visual intrusion of power lines cannot effectively be mitigated.

The visual impact of a 400kV transmission line is definite, long-term, and not given to effective mitigation, but is otherwise entirely limited to the local context. The fact that all proposed alignments of the Kwagga-Phoebus section of the Tshwane Strengthening Project Phase 1 impact unavoidably on a declared protected natural environment. However, there are no fatal flaws as the development would not cause a cessation of existing processes or functions. The marginal difference in total area calculated of high impact for each alternative indicates that alternative 2 is preferred as it has the lowest total, followed by alternative 3 and alternative 1 respectively.

The transmission power lines towers should, in spatially constrained sections of the development corridors (i.e. in built up areas), consist of monopole structures that are less bulky (albeit slightly taller) and less visually intrusive than conventional power line towers. Where space and technical considerations permit, the utilisation of cross rope suspension tower structures is recommended in preference to the more obstructive conventional self-supporting strain towers.

Figure 6.6: Example of a self-supporting double circuit tower and a monopole tower that can be used where there are space constraints.

6.5. Assessment of Impacts associated with Heritage Resources

The Phase I HIA study for the proposed 400kV Kwagga-Phoebus power line revealed the following types and ranges of heritage resources as outlined in Section 3 of the National Heritage Resources Act (No 25 of 1999), namely:

- A number of blockhouses running along the Daspoortrand near Alternative 01 for the 400kV Phoebus Kwagga power line.

Historical evidence has indicated that at least one hundred blockhouses were constructed during the Anglo Transvaal War (1899 to 1902) in and near Pretoria. Most of these structures occur along mountain ranges such as the Magaliesberg, Witwatersberg and the Daspoortrand. The remains of 28 of these blockhouses were discovered during fieldwork while evidence for the destruction of at least ten blockhouses was found in historical documents. The remaining blockhouses were probably destroyed during the expansion of the inner city and the subsequent development of the outlying suburbs.

The blockhouses built in and near Pretoria can, for the sake of clarity, be divided into:

- The forte in Pretoria;
- The line of blockhouses on the Daspoortrand;
- Blockhouses on the Magaliesberg;

- » Blockhouses along the perimeters of Pretoria; and
- » A line of blockhouses towards Rustenburg.

The significance of any possible impact on the British Blockhouse is indicated in Table 6.5. At least eight of these blockhouses, all located to the east of Alternative 01 for the proposed 400kV Phoebus-Kwagga power line were geo-referenced and mapped (Figure 6.6).

6.5.1. Conclusions and Recommendations

It is unlikely that Blockhouse 01 will be directly impacted by Alternative 01 for the proposed 400kV Phoebus Kwagga power line due to the following reason:

- » Alternative 01 for the proposed 400kV Phoebus Kwagga power line runs at a safe distance to the east of Blockhouse 01.

Table 6.2: Impact significance assessment for British Blockhouse near the proposed 400kV Kwagga-Phoebus power line

Potential environmental impact	Project Activity or issue	Environmental significance before mitigation							Environmental significance after mitigation as per EMP						
		M	E	D	R	P			M	E	D	R	P	TOTAL	SI
Alter, damage, destroy Stone Age sites in/near the power line corridors	as a result of pre-construction, construction, or operational activities	0	0	0	0	0	0	L	0	0	0	0	0	0	L

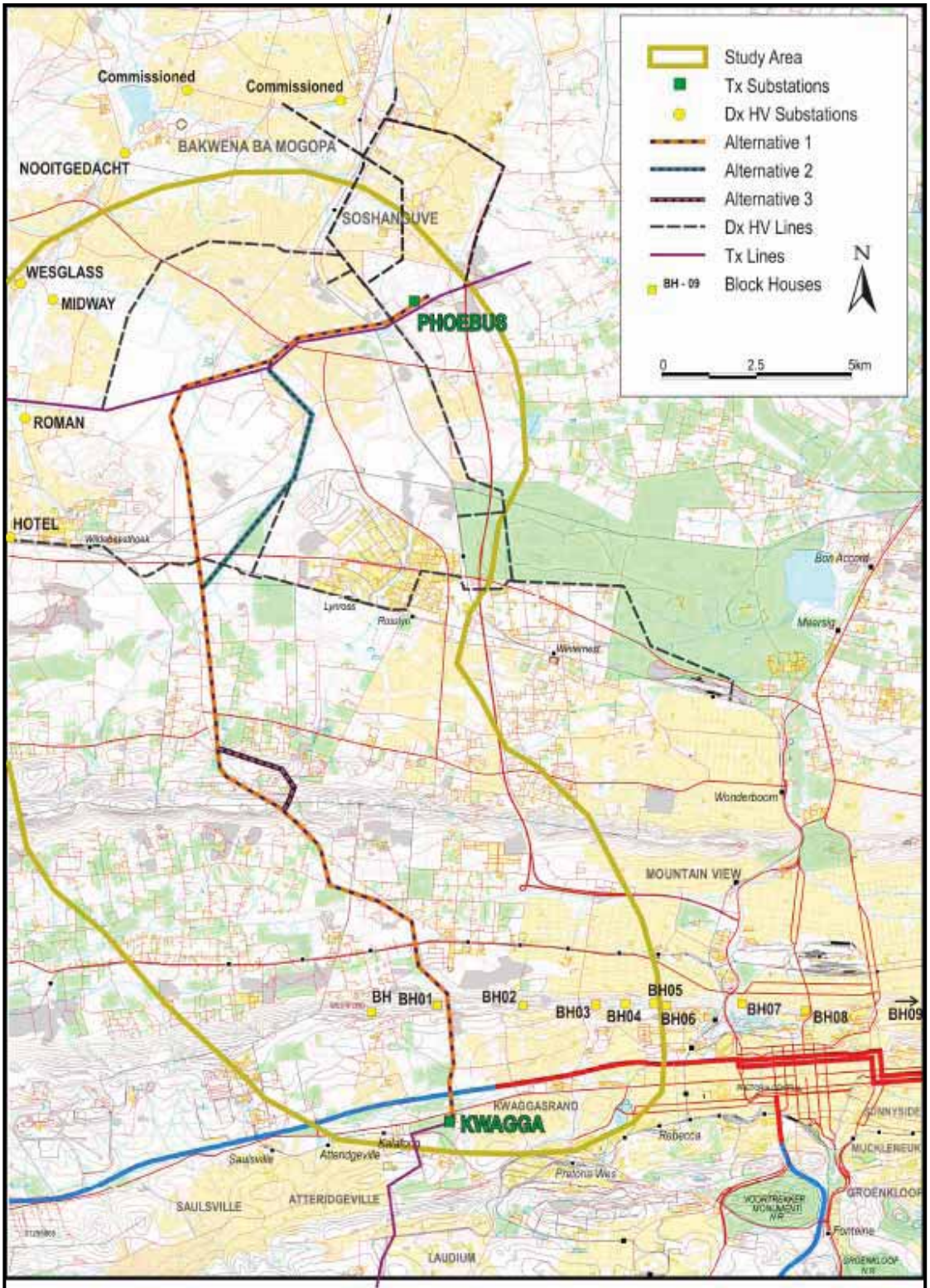

Figure 3- Blockhouses dating from the Anglo Transvaal War (AD 1899 to 1902) occurring along the Daspoortrand, one of which is located near Alternative 01 for the proposed 400kV Phoebus-Kwagga power line (above).

