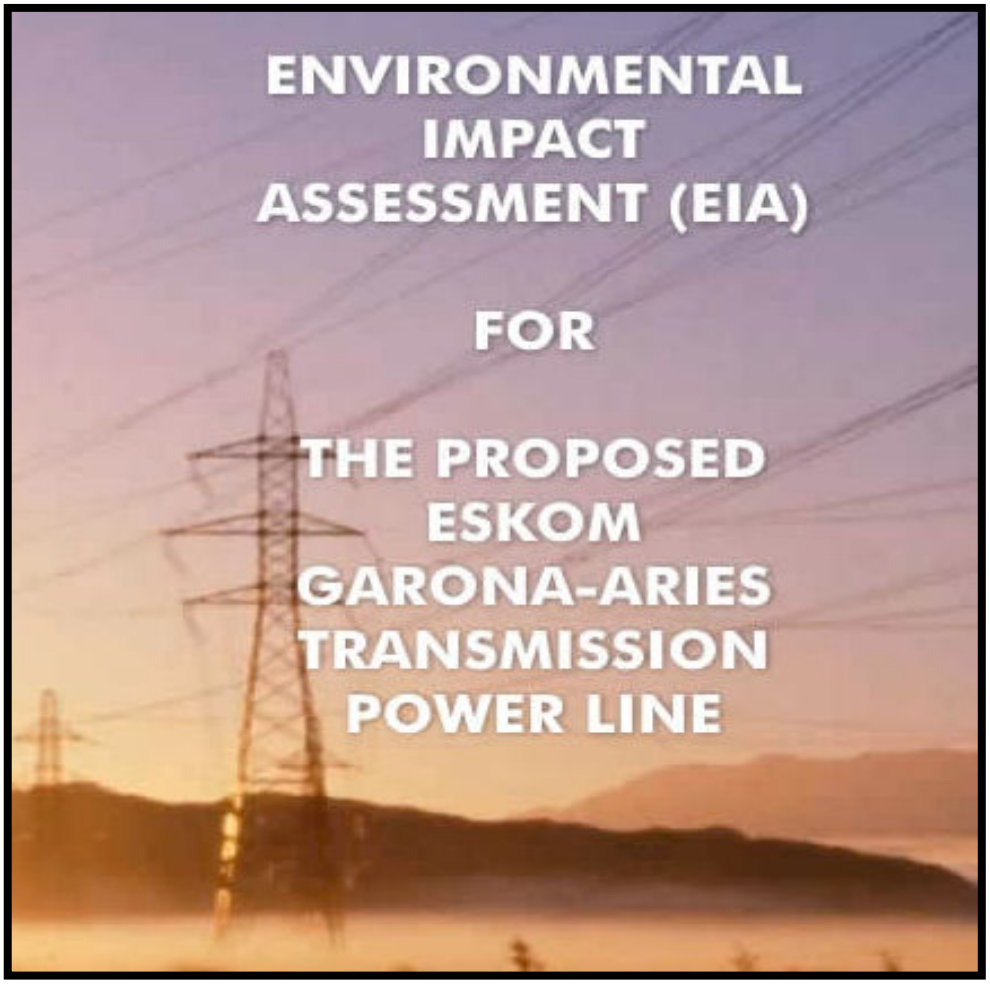

DRAFT
ENVIRONMENTAL IMPACT REPORT

Proposed Aries-Garona 400kv Transmission power line and Extension of the Garona Substation, Northern Cape Province.

DEAT ref: 12/12/20/740

Northern Cape ref: NNO 25/19

November 2006

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DOCUMENT CONTROL

ENVIRONMENTAL IMPACT REPORT: PROPOSED ARIES-GARONA 400kV TRANSMISSION POWER LINE AND EXTENSION OF THE GARONA SUBSTATION, NORTHERN CAPE PROVINCE

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DATE	No.	DESCRIPTION OF REVISION OR AMENDMENT

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Tswelopele Environmental (2006), Draft Environmental Impact Report for the Proposed Eskom Holdings Limited Aries-Garona 400kV Transmission power line and extension of the Garona Substation, Northern Cape Province.

Opinions expressed and conclusions arrived at are those of the authors and not necessarily the official view of the proponent.

ENVIRONMENTAL IMPACT REPORT

FOR

Eskom Holdings Limited Aries-Garona 400kV Transmission power line and extension of the Garona Substation, Northern Cape Province

To be submitted to the Department of Environmental Affairs and Tourism to fulfil the requirements of Government Notices No. R.1182 and R.1183 of the Environment Conservation Act (No. 73 of 1989)

APPLICATION SUMMARY DATA

PROJECT:	**Aries-Garona 400kV Transmission power line and Extension of the Garona Substation**
LOCATION:	**Northern Cape Province**
APPLICANT:	**Eskom Holdings Limited Transmission Services**
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Executive Summary

Eskom Holdings Limited Transmission Services proposes constructing a 400kV transmission power line between the existing Aries and Garona substations in the Northern Cape Province. In order to accommodate the 400kV power line, an extension of the Garona substation is also investigated as part of this EIA.

The majority of the terrain that will be impacted upon consists of very sparsely populated areas with low vegetative cover. A comprehensive Environmental Impact Assessment has been undertaken to ensure that impacts are minimised and mitigation measures proposed for sensitive areas. The nearest populated areas to the study area include the town of Kenhardt and Groblershoop as well as the settlement known as Wegdraai. Detailed public participation has been undertaken during the scoping phase of this EIA and included public meetings in Kenhardt and Groblershoop as well as a focus group meeting held on Mr. Louis Kotze's farm Kleinbegin with representatives of the various farms in the area. Comments, objections and recommendations received through this public involvement process have been used to inform this Environmental Impact Report.

Specialist studies were commissioned at the start of this EIA application in the areas of Soils and Agriculture Potential, Avifauna, General Ecology, Heritage/Archaeology, Social, Tourism and Visual in order to obtain professional opinions and mitigation of perceived potential impacts. These studies have helped to inform the entire EIA process and have resulted in the identification of a suitable route alignment from the various alternatives proposed as well as the identification of potential management and mitigating measures. A detailed assessment of the ecology and heritage nature of the pylon positions (once known) will be undertaken prior to construction to ensure that no sensitive features are impacted upon.

Invariably, transmission power lines have a detrimental impact on avifaunal species that use the pylon structures for nesting as well as elevated perches to gain a hunting advantage (in the case of raptors). This impact has been extensively investigated and the choice of pylon structure (cross-rope suspension) will result in the least significant impact on avifauna as birds cannot nest or sit directly above the spans of earth wires. Additionally, in areas of higher bird density (such as wetlands and rivers), recommendations have been made to assess these areas and mark sensitive spans with a suitable marking device that will limit bird collisions.

Finally, numerous comments were received regarding the need for electricity supply in the study area however the proposed transmission power line will not result in a direct electricity supply to areas within the study area but will improve the national electricity grid in the Cape region as a whole. Indirect benefits will be perceived during the construction phase in which members of the local community will have the opportunity for some employment, be it directly or indirectly as a result of the construction process. Recommendations are presented in this EIR in which local labour should be utilized as far as practically possible however the community should bear in mind that high voltage electricity infrastructure requires specialist construction personnel with the correct training and experience to undertake this task safely and successfully. There will however be numerous employment opportunities for the local community such as vegetation clearing, environmental monitoring during and after construction and service provision to construction personnel (such as food and accommodation). The construction phase will bring in these sorts of financial gains to the area that will trickle down into the community as a whole.

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List of Abbreviations:

DEAT:	Department of Environmental Affairs and Tourism
EIA:	Environmental Impact Assessment
EIR:	Environmental Impact Report
HIA:	Heritage Impact Assessment
SAHRA:	South African Heritage Resource Association
SIA:	Social Impact Assessment
VIA:	Visual Impact Assessment

1 Introduction and Motivation

1.1 Description of the Project

The proposed development is situated in the Northern Cape Province between the existing Aries and Garona substations. The applicant, Eskom Holdings Limited Transmission Services, would like to construct a 400kV transmission power line and to upgrade the existing Garona sub-station. The aim of this Environmental Impact Report is to assess possible impacts on the biophysical and socio-economic environment, assess the identified feasible alternatives, and provide mitigation measures where applicable. An extension of the Garona sub-station is required in order to accommodate the 400kV power line infrastructure (refer to Appendix 14 for a schematic diagram of the proposed extension). A study area (refer to map in Appendix 2) comprising a 15km buffer zone around the direct line between the two substations has been delineated in order to identify the most suitable route for the power line and to minimise its impact on the biophysical, social and economic environment. For the purposes of this study a route will be defined as a 500m wide corridor, within which the proposed transmission power line could align. It is expected that a decision will be issued for the preferred corridor and that prior to finalising the exact route and associated pylon positions a survey will be undertaken by the specialists to ensure that the most suitable footprint position is identified and utilised.

1.2 Needs and Justification for the Project

Electricity cannot be stored. It is therefore necessary to generate and deliver power over long distances at the very instant it is needed. In South Africa, thousands of kilometres of high voltage transmission power lines transmit power, mainly from the Power Stations located at the Mpumalanga coalfields to major substations where the voltage is reduced for distribution to industry, businesses, homes and farms all over the country.

If Eskom Holdings Limited is to honour its commitment to meet the increasing needs of end users, it has to establish and expand its infrastructure of transmission network and substations on an ongoing basis. Due to normal load growth as well as possible new Railway loads in the Northern Cape area, it has become necessary to reinforce the existing electrical infrastructure.

Most towns and cities purchases electricity in bulk from Eskom and sell it to households, industrialists and other end users within their areas of jurisdiction, while Eskom also sells electricity directly to end users in some parts of South Africa.

1.2.1 Eskom Transmission in the Cape region

Additional transmission power line infrastructure will be required in the future to meet customer load demands in the Cape load centres. Installation of a new 400kV injection at Aries substation via the Ferrum (Kimberly) corridor would defer the construction of the more expensive 765kV power line in the Southern corridor (which runs from De Aar to the Cape Peninsula).

This introduction is concerned only with the section between Aries and Ferrum substations (refer to **Figure 1** below). This Scoping Report which, forms part of a full Environmental Impact Assessment (EIA), refers only to the proposed Aries to Garona 400kV Transmission power line (and upgrade to the Garona sub-station). A separate EIA application and associated process has commenced for the Ferrum to Garona transmission power line.

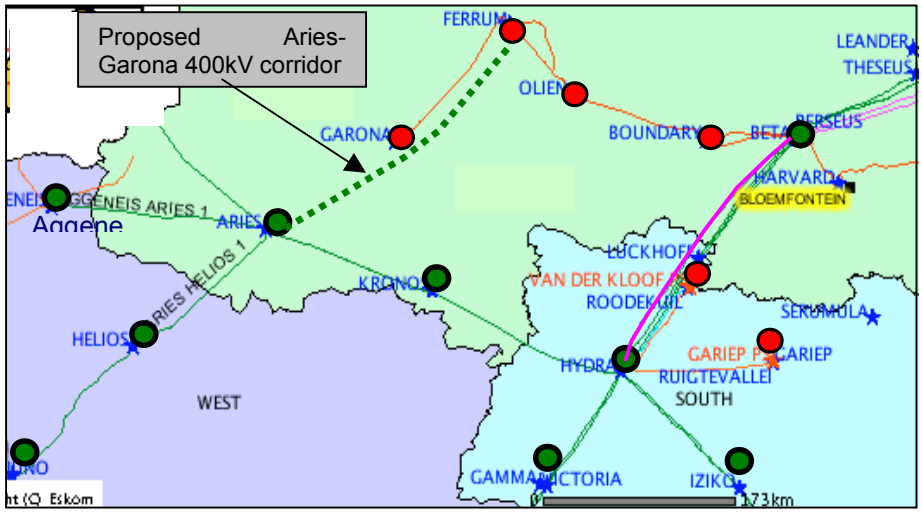


Figure 1: Proposed future network showing the Aries to Garona sub-station link with a 400kV Transmission power line.

Eskom has a mandate to satisfy potential customer needs, which implies certain responsibilities. One of the most significant of these is to find and maintain the balances between satisfying the needs of society and remaining within the capabilities of the environment. In order to achieve this Eskom must continually re-assess its present infrastructure and take into account new developments to ensure that there is a continued supply of electricity, without negatively impacting on the environment.

1.2.2 The need for additional transmission capacity in the corridor supplying the Cape area

The Cape 400kV transmission network system, in the Northern Cape area supports customer loads in the Southern Cape, West Coast, Peninsula and Namaqualand load centres. These four load centres had a combined 2004 peak load demand of 3540 MW. This peak load does not include the supply to Namibia, which can amount to 250 MW.

Local generation in the Cape region is limited to the Koeberg Nuclear Power Station (1800MW but only 900MW during refuelling) and the Palmiet Pumped Storage scheme 400MW (near Grabouw). This leaves around 2450MW (3540MW + 250MW - 1300MW) of load that presently needs to be fed from sources in Mpumalanga during system healthy conditions. This also needs to be taken into account when developing the network.

