

5. ASSESSMENT OF POTENTIAL IMPACTS ASSOCIATED WITH THE PROPOSED TRANSMISSION LINES BETWEEN THE MATIMBA-MIDAS LINE AND THE IKAROS SUBSTATION

Following the identification of a preferred proposed position for the Ikaros Substation, feasible alternative Transmission line corridors were identified. The distance between the existing Matimba-Midas No 2 400 kV Transmission line and the proposed Ikaros Substation is approximately 50 km, but will be dependent on the final alignment between these two points. Detailed studies undertaken within the Environmental Impact Assessment investigated three feasible corridors, i.e. the northern, southern and N-S composite corridors (refer to Figure 1.1).

5.1. Potential Impacts on Transmission Line Components associated with Climate and Atmospheric Conditions

The local climate is expected to have very little impact on the conductors or tower structures, but may cause small variations in the transmission of electricity. An increase in temperature has been associated with a drop in capacity in Transmission lines (Skea, 1997).

Any towers located on floodplains (such as in the Sandspruit area of the N-S composite corridor) would be at risk from flood waters in flood conditions, which would scour away sediment from around the base of the towers. However, this is unlikely to pose any real threat to the overall stability of the Transmission line. The effects of the flood waters will be of low intensity and significance, unless a tower is located close to an active channel where a real risk that the tower could be undercut and collapse exists. This can easily be avoided by ensuring that towers are erected well away from river banks.

High wind speeds may also cause some stress to the Transmission lines, and it is necessary to ensure that the sideways movement or swing of the conductors caused by the maximum gust which can be expected in the next 100 years does not exceed the required 3,5 m clearance, or the breaking strain of the conductors or tower structures.

With the adoption of mitigating measures to alleviate the threat posed by lightning to the transmission of electricity, no negative impacts are anticipated from this phenomenon.

Levels of pollution within the atmosphere may present operational problems to the Transmission lines. Oxidation and subsequent corrosion of metallic components may occur with time, but is considered to be highly unlikely.

It is anticipated that the potential impact associated with climate and atmospheric conditions will be similar for all three proposed corridors.

Table 5.1: Potential impacts on Transmission line infrastructure associated with climate and atmospheric conditions

Nature	Extent	Duration	Probability	Significance	Status
Local climate	Local	Long-term	Low	Low	Negative
Extreme weather conditions	Regional	Short-term	Low	High	Negative
High wind speeds	Local	Short-term	Low	High	Negative
Pollution	Local	Long-term	Low	High	Negative

5.2. Potential Impacts associated with Geology and Soils

The erosion risk within the study area is largely limited to slopes greater than 20°, although accelerated erosion may occur on any un-vegetated slopes. The construction and maintenance of the access/service road to the tower sites could potentially pose a very high erosion risk in the future, particularly in steep areas and those areas with soils prone to erosion. The potential impact is anticipated to be localised, of a long-term nature and of moderate significance.

It is anticipated that the potential impact associated with geology and soils will be similar for all three proposed corridors.

Table 5.2: Potential impacts on geology and soils associated with the construction of new Transmission lines between the Matimba-Midas No 2 400 kV Transmission line and the Ikaros Substation

Nature	Extent	Duration	Probability	Significance	Status
Erosion potential at tower positions	Local	Long-term	Low	Moderate	Negative
Erosion potential along access/service roads	Local	Long-term	Low	Moderate	Negative

5.2.1. Recommendations

The establishment of towers on the sites with slopes greater than 20° is to be avoided as far as possible. If no other sites are available, it should be ensured that the construction site is not left denuded of vegetation for any length of time. Immediately after erection of the towers, disturbed areas should be re-vegetated with appropriate species as soon as possible. In addition, sufficient supports and re-enforcement must be introduced to the site for stability. Great care should also be

exercised in the construction and maintenance of the access/service road to these sites, as it is likely to pose a very high erosion risk in the future. Ideally, the steep sections of any service/access road should be paved to mitigate against the erosion hazard.

5.3. Potential Impacts on Agricultural Potential

The soil information which was used to compile this study forms part of the Rustenburg map of the national 1:250 000 land type survey (Bruce, Schoeman & Verster, 1978). Each land type is a unique combination of soil pattern, terrain and macroclimate. The study area crosses a total of seven land types, namely:

- Ae62 (red, structureless soils)
- Ae64 (red, structureless soils)
- Bc8 (red, structureless soils with plinthite)
- Ea3 (black, swelling clays)
- Ea68 (red, structured soils)
- Ib3 (rocky area)
- Ib116 (rocky area),

The proposed corridor alternatives are indicated in Figure 5.1 by the double dashed lines, and the land type boundaries are indicated as single solid lines.

Land types containing higher proportions of red soils (Ae62, Ae64, Bc8 and Ea68) are those with a higher agricultural potential. The land types with mainly rock and shallow soils (Ib3 and Ib116) have a low agricultural potential, but have significantly steeper slopes throughout most of the land type.

Land type Ea3, which accounts for some 80% of the proposed corridors, consists mainly of fairly deep, black, swelling clay (turf) soils, which have a moderate agricultural potential. The mainly smectitic nature, with consequent shrinking and swelling properties, of the Arcadia (turf) soils means that there is a narrower moisture range for cultivation than other agricultural soils. If the swelling clay soils become wet, the pores fill up, they saturate easily and drain slowly, causing anaerobic conditions (especially under irrigation) and a deficit of oxygen in the root zone. If allowed to dry out, however, these soils can crack, damaging roots.

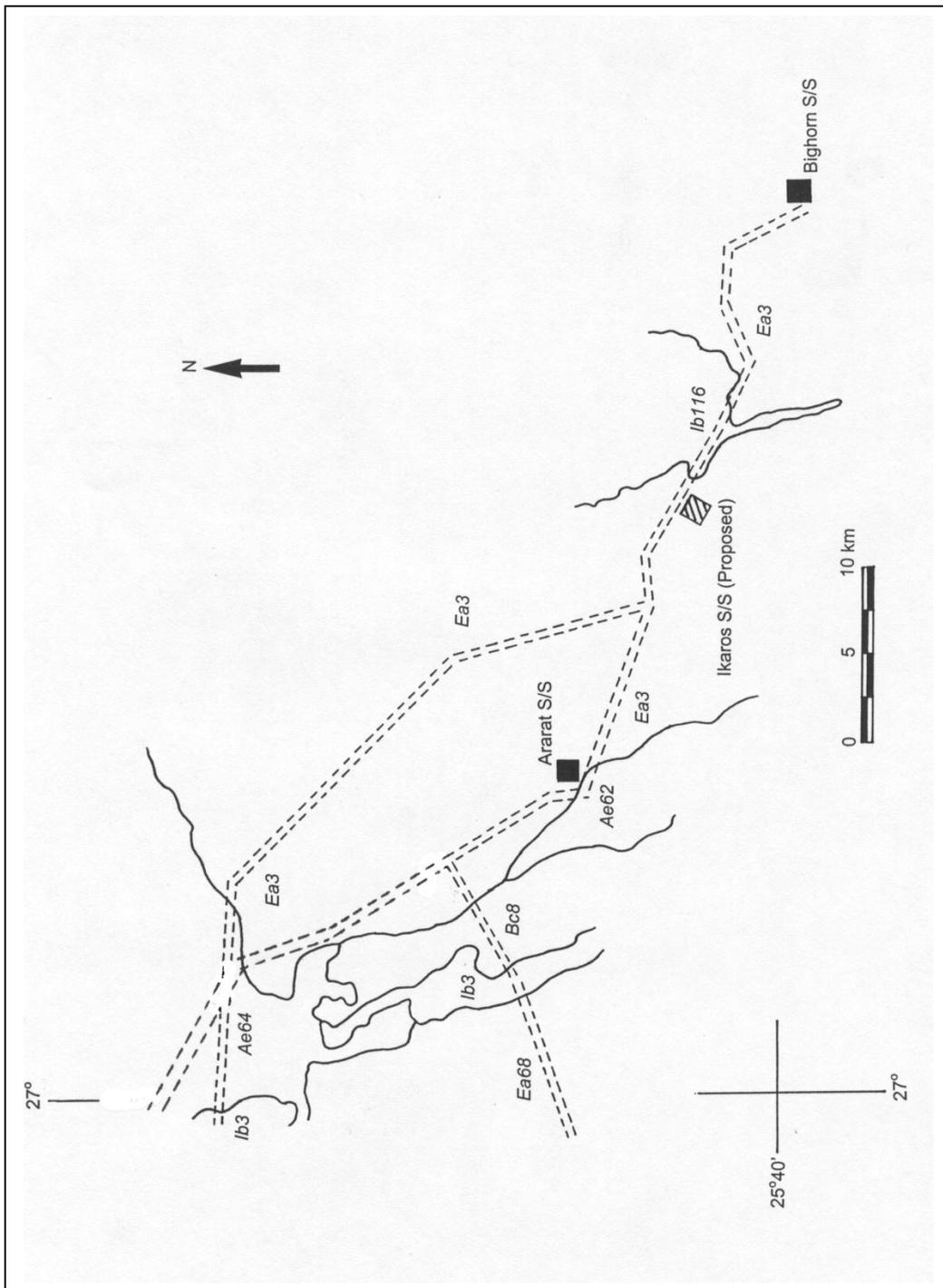


Figure 5.1: Land type boundaries (single solid lines) shown in relation to the proposed Transmission line corridors (double dashed lines)

Surface crusting is also a potential problem, due to the swelling and sealing nature of the soils, which can lead to increased infiltration rates. However, the black clay soils are naturally fertile, with high cation exchange capacities and high organic carbon contents. If well managed, they can be productive soils. There is also a significant proportion within this land type where rock outcrops and shallow soils occur.

Comparing the agricultural potential of the three proposed corridors between the Matimba-Midas No 2 400 kV Transmission line and the proposed Ikaros Substation, the following can be stated:

- *Southern corridor:*
 - Ea3 (77% moderate potential soils) – 60% of route
 - Ea68/Bc8/Ae62 (>60% high potential soils) – 35% of route
 - Ib3 (Rock + low potential soils) – 5% of route

- *Northern corridor*
 - Ea3 (77% moderate potential soils) – 70% of route
 - Ae64 (75% high potential soils) – 25% of route
 - Ib3 (Rock + low potential soils) – <5% of route

- *N-S Composite corridor*
 - Ea3 (77% moderate potential soils) – 78% of route
 - Ae62 (76% high potential soils) – +2% of route
 - Ae64 (75% high potential soils) – 20% of route

Therefore, the N-S composite corridor has the highest percentage of moderate potential soils, and the lowest percentage of high potential soils.