Figure 6.6: Blockhouses along the Daspoortrand adjacent to Alternative 1

6.6. Assessment of Potential Social Impacts

Impacts on the social environment as a result of the proposed 400kV power lines are expected to occur during both the construction and operation phases (as well as during the eventual decommissioning of the infrastructure). The construction phase associated with the proposed power lines is expected to last for approximately 24 months.

Social Impact Assessment considers the following:

» Demographic processes (Change in population size, density and/or demographic profile).
» Economic processes (the way in which people make a living and the economic activities in the society)
» Geographic processes (land use patterns)
» Empowerment, institutional and legal processes (the ability of people to be involved and influence decision making process and role and efficiency and operation of governments and other organisations),
» Socio-cultural process (the way in which humans behave, interact and relate to each other and their environment and the belief and value systems which guide these interactions)

Considering all these processes, potential social health impacts will also be assessed. A distinction was made between the change process and impacts. A change process is defined as a change that takes place within the receiving environment as a result of a certain intervention. A potential social impact follows as a result of the impact once it is experienced as such by an individual/household/community/organisation on a physical and cognitive level.

The following geographic change processes are likely to occur:
» Change in access to resources that sustain livelihoods; and
» Land acquisition and disposal, including availability of land.

Impact Tables summarising the significance of Social Impacts associated with the transmission power lines.

In order to assess the corridor alternatives in respect of their anticipated social impacts, a distinction is made between the following impacts:
» **Category 1:** Impacts that are not expected to differ between the proposed corridor alternatives, e.g. the number of construction workers that will be needed for the proposed project remains the same, irrespective of the chosen alternative.
» **Category 2:** Impacts that are expected to differ between the proposed alternative Corridors, e.g. the number of households to be resettled increases

if the development traversed densely populated areas as opposed to skirting populated areas.

GEOGRAPHIC CHANGE PROCESSES (TRANSMISSION POWER LINE)

Summary of change process: The proposed 400kV transmission line will be operated within a servitude of 55m in width. As the servitude gives Eskom right of way on that particular part of the property, the landowner forfeits the land use rights within the servitude and has to comply with the regulations set forth by Eskom to ensure the safe operation of the line. Depending on the land use and the servitude width, this loss of land can affect a landowner's ability to sustain his/her livelihood. The presence of a transmission line can set a precedent for further land use changes if additional transmission lines are required in the same area in future, as it is preferential to keep infrastructure of a similar nature within one 'spoilt' corridor as opposed to wide-spread throughout a 'green fields' area. Temporary land use changes can also be expected during construction due to the activities associated with the construction process.

Nature of impact: A loss of land affects a private landowner financially when he/she has to cease certain land uses within the servitude area.

This is considered to be a **Category 2 Impact**

Mitigation measures:

» Land rehabilitation should take place upon completion of the construction process to ensure that the land is returned to the landowner in the same condition as prior to construction, unless otherwise agreed with the landowner in question.

Enhancement measures:

» None.

Rating Scale	Alternative 1		Alternative 2		Alternative 3	
	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
Extent	Local [2]	Site [1]	Local [2]	Site [1]	Local [2]	Site [1]
Duration	Short [2]	Very short [1]	Short [2]	Very short [1]	Short [2]	Very short [1]
Magnitude	Very high [10]	Moderate [6]	High [8]	Moderate [6]	Very high [10]	Moderate [6]
Reversibility	Recoverable [3]	n/a	Recoverable [3]	n/a	Recoverable [3]	n/a

Probability	Highly probable [4]	Probable [3]	Highly probable [4]	Probable [3]	Highly probable [4]	Probable [3]
Significance	**High [68]**	**Low [24]**	**High [60]**	**Low [24]**	**High [68]**	**Low [24]**
Status	Negative	Negative	Negative	Negative	Negative	Negative

Cumulative impacts:

» N/A

Residual impacts:

» A precedence for land use change has been set.

Links:

» Impacts due to land use (geographic) change processes links to economic change processes (compensation for servitude), emancipation and empowerment processes (negotiations), and socio-cultural processes (change in sense of place).

It is expected that the construction of the Kwagga-Phoebus transmission line will lead to a temporary change in the population size of the affected area and also, possibly, to the composition of the local population. In this regard, the following demographic change processes are expected:

» An influx of construction workers;
» An influx of unemployed job seekers; and
» The relocation of households and/or other structures.

In all probability, the skills required for the construction of proposed power line will not be present in the area, which means that the contractor will make use of his permanent workforce – i.e. 'strangers' who have to enter the area and who are often viewed as people who 'stole' jobs from the locals. However, a construction team consists of a certain number of people (the size of the team depends largely on the type of construction required) and they enter the area with a very specific purpose. The time they spend in the area is clearly defined and often controlled as such (e.g. construction workers arrive on site in the morning and depart from the area in the evening), and due the nature of their work, their contact with the local community is limited during working hours.

At the peak of construction the number of construction workers on site is estimated to be around 90 people across the length of the transmission line). The construction workers will in all probability commute to site, and therefore it is expected that the influx of construction workers will have a negligible effect on the host community.

Unlike the regulated circumstances surrounding a construction team, the influx of job seekers is unregulated and often very difficult to control. It is also very difficult to predict how many job seekers to expect and the extent to which they can change the size and composition of the local population, as the intensity of the effect will be influenced by the actual number of job seekers.

Given the skills required for the respective construction processes, it is highly unlikely that a job seeker will find formal employment by loitering at the construction camp or sites. The unemployed job seekers then become a burden to the host community, as they do not have the means to sustain themselves, and then become dependent on others (usually people who themselves only have limited resources). The presence of job seekers can also lead to the expansion of the informal settlement located on Hornsnek Road in the Hornsoord area (refer to Figure 6.7). The settlement has expanded drastically in the past 2 years, from the small area indicated by the solid red circle (2007, when the aerial photograph was taken) to the larger area indicated by the dashed red circle (refer to Figure 6.7 below). For this reason, the proposed development in the area has the

potential to increase the influx of job seekers in the area and a potential for the expansion of the informal settlement.

Figure 6.7: An image showing an informal settlement *on Hornsnek Road in Hornsoord area*

In general, land uses that are associated with human occupation on either a temporary or permanent basis, are not permitted within the servitude. This measure is taken to ensure the safe operation of the transmission line, firstly to ensure unrestricted access to the line for routine or emergency maintenance, and secondly to ensure the health and safety of people in the area. The following structures were identified either within or close to the proposed transmission power line servitude:

Alternative 1:

» Just north of the R514 (Van der Hoff Road), the route passes 14m east of a household, which would be in the 55m servitude area;
» At the corner of Kenneth and Cornelia Streets in Loeka Villa, the route directly affects at least one household, with a further one household located within the proposed servitude;
» At the foot of the Magaliesberg heading north, this route directly affects approximately 5 households and one communal property that appears to be a school;
» On top of the Magaliesberg just west of Hornsnek Road, one house is directly affected;

» East of the R513/M17 junction, the route directly affects what appears to be a residential property;
» North of Mallow Street, the route directly affects a residential property;
» South of Itumeleng, the route directly affects two (scattered) residential households;
» It appears that one household settled within the existing servitude between the areas of Itumuleng and Soshanguve SS;
» The route passes close (approximately 20m) to what appears to be an existing household next to what appears to be an abandoned household;
» Route passes close (approximately 17m) to the far southern corner of Itumuleng; and
» An underground gas pipeline runs west of Elandspoort and is located approximately 50m east and parallel to the proposed transmission power line. It is unclear where the pipeline originates or terminates.