The forecasted average load growth, based on historical data, is around 2.5% per annum. The steady growth in electricity demand is expected to continue, as a result of electrification, increased housing

densities, railway transport (possibly on the Sishen-Saldanha railway line) and commercial development.

The existing transmission power lines are becoming heavily loaded and are predicted to reach their full capacity around 2009/2010. These transmission power lines cannot supply the increased normal load demand in the long-term. New transmission power line extensions and substations upgrades are currently under consideration and will be constructed in the near future. This EIA application includes an extension to the Garona substation in order to accommodate the 400kV transmission power line.

It is becoming very difficult to manage with one power line out of service or the loss of generation, since the other power lines have to carry the entire load. This makes it difficult to carry out routine maintenance, the condition of the operating lines can deteriorate and this will result in poor line performance (faults etc.).

Studies have shown a steady 2.5% per annum average load growth for the area. It is a sign of good economic growth in this area. The load forecasters predict that this load growth will continue - which will result in the need for additional power lines around the year 2008/9.

A definite need has been identified, viz.: need for additional capacity towards the Cape area.

By increasing the supply into the Cape area, the foreseen load growth can be addressed in a suitable and economical way. Optimisation of the current system is currently underway (Cape Strengthening Western Grid project), and would alleviate some problems in the system. The short to medium term needs will be addressed by the increased supply due to the new Transmission power lines.

1.3 Terms of Reference

Tswelopele Environmental (Pty) Ltd was appointed by Eskom Holdings Limited Transmission Services as independent environmental consultants to compile and submit the Environmental Impact Report (EIR) to the Department of Environmental Affairs and Tourism (DEAT) as part of the EIA process undertaken for this application. The letter received by Eskom Holdings Limited Transmission Services and Tswelopele Environmental from DEAT on 01 July 2005 outlines the requirements for the EIR and is included in Appendix 1.1 together with the Plan of Study for EIA.

1.4 Structure of the EIR

The structure of this Environmental Impact Report (EIR) is guided by the following:

1. The requirements for an EIR as defined in the EIA regulations promulgated under the Environment Conservation Act (Act 73 of 1989), GNR 1183.
2. The guidelines outlined in the Integrated Environmental Management Information Series – Environmental Impact Reporting (15) published by the Department of Environmental Affairs and Tourism (DEAT, 2004).
3. The approved Plan for Study for EIA.

4. The comments received from the relevant authorities in response to the Scoping Report and the Plan of Study for EIA.

1.5 Approach to the EIA

This Environmental Impact Report aims at highlighting issues which have been identified during the Scoping phase in order to assess the likely significance of the various impacts on the receiving environment and to propose mitigation measures (where possible) to lower the significance of these impacts. As part of the EIR, a comparative assessment of the alternative routes put forward during the Scoping phase has been undertaken in order to highlight the route alignment with the least significant impact on the receiving environment.

1.6 Assumptions and Limitations

The following assumptions and limitations apply to this report:

- It is assumed that all information provided by the applicant and the technical team which informed the environmental consultants as well as which is contained within this report is reliable, accurate and up to date.
- All specialists who undertook specialist studies for the Environmental Impact Assessment were qualified and had the necessary experience to undertake the necessary investigations required.
- It is assumed that all information and reports obtained from the specialists have taken into consideration all relevant information pertaining to their specialisation.
- The final pylon positions are not yet known. A selection of pylon positions (when known) which are deemed to be in more environmentally sensitive locations will be investigated by the ecologist and the archaeologist to ensure that no sensitive features/species are impacted upon.

1.7 Administrative, Legal and Policy Requirements

Activities, which may have a substantial detrimental environmental effect, have been identified in terms of Section 21 of the Environment Conservation Act 73 of 1989 (ECA) and GNR1182 of 5 September 1997. No person may undertake such activities unless a written authorisation is issued by the Minister of Environmental Affairs and Tourism, or by a competent authority designated as such by the Minister.

The potential project activities have been assessed against the activities listed in Regulation GNR1182, promulgated in terms of the ECA. The construction of the 400kV transmission power line constitutes a listed activity in terms of Section 1(a), “The construction or upgrading of facilities for commercial electricity generation and supply”.

As a result of the above, environmental authorisation is required from the relevant authority (DEAT) before the construction of the transmission line can take place. This EIR aims to assist the applicant in

following the correct legal procedure as required by DEAT and the requirements of the Environment Conservation Act (Act 73 of 1989).

This EIR will follow the general guidelines for EIA as published by the National Department of Environmental Affairs and Tourism (DEAT).

2 Description and Evaluation of Project Alternatives

The identification of alternatives is a key aspect of the success of the EIA process and was initiated at the start of this project in the Scoping phase. All feasible alternatives must be fully addressed and their advantages and disadvantages compared in order to determine the best alternative. There are however some significant constraints that have to be taken into account when identifying alternatives for a project of this scope. Such constraints include financial, social and environmentally related issues that will be discussed in the evaluation of the alternatives. Alternatives can be identified according to:

1. Status quo alternative;
2. Location alternative;
3. Land use alternative; and
4. Design Alternative
5. Demand side management

2.1 Status Quo Alternative

Eskom Transmission has deemed the construction of a 400kV transmission power line between the Aries-Garona substation the most feasible option for increasing the power supply to the Cape region based on the existing transmission infrastructure in the region. Presently, the Cape region is suffering from numerous energy supply problems and therefore this problem requires urgent attention to circumvent an energy crisis in the region. An additional 400kV power line is proposed between Aries-Garona-Ferrum substations (separate EIA application for the Garona to Ferrum transmission power line) in order to complete this route. Thus the status quo alternative is not a feasible option to consider as the inability to supply reliable electricity to the Cape region would have significant negative impacts on the economy and living environment of the region.

The status quo alternative (i.e. existing situation without the proposed transmission power line) will be considered as the baseline against which the impacts are rated for significance (refer to Section 5 and Section 6) as a change to current conditions.

2.2 Alternative Location

Alternative locations could mean an alternative route between the Aries and Garona substations or alternatively, a completely different location within the greater region to provide the necessary power supply to the Cape region. Eskom Holdings Limited Transmission Services has, through intensive studies, deemed the proposed route (i.e. Aries-Garona 400kV transmission power line) to be the optimal choice based on the existing transmission infrastructure in the Cape region. The study area was defined during the Scoping Phase of the investigation and was presented to the relevant authorities in the Plan of Study for Scoping and subsequently approved. It is understood that this study area provides a representative and feasible envelope within which alternative route alignments have been identified. The primary biophysical environmental sensitivities within the study area are the Orange River and the

Hartbeesrivier as well as the Neus se Berg, Aasvoëlkop and Driekop se Poort range of mountains. Regardless of whether the study area was expanded further north or south, these features would still need to be traversed.

Five alternative routes have been identified during the scoping investigations and will be considered in this EIA (refer to map in Appendix 2). Section 3 of this report provides a description of the alternatives while Section 5 details the comparative assessment of alternative routes.

2.3 Alternative Land Use

The proposed development of a 400kV Transmission power line is a linear project and does not require a change of land use for the majority of the properties along its length. Eskom will negotiate for a 55m wide servitude strip with the affected landowners; however, the land below the spans will still remain in the current land use (i.e. mainly farming). Only the footprint of the pylon structures will necessitate the land directly below them to be affected. As the pylons are approximately 400m apart it is not foreseen that this small loss of land will negatively affect any property owners. The nature of this application does not depend on land-use and as such this is not a viable alternative to be considered.

2.4 Alternative Design / New Generation Systems

Electricity can only be transmitted through power lines. Power line designs consist of two broad types, i.e. subterranean or above ground. Subterranean power transmission is a hugely costly affair and at present there are no subterranean high voltage transmission power lines in South Africa (due to the cost and the land/area that is needed). Additionally, subterranean power lines are difficult to maintain and result in disturbance of the land surface throughout its length (as opposed to individual pylon positions). Thus the only option for power transmission is above ground using the standard pylon designs with spans of cable between them.

Another alternative design investigated would be upgrading existing transmission power lines to carry more power. This option would result in the physical load on the existing towers to increase substantially and thus the towers would be inadequate and require replacement. Furthermore, it would not be possible to remove any transmission power lines from service to perform the upgrading work, as the remaining transmission power lines would not be able to supply the electrical loads in the region. This option would not optimise the existing infrastructure or permit future growth in the region. Another option would be to utilize existing power line servitudes and simply upgrade the capacity of these servitudes (i.e. a second transmission power line running parallel to existing). Unfortunately there are at present no existing high voltage transmission power lines between the Aries and Garona sub-stations, which could be utilized.

Transmitting power through transmission power lines is currently the cheapest way to supply the end customers. The permitting process and construction of a new generating facility would require a much greater amount of time prior to supply that a transmission power line would. The need for the supply is urgent and therefore there is a requirement to provide supply fairly quickly. It is also important to note that Eskom is at present planning two new peaking power generation facilities in the Western Cape

Province as well as recommissioning certain old coal fired power stations in order to address the specific generation demands.

Alternative pylon structure designs have been considered in this EIA and recommendations made regarding the most suitable designs for a particular situation/circumstance.

Alternative designs and/or new generating capacity are therefore not deemed feasible.

2.5 Demand side management

Demand Side Management (DSM) can generally be defined as the activities performed by the electricity supply utility, which are designed to produce the desired changes in the load shape through influencing customer usage of electricity and to reduce overall demand by more efficient use. These efforts are intended to produce a flat load duration curve to ensure the most efficient use of installed network capacity. By reducing peak demand and shifting load from high load to low load periods, reductions in capital expenditure (for network capacity expansion) and operating costs can be achieved. Some of the basic tools are the price signals (such as time of use tariffs) given by the utility and direct load management. This option is practiced to a certain extent, but is currently not considered feasible for expansion in this particular region. Eskom is currently looking at various means to achieve a flatter load profile in this area. However, the increase in energy demand in the region requires additional energy input and not simply adjusting the load profile.

3 Brief Description of Project and Proposed Alternative Alignments

The proposed 400kV transmission power line would be constructed between the existing Aries and Garona substations in the Northern Cape Province. The Aries substation is situated approximately 43.5 km south-west of the town of Kenhardt while the Garona substation lies approximately 18.5 km north of the town of Groblershoop. The geographical coordinates of the two substations are as follows:

- Aries substation: 29º 29' 38.68"S; 20º 47' 40.59"E
- Garona substation: 28º 44' 20.0"S; 21º 59' 44.998"E

The study area is situated between the Aries and Garona substations and consists of a 155 km direct line between the two substations with a 15 km buffer zone on either side (tapering off towards the substations). The study area includes a variety of landscape features that were identified during the Scoping phase of this EIA. Sensitive features, based on detailed Scoping investigations, have been delineated and appropriate buffer zones inserted around them in order to ensure that the power line does not cause unnecessary disturbances to the biophysical and/or socio-economic environment. A brief description of the need for and description of alternative route alignments follows as these alternatives are referred to throughout this report. The various route alignments (with alternatives) are shown in the map included in Appendix 2.

A number of obstacles have been encountered within the study area with respect to route alignments. In the northern section of the study area, the Neus se Berg mountain range represents a terrain obstacle to the feasible implementation of the transmission power line while the Thuru Game Lodge represents a tourism/visual impact that must be considered. Alternative routes 1A and 1B are put forward to accommodate these obstacles. In the southern section of the study area, the town of Kenhardt, the nearby quiver tree forest, Aasvoëlkop and Driekop se Poort mountain ranges necessitated the investigation of alternative alignments 2A, 2B and 2C.

Alternative 1A: This route alignment is located in the north-eastern section of the study area and travels around the north-western section of Neus se Berg in order to mitigate the impact of the transmission power line on the Thuru Game Lodge. This alignment would require the transmission power line to be routed through “virgin” land (little to no existing infrastructure such as roads).

Alternative 1B: In order to limit potential impacts on the receiving environment, this alignment has been put forward as it lies within close proximity to the existing Spoornet railway line and as such, sharing of the existing service road is envisaged. Additionally, by routing the transmission line within close proximity to the railway line, it is proposed that the significance of the visual impact of the transmission power line will be lowered because the railway line already adds a visual impact in the area.

Alternative 2A: Aasvoëlkop and Driekop se Poort ranges (rocky hills) in the southern section of the study area pose a terrain obstacle to the routing of the transmission power line. This alternative represents a possible alignment that diverts the transmission power line through more undulating plains to bypass these rocky hills.

Alternative 2B: The same logic was used as detailed in Alternative 1B above to try and keep the transmission power line as close to existing infrastructure (railway line) as possible to reduce impacts on pristine "virgin" land. This alignment proposes sharing the excavated pass of the railway line through the mountainous area.

Alternative 2C: This route alignment represents the most direct route for the transmission power line from the Aries substation to just north of the town of Kenhardt. 2C travels in a southerly direction with respect to Aasvoëlkop and Driekop se Poort ranges, just north of the quiver tree forest scenic area and the town of Kenhardt.

Common Routes: The central section of the study area represents the common route alignment as no alternatives to this section have been identified. This is due to the attempt to locate the route as close as possible to the railway line (to share the existing service road) in addition to the lack of obstacles and sensitive features in this area.