Table 5.3: Potential impacts on agricultural potential associated with the construction of new Transmission lines between the Matimba-Midas No 2 400 kV Transmission line and the Ikaros Substation

Nature	Extent	Duration	Probability	Significance	Status
Construction of towers	Local	Long-term	Likely	Low	Negative

5.3.1. Recommendations

In terms of agricultural potential, the new Transmission lines can be constructed in any of the identified feasible corridors as the potential impacts on agricultural potential associated with the proposed Transmission line will be localised and restricted to the tower footprint area. However, construction of the proposed Transmission line within the N-S composite corridor will have the lowest impact on high potential soils, and therefore this option is favoured.

5.4. Potential Impacts on Flora and Terrestrial Fauna

5.4.1. Condition of Vegetation and Habitats within the Study Area

The vegetation within the study area is highly fragmented as a result of mining and agricultural activities, roads and urban development. The condition of the vegetation within the southern corridor is considered to be in a good condition where this corridor crosses the tip of the Magaliesberg. The vegetation within the remainder of the southern corridor, the northern corridor and the N-S composite corridor is considered to be in a reasonable to poor condition depending on site-specific management practices implemented by individual landowners.

As a consequence of the disturbed nature of the vegetation within the study area, natural habitats available for fauna species are limited. Fauna recorded in the study area comprise mainly domestic animals such as cattle and goats, although some game occurs in the area to the west of the Magaliesberg.

According to representatives of the Agricultural Unions, animals (for instance cattle) prefer not to pass underneath the powerlines in rainy or cloudy conditions. The proposed Transmission lines may, therefore, restrict the movement of cattle (other animals) on a farm portion. This applies equally to game farming.

5.4.2. Red Data and Sensitive Species

The Magaliesberg mid-slopes and crest, west of Rustenburg was identified as a “hot spot” in terms of flora and fauna during the Scoping Phase. This was confirmed as a highly sensitive area during more detailed studies undertaken within the EIA studies, although no Red Data species were recorded.

The huge variation in habitat caused by a complex variety of environmental parameters (soils, aspect, drainage, exposure, etc.) over time gave rise to ecological systems of rich bio-diversity in terms of fauna and flora. Several protected and Red Data plant species either occur here or have a high possibility of occurring here in terms of habitat preference and previous distribution records. In addition, it is highly likely that sensitive fauna species associated with this vegetation type will be located here.

Table 5.4: Potential impacts on flora and terrestrial fauna associated with the construction of new Transmission lines between the Matimba-Midas No 2 400 kV Transmission line and the Ikaros Substation

Nature	Extent	Duration	Probability	Significance	Status
Red Data Species - Southern corridor	Local	Permanent	Probable	High	Negative
Red Data Species - Northern and N-S composite corridor	None	None	None	None	Negative
Clearance of servitude	Regional	Long term	Definite	Low	Negative
Clearance of tower footprint	Local	Permanent	Definite	Low	Negative

5.4.3. Recommendations

Considering the findings of the detailed flora and fauna studies undertaken, the order of preference for the corridor for the construction of the Transmission lines between the Matimba-Midas No 2 400 kV Transmission line and the Ikaros Substation is as follows:

- The N-S composite corridor is recommended as the first option, as this corridor is considered to be largely disturbed with little natural vegetation and habitats.
- The northern corridor is the second option, as the condition of the vegetation within this corridor is predominately considered to be low.
- The southern corridor is the least preferred option, as the condition of the vegetation within this corridor (particularly the section of the corridor over the Magaliesberg ridge) is considered to be moderate.

In order to assist contractors in the identification of any sensitive flora and fauna species which may be encountered during the construction phase, the following generic mitigation measures are proposed:

- The final alignment should be situated as far as possible outside of the 1 in 100 year flood line of the Sandspruit, along the western end of the N-S composite alternative.
- Prior to the commencement of construction, a detailed survey of the final Transmission line alignment should be undertaken in order to confirm the absence of Red Data and/or protected species.
- Special environmental provisions should be included in construction agreements. This should include:
 - * Penalties for removal and/or destruction of threatened species for any reason (firewood, medicinal use, collectors value etc) should be agreed upon beforehand.
 - * A protocol describing the actions to be followed if a threatened species is found should be in place.
- A baseline data set (list of probable rare, endangered or threatened) that could be encountered by the construction team should be drawn up.
- Rare/endangered/protected species which are found on the site may be relocated (to a similar location not more than 300 m from original location) before construction proceeds. The contractor must be assisted by an experienced person or organisation to ensure that the best option is exercised (i.e. relocation of the species individuals if possible or even removal for genetic propagation by an established institution such as the NBI, Pretoria).
- Mitigation measures, including pre-arranged agreements with specialist institutions/persons to deal with any threatened species found during construction, should be included in the Environmental Management Plan (EMP).
- Methods of eradication and control of alien and invader plant species should be included within the EMP.

5.5. Potential Impacts on Avifauna

Impacts as a result of human activities has been extensive on all the proposed corridors, completely altering both the bird species composition and behaviour from what was historically the case. A few areas of relatively undisturbed habitat remain where historical patterns of occurrence and species composition may not have altered dramatically. This is most predominant with the western section of the southern corridor, and parts of the northern corridor, and (less so) the north-western part of the N-S composite corridor.

Generally speaking, it is unavoidable that birds are killed through interaction with infrastructure, including powerlines, despite the best possible mitigation measures. It is, therefore, important to direct risk assessments and mitigation efforts towards species that have a high biological

significance, in order to achieve maximum results with the available resources at hand. However, a pure scientific approach would only consider the effects of deaths on the sustainability of the population, but society places other values on certain species (e.g. aesthetic or commercial), which can not be accounted for in a pure scientific approach, but can not be ignored either. In accordance with this principle, the risk assessment is primarily aimed at assessing the potential threat to Red Data species (biological significance), but in addition, more common large species which are vulnerable to powerlines, and which occur or potentially occur along the proposed corridors, will also be considered in the study, although in less detail.

5.5.1. Potential Impacts as a Result of Collisions

Collisions with the earthwire of the proposed Transmission lines is anticipated to be of a long-term nature. This is the only potentially significant impact of the line on bird species along any of the corridors, but due to the disturbed nature of the study area and the resultant low occurrence of sensitive bird species, the potential for this impact to occur is low. The most likely scenarios where collisions will occur are the following:

- where vultures congregate at a carcass near the powerlines;
- waterbirds fly down drainage lines and collide with the line at river crossings;
- at seasonal waterbodies where the powerline skirts or crosses the waterbody;
- where White and Abdim's Storks congregate in large flocks in agricultural areas; or
- near active Secretarybird nests.

Potential Impacts on Red Data Species:

- *Pinkbacked Pelican:*
This species is a vagrant to the area and is most likely to occur at seasonal pans in years of good rain. This species is highly susceptible to collisions with Transmission lines. Due to the low probability of occurrence of this species in the area as a result of the disturbed nature of the habitat, it is anticipated that the impact on this species will be negligible.
- *Black Stork:*
The species breeds in the Magaliesberg at Roberts Farm, east of Olifantsnek. It occurs sparsely throughout the study area and frequents cliffs to roost and breed, rivers and wetlands to feed, and is known to occasionally roost on powerlines. This species could be encountered along the proposed corridors at river crossings. The susceptibility of this species to collisions

with Transmission lines is unknown. However, its close relative, the White Stork is highly susceptible to collisions and electrocutions. Due to the low numbers of this species in the study area as a result of the disturbed nature of the habitat, it is anticipated that the potential impact on this species will be unlikely and of low significance.

- *Marabou Stork:*

This species is a vagrant to the area, and occur sporadically in the Pilanesberg National Park. Its susceptibility to collisions with Transmission lines is unknown, but probably high due to its physical size and behaviour. Due to the low occurrence of this species in the study area, it is anticipated that the impact on this species will be negligible.

- *Secretarybird:*

This species is most likely to be encountered along the northern and N-S composite corridors south and west of Sun City in open woodland. It is highly susceptible to collisions with Transmission lines. However, the potential for the impact to occur is considered to be very low as the birds generally occur singularly or in pairs, and wander widely outside of the breeding season.

- *Cape Griffon and African Whitebacked Vulture:*

These species roost regularly on powerlines in the vicinity of Sun City, but could be encountered anywhere away from human settlements, feeding on livestock carcasses. They are moderately susceptible to collisions with Transmission lines, although the probability of this impact occurring is considered to be low.

- *Lappetfaced Vulture:*

This species occurs and breeds in the Pilanesberg National Park located to the north of the study area, and could be encountered anywhere away from human settlements, feeding on livestock carcasses. It is moderately susceptible to collisions with Transmission lines, although the probability of this impact occurring is considered to be low.

- *Tawny Eagle:*

Tawny Eagles are extremely rare outside large game reserves. The only area that they could be encountered is in the vicinity of Pilanesberg National Park. Due to the low numbers of this species in the area, no potential impacts are anticipated.

- *Martial Eagle:*

Martial Eagles could occur anywhere away from human settlements and have been recorded in the vicinity of Pilanesberg National Park. Due to the low numbers of this species in the area, no potential impacts are anticipated.
- *Lanner Falcon:*

Lanner Falcons could occur anywhere away from human settlements and have been recorded in the vicinity of Pilanesberg National Park. The susceptibility of this species to collisions with Transmission lines, and therefore, the potential impact on this species is considered to be low.
- *Lesser Kestrel:*

This species is a vagrant to the area. It is anticipated that this species will benefit from the construction of the new Transmission lines as it uses them to perch on. The susceptibility of this species to collisions with Transmission lines, and therefore the potential impact on this species is considered to be low.
- *African Marsh Harrier:*

This species is a vagrant to the area. The susceptibility of this species to collisions with Transmission lines, and therefore the potential impact on this species is considered to be low.
- *Blue Crane:*

This species is a vagrant to the area. The susceptibility of this species to collisions with Transmission lines is considered to be high. However, due to the low numbers of this species in the area, no potential impacts are anticipated.
- *Whitebellied Korhaan:*

This species is a vagrant to area and has only been recorded in tall sour grassveld. The susceptibility of this species to collisions with Transmission lines, and therefore the potential impact on this species, is considered to be low.
- *Grass Owl:*

This species is a vagrant to area and requires tall, undisturbed rank grassland as a habitat. The susceptibility of this species to collisions with Transmission lines is unknown, but is considered to be unlikely.