Alternative 2:

» South of and adjacent to the R566, the route directly affects one household and passes approximately 26.5m from other households in what appears to be a low cost housing development; and
» The route directly affects approximately seven (7) households on the north-eastern corner of the residential area west of Soshanguve SS.

Alternative 3:

» The route traverses a sensitive area (Magaliesberg Nature Reserve), but no relocation is foreseen at this stage.

The impacts as a result of relocation might be numerous and will often vary between people, as it depends on the level of place attachment, which in turn is informed by variables such as personality, age and number of years spent in a particular area. Where people have been living in a specific area for years, they are used to their surroundings, e.g. the route they travel to work, the amenities (shops, businesses, leisure) they visit, etc. Apart from their surroundings, one could also expect that they are attached to their homes and what it represents. Relocating such households can have a severe impact on their standard of living and quality of life, which might further impact on a psycho-social level.

<table>
<tr><th colspan="6">DEMOGRAPHIC CHANGE PROCESSES (TRANSMISSION POWER LINE)</th></tr>
<tr><td colspan="6">Summary of change process: A total of 241 construction workers will move through the area on a temporary basis across the lifespan of the project, The full work component will never be on site simultaneously – the biggest team expected at the same time is during assembly and erection when 90 people are expected. This will not have a permanent effect on the population size. Job seekers might also enter the area, but usually the number is restricted to individuals.</td></tr>
<tr><td colspan="6">Nature of impact: Generally speaking, accelerated population growth creates unexpected demands on local resources. However, this will not be the case with the current project, as the size of the construction team is too small and their time spent in the area too limited to have any real effect on the local population size. Individual job seekers will also not contribute to accelerated population growth.

This is considered to be a Category 2 Impact</td></tr>
<tr><td colspan="6">Site characteristics: The area along the transmission line route alternatives is characterised by medium to high income groups. The area itself consists mostly of residential areas, either condensed (areas such as Danville, Booysens, Chantelle and Soshanguve) or scattered (areas like Andeon, Hornsoord and Wonderboom NU).</td></tr>
<tr><td colspan="3">Mitigation measures:
» Do not create false expectations – inform local job seekers upfront about the skilled nature of the construction and the low likelihood of employing an unskilled and/or inexperienced workforce.
» Also inform local communities that contractors have a permanent workforce and that they will mostly likely make use of this workforce, which will further the reduce the possibility of local employment.
» Discourage job seekers to travel to the area by advertising in the local and/or regional press before construction commences to show that all positions have been filled and that there are no further job opportunities available.</td><td colspan="3">Enhancement measures:
» None.</td></tr>
<tr><th rowspan="2">Rating Scale</th><th colspan="2">Alternative 1</th><th colspan="2">Alternative 2</th><th colspan="2">Alternative 3</th></tr>
<tr><th>Without</th><th>With</th><th>Without</th><th>With</th><th>Without</th><th>With</th></tr>
</table>

	Mitigation	Mitigation	Mitigation	Mitigation	Mitigation	Mitigation
Extent	Local [2]	Site [1]	Local [2]	Site [1]	Local [2]	Site [1]
Duration	Short [2]	Very short [1]	Short [2]	Very short [1]	Short [2]	Very short [1]
Magnitude	High [8]	Moderate [6]	Moderate [6]	Low [4]	High [8]	Moderate [6]
Reversibility	Recoverable [3]	n/a	Recoverable [3]	n/a	Recoverable [3]	n/a
Probability	Probable [3]	Improbable [2]	Probable [3]	Improbable [2]	Probable [3]	Improbable [2]
Significance	**Medium [45]**	**Low [16]**	**Medium [39]**	**Low [12]**	**Medium [45]**	**Low [16]**
Status	Negative	Negative	Negative	Negative	Negative	Negative
Cumulative impacts: » The simultaneous influx of construction workers to the substation sites.						
Residual impacts: » Job seekers who remain in the area despite being unable to secure any employment, increasing the dependency ratio on the local authority.						
Links: » Impacts due to demographic change processes in turn links to institutional and legal change processes (change in housing needs/demands, change in community infrastructure), and socio-cultural processes (dissimilarity in social practices, conflict, and safety and crime impacts).						

Demographic Change Process

This sub-section deals with the expected economic change processes and resultant impacts that can be expected because of the introduction of the project to the affected environment. The Scoping study identified the following economic change processes as likely to occur:

» Enhanced / reinforced economic opportunities;
» Change in the employment equity of vulnerable groups; and
» Change in occupational opportunities.

In addition to the identified change processes mentioned above, the SIA study also considered enhanced electricity supply and economic growth as an additional change processes on a more macro scale.

The construction phase of the project for the transmission line will create an estimated 731 job opportunities over the length of the contract period. Most of these jobs will have an average contract period of 2-3 months. Due to the skilled/semi skilled nature of the construction processes, only skilled/semi skilled workers are used, usually in the form of the contractor's own permanent workforce. According to an Eskom official, contractors seldom employ causal workers from the local community, mainly because of the skills levels required, and the sensitive nature of the material used in these installations (i.e. the copper wiring often gets stolen).

The proposed new 400kV Kwagga-Phoebus transmission line between these two points will enhance the electricity supply to the City of Tshwane, which in turn will indirectly stimulate economic growth as the electricity supply can meet the demand, allowing businesses and industries to expand. Growing businesses and industries create additional employment opportunities, which enhance economic growth, permitting a positive economic impact to filter down to a more grassroots level.

ECONOMIC CHANGE PROCESSES (TRANSMISSION POWER LINE)	
Summary of change process: The construction of the proposed Kwagga-Phoebus transmission line will create an estimated 731 jobs over the lifespan of the construction phase. Employment enhances economic equities, even if it is over the short-term. Members of vulnerable groups will have equal opportunity to apply for local positions, but such persons often do not apply as they are 'trapped' within their traditional role of housekeeper, caregiver, etc. A change in occupational opportunities is an indirect result of the project as auxiliary services are required during the construction phase, such as shelter, food, etc. A reliable electricity supply stimulates economic growth.	
Nature of impact: Employment first and foremost has an economic impact on the individual and his/her nuclear family. In addition to securing an income, employment (direct formal or indirect informal) also creates a sense of self-worth and offers the individual the opportunity to extend his/her skills base and to gain some experience – this makes people more 'marketable' for future jobs. On a macro scale, the availability of electricity enhances economic growth, which creates more job opportunities with a positive economic impact. This is considered to be a **Category 1 Impact**	
Mitigation measures: » Regarding informal trade: Make use of a permit system and only allow vendors with a valid permit to supply goods and services. Such a system can also assist in controlling access to and from the construction sites and camp by knowing who the vendors are and who the loiterers are, and it can aid in preventing conflict amongst vendors due to an over-supply of the same product.	**Enhancement measures**: » House construction workers within the local community, where possible. The 'rent' paid to the home owner should be a realistic boarding & lodging fee (i.e. according to the rental market in the surrounding area). » Contractors must be contractually obliged to appoint local labour wherever possible. » Give preferential treatment to local entrepreneurs and/or subcontractors to supply goods and services. » Females should be encouraged to apply for positions. » Individuals with the potential to develop their skills further should be afforded training opportunities, where possible. » Payment should comply with applicable Labour Law legislation in terms of minimum wages. » Where required, workers must be registered with any and all official bodies as required by law, e.g. Income Revenue Services, Unemployment Insurance Fund, etc.