A more detailed description of the receiving environment as identified during the Scoping phase of this EIA is included in Appendix 1.2. Additional correspondence with DEAT on supplemental information pertaining to the Final Scoping Report is included in Appendix 1.3.

4 Specialist Assessment Findings

A range of specialist assessments have been undertaken to provide specialist input on impacts which have been identified during the course of this EIA. They include a Soil and Agricultural Study undertaken by the Agricultural Research Council (ARC), an Avifaunal Assessment undertaken by the Endangered Wildlife Trust (EWT), an Ecological Study undertaken by David Hoare Consulting cc., a Heritage Impact Assessment undertaken by the McGregor Museum (Kimberly), a Social Impact Assessment undertaken by Strategic Environmental Focus (SEF), a Visual Impact Assessment undertaken by Newtown Landscape Architects and finally, a Tourism Impact Assessment undertaken by ECO Africa.

The key findings of each of these specialist assessments are presented below.

4.1 Soil and Agricultural Study

A specialist soil and agricultural potential study was undertaken by Garry Patterson with the Agricultural Research Council (Institute of Soil Climate and Water) and a summary of his findings is included below. His complete report is included as Appendix 3.

4.1.1 Key findings of the Soil and Agricultural Study

Due to the linear nature of the proposed transmission power line, the study area comprises a number of broad soil patterns. In general, most of the area has red, shallow to very shallow, often calcareous soils on rock. There are small areas of deeper red and yellow soils in the south-west as well as a larger area of deeper red soils (some with dunes) in the north-east. The various broad soil patterns will have different dominant potential as far as farming systems and types of agriculture are concerned (although this will obviously vary with slope angle and soil depth).

The harsh climate of the area (200 mm rainfall per year, hot temperatures) is the main restricting factor for agriculture in the study area, no matter how favourable the soils might otherwise be. The entire area is classed as Land Capability Class VII or VIII (non-arable), due almost entirely to the shallow soils and dry climate. The only area with agricultural possibilities is the zone of alluvial soils along the Orange River, where irrigation might be applied.

Erosion of soils has been assessed and certain broad soil patterns may pose an increased chance of wind erosion however the majority of the study area has shallow, often rocky soils on which erosion is not a major concern. No preference for either of the alternative route alignments is given due to the relatively homogenous soils within the study area (all impacts have the same significance rating).

4.2 Avifaunal Impact Assessment

An assessment of the avifaunal presence in the area was undertaken by Jon Smallie of the Endangered Wildlife Trust (EWT) to determine the impact of the proposed transmission line on bird species and to

pose mitigation measures for identified negative impacts. The full avifaunal report is included in Appendix 4.

4.2.1 Key findings of the avifaunal study

The preferred 2 alignments from a bird impact perspective are Alternative 2B and Alternative 1B. This is primarily due to their shorter length and proximity to existing infrastructure. The impacts of the proposed power line on birds have been assessed in detail on an individual species basis for Red Data species and on a family level for non Red Data species. Those impacts that were rated overall as being of MEDIUM significance are described below:

Impact 1: Collision with earth wire

- Kori Bustard in the natural vegetation along the alignment, particularly drainage lines with woody vegetation.
- Ludwig's Bustard in natural vegetation along the alignment particularly the flat areas such as the pans and "wetlands".
- Secretary bird almost throughout the study area.
- Black Stork in river valleys and wetlands.
- Greater Flamingo at open water sources such as dams and pans.
- White Stork – particularly in arable lands and wetlands.
- Abdim's Stork at open water, arable lands and wetlands.
- Assorted non Red Data water birds and ibises in close association with water sources such as the river crossings.
- Assorted non Red Data korhaans in the natural vegetation areas.

Mitigation

- All sections of power line crossing drainage lines should be marked, only on the one relevant span.
- All sections of power line through or adjacent to the priority flats and wetlands, including one span either side.
- Power line crossing the Hartbeesrivier and Orange River and associated arable lands should be marked, including one span either side.
- Power line crossing or adjacent to any dams or open water sources should be marked, including one span either side.

- Since it would be impractical to mark the power line through all the natural vegetation areas to mitigate for collision of species such as Secretary bird, it is rather suggested that the power line be patrolled annually and areas where collisions have occurred can then be marked reactively.
- Marking of the power line should be according to the technical specifications contained in APPENDIX E of the specialist report(drawn up by Jose Clara from Trans Africa Projects).
- Due to the sensitivity of the "wetland"/pan/flats areas, the difficulty in distinguishing them from the surrounding habitat, and their apparent absence from the land cover and land use data sets - it will be necessary for the EWT to conduct a final "walk through" assessment once the exact alignment has been surveyed and each tower position has been pegged. This will allow the identification of exact spans of power line that will need to be marked with a suitable marking device.

Impact 2: Nesting on power line towers

- Assorted smaller non Red Data raptor species throughout the study area (positive impact)
- Sociable Weavers particularly in vicinity of Groblershoop

Mitigation

- The raptor nests should not require any management and should be left alone as far as possible
- The Sociable Weaver nests should be monitored closely and if they begin to pose problems then EWT should be consulted for recommendations on how best to manage them. Nest management recommendations may include nest removal in cases where no other species are breeding on the same nest, for example Pygmy Falcons and assorted other raptors. EWT is currently investigating the issue of Sociable Weaver nests on steel towers in other areas and should have a set of proven recommendations by the time Aries Garona is constructed.

Impact 3: Disturbance while breeding

- Martial Eagle in natural vegetation areas
- Assorted non Red Data raptor species such as Black Eagle, particularly close to the ridges

Mitigation

- All construction and maintenance activities should conform to generally accepted environmental best practice guidelines at all times. In particular, construction camps should preferably be placed in the towns and not close to natural vegetation so as to minimize the impact of illegal activities such as hunting, snaring firewood collection etc.
- The ECO for the project should attempt to identify any breeding pairs of raptors (or any other bird species) and report them to the EWT as early as possible in the construction phase so as

to allow adequate recommendations to be made with respect to minimising the impact on these birds.

4.3 Ecological Study

An ecological study was undertaken by Mr. David Hoare of David Hoare Consulting cc. The summary of the report is included below, whilst the entire report is included in Appendix 5.

4.3.1 Key findings of the ecological study

The site is on the boundary between two vegetation types, namely Kalahari Karroid Shrubland and Gordonia Duneveld, both of which are considered to have Medium sensitivity and importance for conservation. The study area enters the Griqualand West Centre of Plant Endemism close to Groblershoop. During the survey, 21 plant species were recorded, none of which are declared weeds or invader plants. Four plant species considered to be of conservation concern, namely *Hoodia gordonii*, *Brachiaria dura* var. *pilosa*, *Pterothrix tecta* and *Vahlia capensis* subsp. *ellipticifolia* could occur in the types of habitats found on the site, although they were not found during the survey. A single juvenile tree of the protected *Acacia haematoxylon* (protected in terms of the National Forests Act of 1998 (Act 84 of 1998)) was recorded on the site. Two reptiles and six birds have a medium to high chance of occurring in the study area due to geographical distribution and habitat preferences which coincide with that of the study area. These are the Black Spitting Cobra, the Beaked Blind Snake, the Black Harrier, the Kori Bustard, the Martial Eagle, the Ludwig's Bustard, the Lanner Falcon and Sclater's Lark. Of 54 species of butterfly that have a geographical range that includes the study area (out of a total of 666 for South Africa), only three have a slightly restricted range, of which one, the Dune copper, occurs in the type of habitats available on site. None are rare or truly restricted in distribution, and none are presently known to be threatened with extinction.

Impacts identified include increased noise pollution during construction, increased dust during construction, increased risk of veld fires, loss and fragmentation of habitats, spread of alien species, disturbance to sensitive ecosystems, impacts on populations of endemic and red data species, and impacts on the movement and migration of bird and animal species. The impacts of the proposed development are mostly of low significance. However, there is a high incidence of fatalities and injuries due to collisions with overhead power lines and fences for Ludwig's Bustard, the Peregrine Falcon and the Lanner Falcon. Such impacts are considered to be permanent to long-term at the regional scale and have MEDIUM negative significance at the scale of the proposed development. Recommendations are that existing access routes should be used as much as possible during construction and maintenance of the substation, limit disturbance to vegetation and rehabilitate disturbed vegetation as quickly as possible, ensure effective fire control at camp and construction sites during construction, sections of infrastructure that pose a hazard to Ludwig's bustard and other large birds should be marked with appropriate devices.

The identification of the protected tree species found on site, *Acacia haematoxylon*, will be confirmed during a detailed assessment of each pylon position (once known) and avoidance of all sensitive

species will be the first mitigation option for consideration. The report concludes that the proposed substation extension could have a negative impact on the conservation status of threatened plant or animal species or vegetation communities, but few of these impacts are considered to have a high significance due to the small size of the proposed development in relation to the surrounding areas. Mitigation can also reduce many of these impacts to a low level of significance. The impact of greatest concern is the high incidence of mortality of birds that is associated with electrocution by or impacts with power lines. The significance of this impact is evaluated in Section 6.3.1.5 with mitigation measures detailed and is also discussed in greater detail by the appointed avifaunal specialist.

4.4 Heritage Impact Assessment

Mr. David Morris with the McGregor Museum in Kimberly undertook a heritage impact assessment (HIA). Key findings of the HIA are detailed below while the complete report is included in Appendix 6.

4.4.1 Key findings of the HIA

Due to the lack of knowledge with respect to archaeological resources of the Cape region as stated in the attached HIA, there are no grounds presently for deciding between the alternative routes at the northern and southern sections of the development. Once the final route is decided and tower positions known, a selection of the latter that are deemed to be in potentially more sensitive locales will be inspected more closely prior to construction.

4.5 Social Impact Assessment

Ms. Ilse Aucamp from Strategic Environmental Focus (SEF) undertook the Social Impact Assessment (SIA). The key findings of the SIA are detailed below while the complete SIA report is included in Appendix 7.

4.5.1 Key findings of the SIA

The general perception of the community is that development is necessary, and although no one would want a power line to cut across their property, they do understand the need. The community in general prefer the alignment adjacent to the existing railway and associated service road, with some exceptions.

The following recommendations are made on the basis of the Social Impact Assessment study and conversations with the local community:

- It is recommended that a Community Management and Monitoring Committee (CMMC) must be established. This committee would serve as a communication channel between the community and ESKOM. Members of the committee should include representatives from environmental groups, civil society, ward councillors, government departments, construction teams and Eskom. Such a committee will play an important role in executing the proposed mitigation measures.
- The CMMC must meet on a monthly basis during the construction phase.

- Local people should be utilised in the construction and operation of the project as far as possible. This will minimise the risk of conflict between locals and new comers, and obviate the need for developing temporary housing for construction workers. Since it is expected that there will be an influx of newcomers to the community as result of the proposed development, a system should be in place to ensure that people getting first option on jobs are permanent residents of the area and have been for a while. It is therefore suggested that a list of local contractors and service providers must be compiled by the municipality. Contractors and suppliers can then be chosen from the list. The CMMC should act as a watch dog.
- Local materials and suppliers should be used for construction as far as possible.
- The local community must not be exploited. If they are employed, they should receive proper contracts in accordance with the Labour Act.
- The possible crime problem in the area is of great concern. All sectors of the community must be encouraged to become involved in community policing. The local authority should specifically be made aware of the impact that the influx of new people can have on services like the police in the area.
- Eskom must liaise with the farmer's unions and a protocol for gaining access to farms should be established and distributed to all parties involved. The impact of careless conduct of contractors must be acknowledged and the contractors should go through induction to explain the possible consequences of behaviour like leaving a gate open and driving off road.
- Construction teams should be clearly identified by wearing uniforms or identification cards that should be exhibited in a visible place on their body.
- Farmers should be consulted about the exact placing of structures on their properties.
- The proposed route should not break fields or run to close to houses.
- An Environmental Control Officer must be appointed to ensure contractors conduct themselves in an appropriate way.
- Cumulative impacts of linear developments in the area must be taken in account, and the relevant role players (Transnet, Telkom, Eskom) should strategise and compile a strategic framework. Existing infrastructure must be utilised and shared as far as possible and may include sharing of the existing Spoornet service road adjacent to the railway line.
- Eskom Distribution must be made aware of the needs of the community and engage in discussions about possible solutions with the local municipality to ensure that the impacted community will share in the benefits of the project. Electricity supply to farms and the surrounding community should be a priority given the fact that these people are directly impacted on without receiving any benefits.

Community consultation throughout the project is imperative and the community and Eskom should work together to obtain the best solution. The community stressed the importance of good neighbourly relationships, especially because the history of their relationship with Eskom. Across the board farmers

and community members expressed dissatisfaction with the fact that the power line will cross their community while they do not have access to electricity. It is imperative that this must be addressed by Eskom in order to avoid the formation of social pressure groups in the society.

From a social perspective, the various alternative alignments put forward are all considered of low significance due to the low population densities in these areas. The majority of the population within the area live in the town of Kenhardt and Groblershoop as well as in Wegdraai settlement.