Potential Impacts on non-Red Data Medium to Large Species:

- *Large raptors:*

These species could be encountered in low numbers anywhere along the proposed corridors in suitable habitat, but the least disturbed areas i.e. east and south of Sun City are the areas where the biggest populations occur. All these species are potentially vulnerable to collisions with powerlines, although the risk decreases with the size of the bird. The probability is, however, low due to expected low numbers along the corridors due to severe human impacts on the habitat.

- *Waterbirds:*

These species could be encountered anywhere along the proposed corridors in low numbers in suitable habitat outside human settlements. Population numbers could vary hugely depending on the availability of seasonal wetlands. Most likely areas where they will at risk are at seasonal wetlands and river crossings (i.e. Selons River, Elands River, Sterkstroom). All these species are potentially vulnerable to collisions with powerlines, although the risk decreases with the size of the bird. The probability is, however, low due to expected low numbers occurring along the corridors due to severe human impacts on the habitat.

- *Storks:*

These species could be encountered anywhere along the proposed corridors in a suitable habitat, even close to human settlements. Population numbers could vary hugely depending on the availability of food. In good rain years can congregate in huge numbers in agricultural areas. These species are potentially vulnerable to collisions with powerlines. Collisions with the Transmission line are probable near agricultural areas.

5.5.2. Disturbance

A short-term disturbance impact during construction on birds breeding and roosting near the Transmission line is possible, but this impact is anticipated to be negligible and is not a cause of any special concern.

5.5.3. Electrocutions

Electrocutions are ruled out due to the large clearances between potentially lethal components, which make it impossible for any bird to bridge the air gap and cause an electrical short circuit.

Table 5.5: Potential collision impacts on bird species associated with the construction of new Transmission lines between the Matimba-Midas No 2 400 kV Transmission line and the Ikaros Substation

Nature	Extent	Duration	Probability	Significance	Status
<i>Red Data Species</i>					
Pinkbacked Pelican; Marabou Stork	Regional	Long-term	Improbable	Negligible	Negative
Black Stork	Regional	Long-term	Probable	Low	Negative
Secretarybird; Lappetfaced Vulture	Regional	Long-term	Probable	Very low	Negative
Cape Griffon; African Whitebacked Vulture	Regional	Long-term	Probable	Low	Negative
Tawny Eagle; Martial Eagle	Regional	Long-term	Improbable	None	Negative
Lanner Falcon; Whitebellied Korhaan; Grass Owl	Regional	Long-term	Improbable	Low	Negative
Lesser Kestrel; African Marsh Harrier	Regional	Long-term	Improbable	Very low	Negative
Blue Crane	Regional	Long-term	Improbable	Moderate	Negative
<i>Non Red Data Species</i>					
Large raptors	Regional	Long-term	Improbable	Low	Negative
Waterbirds	Regional	Long-term	Improbable	Low	Negative
Storks	Regional	Long-term	Probable near agricultural land	Low	Negative

5.5.4. Recommendations

Considering the findings of the detailed studies undertaken regarding potential impacts on avifauna as a result of the proposed project, the order of preference for the corridor for the construction of the Transmission lines between the Matimba-Midas No 2 400 kV Transmission line and the Ikaros Substation is as follows:

- The N-S composite corridor is recommended as the first option, as this corridor is heavily impacted on by human activity, and therefore most of the collisions sensitive species have most likely already disappeared in and adjacent to the corridor, or occur sporadically in very low numbers .
- The northern corridor is the second option, as this corridor is largely disturbed due to mining activities, thus decreasing the potential for sensitive bird species to occur.
- The southern corridor is the least preferred option, largely due to the potential sensitivity of the area surrounding the Magaliesberg ridge.

Areas in which collision sensitive species may occur should be identified and mapped once the final alignment has been determined. In order to minimise the potential impacts on avifauna in these areas, bird diverters should be implemented on the earthwire.

In addition, areas in which birds may pose a threat to the reliable operation of the Transmission line (i.e. as a result of the streamer effect) should be identified and mapped once the final alignment has been determined. In order to minimise potential impacts, bird guards should be implemented on towers (refer to Figure 5.2).



Figure 5.2: Bird guards should be implemented in areas where the streamer effect could pose a threat to the reliable operation of the Transmission line

5.6. Potential Impacts on Land Use

5.6.1. Towns and Settlements (formal and informal)

- *Functional division:*

Where the proposed Transmission lines pass close to, or through settlements it may result in a functional division of the settlements, as it may result in servitude areas which pose certain restrictions in terms of development. This may result in the separation of two portions of a settlement, which formerly functioned as one integrated entity. However, there is no specific example of the proposed corridors dividing an existing settlement (formal or informal) to the

extent described above. Although the proposed corridors affect certain parts of the informal settlements, it would appear that it would generally be peripheral and could be avoided by minimal realignment to skirt the settlements rather than crossing over portions thereof.

- * Phatsima is located to the north-west of Rustenburg, and a large portion of the town falls within the proposed northern corridor. However, the preferred routing does not influence this township directly. The route passes the town to the north.
- * Meriteng is located to the north of Rustenburg and the N-S composite corridor borders the northern extensions of Meriteng. This portion of the N-S composite corridor also serves as the southern corridor and passes to the east of Meriteng and, therefore, does not directly affect the town (refer to Figure 3.9).
- * A component of the northern corridor passes over the southern portion of Frisgewaagd and the south-western portions of Shashalaza and Kana. The proposed corridor appears to be wide enough where it passes over a portion of Frisgewaagd and Kana to align the powerline servitudes in such a way as to not influence the existing erven in the settlements. The Transmission lines can be accommodated within the identified corridor, so as to pass to the south of Frisgewaagd and to the south-west of Kana. At Shashalaza, the corridor cuts through a part of the township, and informal dwellings exist on both sides (close to) the corridor. Relocation of households will be inevitable at this point.

Informal settlements that may be affected by the southern corridor are as follows:

- * Phokeng
- * Shashalaza
- * Kana

Part of the southern corridor passes over the north-eastern extensions of Phokeng and the southern extensions of Shashalaza and Kana. Although a section of the proposed corridor passes over Phokeng and Kana, the corridor appears to be wide enough to accommodate the lines to the east of Phokeng, and to the south of Kana, without directly affecting existing dwellings. At Shashalaza the situation is similar to the northern corridor, where the corridor cuts through a part of the settlement, and it will have to be addressed in the same manner.

- *Possible restriction of access:*

During the construction phase, access and movement may be temporarily affected along the servitude alignments. The powerline servitudes will not restrict pedestrian access and movement once the Transmission lines are established.
- *Possible restriction of future development:*

The proposed Transmission lines may restrict the formal extension of settlements located in close proximity to the proposed servitudes, as no residential buildings are permitted to be developed within the Transmission line servitudes. In this regard, specific reference is made to Boitekong, Meriteng, Rasimone, Kana and Shashalaza, which are all in close proximity to the proposed Transmission line corridors.
- *Possible resettlement of households:*

It may be necessary to relocate some of the households if existing dwellings are found to be located within the proposed servitude of the powerlines. In this regard, specific reference is made to informal/illegal settlements along the R510 Provincial Road, where the existing 275 kV Transmission lines cross this road.

During detailed studies undertaken in the area, it was noted that a number of shacks/dwellings were dangerously close to the existing powerlines. Some shack-dwellings were even found underneath the existing powerlines. To ensure the safety of residents in these settlements (informal), resettlement of certain households would be required to take place. This applies mainly to Shashalaza, as indicated on Figure 3.9.

- *Possible impact on planning policies and future development:*

The proposed Transmission lines are deemed to be generally consistent with the existing LDO/IDP directives for the area under consideration and amendment of these policies will, therefore, not be necessary.

The N-S composite corridor, as well as the northern and southern corridors do not affect any pending applications for changes in land use rights and/or applications for township establishment. The southern corridor crosses over the farm Boschoek 103 JQ. An application for township establishment, on certain portions of the farm, has been submitted to the Rustenburg Local Municipality. However, this application does not influence any of the proposed corridors.

- *Possible safety risk:*

Where Transmission lines pass close to or through residential areas, they are perceived to create a safety and/or health risk. It has been raised by the local community that the towers are an attraction for children in rural areas, where it is often found that children climb up these towers, sometimes with fatal consequences. This requires precautionary measures and appropriate management.

5.6.2. *Farming (communal and commercial)*

- *Functional Division:*

The Transmission lines may result in the functional division of certain farm portions, where the presence of the powerlines “divides” a farm portion into two or more portions. According to representatives of the Agricultural Unions, animals (for instance cattle) prefer not to pass underneath the powerlines in rainy or cloudy conditions. The proposed Transmission lines may, therefore, restrict the movement of cattle (other animals) on a farm portion. This applies equally to game farming. The Zwartkoppies farms have been cited as an example (refer to Figure 5.3).

- *Limitations to farming operations:*

The placement of towers on farm portions may restrict access and movement. This applies to central pivot irrigation schemes and access for crop-spraying aircraft. This would typically apply to the area around Bighorn substation (refer to Figure 3.9).

- *Loss of Agricultural Land:*

Some agricultural activities, such as maize farming, are permitted within the Transmission line servitude. However, some forms of farming, e.g. citrus farming may pose problems if trees grow too high (i.e. higher than 4 m) and are, therefore, restricted.

The base plinths of the self-supporting towers (to be used on a bend) take up substantial areas of valuable farm land which will be permanently lost to agriculture. The members of the cross-rope suspension tower, which is proposed to be used for the majority of the Transmission line length, have a small footprint and will, therefore, have a very low, localised impact in terms of the loss of agricultural land.

Figure 5.3:

- *Possible relocation of houses/structures:*

The exact location of buildings (houses, barns, etc) on farm portions is unknown at this stage, and will be required to be determined on a site-specific basis when the final routing of the Transmission lines is surveyed and negotiated.

It is anticipated that some houses and structures may fall within the final routing of the powerlines and the final alignment will be required to be negotiated and possibly re-aligned, if feasible.

- *Possible safety risk:*

As previously mentioned, some agricultural activities can take place under the powerlines without significant health/safety risks. Other agricultural activities hold a higher risk, if exercised under the powerlines. These activities normally involve the growth of bigger trees and activities which include the use of large agricultural implements and other vehicles (e.g. combine harvesters).

The towers of the powerlines may create further safety risks when activities like ploughing and planting takes place dangerously close to the towers in the case where the towers are situated within cultivated areas.