Rating Scale	Alternative 1		Alternative 2		Alternative 3	
	Without Mitigation	**With Mitigation**	**Without Mitigation**	**With Mitigation**	**Without Mitigation**	**With Mitigation**
Extent	Site [1]	Local [2]	Site [1]	Local [2]	Site [1]	Local [2]
Duration	Very short term [1]	Short term [2]	Very short term [1]	Short term [2]	Very short term [1]	Short term [2]
Magnitude	Low [4]	Moderate [6]	Low [4]	Moderate [6]	Low [4]	Moderate [6]
Reversibility	Recoverable [3]	n/a	Recoverable [3]	n/a	Recoverable [3]	n/a
Probability	Improbable [2]	Probable [3]	Improbable [2]	Probable [3]	Improbable [2]	Probable [3]
Significance	**Low [18]**	**Medium [30]**	**Low [18]**	**Medium [30]**	**Low [18]**	**Medium [30]**
Status	Positive	Positive	Positive	Positive	Positive	Positive

Cumulative impacts:

» Increased influx of job seekers and pressure on institutional infrastructure.

Residual impacts:

» Increased capacity on electricity network resulting in a stable network that can facilitate economic growth.

Links:

» Economic change processes link to geographic change processes (change in access to resources that sustain livelihoods), and demographic processes (influx of job seekers to an area with a growing economy).

Institutional and Legal Change Process

Institutional and Legal Change Processes assesses the way in which a development of this nature could change the face of service delivery in the affected area and how this change in turn could affect the quality of life of local residents. The following institutional and legal change processes are likely to occur:

» Change in housing needs / demands; and
» Change in community infrastructure.

Of the total construction team of 241 people on the transmission line, an estimated 140 will require housing at some point during the construction phase. As few of the construction activities on the transmission line will take place concurrently, the number of people who require housing at any given time will also vary, and is estimated to range between 30 and 80 people.

If a construction camp is utilised, the contractor decides on the location for the camp, based on the distance from the camp site to the construction site(s) and the proximity of the camp to sanitary services. Once the contractor has decided on a preferred location, he/she negotiates with the landowner to secure the site, and with the local authority to secure municipal services (water, sanitation, electricity, and waste removal). The Environmental Control Officer (ECO) will inspect the conditions at the construction camp on a regular basis and if a contractor fails to supply sufficient and hygienic living conditions, he/she may be liable to a fine.

Unfortunately, construction camps have earned a certain level of social stigma over the years due to an increase in social problems in the surrounding area for the duration of the camp's presence. Some of the most common problems associated with residential construction camps include the following:

» An increase in prostitution: disempowered and desperate local women often view construction workers as financially well-off and therefore as a source of income to the women who, quite frequently, are the sole breadwinners in the family. Apart from the wilful act of prostitution, other women are willing to enter into sexual relationships with construction workers believing that they will gain financially, which is often not the case. This leads to an increase in pregnancies and teenage pregnancies and more often than not, both woman and child is left behind in the community without any financial support when the construction worker moves out of the area.

» An increase in casual sexual relationships has the obvious health implication of an increase in sexually transmitted infections, including HIV. Human beings are mobile beings which mean that these infections are spread further when an infected person enters a new area and engage in a new casual sexual relationship.

» Infrastructure and services (e.g. water and sanitation) that are not managed and maintained properly within a construction camp can lead to waterborne diseases such as cholera. Within concentrated living conditions, diseases are easily spread within not only the confines of the camp, but also to the surrounding community.

» Construction workers seldom spend their free time in the camp, but would rather venture into town or nearby settlement in search of entertainment, which quite often leads to alcohol abuse. This in turn can lead to an increase in conflict and violence, as well as an increase in risky behaviour, such as drug abuse, unprotected causal sexual encounters, etc.

It is therefore imperative that the position of the construction camp is carefully selected as construction camps are areas where some of the most significant social change processes could take place, as outlined above. On the other hand, housing construction workers in the local community creates economic opportunities for local households, reduces the additional demand on municipal services (see 'change in community infrastructure' below) as additional connections is not required, and minimises the possibility and extent of problems associated with construction camps.

Additional municipal services (such as water, sewage, and waste removal) will be required at the construction site(s) and, if used, the construction camp. Where contractors do make use of local municipal services, they have to obtain approval from the CoT as the guardian of these services, and once approved, the contractor must install and manage the necessary (temporary) infrastructure to access the municipal services network.

INSTITUTIONAL AND LEGAL CHANGE PROCESSES (TRANSMISSION POWER LINE)						
Summary of change process: Construction workers require housing, either within the community or within a construction camp. Municipal services such as water, sanitation, and waste removal will be required at the construction camp. Existing services can be used if construction workers are housed in the local community. Due to the temporary nature of a construction camp, a number of social problems are associated with a camp, including prostitution, unhygienic living conditions, alcohol abuse, and conflict. Most of the problems will be negated if construction workers are housed in the community.						
Nature of impact: A lack of proper municipal services intensifies unhygienic living conditions, which impacts on health. Other social ills associated with a construction camp (e.g. prostitution) further impacts on health. Alcohol abuse and conflict increase noise levels and impacts on neighbouring areas' quality of life. This is considered to be a **Category 1 Impact**						
Site characteristics: It is expected that the households surrounding the transmission line construction area will be less 'open' to strangers in their homes. Construction workers might be able to find accommodation in Soshanguve, but this means that they will require transport to and from the construction site as construction progresses.						
Mitigation measures: » As per the substations' mitigation measures for institutional and legal change processes.			**Enhancement measures**: » None.			
Rating Scale	**Alternative 1**		**Alternative 2**		**Alternative 3**	
	Without Mitigation	**With Mitigation**	**Without Mitigation**	**With Mitigation**	**Without Mitigation**	**With Mitigation**
Extent	Local [2]	Site [1]	Local [2]	Site [1]	Local [2]	Site [1]
Duration	Short term [2]	Very short term [1]	Short term [2]	Very short term [1]	Short term [2]	Very short term [1]
Magnitude	High [8]	Moderate [6]	High [8]	Moderate [6]	High [8]	Moderate [6]

Reversibility	Recoverable [3]	n/a	Recoverable [3]	n/a	Recoverable [3]	n/a
Probability	Probable [3]	Improbable [2]	Probable [3]	Improbable [2]	Probable [3]	Improbable [2]
Significance	**Medium [45]**	**Low [16]**	**Medium [45]**	**Low [16]**	**Medium [45]**	**Low [16]**
Status	Negative	Negative	Negative	Negative	Negative	Negative

Cumulative impacts:

» None.