4.6 Visual Impact Assessment

Mr. Graham Young of Newtown Landscape Architects undertook the Visual Impact Assessment. The key findings of the VIA are detailed below while the entire report is included in Appendix 8.

4.6.1 Key findings of the VIA

Alternative 2C (refer to the map in Appendix 2) is rated to have the greatest potential impact on the visual environment. Its impact is *high* i.e. where the impact must have an influence on the decision process to develop in the area. Although there are minor differences in the impact rating for the other alignments, they are all *medium* i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated.

The following route alignment is therefore proposed from a visual point of view, as it would have the least impact on the visual environment:

Northern section:	Alternative 1B
Central section:	Common section
Southern section:	Alternative 2A

It is *highly probable* that the proposed 400kv transmission power line will have at least a *medium negative* impact on the *local* visual environment in the *short term* during the construction phase. During the operational phase, the significance of impact is predicted to be *medium* in the *long term* i.e. the impact will only cease after the operational life span of the project, and *high* for Alternative 2C should it be selected.

Mitigation measures are not feasible after the route has been chosen i.e. mitigation can only take place in the routing of the line to avoid conflict areas. Therefore mitigation of any significant kind is not achievable during the operational phase.

4.7 Tourism Assessment

Mr. Mark Thornton of ECO Africa undertook the Tourism study. The key findings of the tourism study are detailed below while the entire report is included in Appendix 9.

4.7.1 Key findings of the Tourism study

The potential issues which have been investigated in planning the location of a transmission line linking Garona and Aries substations are described below. **Visual impacts** and potential **disruption from construction activities** are the greatest possible issues in terms of tourism.

Visual impacts

Tourism is a sensitive industry based primarily on subjective perspectives of visitors to an area. In destinations where tourism is focused on outdoors or based on natural elements, such as wilderness, sky, rivers, veld and wildlife, the tourism value rests largely on the experience which can be provided. The study area is such an area, and there is potential for negative visual impacts on tourism from the erection of a transmission line.

For people coming from overseas or even from other parts of South Africa who are seeking a pure experience in the wilderness, it is possible that they will not want the view, which they have sought out, obscured by an electricity line. Such visual impacts can be put into perspective based on whether or not other visual impacts already exist. In areas with no such infrastructure, such as pristine areas as found in national parks, infrastructure development such as transmission lines may have significant impacts on the tourism experience and tourism value of an area and pose a threat to local and regional tourism industries. For other areas, where the scenic integrity has already been affected by other developments, the impacts may be acceptable. The Interested and Affected Parties, specifically those owners and managers of existing and emerging tourism facilities, have been consulted as to their sentiments about possible detrimental or acceptable impacts on their businesses.

Disruption from construction activities

There is also the potential that construction activities carried out in close proximity to tourism enterprises or to places where tourists visit will negatively impact on and detract from the tourist experience. Such impacts could include noise, site disturbance during the construction phase, dust from vehicles and visual and aesthetic impacts from such construction and crew camps on the feeling of tourists having a serene and secluded nature experience. The location of work camps in close proximity to tourism enterprises can also be a potential issue in terms of noise, light, and feelings of solitude that tourists are seeking out.

5 Comparative Assessment of Alternative Route Alignments

Based on the significance ratings for route alignments received from the various specialists, a comparative assessment of alternative alignments is put forward in order to highlight which alignment would potentially result in the least significant impact on the receiving environment. Impact tables for each of the route alignments are presented below and represent only the individual impacts that differ between the route alignments. In the event that impacts that are common to all route alternatives have the same significance rating (e.g. soils have equal significance ratings per route alternative), these impacts are not included in the comparative assessment, as they would cancel each other out when summed together and thereby provide no additional insight to the comparative assessment. As such, social impacts, heritage impacts and soil impacts are excluded from this section due to no particular preference for alternative routes given by the relevant specialists.

The main impacts on the alternative route alignments deal predominantly with ecological, avifaunal, visual and tourism impacts. From a heritage and soils (agricultural) perspective, none of the alternatives are highlighted as sensitive and all route alignments are given equal significance ratings. From a social perspective, the route alignments are all located some distance from populated areas and thus no particular route alignment is preferred. In terms of tourism impacts, the Thuru Lodge located near alternative 1B and the Quiver Tree Forest scenic area located near Alternative 2B and 2C have been identified.

The comparative assessment is presented in this section and is structured such that each section of the study area (northern and southern) and the particular alternatives are assessed in terms of their potential impacts and then compared.

5.1 Impacts with respect to the northern section of the study area

Within the northern section of the study area (refer to map in Appendix 2), two alternative route alignments (1A and 1B) are presented as a means of traversing the Neus se Berg mountain range. A discussion of these alternatives follows.

5.1.1 Alternative 1A

This is the northeastern alternative that passes around the northern side of Neus se Berg.

The most significant impact associated with this alternative is from an ecological perspective. This section covers approximately 32.9 km's of habitat classified as having Low ecological sensitivity, 10.5 km's with Medium sensitivity and 1.2 km's with High sensitivity. The High sensitivity section is the crossing of the low mountain range. The vegetation along these ridges is classified as Lower Gariep Broken Veld, which from a natural vegetation perspective is considered to have a HIGH sensitivity to disturbance by the proposed development for the following reasons:

1. There is a chance that this vegetation unit would support populations of threatened plant or animal species, including *Aloe dichotoma* subsp. *dichotoma*, the Black Spitting Cobra and the Beaked Blind Snake, as well as the sensitive plant species, *Hoodia gordonii*;

2. Two endemic plant species are found in this vegetation type;
3. The vegetation contains endemics belonging to the Griqualand West or Gariep Centres of Endemism (van Wyk & Smith 2001), namely. *Digitaria polyphylla* and *Crassula corallina* subsp. *macrorrhiza;*
4. The vegetation structure is medium and sparse and therefore could be affected by overhead power lines.

The areas classified as having medium sensitivity under this route are mostly those classified as Gordonia Dunes, but includes areas unaffected by existing infrastructure. This alternative would therefore potentially result in new fragmentation of these areas.

Impact tables reflecting the potential ecological impacts on alternative 1A (only impacts which differ across the various alternatives) are presented below. Detailed discussions of these impacts are presented in the ecological specialist report (Appendix 5).

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Increased risk of veld fires leading to damage of sensitive habitats or populations of sensitive plant species or vegetation production	No	Negative	3	1	4	3	24 **Low**
	Yes	Negative	3	1	3	2	14 **Low**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the powerline route • Ensure effective fire-control at camp and construction sites of construction crew • Raise awareness of necessity for fire-control • Institute management system to react to veld fires that do occur						

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Loss of portions of sensitive habitats	No	Negative	2	5	8	4	60 **High**
	Yes	Negative	1	5	8	3	42 **Medium**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the powerline route. • Use existing access roads as service and construction roads, where possible						

	• Avoid medium to tall vegetation in planning the powerline route • Assess the planned pylon sites individually for sensitive features

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Fragmentation of sensitive habitats	No	Negative	2	5	5	4	52 **Medium**
	Yes	Negative	3	5	5	2	26 **Low**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the powerline route. • If it is necessary to cross potentially sensitive areas, then attempt to do so in a manner that will cause the least amount of fragmentation. • Use existing access roads as service and construction roads, where possible.						

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Disturbance to sensitive ecosystems	No	Negative	2	5	7	3	42 **Medium**
	Yes	Negative	2	5	5	2	24 **Low**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the powerline route. • Avoid populations of species of special concern, e.g. *Aloe dichotoma*, when planning the powerline route.						

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Impacts on populations of endemic and red data species	No	Negative	3	5	7	3	45 **Medium**
	Yes	Negative	3	5	5	1	13 **Low**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment • Avoid populations of species of special concern, e.g. *Aloe dichotoma*						

From an avifaunal perspective, the collision of various species with the earth wire as well as disturbance while breeding are impacts that differ between the various alternatives. These two impacts (applicable to alternative 1A) are presented in the tables below:

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Collision of various species with the earth wire	No	Negative	1	4	8	4	52 **Medium**
	Yes	Negative	1	4	4	4	36 **Medium**
Corrective / Mitigation Measures	• All sections of line crossing drainage lines should be marked, only on the one relevant span • All sections of line through or adjacent to the priority flats and wetlands, including one span either side • Line crossing the Hartbeesrivier and Orange River and associated arable lands should be marked, including one span either side • Line crossing or adjacent to any dams or open water should be marked, including one span either side • Since it would be impractical to mark the line through all the natural vegetation areas to mitigate for collision of species such as Secretary bird bird, it is rather suggested that the line be patrolled annually and areas where collisions have occurred can then be marked reactively • Marking of the power line should be according to the technical specifications contained in APPENDIX E (drawn up by Jose Clara from Trans Africa Projects) • **Due to the sensitivity of the "wetland"/pan/flats areas, the difficulty in distinguishing them from the surrounding habitat, and their apparent absence from the land cover and land use data sets - it will be necessary for the EWT to conduct a final "walk through" assessment once the exact alignment has been surveyed and each tower position has been pegged. This will allow the identification of exact spans of line that will need to be marked with a suitable marking device**						

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Disturbance while breeding	No	Negative	2	2	6	3	30 **Medium**
	Yes	Negative	2	2	4	3	24 **Low**
Corrective / Mitigation Measures	• All construction and maintenance activities should conform to generally accepted environmental best practice guidelines at all times. In particular, construction camps should preferably be placed in the towns and not close to natural vegetation so as to minimize the impact of illegal activities such as hunting, snaring firewood collection etc. • The ECO for the project should attempt to identify any breeding pairs of						

	raptors (or any other bird species) and report them to the EWT as early as possible in the construction phase so as to allow adequate recommendations to be made with respect to minimising the impact on these birds.

From a visual perspective, the transmission power line will cause a notable change in landscape characteristics over an extensive area that will result in major changes in key views (from the N10 road and from the Orange River). Mitigation of this impact is not possible as the impact is based on the presence of the transmission power line in the area and once constructed, the visual impact is encountered.

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Notable change in landscape characteristics over an extensive area (alternative 1A) and/or intensive change over a localized area resulting in major changes in key views (from N10 and at Orange River)	No	Negative	2	4	8	4	56 **Medium**
	Not possible to mitigate once constructed (therefore no change in significance)	Negative	2	4	8	4	56 **Medium**
Corrective / Mitigation Measures	• No amount of corrective measures will reduce the impact of the visual appearance of the transmission power line once constructed.						

While the power line will cause a notable change in landscape characteristics, the potential significance of impacts on tourism are perceived as MEDIUM to LOW as few tourism activities are currently taking place in the immediate vicinity of this routing.

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Impact on tourism	No	Negative	2	4	4	3	30 **Medium**
	Not possible to mitigate once constructed (therefore no change in significance)	Negative	2	4	4	3	30 **Medium**
Corrective /	• No amount of corrective measures will reduce the impact of the						

Mitigation Measures	appearance of the transmission power line once constructed.

5.1.2 Alternative 1B

This is the northeastern alternative that passes around the southern side of Neus se Berg.

From both an ecological perspective as well as a visual perspective, alternative 1B is preferred over alternative 1A for reasons discussed below.

This section covers approximately 31.1 km's of habitat classified as having Low ecological sensitivity, 16.3 km's with Medium sensitivity and 0.4 km's with High sensitivity. The High sensitivity section is the crossing of the low mountain range, as discussed for option 1A, but the crossing is positioned through a pass where there is already an existing road and railway line. The areas classified as having medium sensitivity under this route are mostly those classified as Gordonia Dunes, but in areas where there is already an existing road network.

Impact tables reflecting the potential ecological impacts on alternative 1B (only impacts which differ across the various alternatives) are presented below. Detailed discussions of these impacts are presented in the ecological specialist report (Appendix 5).