- *Fences and construction:*

The construction phase of the proposed project may pose problems in terms of project management and co-ordination on each affected farm portion. At each crossing of a fence line by the Transmission line corridor, Eskom install a gate for access, so as to mitigate the potential for loss of livestock via a disrupted fenceline. The possibility exists that cattle (or other animals) may move through the temporary access points during the construction phase, but this impact is considered to be low to negligible.

- *Impact on production:*

Construction of the Transmission lines over farms that are being used for the commercial crop farming should take place off season to minimise the impact of construction on productivity.

5.6.3. Mining Areas

- *Possible restrictions on future mining operations:*

The servitude to be registered for the proposed Transmission lines may influence the future development of existing mines, particularly where the powerlines pass close to existing mine infrastructure or operations (e.g. shafts, etc.). From discussions with the personnel at the primary mining houses in the area (e.g. Anglo Platinum and Impala Platinum) it was confirmed that no major expansion plans are affected by the alignment of the N-S composite corridor or the southern corridor. The platinum reef (Merensky reef) determines the location of possible new areas to be mined, and the above-mentioned routes do not intrude into any of the areas for potential mining development. The northern corridor will, however, influence future extension of existing mines although exact details of these future mine extensions were not available.

- *Impact on operational activities of existing mines:*

The placement of towers and the height of powerlines may influence the movement of mining equipment and large machinery around existing mines, should the alignment of the lines encroach on the area of mining operations. These areas are ideally to be avoided..

5.6.4. Resorts

The southern corridor and the N-S composite corridor do not pass over any properties which are being used for resorts, or have approved resort rights. The southern corridor passes over Portion 9 of the farm Boschhoek 103 JQ, whereon a resort exists. The southern corridor covers approximately 70% of the farm portion occupied by the resort. Potential impacts associated with the establishment of Transmission lines over this portion include visual impacts and impacts on tourism potential.

Table 5.6: Potential impacts on land use associated with the construction of new Transmission lines between the Matimba-Midas No 2 400 kV Transmission line and the Ikaros Substation

Nature	Extent	Duration	Probability	Significance	Status
<i>Towns and Settlements</i>					
Functional Division: Shashalaza	Local	Permanent	Definite	High	Negative
Functional Division: Other settlements	Local	Permanent	Probable	Medium	Negative

Nature	Extent	Duration	Probability	Significance	Status
Possible Restriction of Access	Local	Short-term (construction)	Probable	Low	Negative
Possible Restriction of Development	Local	Permanent	Probable	Medium	Negative
Possible Resettlement of Households: Shashalaza	Local	Short	Definite	High	Neutral
Possible Resettlement of Households: Other settlements	Local	Short	Probable	Medium	Neutral
Possible impact on planning policies and future development	Regional and Local	Short	Probable	None	Neutral
Possible safety risk	Local	Permanent	Highly probable	High	Negative
Farming					
Functional Division	Local	Permanent	Probable	Medium	Negative
Possible Restriction of access and movement	Local	Permanent	Probable	Medium	Negative
Loss of Agricultural Land	Local	Permanent	Highly probable	Medium	Negative
Visual Impact	Local	Permanent	Definite	High	Negative
Possible Relocation of Houses/Structures	Local	Short	Probable	Medium	Negative
Possible Safety Risk	Local	Permanent	Probable	High	Negative
Fences and Construction	Local	Short	Highly probable	Medium	Negative
Impact on Production	Regional	Short	Probable	Medium	Negative
Mining					
Possible Restriction of Extension of Existing Mines	Local	Permanent	Probable	Medium	Negative
Impact on Operational Activities of Existing Mines	Local	Permanent	Probable	medium	Negative

5.6.5. Recommendations

Considering the findings of the detailed studies undertaken regarding potential impacts on land use as a result of the proposed project, the order of preference for the corridor for the construction of the Transmission lines between the Matimba-Midas No 2 400 kV Transmission line and the Ikaros Substation is as follows:

- The N-S composite corridor is recommended as the first option, although impacts on Bala township are required to be addressed in the final alignment of the Transmission line.
- The southern corridor is the second option.

- The northern corridor is the least preferred option, largely due to the planned expansions of mining activities within the area surrounding this corridor and the potential land use conflicts associated with the Transmission lines and the mining expansions.

Many of the identified impacts are not of a significant nature (in a context of the land use regime in the area) and will not necessarily require substantial mitigation.

- *Functional Division:*

In order to minimise the possibility of functional division of settlements, the alignment of the Transmission lines should be planned in such a way as to bypass towns and settlements, as far as possible. This will be beneficial to both the affected communities and Eskom. This applies to all proposed corridors.

- * *Shashalaza and Kana*

All three corridors affect erven on the eastern boundary of Shashalaza and Kana and although these townships have not been proclaimed (currently informal settlements), it is important to avoid settlements in order to minimise potential impact. The only alternative would be to relocate the affected families. It may be possible to align the northern corridor to bypass Kana on the western side, without impacting directly on any of the erven. The corridor appears to be sufficiently wide for this purpose. At Shashalaza this would not be possible as the corridor cuts through the township.

Functional division of farm portions can be minimised through planning of the final routing to ensure that, where farm portions are divided, it be done in such a way that the smallest possible portion is separated of from the affected farm portion. Route alignments should, where possible, follow cadastral boundaries, or traverse areas of the farms least likely to be used for active agriculture. The final positioning of towers will be negotiated by Eskom Transmission with individual farmers once a final corridor has been selected and approved.

- *Limitation of farming operations:*

In order to minimise potential restriction of access of equipment in agricultural areas, the type of farming activity and farming equipment used on each affected farm should be considered before the final placement of infrastructure is confirmed.

- *Possible restriction of future development:*

No buildings are permitted to be established within the Transmission lines servitude due to health and safety considerations. The imposition of new Transmission line servitudes along the perimeter of an existing township or settlement usually has the effect of restricting future extensions of the settlement beyond the servitude line. In mitigation of any possible impact in this regard, the alignment and position of the Transmission line servitudes, where they skirt on existing settlements (or are located in close proximity) must take cognisance of future expansion possibilities.
- *Possible resettlement of households:*

It is suggested that the proposed new Transmission lines, as well as the existing residential situation (where informal houses are being built underneath the existing lines) be negotiated with the residents of these informal settlements in order to reach an agreement on the conditions of resettlement. This resettlement requirement only affects the Shashalaza area.

It is proposed that the routing of the Transmission line being planned in such a way that existing dwellings and structures on farm portions be avoided. Where it is impossible to do so, the possibility of relocation and/or expropriation should be discussed and negotiated with the registered landowner.
- *Possible impact on planning policies and future development:*

The proposed Transmission lines can be accommodated in terms of the existing LDO/IDPs applicable to the area under consideration and changes to these policy documents will, therefore, not be necessary.
- *Possible safety risks:*

Where Transmission lines are being constructed in close proximity to existing residential areas, access to the towers should be restricted by means of appropriate guard fencing being introduced on each tower to prevent children from climbing up these towers. The perception of health and safety risks associated with EMFs generated by the Transmission lines should be considered, and servitudes strategically placed away from existing households or dwellings (refer to Appendix L).
- *Loss of agricultural land:*

It is proposed that the cross-rope suspension towers be used as far as possible in order to minimise the area of agricultural land which is lost to the footprint of the erected towers. This

will enable landowners to use valuable agricultural land around the smaller footprint of this tower type (refer to Figure 5.4).



Figure 5.4: Use of the cross-rope suspension tower will enable landowners to use valuable agricultural land around the smaller footprint of this tower type

- *Impact on production:*
In order to minimise the potential impact on agricultural production, it is suggested that construction of the powerlines be limited to the off-season, when agricultural activity is reduced to a minimum, to prevent conflict and logistical problems between construction personnel and farmers.
- *Possible restriction of extension of existing mines:*
It is suggested that, in terms of possible impact on mining activities, either the N-S composite corridor or the southern corridor be followed.
- *Operational activities of existing mines:*
In terms of the movement of mining equipment and big mining machinery around existing mines and future planned mines, it is suggested that detailed discussions regarding the replacement of towers and height of suspended powerlines be discussed with the various Mining Houses prior to construction.

5.7. Potential Impacts on Archaeological, Cultural and Historical Sites

5.7.1. Northern Corridor

No archaeological, cultural or historical sites of significance were noted. This corridor traverses a highly disturbed area.

5.7.2. Southern Corridor

A stone-walled settlement (Site 9: 25° 34' 25,5"S; 27° 11' 42,5"E) lies on the southern side of hill 29 near the Ararat Substation on the farm Kookfontein 265 JQ (refer to Figure 4.3). The site was heavily overgrown, and its full extent is unclear.

One African graveyard (Site 10: 25° 32' 41,0" S; 27° 10' 21,7" E) was identified next to existing towers on Beerfontein 263 JQ (refer to Figure 4.3). Stone piles about 2 m long and 1 m wide mark four graves. Presumably, these graves used to be in close proximity to the residences of farm labourers.

A few Middle Stone Age artefacts (from about 250 000 to 25 000 years ago) lay in the stream bed below the grave yard. These artefacts are not *in situ*.

- *Significance:*
 - * The stone-walled settlement has medium significance
 - * The Middle Stone Age artefacts have no significance.
 - * The African graveyard has medium significance.

On the western limb of this corridor, one complex stone-walled settlement (Site 12: 25° 31' 39,5' S; 27° 04' 41'-39,5' E) occurs on a small hill on the farm Boschhoek 103 JQ on the east side of the Magaliesberg (refer to Figure 4.3). *In situ* burnt daga marked at least one house, and preservation appears to be good. Associated pottery contains a high proportion of mica temper typical of Western Sotho-Tswana.

More mica-tempered pottery lay exposed by sheet erosion (Site 13: 25° 31' 41,5' S; 27° 02' 46,0' E) on the west side of the mountain range (refer to Figure 4.3). Presumably, this pottery has washed down from a stone-walled site, or, alternatively, a vessel was broken in agricultural lands.

- *Significance:*
 - * The stone-walled site has medium archaeological significance. (Apparently, this site has high significance to local communities, and this is one reason why the western limb of this corridor is rejected by the archaeological study).
 - * The eroded potsherds have no significance.

5.7.3. *N-S Composite Corridor*

No archaeological, cultural or historical sites of significance were noted. This corridor largely follows existing linear developments such as roads and fence lines, which would potentially have resulted in disturbance of archaeological sites. However, a moderate potential exists for archaeological or cultural sites between norite hill complex and the Sandspruit in the northern section of this corridor.