Residual impacts:

» Contamination of local natural resources, if services were not managed properly during construction.

Links:

» Institutional and legal change processes links to geographic change processes (land acquisition and disposal, including the temporary unavailability of land taken up by the construction camp), economic change processes (change in occupational opportunities as people shift their attention from the construction sites to the construction camp to deliver services to the camp and construction workers) and socio-cultural change processes (conflict inside the camp and crime and safety impacts – people perceive the construction camp with an increase in crime).

The construction and operation of the transmission power line between Kwagga and Phoebus substations can alter the interactions and relationships within the local community by bringing about a change in the socio-cultural environment.

As per the results of the scoping study, the following socio-cultural change processes are expected:

» Dissimilarity in social practices;
» Alteration in family structure;
» Conflict;
» Safety and crime impacts; and
» Change in sense of place.

Dissimilarity in social practices is more likely to come to the fore if construction workers are housed in a construction camp and if such a camp is located close to existing formal and informal settlements. This is because construction workers spend part of their free time at the construction camp and therefore social and cultural practices will be more evident at the camp than on site.

At the time of the study, there was no apparent conflict within the local community or between the local community and the project proponent (Eskom) over the proposed substations or the transmission line. The situation is unlikely to change if the project processes proceed in an open and transparent manner.

Sense of place goes hand in hand with place attachment, which is the sense of connectedness a person/community feels towards certain places. Place attachment may be evident at different geographic levels, i.e. site specific (e.g. a house, burial site, or tree where religious gatherings take place), area specific (e.g. a residential area), and/or physiographic specific (e.g. an attachment to the look and feel of an area). The concept of sense of place therefore attempts to integrate the character of a particular setting with the personal emotions, memories, and cultural activities associated with such a setting.

The potential impact on socio-cultural behaviour and the related perception of environmental changes can have either a positive or a negative impact on sense of place (e.g. peace of mind vs. frustration/anger). The introduction of a new project to the area can be viewed as a positive impact if people perceive the project as infrastructural and/or economic development that is not intrusive on their lives and do not cause them immediate danger. Potential negative impacts include the visual impact and the resultant intrusion on sense of place.

SOCIO-CULTURAL CHANGE PROCESSES (TRANSMISSION POWER LINE)

Summary of change process: The arrival of people who are not from the area can lead to conflict if there is dissimilarity in social practices and if such differences are not respected. Family structures can be altered where the breadwinner is absent for prolonged periods of time and in cases of HIV transmission, the family structure can further be altered. The presence the transmission line can change the face of the area there used to be no infrastructure, and therefore has the potential to alter the way in which people relate to each other and their environment, affecting their sense of place.

Nature of impact: Conflict affects a community's group cohesion and way of life. Apart from the obvious health impacts associated with illnesses such as HIV, it also bears an economic impact when people become too ill to work – on the macro economy as well as the micro economy of the family who loses their source of income, which affects their livelihood. People lose their sense of belonging and place attachment, resulting in a loss of sense of place.

This is considered to be both **Category 1 and 2 Impact**

Site characteristics: The area has unique characteristics with amenities like the Magaliesberg Nature Reserve close by.

Mitigation measures:	**Enhancement measures**:
» As per the substations' mitigation measures for institutional and legal change processes.	» None.

Rating Scale	**Alternative 1**		**Alternative 2**		**Alternative 3**	
	Without Mitigation	**With Mitigation**	**Without Mitigation**	**With Mitigation**	**Without Mitigation**	**With Mitigation**
Extent	Local [2]	Site [1]	Local [2]	Site [1]	Local [2]	Site [1]
Duration	Short [2]	Very short [1]	Short [2]	Very short [1]	Short [2]	Very short [1]
Magnitude	High [8]	Moderate [6]	Moderate [6]	Low [4]	High [8]	Moderate [6]
Reversibility	Recoverable [3]	n/a	Recoverable [3]	n/a	Recoverable [3]	n/a

Probability	Probable [3]	Improbable [2]	Probable [3]	Improbable [2]	Probable [3]	Improbable [2]
Significance	**Medium [45]**	**Low [16]**	**Medium [39]**	**Low [12]**	**Medium [45]**	**Low [16]**
Status	Negative	Negative	Negative	Negative	Negative	Negative

Cumulative impacts:

» None.

Residual impacts:

» An increase in the HIV infection rate.

» Vulnerable families.

» A loss of place attachment and sense of place.

Links:

» Socio-cultural change processes links to demographic change processes (population growth and decline), economic change processes, and empowerment and emancipation processes (people are disempowered when they are forced to remain in a destructive cycle).

6.6.1. Conclusions and Recommendations

As could be expected, the construction phase is characterised by a number of negative social impacts, which is mainly due to the nature of the activities that take place during this phase. Although the expected social impacts associated with the construction phase are mostly negative across all the change processes, these impacts are for the most part only temporary in nature and as such, it is expected to only last over the construction period.

Even though all of the identified social impacts can be mitigated or enhanced successfully, it can only be done if Eskom, or its appointed contractor(s), commit to the responsibility of ensuring that the level of disturbance brought about to the social environment by the more negative aspects of the project, is minimised as far as possible.

Overall, based on the conclusions and findings of this report, the proposed transmission line does not pose any social impact that is deemed irreversible, fatally flawed, or severely detrimental to the social environment. However, this finding is subject to the implementation of, and adherence to, the identified mitigation measures contained in this report, and as recommended for inclusion in the EMP. In addition, the social specialist recommends the following:

» Where possible, accommodate workers in private homes in the surrounding community.

» Ensure that social issues identified during the EIA phase are addressed during construction. This could be done by engaging social specialists where necessary or by ensuring that ECOs used during construction have the necessary knowledge and skills to identify social problems and address these when necessary. Guidelines on managing possible social changes and impacts could be developed for this purpose.

» Always inform landowners on any construction activity to start on their property. Prepare them on the number of people that will be on the property and on the activities they will engage in.

» Ensure that Eskom employees are aware of their responsibility in terms of Eskom's relationship with landowners and communities surrounding power lines. Implement an awareness drive to relevant sections to focus on respect, adequate communication and the 'good neighbour principle.'
» Incorporate all mitigation measures in the SIA that are relevant to the construction phase in the EMP to ensure these are adhered to by Eskom and the contractor.

CONCLUSIONS AND RECOMMENDATIONS CHAPTER 7

The conclusions and recommendations of this EIA are a result of the assessment of the impacts identified by the specialists, and the parallel process of public participation. The public consultation process has been extensive and every effort has been made to include representatives of all, interested and affected parties as well as stakeholders in the study area.