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Increased risk of veld fires leading to damage of sensitive habitats or populations of sensitive plant species or vegetation production	No	Negative	3	1	4	3	24 **Low**
	Yes	Negative	3	1	3	2	14 Low
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the powerline route • Ensure effective fire-control at camp and construction sites of construction crew • Raise awareness of necessity for fire-control • Institute management system to react to veld fires that do occur						

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	

Loss of portions of sensitive habitats	No	Negative	2	5	4	2	22 **Low**
	Yes	Negative	1	5	4	1	14 **Low**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the powerline route. • Use existing access roads as service and construction roads, where possible • Avoid medium to tall vegetation in planning the powerline route • Assess the planned pylon sites individually for sensitive features						

Issue/Impact	**Corrective measures**	**Impact**					**Significance**
		Nature	Extent	Duration	Magnitude	Probability	
Fragmentation of sensitive habitats	No	Negative	3	5	3	2	22 **Low**
	Yes	Negative	3	5	3	1	11 **Low**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the powerline route. • If it is necessary to cross potentially sensitive areas, then attempt to do so in a manner that will cause the least amount of fragmentation. • Use existing access roads as service and construction roads, where possible						

Issue/Impact	**Corrective measures**	**Impact**					**Significance**
		Nature	Extent	Duration	Magnitude	Probability	
Disturbance to sensitive ecosystems	No	Negative	2	5	5	2	24 **Low**
	Yes	Negative	2	5	4	1	22 **Low**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the powerline route • Avoid populations of species of special concern, e.g. *Aloe dichotoma*, when planning the powerline route						

Issue/Impact	**Corrective measures**	**Impact**					**Significance**
		Nature	Extent	Duration	Magnitude	Probability	
Impacts on populations of endemic and red data species	No	Negative	3	5	4	2	24 **Low**

	Yes	Negative	3	5	2	1	10 **Low**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment • Avoid populations of species of special concern, e.g. *Aloe dichotoma*						

From an avifaunal perspective, alternative 1B is preferred to alternative 1A due to the already disturbed nature of the area (existing railway line). This alignment will result in the least significant impact on the receiving environment with the inclusion of mitigation measures. From an avifaunal perspective, the collision of various species with the earth wire as well as disturbance while breeding are impacts that differ between the various alternatives. These two impacts (applicable to alternative 1B) are presented in the tables below:

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Collision of various species with the earth wire	No	Negative	1	4	6	4	44 **Medium**
	Yes	Negative	1	4	2	4	28 **Low**
Corrective / Mitigation Measures	• All sections of power line crossing drainage lines should be marked, only on the one relevant span • All sections of line through or adjacent to the priority flats and wetlands, including one span either side • Power line crossing the Hartbeesrivier and Orange River and associated arable lands should be marked, including one span either side • Power line crossing or adjacent to any dams or open water should be marked, including one span either side • Since it would be impractical to mark the line through all the natural vegetation areas to mitigate for collision of species such as Secretary bird bird, it is rather suggested that the line be patrolled annually and areas where collisions have occurred can then be marked reactively • Marking of the line should be according to the technical specifications contained in APPENDIX E (drawn up by Jose Clara from Trans Africa Projects) • **Due to the sensitivity of the "wetland"/pan/flats areas, the difficulty in distinguishing them from the surrounding habitat, and their apparent absence from the land cover and land use data sets - it will be necessary for the EWT to conduct a final "walk through" assessment once the exact alignment has been surveyed and each tower position has been pegged. This will allow the identification of exact spans of line that will need to be marked with a suitable marking device**						

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	

Disturbance while breeding	No	Negative	2	2	4	3	24	**Low**
	Yes	Negative	2	2	2	3	18	**Low**
Corrective / Mitigation Measures	• All construction and maintenance activities should conform to generally accepted environmental best practice guidelines at all times. In particular, construction camps should preferably be placed in the towns and not close to natural vegetation so as to minimize the impact of illegal activities such as hunting, snaring firewood collection etc. • The ECO for the project should attempt to identify any breeding pairs of raptors (or any other bird species) and report them to the EWT as early as possible in the construction phase so as to allow adequate recommendations to be made with respect to minimising the impact on these birds.							

From a visual perspective, the transmission power line will cause a moderate change in landscape characteristics over the localized area (along the public road and at Thuru Lodge) resulting in a moderate change to key views. Additionally, from a tourism perspective and through correspondence with the owner of the Thuru Game Lodge, it was conveyed that there may be a proposal to extend the game lodge in a northerly direction in the near future and that the proposed transmission power line would then bisect the game farm should the proposed extension proceed. However, taking into consideration that the existing railway line currently bisects the "proposed" game farm boundaries, this impact of the transmission line is considered more acceptable than the ecological impact of route 1A.

Issue/Impact	**Corrective measures**	**Impact**					**Significance**	
		Nature	Extent	Duration	Magnitude	Probability		
Moderate change in landscape characteristics over a localized area (along the public road and at Thuru Lodge) resulting in a moderate change to key views. Operational activities will add to the cumulative negative effect on the visual quality of the landscape	No	Negative	2	4	6	4	48	**Medium**
	Not possible to mitigate once constructed (therefore no change in significance)	Negative	2	4	6	4	48	**Medium**
Corrective / Mitigation Measures	• No amount of corrective measures will reduce the impact of the visual appearance of the transmission power line once constructed.							

The power line will cause a moderate change in landscape characteristics over a localized area, however the significance of potential impacts on tourism are perceived as MEDIUM to HIGH, as this option involves routing the power line within close proximity to Thuru Lodge.

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Impact on tourism (Thuru Lodge)	No	Negative	2	4	8	4	56 **Medium**
	Not possible to mitigate once constructed (therefore no change in significance)	Negative	2	4	8	4	56 **Medium**
Corrective / Mitigation Measures	• No amount of corrective measures will reduce the impact of the appearance of the transmission power line once constructed.						

5.2 Impacts with respect to the southern section of the study area

Three alternatives are proposed in the southern section of the study area. Alternative Route 2A is proposed in order to minimise the visual impact of the proposed power line on the Quiver Tree Forest (a scenic area of this endangered tree species). Alternative Route 2B is proposed in order to align the transmission power line with the existing railway line as far as possible and Alternative Route 2C is proposed as this route alignment provides the shortest route and thus a significant cost saving (R4.5 – R15 million) to Eskom Holdings Limited Transmission Services.

5.2.1 Alternative 2A

This is the south-western alternative that passes slightly northwards around the western side of Kenhardt.

This section covers approximately 34.9 km's of habitat classified as having Low ecological sensitivity, 0.1 km's with Medium sensitivity and 0.0 km's with High sensitivity. The area classified as having medium sensitivity under this route is a small piece of Gordonia Dunes that will be affected by the Common portion of the route irrespective of whether alternative 2A or 2B is selected.

Impact tables reflecting the potential ecological impacts on alternative 2A (only impacts which differ across the various alternatives) are presented below. Detailed discussions of these impacts are presented in the ecological specialist report (Appendix 5).

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	

Increased risk of veld fires leading to damage of sensitive habitats or populations of sensitive plant species or vegetation production	No	Negative	3	1	3	2	14 **Low**
	Yes	Negative	3	1	3	1	7 **Low**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the powerline route • Ensure effective fire-control at camp and construction sites of construction crew • Raise awareness of necessity for fire-control • Institute management system to react to veld fires that do occur						

Issue/Impact	**Corrective measures**	**Impact**					**Significance**
		Nature	Extent	Duration	Magnitude	Probability	
Loss of portions of sensitive habitats	No	Negative	2	5	3	2	20 **Low**
	Yes	Negative	1	5	3	1	9 **Low**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the powerline route. • Use existing access roads as service and construction roads, where possible • Avoid medium to tall vegetation in planning the powerline route • Assess the planned pylon sites individually for sensitive features						

Issue/Impact	**Corrective measures**	**Impact**					**Significance**
		Nature	Extent	Duration	Magnitude	Probability	
Fragmentation of sensitive habitats	No	Negative	3	5	2	2	20 **Low**
	Yes	Negative	3	5	2	1	10 **Low**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the powerline route. • If it is necessary to cross potentially sensitive areas, then attempt to do so in a manner that will cause the least amount of fragmentation. • Use existing access roads as service and construction roads, where possible						

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Disturbance to sensitive ecosystems	No	Negative	2	5	4	2	22 **Low**
	Yes	Negative	2	5	3	1	10 **Low**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the powerline route • Avoid populations of species of special concern, e.g. *Aloe dichotoma*, when planning the power line route						

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Impacts on populations of endemic and red data species	No	Negative	3	5	3	2	22 **Low**
	Yes	Negative	3	5	2	1	10 **Low**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment • Avoid populations of species of special concern, e.g. *Aloe dichotoma*						

From an avifaunal perspective, the collision of various species with the earth wire as well as disturbance while breeding are impacts that differ between the various alternatives. These two impacts (applicable to alternative 2A) are presented in the tables below:

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Collision of various species with the earth wire	No	Negative	1	4	8	4	52 **Medium**
	Yes	Negative	1	4	4	4	36 **Medium**
Corrective / Mitigation Measures	• All sections of power line crossing drainage lines should be marked, only on the one relevant span • All sections of power line through or adjacent to the priority flats and wetlands, including one span either side • Power line crossing the Hartbeesrivier and Orange River and associated arable lands should be marked, including one span either side • Line crossing or adjacent to any dams or open water should be marked, including one span either side • Since it would be impractical to mark the line through all the natural						

	vegetation areas to mitigate for collision of species such as Secretary bird bird, it is rather suggested that the line be patrolled annually and areas where collisions have occurred can then be marked reactively • Marking of the power line should be according to the technical specifications contained in APPENDIX E (drawn up by Jose Clara from Trans Africa Projects) • **Due to the sensitivity of the "wetland"/pan/flats areas, the difficulty in distinguishing them from the surrounding habitat, and their apparent absence from the land cover and land use data sets - it will be necessary for the EWT to conduct a final "walk through" assessment once the exact alignment has been surveyed and each tower position has been pegged. This will allow the identification of exact spans of line that will need to be marked with a suitable marking device**

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Disturbance while breeding	No	Negative	2	2	6	3	30 **Medium**
	Yes	Negative	2	2	4	3	24 **Low**
Corrective / Mitigation Measures	• All construction and maintenance activities should conform to generally accepted environmental best practice guidelines at all times. In particular, construction camps should preferably be placed in the towns and not close to natural vegetation so as to minimize the impact of illegal activities such as hunting, snaring firewood collection etc. • The ECO for the project should attempt to identify any breeding pairs of raptors (or any other bird species) and report them to the EWT as early as possible in the construction phase so as to allow adequate recommendations to be made with respect to minimising the impact on these birds.						

Visually, alternative 2A will cause a small change in landscape characteristics over a localized area resulting in a minor change to a few key views. From a visual perspective, alternative 2A is preferable to alternative 2B and 2C.

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Small change in landscape characteristics over a localized area resulting in a minor change to certain key views	No	Negative	2	4	4	4	40 **Medium**

	Not possible to mitigate once constructed (therefore no change in significance)	Negative	2	4	4	4	40 **Medium**
Corrective / Mitigation Measures	• No amount of corrective measures will reduce the impact of the visual appearance of the transmission power line once constructed.						

With few existing tourism activities taking place in this section and the significance of changes to the landscape and key views being minor, the significance of any potential impacts on tourism have been assessed as LOW.

Issue/Impact	**Corrective measures**	**Impact**					**Significance**
		Nature	Extent	Duration	Magnitude	Probability	
Impact on tourism	No	Negative	2	4	2	3	24 **Low**
	Not possible to mitigate once constructed (therefore no change in significance)	Negative	2	4	2	3	24 **Low**
Corrective / Mitigation Measures	• No amount of corrective measures will reduce the impact of the visual appearance of the transmission power line once constructed.						

5.2.2 Alternative 2 B

This is the south-western alternative that passes slightly southwards around the western side of Kenhardt.

This section covers approximately 29.2 km's of habitat classified as having Low ecological sensitivity, 0.1 km's with Medium sensitivity and 0.4 km's with High sensitivity. The High sensitivity section is the crossing of a low ridge west of Kenhardt, but the crossing is positioned through a pass where there is already an existing road and railway line. The area classified as having medium sensitivity under this route is a small piece of Gordonia Dunes that will be affected by the Common portion of the route irrespective of whether alternative 2A or 2B is selected.

Impact tables reflecting the potential ecological impacts on alternative 2B (only impacts which differ across the various alternatives) are presented below. Detailed discussions of these impacts are presented in the ecological specialist report (Appendix 5).

Issue/Impact	**Corrective measures**	**Impact**	**Significance**

		Nature	Extent	Duration	Magnitude	Probability	
Increased risk of veld fires leading to damage of sensitive habitats or populations of sensitive plant species or vegetation production	No	Negative	3	1	4	3	24 **Low**
	Yes	Negative	3	1	3	2	14 **Low**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the power line route • Ensure effective fire-control at camp and construction sites of construction crew • Raise awareness of necessity for fire-control • Institute management system to react to veld fires that do occur						

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Loss of portions of sensitive habitats	No	Negative	2	5	4	3	33 **Medium**
	Yes	Negative	1	5	4	1	10 **Low**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the powerline route. • Use existing access roads as service and construction roads, where possible • Avoid medium to tall vegetation in planning the powerline route • Assess the planned pylon sites individually for sensitive features						

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Fragmentation of sensitive habitats	No	Negative	3	5	2	2	20 **Low**
	Yes	Negative	3	5	2	1	10 **Low**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the powerline route. • If it is necessary to cross potentially sensitive areas, then attempt to do so in a manner that will cause the least amount of fragmentation. • Use existing access roads as service and construction roads, where possible						

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Disturbance to sensitive ecosystems	No	Negative	2	5	5	2	24 **Low**
	Yes	Negative	2	5	3	1	10 **Low**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the powerline route • Avoid populations of species of special concern, e.g. *Aloe dichotoma*, when planning the powerline route						

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Impacts on populations of endemic and red data species	No	Negative	3	5	3	2	22 **Low**
	Yes	Negative	3	5	2	1	10 **Low**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment • Avoid populations of species of special concern, e.g. *Aloe dichotoma*						

From an avifaunal perspective, alternative 2B is preferred over 2A as this alignment is closer to the existing district road and railway line (existing sources of disturbance). Mitigation measures (detailed in the table below) will help reduce the impact of this route alignment to lower levels. The collision of various species with the earth wire as well as disturbance while breeding are impacts that differ between the various alternatives. These two impacts (applicable to alternative 2B) are presented in the tables below:

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Collision of various species with the earth wire	No	Negative	1	4	6	4	44 **Medium**
	Yes	Negative	1	4	2	4	28 **Low**
Corrective / Mitigation Measures	• All sections of power line crossing drainage lines should be marked, only on the one relevant span • All sections of power line through or adjacent to the priority flats and wetlands, including one span either side • Power line crossing the Hartbeesrivier and Orange River and associated						

	arable lands should be marked, including one span either side • Power line crossing or adjacent to any dams or open water should be marked, including one span either side • Since it would be impractical to mark the power line through all the natural vegetation areas to mitigate for collision of species such as Secretary bird bird, it is rather suggested that the power line be patrolled annually and areas where collisions have occurred can then be marked reactively • Marking of the power line should be according to the technical specifications contained in APPENDIX E (drawn up by Jose Clara from Trans Africa Projects) • **Due to the sensitivity of the "wetland"/pan/flats areas, the difficulty in distinguishing them from the surrounding habitat, and their apparent absence from the land cover and land use data sets - it will be necessary for the EWT to conduct a final "walk through" assessment once the exact alignment has been surveyed and each tower position has been pegged. This will allow the identification of exact spans of line that will need to be marked with a suitable marking device**

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Disturbance while breeding	No	Negative	2	2	4	3	24 **Low**
	Yes	Negative	2	2	2	3	18 **Low**
Corrective / Mitigation Measures	• All construction and maintenance activities should conform to generally accepted environmental best practice guidelines at all times. In particular, construction camps should preferably be placed in the towns and not close to natural vegetation so as to minimize the impact of illegal activities such as hunting, snaring firewood collection etc. • The ECO for the project should attempt to identify any breeding pairs of raptors (or any other bird species) and report them to the EWT as early as possible in the construction phase so as to allow adequate recommendations to be made with respect to minimising the impact on these birds.						