Table 5.7: Potential impacts on archaeological, cultural and historical sites associated with the construction of new Transmission lines between the Matimba-Midas No 2 400 kV Transmission line and the Ikaros Substation

Nature	Extent	Duration	Probability	Significance	Status
<i>Construction impacts</i>					
Stone walling recorded on southern corridor	Local	Permanent	Unknown	Medium	Negative
African graveyard recorded on southern corridor	Local	Permanent	Unknown	Medium	Negative
Middle Stone Age Site recorded on southern corridor	Local	Permanent	Unknown	None	Negative

Until a precise alignment is selected, the impact of the project on individual archaeological sites cannot be accurately defined. Consequently, the probability of the impact can not be assessed at present, although the nature (construction), extent (local) and duration (permanent) of the impact, if it occurs, are clear (Table 5.7).

5.7.4. *Recommendations*

Considering the findings of the detailed archaeological studies undertaken, the order of preference for the corridor for the construction of the Transmission lines between the Matimba-Midas No 2 400 kV Transmission line and the Ikaros Substation is as follows:

- The N-S composite corridor is recommended as the first option, as the proposed Transmission line follows existing linear infrastructure, which could potentially have had an impact on sites in the area.
- The northern corridor is the second option, as this corridor is largely disturbed due to mining activities, thus decreasing the potential for the occurrence of significant sites.
- The southern corridor is the least preferred option, largely due to the potential significance of sites identified within this corridor.

The sites recorded during this archaeological assessment demonstrate the necessity for a detailed examination of the final route at final design stage. The distribution of archaeological sites typically forms a pattern, with open agricultural villages near watercourses with cultivatable soils, while stone-walled settlements stand at the base or on top of hills. Thus, a more detailed examination should concentrate on these localities.

Open pottery sites will not require further recording, unless burnt daga structures are also present. If towers (the only part of the project of archaeological concern) cannot be deviated to avoid burnt structures or a stone-walled site, then archaeologists need to excavate or otherwise record that area. The African graveyard (Site 10) should be avoided. Otherwise its removal and reburial must be negotiated with the descendents, which is commonly a time-consuming process.

5.8. Potential Impacts on Aesthetics/Visual Quality

5.8.1. Northern Corridor

The potential visual impact for this corridor is anticipated to be medium over most of the area (refer to Figure 5.5). Impact of high potential is limited to the southern edge of the Pilanesberg and settlement/township areas. Due to the proximity of the northern corridor to the elevated topography characteristic of the Pilanesberg (i.e. less than 5 km), this impact is considered to be significant to viewers on the border of the conservation area. The north-western section of the corridor is, in fact, obscured from Pilanesberg National Park by the Pilanesberg ridge. Tourist destinations (e.g. Sun City) within this area are currently exposed to views of existing Transmission lines (such as the Matimba-Midas No 2 400 kV line). It is anticipated that the impact associated with the construction of additional Transmission lines in this area will not significantly add to this existing impact, as the north-western portion of this corridor follows existing linear developments (such as roads, fence lines, etc.).

As a result of the extent of existing development within the study area surrounding the northern corridor (i.e. predominantly mining operations and associated township developments), potential visual impacts as a result of the construction of the proposed Transmission lines along this corridor are anticipated to be moderate to low.

5.8.2. Southern Corridor

It is anticipated that visual impacts associated with the construction of Transmission lines within this corridor will generally be low to medium (refer to Figure 5.6). A high potential impact is predicted for the area around Paardekraal Platinum Mine (including Boitekong) in the vicinity of the proposed Ikaros Substation. This impact is, however, cumulative (i.e. the Transmission lines and the substation site will alter the views in this area). Other township developments adjacent to the proposed corridor which will experience an altered view include the north-eastern portion of Phokeng, Ga-Luka, Kana and Meriteng.

Impacts along the high ridges of the Magaliesberg range are anticipated to be medium to high due to the viewing platform being elevated above the proposed corridor. This area is also earmarked for future tourist developments, which would result in high impact on local views.

5.8.3. N-S Composite Corridor

The potential impact for this corridor is medium to high along its length (refer to Figure 5.7). The visibility of the line along this corridor is predicted to be medium to high, as it would be readily viewed from developments such as the R565. Due to the nature of the areas through which it passes, the significance of the disruption is anticipated to be low.

This corridor is anticipated to have a higher visual impact from the higher-lying topography of the outer southern ridge of the Pilanesberg (as with the northern corridor) and the north-eastern ridges of the Magaliesberg (as with the southern corridor). The actual views from these areas, however, determined the actual impact on the viewer, and depends on the nature of the developments in the area. Existing development in the area surrounding this corridor is characterised by mines, roads, townships etc. The visual impact associated with the construction of the proposed Transmission lines is, therefore, anticipated to be of low significance.

High impact zones are associated with affected township developments, such as Ledig, Bala, Ga-Luka, Meriteng, Kana and Boitekong, who would potentially experience altered views.

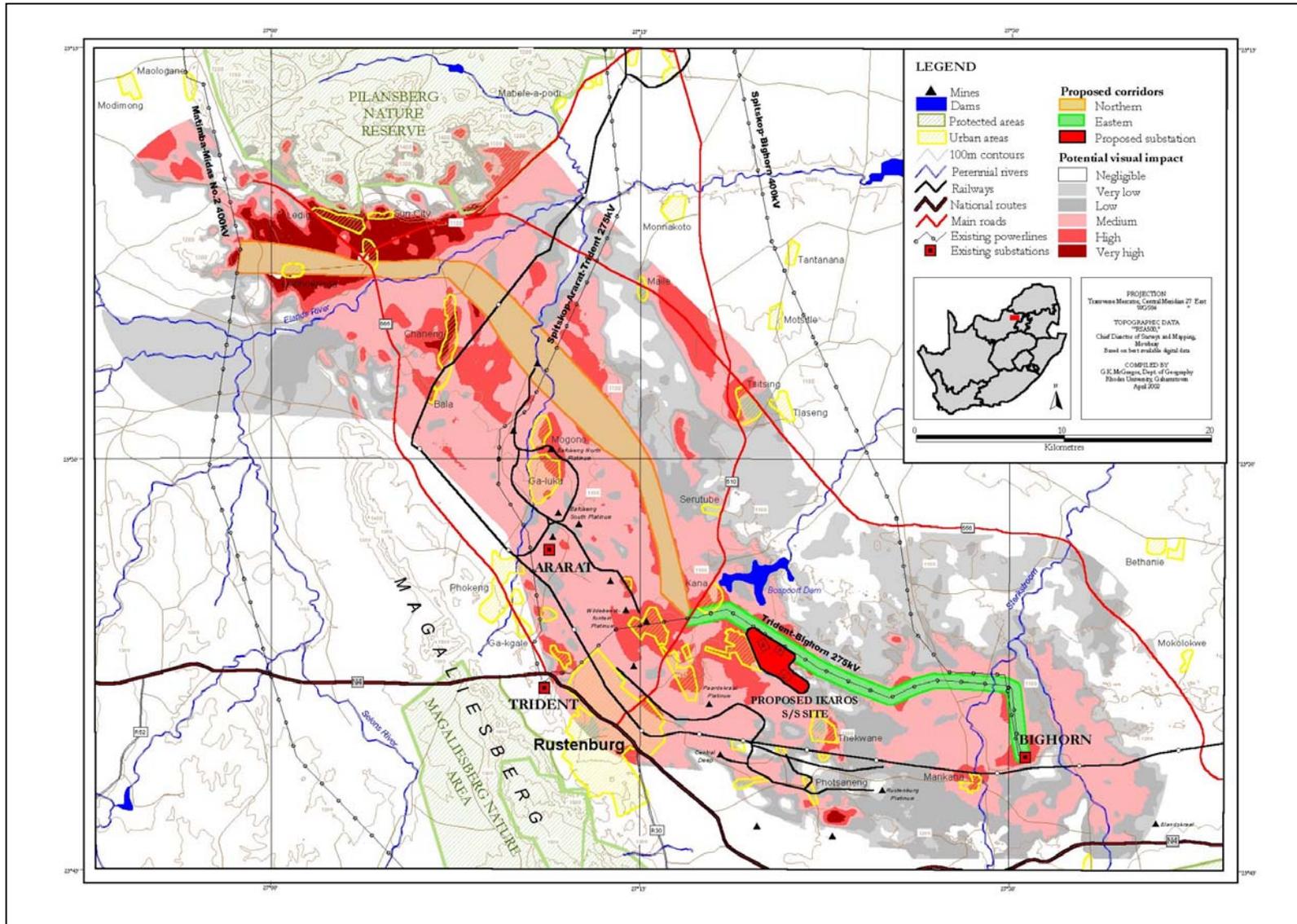


Figure 5.5: Potential visual impact associated with the construction of the proposed Transmission lines within the northern corridor