7.1. Overview of the Proposed Project

In order to reinforce the existing Transmission network in the Tshwane Region, Eskom Transmission is currently proposing the construction of a 400kV transmission power line between the existing Apollo and Pluto substations. In addition, increased demand for a reliable electricity supply in the Central Grid has necessitated that Eskom Transmission improves the reliability and capacity of the transmission network in the area. Further, upgrade of the 400/132kV Kwagga substation and establishment of a new Phoebus substation is also being proposed in the area in order to improve the reliability and quality of supply problems in the Tshwane area. Numerous Distribution options were investigated by Eskom Distribution network planning, the investment and a new Transmission network was preferred as the most suitable long-term solution. Eskom Transmission is therefore proposing the construction of the **Tshwane Strengthening Project Phase 1.**

In total, **approximately 36 km of new power line** is proposed as part of the entire Tshwane Strengthening project Phase 1. The purpose of this project is to:

» Improve the reliability of the existing Central Transmission network.
» Improve the voltage regulation on the Central Grid Distribution and City of Tshwane Metropolitan Municipality network.
» Create additional Transmission network capacity which will supply the increasing electricity demand in the Central Grid.

As part of its assessment of supply requirements, and as a result of the projected load growth of the Gauteng region, Eskom have determined that additional transmission capacity will be required in the Johannesburg North area by the year 2013. For this reason, Eskom Transmission is proposing the **Tshwane Strengthening Project**. This report focuses on the following components:

» Construction/establishment of the **new Phoebus Substation** adjacent to the existing Hangklip Substation.
» Expansion of the existing Kwagga substation

» Construction of a **new 400kV transmission power line** between the Phoebus Substation and the Kwagga Substation, a distance of ~30 km.
» Construction of the loop in/out Apollo-Dinaledi power lines at Phoebus substation.
» **Associated (infrastructure) works** to integrate the new transmission power lines and substation into the Transmission grid (such as access roads, communication tower, turn-in lines, feeder bay etc) and accommodate the new lines at existing substations (such as the construction of new feeder bays within the existing substation sites).

The Environmental Impact Assessment (EIA) for the proposed Tshwane Strengthening Project Phase 1 has been undertaken in accordance with the EIA Regulations published in Government Notice 28753 of 21 April 2006, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998).

The EIA Phase aimed to achieve the following:

» Provide an overall assessment of the social and biophysical environments affected by the proposed alternatives put forward as part of the project.
» Assess potentially significant impacts (direct, indirect and cumulative, where required) associated with the proposed project.
» Comparatively assess identified feasible alternatives put forward as part of the project.
» Nominate a preferred power line alternative corridor for consideration by the decision-making authorities (i.e. DEA and GDARD).
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public involvement process to ensure that I&APs are afforded the opportunity to participate, and that their issues and concerns are recorded.

The following substation site location and power line alternatives have been considered within this EIA process (refer to Figure 7.1 and 7.2):

» A potential site for the establishment of the proposed Phoebus substation. This site is located adjacent (north-west) of the existing Hangklip substation, which is owned by the applicant, Eskom Holdings.
» Four transmission line development corridors (including new deviation recommended during the EIA phase) in order to link the proposed new Phoebus substation with the Kwagga substation. Of the three corridor alternatives, Alternatives 1 is the longest alternative corridor connecting

Kwagga and the proposed Phoebus substation, while the remaining two corridors (Alternatives 2 and 3) are deviations from Alternative 1.

The conclusions and recommendations of this EIA are the result of the assessment of identified impacts by specialists, and the parallel process of public participation. The public consultation process has been extensive and every effort was made to include representatives of all stakeholders in the study area.

7.2. Evaluation of the Proposed Project

The preceding chapters of this report together with the specialist studies contained within Appendices I-N provide a detailed assessment of the environmental impacts on the social and biophysical environment as a result of the proposed project. This chapter concludes the EIA process by providing a summary of the conclusions of the assessment of the proposed substation site and alternative transmission line corridors identified for the 400kV transmission power lines. In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental consultants during the course of the EIA and presents an informed opinion of the environmental impacts associated with the proposed project.

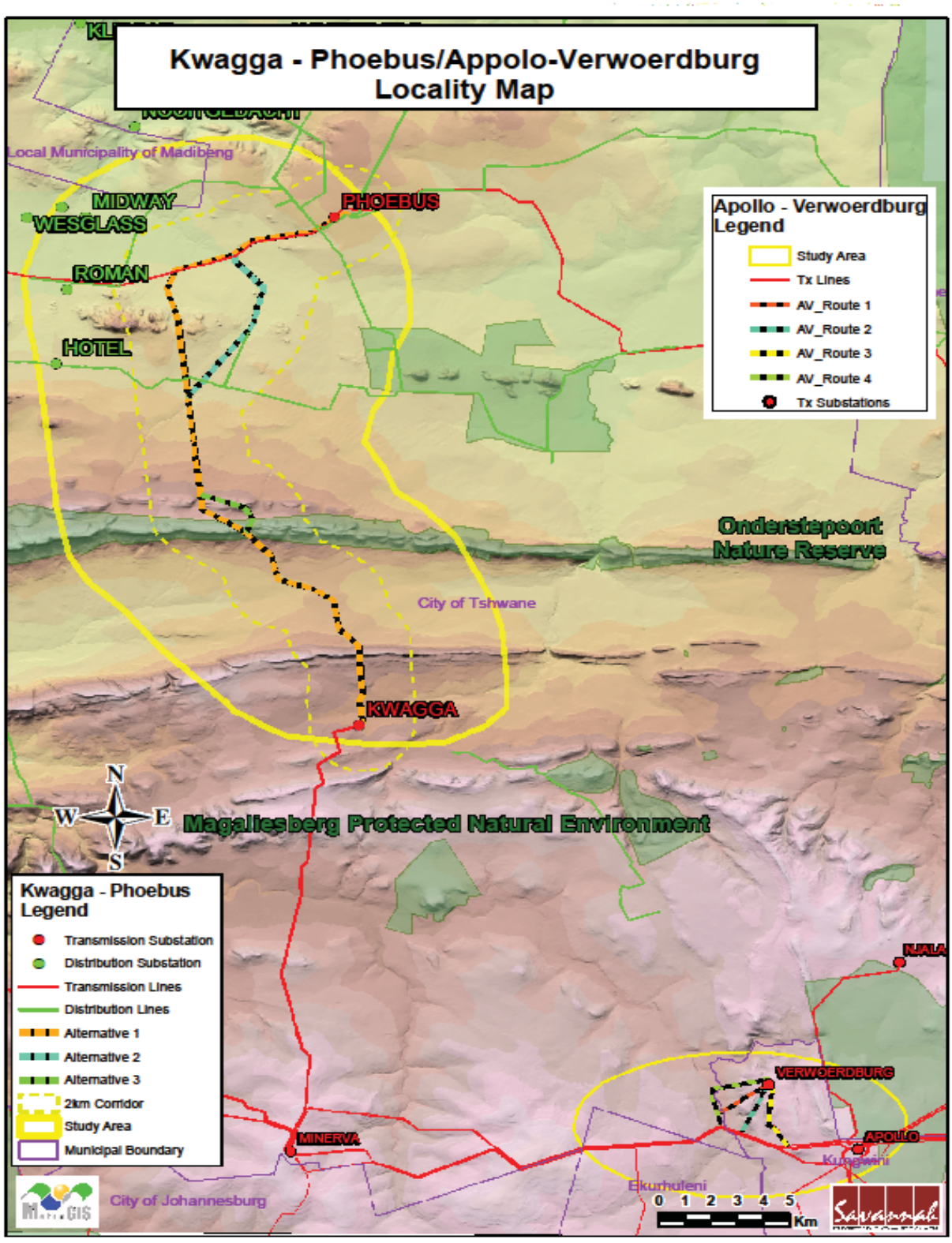

Figure 7.1: Map showing nominated alternatives considered in the EIA Study

Figure 7.2: Image showing the proposed location of the Phoebus substation considered during the EIA study