Visually, the transmission power line will cause a moderate change in landscape characteristics over an extensive area (views from Quiver Tree Forest) resulting in a moderate change to key views. Thus from a visual perspective, alternative 2A is preferable to alternative 2B and 2C.

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Moderate change in landscape characteristics over an extensive area (Quiver Tree Forest National Monument) resulting in a moderate	No	Negative	2	4	6	4	48 **Medium**

	Not possible to mitigate once constructed (therefore no change in significance)	Negative	2	4	6	4	48 **Medium**
Corrective / Mitigation Measures	• No amount of corrective measures will reduce the impact of the visual appearance of the transmission power line once constructed.						

The transmission power line will cause a moderate change in landscape characteristics, however the potential impact on tourism of this alternative has been assessed as MEDIUM as this routing would impact to a degree on the Quiver Tree Forest National Monument which is in the nearby vicinity.

Issue/Impact	**Corrective measures**	**Impact**					**Significance**
		Nature	Extent	Duration	Magnitude	Probability	
Impact on tourism (Quiver Tree Forest National Monument)	No	Negative	2	4	4	4	40 **Medium**
	Not possible to mitigate once constructed (therefore no change in significance)	Negative	2	4	4	4	40 Medium
Corrective / Mitigation Measures	• No amount of corrective measures will reduce the impact of the appearance of the transmission power line once constructed.						

5.2.3 Alternative 2 C

This is the most southerly of the southwestern alternatives and passes slightly southwards around the western side of Kenhardt. This section covers approximately 36.4 km's of habitat classified as having Low ecological sensitivity, 7.0 km's with Medium sensitivity and 0.5 km's with High sensitivity. The High sensitivity section is the crossing of a low ridge west of Kenhardt. The area classified as having medium sensitivity under this route is a small piece of Bushmanland Basin Shrubland. Vegetation types crossed by this route are Bushmanland Arid Grassland, Bushmanland Basin Shrubland and a small amount of Lower Gariep Broken Veld.

Impact tables reflecting the potential ecological impacts on alternative 2B (only impacts which differ across the various alternatives) are presented below. Detailed discussions of these impacts are presented in the ecological specialist report (Appendix 5).

Issue/Impact	**Corrective measures**	**Impact**					**Significance**
		Nature	Extent	Duration	Magnitude	Probability	

Increased risk of veld fires leading to damage of sensitive habitats or populations of sensitive plant species or vegetation production	No	Negative	3	1	4	3	24 **Low**
	Yes	Negative	3	1	3	2	14 **Low**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the power line route • Ensure effective fire-control at camp and construction sites of construction crew • Raise awareness of necessity for fire-control • Institute management system to react to veld fires that do occur						

Issue/Impact	**Corrective measures**	**Impact**					**Significance**
		Nature	Extent	Duration	Magnitude	Probability	
Loss of portions of sensitive habitats	No	Negative	2	5	4	3	33 **Medium**
	Yes	Negative	1	5	4	1	10 **Low**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the powerline route. • Use existing access roads as service and construction roads, where possible • Avoid medium to tall vegetation in planning the powerline route • Assess the planned pylon sites individually for sensitive features						

Issue/Impact	**Corrective measures**	**Impact**					**Significance**
		Nature	Extent	Duration	Magnitude	Probability	
Fragmentation of sensitive habitats	No	Negative	3	5	2	2	20 **Low**
	Yes	Negative	3	5	2	1	10 **Low**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the powerline route. • If it is necessary to cross potentially sensitive areas, then attempt to do so in a manner that will cause the least amount of fragmentation. • Use existing access roads as service and construction roads, where possible						

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Disturbance to sensitive ecosystems	No	Negative	2	5	3	2	20 **Low**
	Yes	Negative	2	5	2	1	9 **Low**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the power line route • Avoid populations of species of special concern, e.g. *Aloe dichotoma*, when planning the powerline route						

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Impacts on populations of endemic and red data species	No	Negative	3	5	3	2	22 **Low**
	Yes	Negative	3	5	2	1	10 **Low**
Corrective / Mitigation Measures	• Avoid sensitive habitats, as defined in the sensitivity assessment • Avoid populations of species of special concern, e.g. *Aloe dichotoma*						

From an avifaunal perspective, the collision of various species with the earth wire as well as disturbance while breeding are impacts that differ between the various alternatives. These two impacts (applicable to alternative 2C) are presented in the tables below:

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Collision of various species with the earth wire	No	Negative	1	4	8	4	52 **Medium**
	Yes	Negative	1	4	4	4	36 **Medium**
Corrective / Mitigation Measures	• All sections of line crossing drainage lines should be marked, only on the one relevant span • All sections of line through or adjacent to the priority flats and wetlands, including one span either side • Line crossing the Hartbeesrivier and Orange River and associated arable lands should be marked, including one span either side • Line crossing or adjacent to any dams or open water should be marked, including one span either side • Since it would be impractical to mark the line through all the natural						

	vegetation areas to mitigate for collision of species such as Secretary bird, it is rather suggested that the line be patrolled annually and areas where collisions have occurred can then be marked reactively • Marking of the line should be according to the technical specifications contained in APPENDIX E (drawn up by Jose Clara from Trans Africa Projects) • **Due to the sensitivity of the "wetland"/pan/flats areas, the difficulty in distinguishing them from the surrounding habitat, and their apparent absence from the land cover and land use data sets - it will be necessary for the EWT to conduct a final "walk through" assessment once the exact alignment has been surveyed and each tower position has been pegged. This will allow the identification of exact spans of line that will need to be marked with a suitable marking device**

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Disturbance while breeding	No	Negative	2	2	6	3	30 **Medium**
	Yes	Negative	2	2	4	3	24 **Low**
Corrective / Mitigation Measures	• All construction and maintenance activities should conform to generally accepted environmental best practice guidelines at all times. In particular, construction camps should preferably be placed in the towns and not close to natural vegetation so as to minimize the impact of illegal activities such as hunting, snaring firewood collection etc. • The ECO for the project should attempt to identify any breeding pairs of raptors (or any other bird species) and report them to the EWT as early as possible in the construction phase so as to allow adequate recommendations to be made with respect to minimising the impact on these birds.						

Alternative 2C, located nearest to Kenhardt and the Quiver Tree Forest, is rated to have the greatest potential impact on the visual environment. Its impact is *high* i.e. where the impact must have an influence on the decision process to develop in the area. The transmission power line will cause a notable change in landscape characteristics over an extensive area and/or intensive change over a localised area resulting in major changes in key views (from residences in Kenhardt and visitors to the Quiver Tree Forest).

Issue/Impact	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Notable change in landscape characteristics over an extensive area resulting in a moderate change to key views and/or	No	Negative	2	4	10	4	64 **High**

	Not possible to mitigate once constructed (therefore no change in significance)	Negative	2	4	10	4	64 **High**
Corrective / Mitigation Measures	• No amount of corrective measures will reduce the impact of the visual appearance of the transmission power line once constructed.						

The transmission power line will cause a notable change in landscape character. The significance of this option on tourism has been assessed as MEDIUM to HIGH as the routing of this alternative has the potential to directly impact tourism associated with the Quiver Tree Forest National Monument as well as potential tourism opportunities in the town of Kenhardt.

Issue/Impact	**Corrective measures**	**Impact**					**Significance**
		Nature	Extent	Duration	Magnitude	Probability	
Impact on tourism (Quiver Tree Forest National Monument and Kenhardt)	No	Negative	2	4	8	4	56 **Medium**
	Not possible to mitigate once constructed (therefore no change in significance)	Negative	2	4	8	4	56 Medium
Corrective / Mitigation Measures	• No amount of corrective measures will reduce the impact of the appearance of the transmission power line once constructed.						

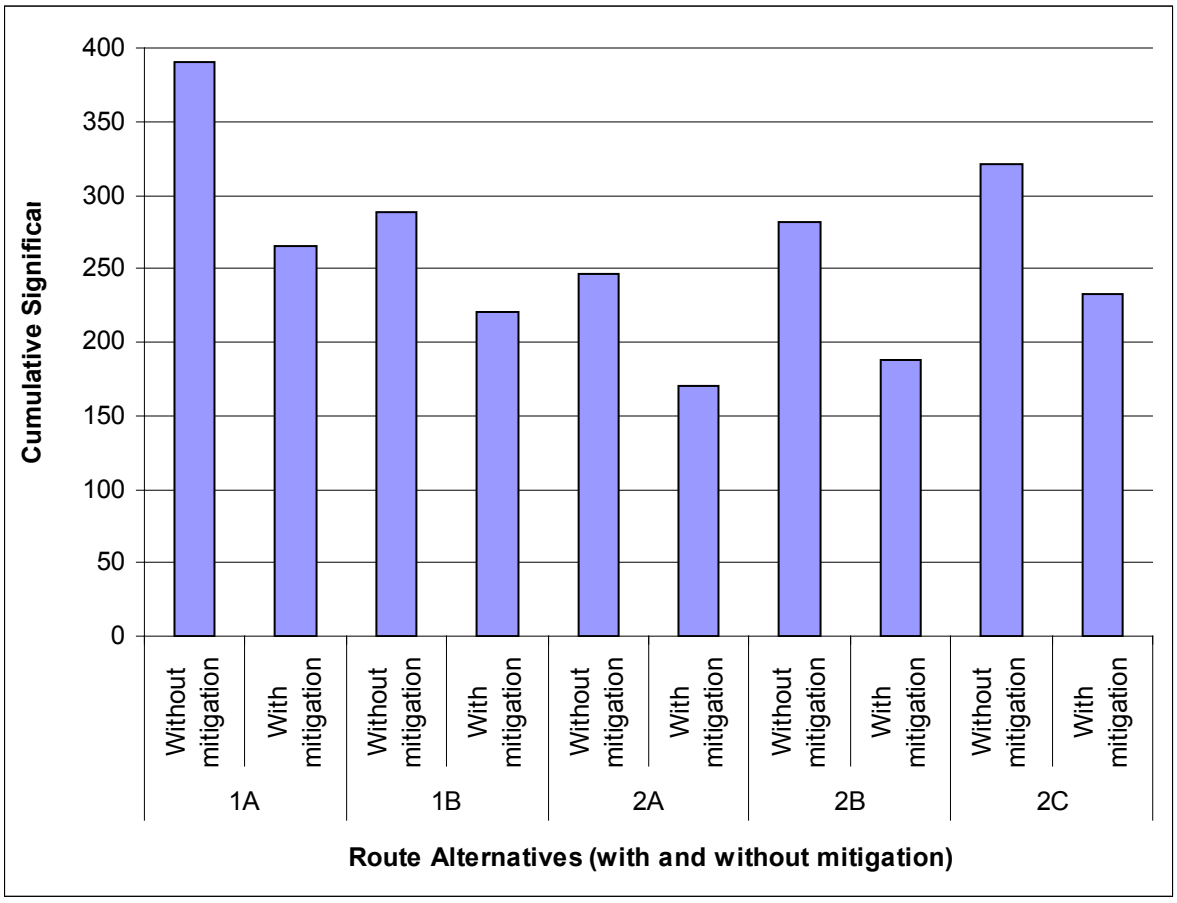
5.3 Summary of Alternative Route Comparative Assessment

Based on feedback received from the various specialists (as detailed in the significance tables above), alternative route 1B and alternative route 2A are considered to have the least significant impacts on the receiving environment as shown in the summary table and graph below. Mitigation measures are proposed for all alternative routes (where possible) in order to assess the likely reduction in significance through the implementation of these measures to aid in the decision for the final route alignment.