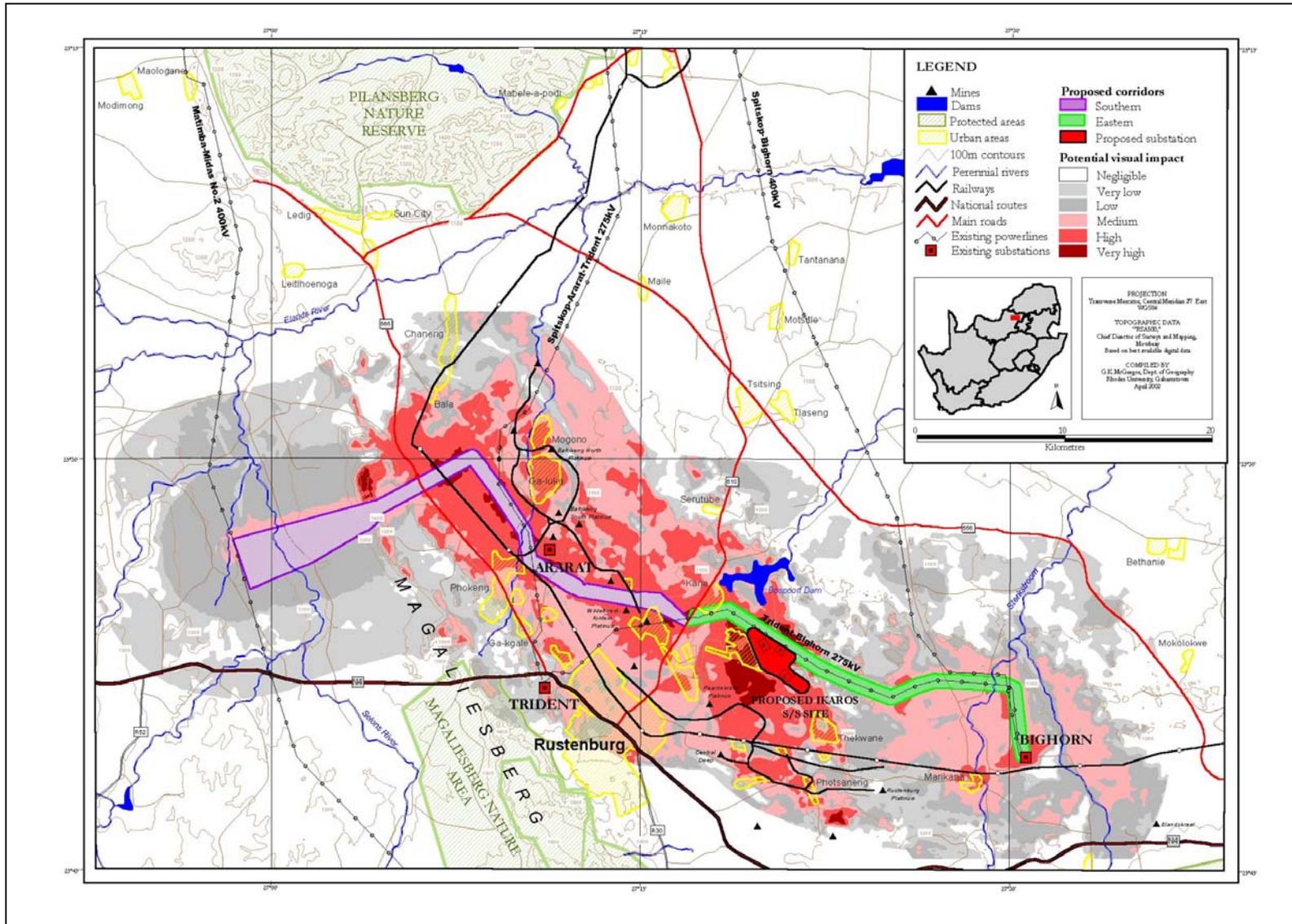


Figure 5.6: Potential visual impact associated with the construction of the proposed Transmission lines within the southern corridor

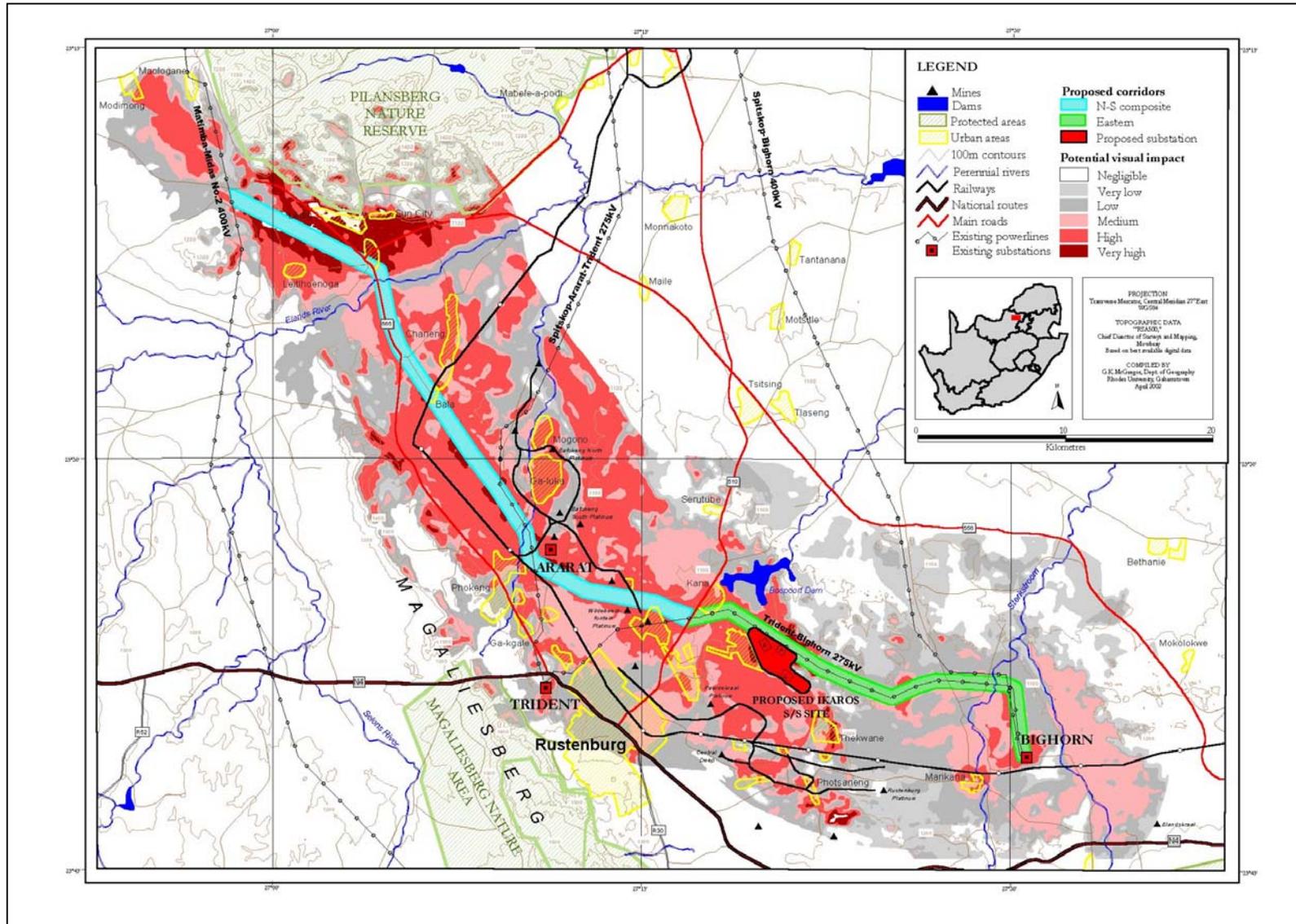


Figure 5.7: Potential visual impact associated with the construction of the proposed Transmission lines within the N-S composite corridor

Table 5.8: Potential visual impacts associated with the construction of Transmission lines between the Matimba-Midas No 2 400 kV Transmission line and the Ikaros Substation

Nature	Extent	Duration	Probability	Significance	Status
<i>Northern Corridor</i>					
Nature areas (viewers on the border of Pilanesberg)	Local	Permanent	Probable	Moderate	Negative
Townships	Local	Permanent	Probable	Low	Negative
Tourism developments	None	-	None	-	-
Public routes (R565 in northern portion of corridor)	Local	Permanent	Probable	Low	Negative
<i>Southern Corridor</i>					
Nature areas (high ridges of the Magaliesberg range)	Local	Permanent	Probable	Moderate to high	Negative
Townships	Local	Permanent	Probable	Moderate to high	Negative
Tourism developments	Local	Permanent	Probable	High	Negative
Public routes (R565)	Local	Permanent	Probable	Low	Negative
<i>N-S Composite Corridor</i>					
Nature areas (Magaliesberg and Pilanesberg)	Local	Permanent	Probable	Low	Negative
Townships	Local	Permanent	Probable	Low	Negative
Tourism developments	None	-	None	-	-
Public routes (R565)	Local	Permanent	Probable	Low	Negative

5.8.4. Recommendations

Considering the findings of the detailed visual assessment undertaken, the order of preference for the corridor for the construction of the Transmission lines between the Matimba-Midas No 2 400 kV Transmission line and the Ikaros Substation is as follows:

- The N-S composite corridor is recommended as the first option, as the proposed Transmission lines follow existing linear infrastructure, which impose an existing visual impact on the local area, thus minimising the potential impact associated with the proposed new Transmission lines.
- The northern corridor is the second option, as this corridor is largely disturbed due to mining activities, thus decreasing the potential for the occurrence of significant sites.
- The southern corridor is the least preferred option, largely due to the potentially high visual quality of the Magaliesberg range and the associated tourism developments planned in this area.

5.9. Potential Social Impacts

The social impact assessment (SIA) variables associated with the proposed 400 kV Transmission lines to be constructed between the Matimba-Midas No 2 400 kV line and the Ikaros Substation include the following:

- Impacts on the local population
- Infrastructure, farming and industrial activity-related impacts
- Public health, safety and security impacts
- Land use and the direct intrusion of the project on communities
- Aesthetic and tourism-related impacts
- Archaeological, cultural or historical sites impacts.

Those variables considered to be relevant to this component of the study are assessed as potential social impacts. The assessment considers the probability of the impact occurring and the actual (not perceived) impact, in respect of the construction and operation phases of the proposed 400 kV Transmission lines to be constructed between the Matimba-Midas No 2 400 kV line and the Ikaros Substation. The SIA is outlined in the tables overleaf, together with an indication of potential mitigation measures, as well as the significance of impacts with mitigation in place.

5.9.1. Recommendations

Considering the findings of the public participation process and social studies undertaken, the order of preference for the corridor for the construction of the Transmission lines between the Matimba-Midas No 2 400 kV Transmission line and the Ikaros Substation is as follows:

- The N-S composite corridor is recommended as the first option, as the proposed Transmission line follows existing linear infrastructure (such as roads, fence lines, etc), which impose an existing impact on the local area.
- The northern corridor is the second option, largely due to the planned expansions to mining activities.
- The southern corridor is the least preferred option, largely due to the planned tourism facilities in the vicinity of the Magaliesberg ridge, as well as the various townships which are potentially affected by this corridor.

Nature of impact	Relocation of individuals or families					
Stage	Construction			Operation & Maintenance		
Corridors	<i>Northern</i>	<i>Southern</i>	<i>N-S Composite</i>	<i>Northern</i>	<i>Southern</i>	<i>N-S Composite</i>
Extent	Local	Local	Local	-	-	-
Duration	Permanent	Permanent	Permanent	-	-	-
Probability of occurrence	Highly probable	Highly probable	Highly probable	-	-	-
Status of impact	Potentially high	Potentially high	Potentially high	-	-	-
Significance	High	High	High	-	-	-
Mitigation measure	In the event of communities being affected by the proposed corridor: First mitigation measure would be to re-align the final route alignment to skirt around the community and avoid households. Second mitigation measure would be to relocate affected households within the 110m servitude and to provide compensation to the affected households. Compensation will be required for re-settlement and loss of dwelling and/or land.			-		
Significance after mitigation	Low	Low	Low	-	-	Not applicable
Discussion	A number of individuals within various townships could potentially be affected, depending on the final route alignment. It is important for any relocation to consider factors such as the locality of social services such as access to transport, schools, places of worship, as well as the current economic base of the property owner. It is important to consider that any change requires adaptive capacity by those who face relocation. The ability to adapt to change is dependent on the individual; the nature and extent of the change as well as the degree to which social support is available within the family and community as well as a break with current social networks. The relocation must consider impacts on the individual.					