7.1.1. Conclusions and Recommendations drawn from the Assessment of the proposed Kwagga substation expansion and new Phoebus Substation

From the majority of the specialist studies undertaken, it has been concluded that the proposed expansion of Kwagga substation and the establishment of the Phoebus substation will have minimal environmental impacts. The majority of potential impacts identified to be associated with the construction and operation of the proposed substation are anticipated to be localised and restricted to an area already transformed due to the existing substation and power line infrastructure. No environmental fatal flaws were identified to be associated with the site. For this reason, the majority of the specialists recommended that the substation expansion and establishment go ahead within the two proposed development footprints. This is largely due to the fact that the expansion of Kwagga substation at this site is within the existing substation site footprint, which is already transformed as well as the fact that it would be associated with minimum disturbance to the environment.

In terms of Agricultural Potential, all the soils occurring on the site of the proposed Phoebus substation are red (occasionally yellow-brown), weakly structured, sandy loam soils on rock or cemented ferricrete. Thus, the whole area will be classed as having **low potential** for arable agriculture, suited for grazing at best.

Some areas requiring mitigation have been highlighted. Environmental specifications for the management of potential impacts are detailed within the draft Environmental Management Plan (EMP) included within Appendix O.

From the majority of the specialist studies undertaken, the proposed expansion of Kwagga substation and the establishment of the Phoebus substation will have minimum environmental impacts. For this reason, the majority of the specialists recommended that the substation expansion and establishment go ahead within the two proposed development footprints. This is largely due to the fact that the expansion of Kwagga substation at this site is within the existing substation site footprint, which is already transformed as well as the fact that it would be associated with minimum disturbance to environment. In addition, the proposed establishment of Phoebus substation north-west of the existing Hangklip substation will take place in an already transformed environment as a result of the existing Hangklip substation and Apollo-Dinaledi power line infrastructure.

In terms of Agricultural Potential, all the soils occurring on the site of the proposed Phoebus substation are red (occasionally yellow-brown), weakly

structured, sandy loam soils on rock or cemented ferricrete. Thus, the whole area will be classed as having **low potential** for arable agriculture, suited for grazing at best.

From a social impact perspective, the proposed expansion of the Kwagga substation and the construction and operation of the new Phoebus substation do not pose any social impacts that is deemed irreversible, fatally flawed, or severely detrimental to the social environment.

When considering the project from a holistic perspective (i.e. taking both the proposed Kwagga substation expansion and Phoebus substation establishment into consideration, as well as future additional transformers and feeder bays which are required to augment the project, the proposed establishment of the Phoebus is recommended because the construction activities at this site would have a lower overall impact on the environment.

The majority of potential impacts identified to be associated with the construction and operation of the proposed substation are anticipated to be localised and restricted to an area already transformed due to the existing substation and power line infrastructure. No environmental fatal flaws were identified to be associated with the site. However some areas requiring mitigation have been highlighted. Environmental specifications for the management of potential impacts are detailed within the draft Environmental Management Plan (EMP) included within Appendix O.

7.1.2. Conclusions and Recommendations drawn from the Assessment and Comparison of the Transmission Power Line Alternatives

Nomination of a preferred alternative is based on the specialist recommendations, public participation and the recommendations of the specialist workshop undertaken during the EIA Phase of the project.

» In terms of impacts on biodiversity, alternative 2 is a "no go area" because of the ecological attributes and sensitivities along this corridors. For this reason, **alternative corridor 1 and 3** are preferred with slight deviations around sensitive areas as shown in Figure 7.3.

» In terms of avifauna two of the alternatives are equal in avifaunal impact and as such either may be used. These are **alternative 1 and 3**. However, it must be stressed that neither of these alternatives are ideal as they both cross ridges and because of this their impact on avifauna is increased. Alternative 2 should be discarded.

» From a visual sensitivity he marginal difference in total area calculated of high impact for each alternative indicates that alternative 2 has the lowest total, but since the deviation in **alternative 3** follows an existing power line that already crosses the Magalisberg Protected Natural Environment (MPNE), the cumulative impact is confined to one area within the most visually sensitive area, it is thus preferred above alternative 1 or 2.

» From a Heritage Impact assessment, it is not likely that Blockhouses identified within the Darspoort ridge will be impacted by **alternative corridor 1 and 2**. Against this background, alternative corridor 1 and 2 are preferred from a heritage impact perspective.

» From a social impact assessment perspective, alternative 2 and 3 will have the least impact as compared to alternative 1, which runs for the entire length of the corridor with residential settlements.

From the conclusions of the specialist workshop undertaken, it was concluded that Alternative corridor 2 is not recommended due to potential impacts of high significance on the environment, and therefore development along this corridor should be avoided. Alternative corridor 1 or 3 was nominated as the preferred alternative by the majority of the specialists. From a holistic environmental (technical, ecological, social and economic) perspective, **Alternative 1** with slight deviations as shown in Figure 7.3 is the most preferred alternative. In addition, it is considered vital that construction of the transmission power lines within this corridor take the recommended conditions identified by the specialist studies into consideration. Should the project be authorised by DEA, the final routing of the power line within the nominated preferred corridor should be undertaken in consultation with the affected landowner and the following specialists.

» Biodiversity specialist
» Avifauna specialist
» Heritage specialist

7.2. Overall Conclusion (Impact Statement)

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed project conclude that:

» Although some impacts of potential high significance are associated with the transmission line and substations, there are no environmental fatal flaws that should prevent the proposed substation expansion, establishment and transmission power line from being constructed on the proposed sites and

nominated alignment respectively, provided that the recommended mitigation measures are implemented.

» No issues of significance were identified to be associated with the proposed expansion of the Kwagga substation and the establishment of the Phoebus substation at the identified sites.

» Alternative corridor 2 is considered to be a **"no-go option"** from the conclusions of both the avifauna and biodiversity specialists. This alternative corridor was only recommended from a social and heritage perspectives.

» From a holistic environmental perspective, **Alternative Corridor 1** with deviations as recommended by the biodiversity specialist is nominated as the preferred corridor for the construction of the proposed 400kV transmission power line.

» It is recommended that the transmission power line be constructed within the same corridor (Alternative 1) as recommended by the EIA team.

» The significance levels of the majority of identified negative impacts can be mitigated and minimised by implementing the recommended mitigation measures.