Table 1. Summary statistics reflecting the significance of the various route alternatives (with and without mitigation/corrective measures) as detailed for each of the impacts identified.

IMPACT:	Alternative Route Alignments									
	1A		1B		2A		2B		2C	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Increased risk of veld fires	24	14	24	14	14	7	24	14	24	14
Loss of portions of sensitive habitats	60	42	22	14	20	9	33	10	33	10
Fragmentation of sensitive habitats	52	26	22	11	20	10	22	10	20	10
Disturbance to sensitive ecosystems	42	24	24	22	22	10	24	10	20	9
Impacts on populations of endemic and red data species	45	13	24	10	24	10	22	10	22	10
Collision with the earth wire	52	36	44	28	52	36	44	28	52	36
Disturbance while breeding	30	24	24	18	30	24	24	18	30	24
Visual impact	56	56	48	48	40	40	48	48	64	64
Tourism	30	30	56	56	24	24	40	40	56	56
Cumulative Impact:	**391**	**265**	**288**	**221**	**246**	**170**	**281**	**188**	**321**	**233**



Graph 1: A summary of the cumulative significance of the various alternatives (with and without mitigation/corrective measures).

6 Environmental Concerns and Potential Impacts

The previous section provided a comparative assessment of the various route alternative alignments and in order to ensure that the EIR is comprehensive in addressing all potential issues regarding the transmission power line, this section shall address the remaining issues of the transmission power line, which have been highlighted during the course of this EIA. This section includes a description of potential impacts and concerns as identified during the site visits, the public participation process and the conclusions drawn from the specialist input into the proposed route alignment and alternative routes.

6.1 Methodology

The impacts will be assessed according to the criteria outlined in the following paragraphs. Issues of concern are broken down into Biophysical and Socio and Cultural impacts that include economic considerations. The issues that have been identified have been determined through various site visits, consultation of published information and brainstorming amongst the consultants. Each issue is ranked according to extent, duration, magnitude and probability. From these criteria, a significance rating is obtained, the method and formula is described below. Where possible, mitigatory recommendations have been made and are presented in tabular form.

Status of Impact

The impacts are to be assessed as either having a:

- negative effect (i.e. at a `cost' to the environment),
- positive effect (i.e. a `benefit' to the environment), or
- neutral effect on the environment

Extent of the Impact

- (**1**) Site (i.e. within 50m of the proposed alignment),
- (**2**) Local (i.e. the area within 10km of the proposed alignment),
- (**3**) Municipal (i.e. Kai!Garib and !Kheis municipal district)
- (**4**) Provincial (i.e. Northern Cape Province),
- (**5**) National (i.e. South Africa), or
- (**6**) International (i.e. outside Southern Africa's borders).

Duration of the Impact

The length that the impact will last for is described as either:

- (**1**) immediate (>1 year)
- (**2**) short term (1-5 years),

- (**3**) medium term (6-15 years),
- (**4**) long term (the impact will cease after the operational life span of the project),
- (**5**) permanent (no mitigation measure of natural process will reduce the impact after construction).

Magnitude of the Impact

The intensity or severity of the impacts is indicated as either:

- (**0**) none (where the aspect will have no impact on the environment),
- (**2**) Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected),
- (**4**) Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected),
- (**6**) Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way),
- (**8**) High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease), or
- (**10**) Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease).

Probability of Occurrence

The likelihood of the impact actually occurring is indicated as either:

- (**0**) None (the impact will not occur),
- (**1**) improbable (the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions)
- (**2**) low probability (there is a possibility that the impact will occur),
- (**3**) medium probability (the impact may occur),
- (**4**) high probability (it is most likely that the impact will occur), or
- (**5**) definite / don't know (the impact will occur regardless of the implementation of any prevention or corrective actions, or you don't know what the probability will be based on too little published information).

Significance of the Impact

Based on the information contained in the points above, the potential impacts are assigned a significance weighting (**S**). This weighting is formulated by adding the sum of the numbers assigned to extent (**E**), duration (**D**) and magnitude (**M**) and multiplying this sum by the probability (**P**) of the impact.

$$S = (E+D+M)P$$

The significance weightings are given below:

- (**<30**) low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- (**30-60**) medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- (**>60**) high (i.e. where the impact must have an influence on the decision process to develop in the area).

6.2 Construction Phase

Impacts during the construction phase of the development on the biophysical and socio-economic environment are detailed below.

6.2.1 Biophysical Impacts

6.2.1.1 Increased noise pollution

Increased noise pollution may occur during construction due to the use of heavy machinery, transport, etc. during construction. This may have an impact on animals in the immediate vicinity by frightening them away from the area and may be serious if these are territorial animals that are displaced due to this activity. The impact will only occur for the duration of construction and will be restricted to the site of current construction activities. The nature of the impact is negative. It will be restricted to the immediate area where construction is taking place and the immediate surroundings and is rated 2. The impact will occur during construction and is therefore short-lived and rated 1. The magnitude is low and rated 2 and the probability is high and rated 4. Mitigation is difficult, but activities can be restricted to habitats that are not important for sensitive species thus reducing potentially harmful effects. It is unlikely to have a long-term negative impact on the threatened status of any organisms as many animals will move away temporarily until the noise abates. The significance of the impact is rated 20, low. With the proposed mitigation the probability of the impact drops to 3 resulting in the impact being rated 15, low.

Issue	**Corrective measures**	**Impact**					**Significance**	
		Nature	Extent	Duration	Magnitude	Probability		
Increased noise pollution	No	Negative	2	1	2	4	20	**Low**
	Yes	Negative	2	1	2	3	15	**Low**
Corrective Actions	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the power line route • Avoid known populations of species of special concern when planning the power line route							

6.2.1.2 Increased dust during construction

Increased dust pollution may occur during construction due to the use of heavy machinery, transport, etc. during construction, especially while driving along gravel service roads. This may have an impact on animal populations and vegetation in the immediate vicinity by causing an increase in dust particles

in the air that could cause respiratory problems in animals or dust deposition on leaves of plants. For vegetation, serious dust pollution can cause plant mortality in the affected areas. The impact will only occur for the duration of construction and will be restricted to the site of current construction and transport activities. The nature of the impact is negative. It will be restricted to the immediate area where construction is taking place and the immediate surroundings and is rated 2. The impact will occur during construction and is therefore short-lived and rated 1. The magnitude is low and rated 2 and the probability is high and rated 4. Mitigation is possible by avoiding areas defined as being sensitive and also by implementing measures o reduce dust pollution, e.g. by spraying water onto roadways that are used very often. It is unlikely to have a long-term negative impact on the threatened status of any organisms, unless it directly affects populations of threatened species, as many animals will move away temporarily until the impact abates. Vegetation may recover following rainfall. The significance of the impact is rated 20, low. With the proposed mitigation the probability of the impact drops to 3 and the magnitude to 3 resulting in the impact being rated 12, low.

Issue	**Corrective measures**	**Impact**					**Significance**	
		Nature	Extent	Duration	Magnitude	Probability		
Increased dust	No	Negative	2	1	2	4	20	**Low**
	Yes	Negative	2	1	2	3	15	**Low**
Corrective Actions	• Avoid sensitive habitats, as defined in the sensitivity assessment • Avoid populations of species of special concern, e.g. *Aloe dichotoma*, when planning power line route • Use water sprayers to reduce dust emissions off road surfaces							

6.2.1.3 Increased risk of veld fires

There may be increased incidence of veld fires in areas surrounding camp and construction sites of the construction crew. This may have an impact on animals and vegetation in the immediate vicinity by causing immediate loss of habitat. Where the vegetation consists of sparse dwarf shrubs, it may not burn very easily, but any vegetation that is primarily composed of taller woody shrubs, the probability of destructive effects from fire are more likely. This may be serious if these are territorial animals that are displaced due to this activity or if populations of threatened, sensitive or protected plants are affected. The impact will only occur for the duration of construction and will be restricted to the site of current construction activities, but may spread further depending on the characteristics of the vegetation. The nature of the impact is negative. It will be restricted to the immediate area where construction is taking place, although it could spread more extensively and is rated 3. The impact will occur during construction and is therefore short-lived and rated 1. The magnitude is potentially high and rated 4 and the probability is moderate and rated 3. Mitigation is possible by raising awareness, by ensuring effective fire control in construction camps and by ensuring that an emergency fire-reaction system is in place to deal with possible veld fires. Potentially harmful effects may also be minimised by avoiding constructing the power line through sensitive areas. The significance of the impact is rated 24, low. With

the proposed mitigation the probability of the impact drops to 2 and the potential magnitude to 3 resulting in the impact being rated 14, low.

Issue	Corrective measures	Impact					Significance	
		Nature	Extent	Duration	Magnitude	Probability		
Increased risk of veld fires	No	Negative	3	1	4	3	24	**Low**
	Yes	Negative	3	1	3	2	14	**Low**
Corrective Actions	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the power line route • Ensure effective fire-control at camp and construction sites of construction crew • Raise awareness of necessity for fire-control • Institute management system to react to veld fires that do occur							

6.2.1.4 Impact on soil and agricultural potential

The main impact will be the loss of the soil resource as a result of sitting of pylons and any other infrastructure. However, this will be minimal, due both to the small areas involved, as well as the fact that the area is climatically of limited dryland potential as a result of the climatic limitations. The only zone of agriculturally important soils is found along the Orange River, where irrigation is practiced. However, the transmission line will minimally impact the river due to the small pylon footprint.

As far as the soils are concerned (given the scale of investigation of 1:250 000), there will is no preference for either of the alternatives. The soils that will be encountered are very similar for either set of alternatives.

Issue	Corrective measures	Impact					Significance	
		Nature	Extent	Duration	Magnitude	Probability		
Impact on soil and agricultural potential	No	Negative	1	4	2	4	28	**Low**
	Yes	Negative	1	4	2	4	28	**Low**
Corrective Actions	• Site clearing must be limited to the footprint of the pylons and not spread into the surrounding areas.							

6.2.2 Socio-Economic Impacts

6.2.2.1 Feelings in relation to the project

Feelings in relation to the project might result in the formation of interest groups. Projects often generate uncertainty or fear and sometimes the impacts perceived in anticipation of the planned intervention can be greater than the impacts ultimately resulting from the intervention. These impacts include uncertainty, annoyance (a feeling/experience such as that due to disruption of life, but which is not necessarily directed at the intervention itself), dissatisfaction due to a failure of the project due to deliver promised benefits, and an experience of moral outrage (such as when a project leads to

violation of deeply held moral or religious beliefs). A number of stakeholders voiced their concerns regarding the proposed project. A number of concerns have been voiced about the fact that strangers will have to gain access to the farms, the impact on safety from this perspective and the impact of carelessness like an open gate on farming itself. Farmers also expressed dissatisfaction about the impact of a power line crossing their properties and not having access to electricity themselves. This was echoed by community members who have inadequate or weak electricity supply. Not all community members are negative about the proposed project.

Issue	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Feelings in relation to the project	No	Negative	1	3	8	4	48 **Medium**
	Yes	Negative	1	2	4	2	14 **Low**
Corrective Actions	• Public should be made aware of their rights and the channels they can utilise to object to the process. • Eskom to inform community about alternatives e.g. self-build schemes. Community Management and Monitoring Committee (CMMC) should approach the local municipality to engage in discussions with Eskom Distribution about possible solutions.						

6.2.2.2 Quality of the physical environment

Social impacts experienced in the physical environment relate to exposure to dust, noise, risk, odour, vibration, artificial light, etc. During the construction phase, there will be a decrease in the quality of the physical environment. Noise levels and traffic will increase as result of the construction activities. Concerns were expressed about the way in which contractors conduct themselves when on site. This relates directly to the physical environment. In an arid area such as the Northern Cape, environmental scars take a long time to heal. Contractors who indiscriminately drive vehicles through vegetation, he might destroy a shrub that takes twenty years to mature and the evidence of his tracks can take years to disappear. Mention was made of red dunes in the area, which are particularly sensitive.

Issue	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Quality of the physical environment	No	Negative	1	1	6	5	40 **Medium**
	Yes	Negative	1	1	2	2	8 **Low**
Corrective Actions	• Establish a Community Management and Monitoring Committee (CMMC) to address traffic and construction concerns with Eskom Transmission. • Construction traffic must be limited to off peak times (also related to harvest times and times of transporting livestock) • An Environmental Control Officer must be appointed to ensure contractors conduct themselves in an appropriate way. A fining system, under the custody of the CMMC, must be put in place where those who do not interact with the environment in a respectful way must pay a fine to enable rehabilitation of the afflicted environment.						