Nature of impact	Population impacts – inflow of temporary workers					
Stage	Construction			Operation		
Corridors	<i>Northern</i>	<i>Southern</i>	<i>N-S Composite</i>	<i>Northern</i>	<i>Southern</i>	<i>N-S Composite</i>
Extent	Regional – but mostly confined to construction camps			-	-	-

Nature of impact	Population impacts – inflow of temporary workers					
Duration	For the duration of the construction phase			-	-	-
Probability of occurrence	Highly probable, as construction for Eskom requires skilled labour			-	-	-
Status of impact	Negative	Negative	Negative	-	-	-
Significance	Moderate	Moderate	Moderate	-	-	-
Mitigation measure	The conduct of on-site workers must be specified to the Contractor. Specification are to include sanitation, water and waste (litter) as well as informal trading, and interfering in local community/cultural affairs.			-	-	-
Significance after mitigation	Low	Low	Low	-	-	-
Discussion	Transmission line construction is specialist in nature, and specialist contractor teams will be required to be employed. The nature, extent and impact of this variable will depend on possible disruptions/intrusion/environmental impacts due to the presence of contractors (whether local or not) as well as potential clashes due to differences in racial and ethnic composition between locals and outside contractors. Historically, the introduction of contractors and construction camps is associated with a number of social and environmental problems. Such problems can include the erection of informal dwellings and allied problems such as lack of water, sanitation and waste disposal infrastructure, with concomitant health, environmental pollution and aesthetic impacts. These problems can be exacerbated in the event of an in- migration of job-seekers from elsewhere, who may set- up informal dwellings in the vicinity of the construction camps. The probability of this occurring is, however, slight, given the limited potential for employment at the site, and the more abundant opportunity for employment at the local mines. Moreover, it is common practice for local informal vendors (notably women providing cooked food) to enter the area, given the new business opportunity provided by the construction workers. Mitigation measures are required to be specified within the EMP provided to the appointed Contractors.					

Nature of impact	Disruption of farming activities					
Stage	Construction			Operation		
Corridors	<i>Northern</i>	<i>Southern</i>	<i>N-S Composite</i>	<i>Northern</i>	<i>Southern</i>	<i>N-S Composite</i>
Extent	Local	Local	Local	Local	Local	Local
Duration	Short term	Short term	Short term	Permanent	Permanent	Permanent
Probability of occurrence	Definite	Definite	Definite	Probable	Probable	Probable
Status of impact	Negative	Negative	Negative	Negative	Negative	Negative
Significance	High	High	High	Low	Low	Low

Nature of impact	Disruption of farming activities					
Mitigation measure	Close co-ordination with affected landowners and farmers will provide information on timed farming-related activities and associated timeframes (planting; harvesting, crop-spraying and breeding seasons). Where possible, the construction activities should be responsive to the needs and requirements of the farmers. Landowners/residents to be notified in advance regarding construction programme and type of activities to take place and equipment that would traverse the property. Procedures to be put in place in the case of compensation for maintenance; stock and crop losses. Provisions to be set for Contractors in this regard in the EMP.			As during construction, with the addition that landowners and the relevant authorities would have to be informed of maintenance activities in advance. It is required that Eskom's servitude is properly maintained.		
Significance after mitigation	Low	Low	Low	Low	Low	Low
Discussion	In cultivated areas, construction and operation activities could exert a negative impact on farming activity (e.g. crop harvesting and irrigation; movement/access of tractors/other farm equipment) and result in crop losses. Clearance of land to facilitate construction and increased use of local roads (maintenance) and/or the creation of additional access roads (erosion risk), as well as livestock loss due to gates being left open by workers, could have financial implications for farmers. Similar impacts could result from maintenance activity during operation, when workers would have to access properties. An additional consideration is the potential restriction on growth and harvesting of crops in the servitude. Moreover, harvesting methods could be adversely affected due to mechanised harvesting equipment or crop-spraying aircraft not being able to negotiate the towers.					

Nature of impact	Loss of agricultural land-use					
Stage	Construction			Operation		
Corridors	<i>Northern</i>	<i>Southern</i>	<i>N-S Composite</i>	<i>Northern</i>	<i>Southern</i>	<i>N-S Composite</i>
Extent	Local	Local	Local	Local	Local	Local
Duration	Short term	Short term	Short term	Permanent	Permanent	Permanent
Probability of occurrence	Improbable	Improbable	Improbable	Definite	Definite	Definite
Status of impact	Negative	Negative	Negative	Negative	Negative	Negative
Significance	Low	Low	Low	Low	Low	Low

Nature of impact	Loss of agricultural land-use					
Mitigation measure	Eskom is required to negotiate with each individual property owner regarding compensation and mitigation. The planned positions of towers are to consider those areas with least possible impact on land-uses, as well as minimising potential economic losses. Construction must be avoided during the planting, harvesting, crop spraying and animal breeding seasons within the proposed corridor.			Eskom's servitude must be properly maintained, although agricultural activities can still take place under the powerline.		
Significance after mitigation	None	None	None	Low	None	Low
Discussion	The corridors traverse small individual properties which are undertaking farming activities. While it is not permissible for infrastructure to be erected within the servitude, most farming activities may continue. A servitude of approximately 110m is required for the two Transmission lines. The degree of loss of land is subject to the type of tower structure to be used and the nature and extent of construction activities. Harvesting in the long-term may also be disrupted due to the shape and footprint of the towers. The majority of the farming area lies in close proximity to Bighorn Substation. Therefore, cumulative impacts are highly probable, as three separate Transmission lines would traverse the area, with the establishment of the new lines.					

Nature of impact	Tourism related impacts					
Stage	Construction			Operation		
Corridors	<i>Northern</i>	<i>Southern</i>	<i>N-S Composite</i>	<i>Northern</i>	<i>Southern</i>	<i>N-S Composite</i>
Extent	Local	Local	Local	Regional	Regional	Regional
Duration	Short term	Short term	Short term	Not applicable	Permanent	Not applicable
Probability of occurrence	Probable	Probable	Probable	Improbable	Definite	Improbable
Status of impact	Negative	Negative	Negative	Negative	Negative	Negative
Significance	Low	Moderate	Low	None	Moderate	None
Mitigation measure	Where practical, construction vehicles should avoid the use of primary tourist routes. Should an access road to a tourist destination be impacted during construction, a deviation road needs to be provided and clearly marked. The location of tourist operations are to be defined, so that construction camps are not established in such areas.			Cross Rose Suspension towers to be used as far as possible (to reduce visual impacts) and any possible negative environmental impacts to be kept to the minimum.		
Significance after mitigation	None	Low	None	None	Low	None

Nature of impact	Tourism related impacts
Discussion	Whilst both construction and operation related activity could have an adverse effect on tourism operations, it is the towers which have an adverse aesthetic impact, which are anticipated to have the most marked impact, potentially rendering the area less attractive. These impacts have the potential to be tourism- site specific, but would also manifest <i>en- route</i> to such sites. There is a high probability of cumulative impacts during operation, given that the general area has a number of existing Transmission lines.

Nature of impact	Management of access routes, fences and gates					
Stage	Construction			Operation		
Corridors	<i>Northern</i>	<i>Southern</i>	<i>N-S Composite</i>	<i>Northern</i>	<i>Southern</i>	<i>N-S Composite</i>
Extent	Local	Local	Local	Local	Local	Local
Duration	Short term	Short term	Short term	Permanent	Permanent	Permanent
Probability of occurrence	Definite	Definite	Definite	Definite	Definite	Definite
Status of impact	Negative	Negative	Negative	Negative	Negative	Negative
Significance	Moderate	Moderate	Moderate	Potentially high	Potentially high	Potentially high
Mitigation measure	Eskom are required to negotiate with individual landowners regarding maintenance of access roads, as well as with regards to compensation in the event of damage to existing infrastructure (e.g. fences) or stock losses. Access gates are to be closed after construction workforce has passed through in order to prevent any stock losses or unintended movement of cattle. Specifics regarding access control are to be individually agreed with the affected landowner.			Eskom are required to negotiate with individual landowners regarding maintenance of access roads, as well as with regards to compensation in the event of damage to existing infrastructure (e.g. fences) or stock losses. Fences and gates being installed must be of high quality to ensure durability. Eskom must ensure that: <ul style="list-style-type: none"> • access roads for maintenance purposes are kept in good travelling conditions and cleared of any obstructions; • fences are regularly inspected for any damages. Should any damages occur, repairs need to be done immediately. • gates to access roads must be closed after entering and exiting properties and locked. When access are not required, gates must be permanently closed and locked. 		

Nature of impact	Management of access routes, fences and gates					
Significance after mitigation	Low	Low	Low	Low	Low	Low
Discussion	The management of access roads, fences and gates is particularly important in areas where agricultural activities are being undertaken. Construction and maintenance will require access to properties along the servitude. This may result in increased deterioration of existing roads (should these be opted for), or erosion problems is appropriate maintenance measures are not implemented. In addition, if workers fail to close gates after entering a property, this would pose a risk of stock losses or ingress of animals from elsewhere.					

Nature of impact	Electro-magnetic field health risks (role of proximity to source)					
Stage	Construction			Operation		
Corridors	<i>Northern</i>	<i>Southern</i>	<i>N-S Composite</i>	<i>Northern</i>	<i>Southern</i>	<i>N-S Composite</i>
Extent	Local	Local	Local	Local	Local	Local
Duration	Short term	Short term	Short term	Permanent	Permanent	Permanent
Probability of occurrence	Improbable	Improbable	Improbable	Definite	Definite	Definite
Status of impact	None	None	None	Negative	Negative	Negative
Significance	None	None	None	Moderate	Moderate	Moderate
Mitigation measure	Comply with Eskom Safety Standards by constructing the powerlines the correct height (ground to lowest point of powerline).			Comply with Eskom Safety Standards. The height of the conductors should ensure that EMF is zero at ground level.		
Significance after mitigation	None	None	None	None	None	None
Discussion	Magnetic fields that naturally emanate from sources such as transmission lines are directly proportionate to the amount of current flowing on the transmission line at any given time. A higher loading condition such as may be present in hot weather summer months will result in increased magnetic field levels. According to the World Health Organisation (WHO) it has become increasingly unlikely (based on the existing body of research) that exposure to EMFs constitutes a serious health hazard, although some uncertainty remains. The WHO's statement derives from a study by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) (June 2001), which, using the standard IARC classification that weighs human, animal and laboratory evidence, classified ELF magnetic fields as possibly carcinogenic to humans based on epidemiological studies of childhood leukaemia. Evidence for all other cancers in children and adults, as well as other types of exposures (i.e. static fields and ELF electric fields) was considered not classifiable either due to insufficient or inconsistent scientific information.					