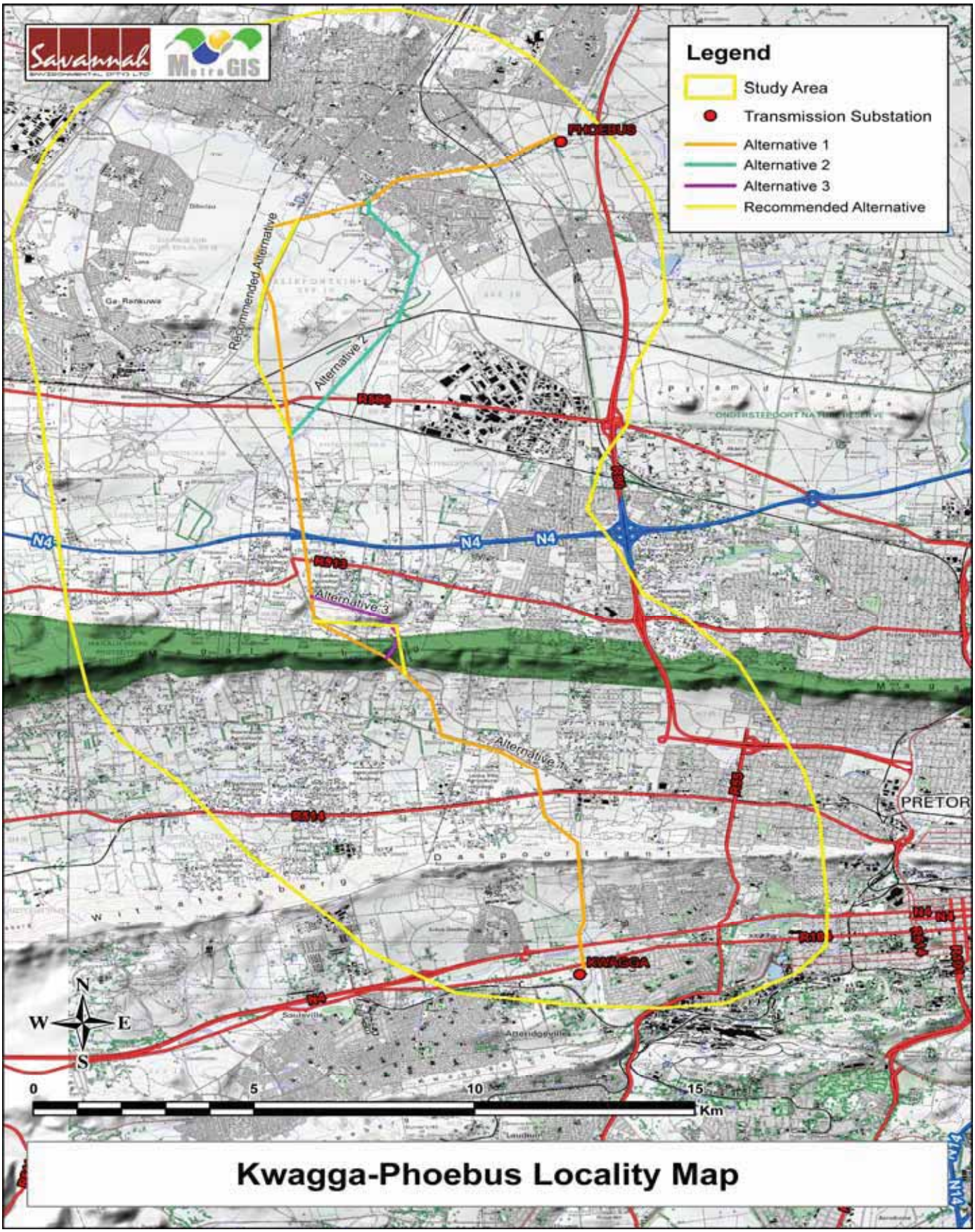

Figure 7.3: Recommended deviations for the Kwagga-Phoebus power line corridors from a biodiversity perspective

7.3. Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the proposed establishment of Phoebus substation, Kwagga substation expansion, construction and operation of the Kwagga-Phoebus 400kV transmission power line, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the application for the proposed Tshwane Strengthening Project Phase 1, Kwagga-Phoebus components (EIA Ref 12/12/20/1471 and 12/12/20/1524) be authorised by DEA to include the following:

» Construction/establishment of the **new Phoebus Substation** adjacent (north-west) to the existing Hangklip Substation.
» Expansion of the **existing Kwagga substation**, south of the substation.
» Construction of a **new 400kV transmission power line** between the Phoebus Substation and the Kwagga Substation within either **alternative corridor 1 or 3**, a distance of ~30 km.
» **Associated (infrastructure) works** to integrate the new transmission power lines and substation into the Transmission grid (such as access roads, communication tower, 1 km turn-in line from Phoebus, feeder bay etc) and accommodate the new lines at existing substations.

The following conditions of this recommendation must be included within the authorisation issued:

» All mitigation measures detailed within this report and the specialist report contained within Appendices F to K must be implemented.
» The draft Environmental Management Plan (EMP) as contained within Appendix L of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed Tshwane Strengthening Project (Kwagga-Phoebus power line and Kwagga and Phoebus substation components)[12], and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for all life cycle phases of the proposed project is considered to be key in achieving the appropriate environmental management standards as detailed for this project.
» Applications for all other relevant and required permits required to be obtained by Eskom must be submitted to the relevant regulating authorities.

[12] This covers only the two project components (12/12/20/1471 and 12/12/20/1524) as the other component is covered in a separate report (12/12/20/1470)

This includes permits for the transporting of all components (abnormal loads) to site and disturbance of protected vegetation.

» An ornithologist must identify the exact power line spans requiring marking in order to minimise the risk of collision of birds with the earth wire. Recommendations must be made regarding the installation of Bird Guards on all self-supporting towers according to the existing Eskom guidelines. This will prevent birds from perching in high risk areas on the towers directly above live conductors.

» An ecological specialist must conduct a final walkthrough before construction in order to identify and relocate any possible plant species of conservation importance.

» A heritage specialist must conduct final walkthrough before construction in order to ensure that any heritage resources are identified and protected. Power lines can be rerouted or realigned in order to avoid heritage sites and heritage resources can be conserved unaffected underneath turn-in power lines.

» During construction, unnecessary disturbance to habitats should be strictly controlled and the footprint of the impact should be kept to a minimum.

» The EMP for construction must be updated to include site-specific information and specifications resulting from the final walk-through surveys. This EMP must be submitted to DEA for approval prior to the commencement of construction on site.

» Utilisation of cross rope suspension tower structures is recommended than the conventional self supporting strain towers that are more obstructive because both technical and space considerations permit on this site.

» Utilisation of monopole structures in densely populated areas

» Mitigation of the visual impact though conventional visual impact mitigation measures (i.e. vegetation screening, landscaping or design) is highly unlikely to succeed due to the inherent functional design of the substation structures and transmission line infrastructure. The mitigation of secondary visual impacts, such as security and functional lighting, construction activities, etc. may be possible and should be implemented and maintained on an on-going basis.

» The process of communication and consultation with the community representatives must be maintained after the closure of this EIA process, and, in particular, during the construction phase associated with the proposed project.

» To ensure that social impacts are mitigated during construction and operation, it is recommended that the following be implemented and monitored by either a Social Engagement Officer or an ECO;

  - An Influx Management Plan
  - A Social Management Plan during construction and operation
  - A Decommissioning and Closure Plan
  - A Local Labour and Workforce Plan
  - A Stakeholder Engagement Plan

- A Grievance mechanism for the construction and operation phases
- Social Impact assessment during construction and implementation

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