Nature of impact	Health (HIV AIDS)					
	Construction			Operation		
Stage						
Corridors	<i>Northern</i>	<i>Southern</i>	<i>N-S Composite</i>	<i>Northern</i>	<i>Southern</i>	<i>N-S Composite</i>
Extent	Local, regional	Local, regional	Local, regional	-	-	-
Duration	Short term (impact during construction, consequences potentially permanent)	Short term (impact during construction, consequences potentially permanent)	Short term (impact during construction, consequences potentially permanent)	-	-	-
Probability of occurrence	Probable	Probable	Probable	-	-	-
Status of impact	Negative	Negative	Negative	-	-	-
Significance	High	High	High	-	-	-
Mitigation measure	Ambient environmental conditions during construction activities to be monitored by contractor. Appointed contractor to ensure that dust is kept to a minimum by implementing appropriate dust-suppression techniques. Oblige contractor to ensure that workers are educated on HIV/AIDS and that condoms are readily distributed. The local health services to participate to ensure education/condom distribution programmes.			-		
Significance after mitigation	Low to None	Low to None	Low to None	-	-	-
Discussion	Construction activities result in unnatural increases in local ambient pollution levels. An increase in the number of sex-trade workers and the spread of sexually transmitted infections (STIs) and HIV/ AIDS is increasingly being recognised as a risk associated with construction camps. Workers are separated from their families, and it is not uncommon for construction camps are frequented by local sex workers. This promotes the spread of STIs.					

Nature of impact	Safety & security					
Stage	Construction			Operation		
Corridors	<i>Northern</i>	<i>Southern</i>	<i>N-S Composite</i>	<i>Northern</i>	<i>Southern</i>	<i>N-S Composite</i>
Extent	Local, regional	Local, regional	Local, regional	Local, regional	Local, regional	Local, regional
Duration	Short term	Short term	Short term	Permanent	Permanent	Permanent
Probability of occurrence	Probable	Probable	Probable	Probable	Probable	Probable
Status of impact	Negative	Negative	Negative	Negative	Negative	Negative
Significance	High	High	High	High	High	High
Mitigation measure	<p><u>Construction worker safety</u>: implement safety management plans</p> <p><u>Community safety</u>: Community safety concerns to be identified by Contractor (or identify from the PPP). Workers employed and vehicles used should be readily identifiable as Eskom construction staff. Workers may be obligated to wear identity cards or corporate clothing to assist the community in identifying them as construction workers.</p> <p>All construction areas to be fenced off before any construction activities take place, access control to construction sites to be in place, and signage to be displayed indicating dangerous areas, etc. All construction materials and equipment to be safely stored. Construction materials to be guarded during operation. Road network to and from construction sites to be clearly marked. Construction company to have security on site at all times.</p>			<p>As per Construction Phase.</p> <p>Proper signage to be displayed indicating danger. Eskom to educate communities (minors and adults) regarding the danger of electricity and electricity infrastructure.</p>		
Significance after mitigation	Low	Low	Low	Low	Low	Low

Nature of impact	Safety & security
Discussion	<p>Safety consideration are of particular importance:</p> <p>Construction worker safety: Are a number of occupational safety risks associated with substation site construction, including the risk of electrocution. Compliance with the OH&S Act would be required in terms of.</p> <p>Community safety: Potential risk of electrocution (people and livestock) if access to the construction site is not controlled. Safety and security threats posed by the presence of the construction camps/workers. Locals readily attribute increases in theft and other crimes to the presence of construction workers, particularly if these workers are from outside their area.</p>

Nature of impact	Noise pollution					
Stage	Construction			Operation		
Corridors	<i>Northern</i>	<i>Southern</i>	<i>N-S Composite</i>	<i>Northern</i>	<i>Southern</i>	<i>N-S Composite</i>
Extent	Local	Local	Local	Local	Local	Local
Duration	Short term (construction period)	Short term (construction period)	Short term (construction period)	Permanent	Permanent	Permanent
Probability of occurrence	Definite	Definite	Definite	Improbable	Improbable	Improbable
Status of impact	Negative	Negative	Negative	Negative	Negative	Negative
Significance	Moderate to low (due to the nature of the area)	Moderate to low (due to the nature of the area)	Moderate to low (due to the nature of the area)	Low (due to proximity of residential areas)	Low (due to proximity of residential areas)	Low (due to proximity of residential areas)
Mitigation measure	Any drilling and other construction activities should be limited to daylight hours. No construction activities on weekends, especially when close to communities. Ensure that all machinery is in good order and complies with generally accepted noise levels. Any high impact activity (such as the use of dynamite to blast rocky outcrops) would require prior warning to adjacent landowners. The impact of blasting activities is considered to be low, due to the extensive quarrying which is undertaken north-east of the substation site..			Ensure that all maintenance vehicles and machinery is in good working order (e.g. silencers, etc) and complies with generally accepted noise levels.		
Significance after mitigation	Low	Low	Low	None	None	None

Nature of impact	Noise pollution
Discussion	<p>Construction and blasting activities are not anticipated to have a significant impact on ambient noise levels due to the nature of the activities (mining and quarrying) in the local vicinity.</p> <p>The main noise associated with the operation of the Transmission line is a buzzing/humming noise which is exuded from the overhead lines. This noise is only perceptible when in close proximity to the lines.</p>

Nature of impact	Sites of cultural, religious, historical or archaeological significance					
Stage	Construction			Operation		
Corridors	<i>Northern</i>	<i>Southern</i>	<i>N-S Composite</i>	<i>Northern</i>	<i>Southern</i>	<i>N-S Composite</i>
Extent	Local	Local	Local	-	-	-
Duration	Permanent	Permanent	Permanent	-	-	-
Probability of occurrence	Improbable	Probable	Improbable	-	-	-
Status of impact	Negative	Negative	Negative	-	-	-
Significance	Low	Moderate	Low	-	-	-
Mitigation measure	Should any archaeological sites of significance be located within the defined route alignment, all possibilities need to be investigated to avoid the site. Contractor must also ensure that employees are aware of the various locations of archaeological sites in or close to the construction sites, and to mark these areas and to ensure that the construction workers do not traverse or disturb the site / area.			-		
Significance after mitigation	None	Low	None	-	-	-
Discussion	Archaeological sites are protected by the National Heritage Resources Act (No 25 of 1999). It is an offence to destroy, damage, excavate, alter or remove from its original position, or collect and archaeological material without a permit issued by the South African Heritage Resource Agency. Note must also be taken of the National Heritage Council Act (No 11 of 1999).					

5.10. Conclusions and Recommendations

Table 5.9 overleaf provides a summary of the recommendations made regarding the proposed Transmission lines between the Matimba-Midas No 2 400 kV Transmission line and the Ikaros Substation. Considering the findings of all the detailed studies undertaken, the order of preference for the corridor for the construction of the Transmission lines between the Matimba-Midas No 2 400 kV Transmission line and the Ikaros Substation is as follows:

- The N-S composite corridor is recommended as the first option.
- The northern corridor is the second option (based mainly on land use restrictions as a result of planned extensions to mining activities in this area).
- The southern corridor is the least preferred option.

Table 5.9: Summary of findings regarding the proposed Transmission lines between the Matimba-Midas No 2 400 kV Transmission line and the Ikaros Substation

Issue	Southern Corridor	Northern Corridor	N-S Composite Corridor	Preferred Corridor
Climate and atmospheric conditions	Minimal impact on Transmission line infrastructure	Minimal impact on Transmission line infrastructure	Minimal impact on Transmission line infrastructure	Northern, southern or N-S composite corridor
Geology & Soils	Potential erosion on slopes greater than 20°; Site specific (EMP) input required	Potential erosion on slopes greater than 20°; Site specific (EMP) input required	Potential erosion on slopes greater than 20°; Site specific (EMP) input required	Northern, southern or N-S composite corridor
Agricultural potential	Moderate agricultural potential	Moderate agricultural potential	Moderate agricultural potential	Northern, southern or N-S composite corridor
Flora & fauna	Protected spp in the area north of the Magaliesberg PNE; Site specific (EMP) input required	Habitat disturbed; Site specific (EMP) input required	Avoid Sandspruit area in the north; Site specific (EMP) input required	Northern or N-S composite corridor
Avifauna	Disturbed habitat; impacts associated with proximity to Magaliesberg PNE	Disturbed habitat	Disturbed habitat; follows other linear developments (e.g. roads, fence lines, powerlines)	Northern or N-S composite corridor
Land use	Land use rights in Boschhoek area – tourism potential; Close to Phokeng and Meriteng but outside settlements; Impact on Shazalaza (informal); possible extension of Magaliesberg PNE as a conservation area; potential impact on resorts in Magaliesberg area	Proclaimed and informal settlements on corridor - enough space for servitude outside of settlements, except at Shazalaza (informal); planned mining extensions may be restricted by development of lines	Close to Bala township; enough space for servitude; Impact on Shazalaza (informal)	N-S composite corridor

Issue	Southern Corridor	Northern Corridor	N-S Composite Corridor	Preferred Corridor
Archaeological, cultural and historical sites	Four grave sites close to Mine buildings; at the edge of the Magaliesberg stone-walled sites exist plus good potential for other archaeological/cultural sites. Site specific (EMP) input required	Disturbed corridor; some sites may require site specific (EMP) input	Moderate potential for arch sites between norite hill complex in the north and the Sandspruit; Site specific (EMP) input required	Northern or N-S composite corridor
Visual	Impact on proposed tourism area and edge of Magaliesberg.	Disturbed habitat; extensive mining development	Disturbed habitat; follows other linear developments	Northern or N-S composite corridor
Social Environment	Tourism potential; visual impact; impact on townships; health and safety – especially informal townships.	Proposed mining expansion; Tribal land	Largely follows linear developments; servitude to be to the east of road R565 to avoid game fencing	N-S composite corridor