6.2.2.3 Crime and violence

Kenhardt has a significantly lower crime rate than Groblershoop (http://www.saps.gov.za). In 2004/2005 the most reported crime in Kenhardt and Groblershoop was assault. The rural nature of the area accounts for the stock theft incidences. In both areas there was a slight decrease in crime in 2004/005. Although the area is seen as a generally safe place, farm murders are a reality in the South African society. Farmers do not feel safe on their own farms, and any strangers are met with suspicion. Many farmers do not welcome the idea of construction teams working on their farms and technical teams fixing the power lines.

Issue	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Crime and violence	No	Negative	2	2	8	3	36 **Medium**
	Yes	Negative	2	1	4	2	14 **Low**
Corrective Actions	• Eskom must liaise with the farmer's unions and a protocol for gaining access to farms should be established and distributed to all parties involved. • Construction teams should be clearly identified by wearing uniforms of identification cards that should be exhibited in a visible place on their body.						

6.2.2.4 Employment

There are high levels of unemployment amongst residents of the area. The demand for especially unskilled labour outnumbers the opportunities by far. In the construction phase a maximum of 40 jobs for unskilled labourers will be available. It is preferable that these jobs must be sourced from local communities, as they might oppose the presence of people from outside, whilst there are skilled individuals inside the community that could fill these positions. An added benefit would be that using local labour would obviate the need for temporary housing for construction workers. Apart from direct opportunities that will be created, a number of indirect jobs will also be created in the construction phase. In the operational phase, no jobs will be created.

Issue	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Employment	No	Negative	2	1	8	4	44 **Medium**
	Yes	Positive	2	1	8	4	44 **Medium**
Corrective Actions	• Source as much labour and resources from local communities.						

6.2.2.5 Social networks

This impact relates to the social interaction of household members with other people in the community. A huge portion of the community is very poor and there is a high unemployment rate. An influx of people with disposable income might lead to an increase in prostitution, which can impact on the HIV

and unwanted pregnancy rate in the area. There can be a number of spin-offs like alcohol abuse and disintegration of families.

Issue	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Social networks	No	Negative	2	5	6	4	52 **Medium**
	Yes	Negative	2	5	2	3	27 **Low**
Corrective Actions	• The Community Monitoring and Management Committee (CMMC) must work with municipalities to create awareness on the issues at hand (in particular HIV and AIDS).						

6.2.2.6 Community connection

It is perceived that there is a lot of social capital in the community. Social capital can be defined as a public good comprised of trust among a diverse group of citizens within the same community that facilitates cooperative networks among those citizens (Young Larance, 1996:13). Social capital comprises the abilities, traditions and attitudes that help ensure that a group of people will support each other, respond to challenges in a constructive manner, and innovate. Social capital is traditionally found amongst the farming communities, because these communities are often isolated and members of the communities need to rely on each other in times of need. In poorer communities, survival depends on interdependence. Individuals in lower income groups often do not have the resources to operate as an individual – they need to look out for each other by sharing food, responsibilities and other social assets.

Issue	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Community connection	No	Positive	2	4	4	3	30 **Medium**
	Yes	Positive	2	4	4	4	40 **Medium**
Corrective Actions	• The Community Monitoring and Management Committee (CMMC) might play a role in making members aware of the importance of communities standing together by its mere existence.						

6.2.2.7 Gender division of labour

The construction industry does not lend itself to employment of women. In the construction phase, women will have less opportunity to become employed.

Issue	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Gender division of labour	No	Negative	2	4	6	3	36 **Medium**
	Yes	Negative	2	4	4	3	30 **Medium**
Corrective Actions	• Women must have equal employment opportunities.						

	• Salaries of women must be equal to that of a man doing the same job

6.2.3 Summary of Construction Phase Impacts

As can be seen in the summary of construction phase impacts (table below), the majority of the impacts caused by the construction phase will be negative however mitigation measures will reduce the significance of these negative impacts if adhered to. Social networks can actually benefit from mitigation measures and result in a positive impact.

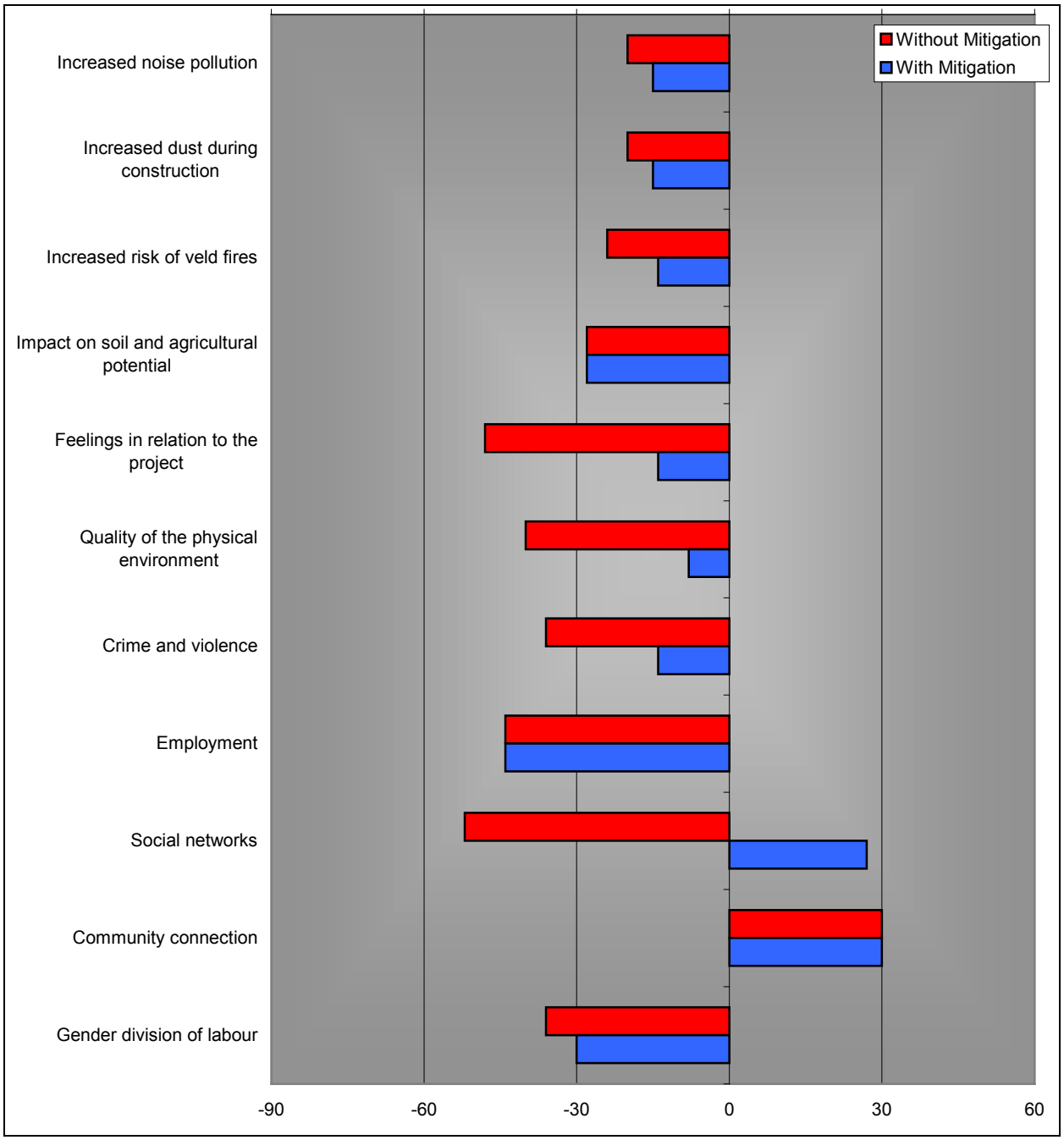


Figure 2: Summary of Construction Phase Significance Ratings.

6.3 Operation Phase

The issues that have been identified during the construction stage of the development are included in the table below.

6.3.1 Biophysical Impacts

6.3.1.1 Loss and fragmentation of habitats

The loss and fragmentation of vegetation and habitats could possibly occur at a local scale (site of individual pylons) as well as across the entire route (access roads, construction impacts, etc.). In addition, clearing of vegetation or cutting of woody vegetation to keep it below a maximum height may lead to loss of habitat. Due to the linear nature of the proposed construction of the power line, this may also lead to fragmentation of habitats. Due to the relatively low stature of most of the vegetation in the study area, cutting of vegetation will probably not be necessary. However, where cutting is necessary, it is usually sensitive habitats that would be affected. The impact will occur for the lifetime of the power line and beyond. The nature of the impact is negative. Habitat loss and habitat fragmentation are assessed separately.

Loss of habitat will be restricted to the immediate area where the power line is built, primarily the sites of the pylons, service roads and Garona substation upgrade and is rated 2. The impact will last permanently and is rated 5. The magnitude is potentially high (locally) and rated 8 and the probability is moderate and rated 3. Mitigation is difficult, but activities can be restricted to habitats that are not sensitive or important for sensitive species thus reducing potentially harmful effects. The significance of the impact is rated 45, medium. With the proposed mitigation the probability of the impact drops to 1 and the extent to 1 resulting in the impact being rated 14, low.

Issue	**Corrective measures**	**Impact**					**Significance**
		Nature	Extent	Duration	Magnitude	Probability	
Loss of portions of sensitive habitats	No	Negative	2	5	8	3	45 **Medium**
	Yes	Negative	1	5	8	1	14 **Low**
Corrective Actions	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the power line route. • Use existing access roads as service and construction roads, where possible • Avoid medium to tall vegetation in planning the power line route • Assess the planned pylon sites individually for sensitive features						

Fragmentation of habitat will affect areas potentially far removed from where the power line is built and is rated 4. The impact will last permanently and is rated 5. The magnitude is moderate due to the diffuse nature of a power line in its affect on the ground and rated 5 and the probability is moderate and rated 3. The power line can be routed to avoid sensitive habitats or, where necessary to cross them, to be done in such a way as to avoid fragmenting these habitats excessively thus reducing potentially harmful

effects. The significance of the impact is rated 39, medium. With the proposed mitigation the probability of the impact drops to 1 resulting in the impact being rated 13, low.

Issue	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Fragmentation of sensitive habitats	No	Negative	3	5	5	3	39 **Medium**
	Yes	Negative	3	5	5	1	13 **Low**
Corrective Actions	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the power line route. • If it is necessary to cross potentially sensitive areas, then attempt to do so in a manner that will cause the least amount of fragmentation. • Use existing access roads as service and construction roads, where possible						

6.3.1.2 Spread of alien species

The development activities may result in conditions that, in the long-term, favour the spread of alien species. These conditions include any disturbance to natural vegetation or the soil surface. The impact will have a long-term effect. The nature of the impact is negative. It will be restricted to the immediate area where the power line is located and the immediate surroundings and is rated 2. The impact will have a long-term effect and rated 4. The magnitude is low and rated 3 and the probability is moderate and rated 3. Mitigation is possible by disturbing limited amounts of natural habitat, especially sensitive areas, rehabilitating disturbed areas as soon as possible and avoiding activities that introduce alien plant propagules from other areas, e.g. translocating topsoil. The significance of the impact is rated 27, low. With the proposed mitigation the probability of the impact drops to 2 and the magnitude to 2 resulting in the impact being rated 16, low.

Issue	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Spread of alien species	No	Negative	2	4	3	3	27 **Low**
	Yes	Negative	2	4	2	2	16 **Low**
Corrective Actions	• Use existing access • Limit disturbance to vegetation, • Avoid sensitive habitats, as defined in the sensitivity assessment • Rehabilitate disturbed areas, • Don't translocate topsoil from one area to another or bring in topsoil from other areas						

6.3.1.3 Disturbance to sensitive ecosystems

Sensitive ecosystems in the study area include rivers, wetlands, seasonally wet areas as well as those vegetation types classified as sensitive. The nature of the impact is negative. It will be restricted to the immediate area where construction takes place (primarily the sites of the pylons) and the immediate

surroundings and is rated 2. The impact will be permanent and rated 5. The magnitude is potentially high and rated 7 and the probability is moderate and rated 3. Mitigation is possible by avoiding sensitive habitats and habitats that are important for sensitive species. The significance of the impact is rated 42, medium. With the proposed mitigation the probability of the impact drops to 2 and the magnitude to 5 resulting in the impact being rated 24, low.

Issue	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Disturbance to sensitive ecosystems	No	Negative	2	5	7	3	42 **Medium**
	Yes	Negative	2	5	5	2	24 **Low**
Corrective Actions	• Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the power line route • Avoid populations of species of special concern, e.g. *Aloe dichotoma*, when planning the power line route						

6.3.1.4 Impacts on populations of endemic and red data species

A number of threatened, endemic, sensitive or protected species have been identified as having the potential to occur along the proposed route of the power line. The location of plants and animals that fall into these categories has been taken into account when defining sensitive habitats. If these habitats are disturbed or destroyed it may have serious negative consequences for populations of these species. The nature of the impact is negative. It will be restricted to the immediate area where construction is taking place and the immediate surroundings, but could cause consequences on a more regional scale and is rated 3. The impact will be permanent and is rated 5. The magnitude is moderate to high and rated 7 and the probability is moderate and rated 3. This can be mitigated by avoiding sensitive habitats or, where particular populations may be identified in the field, e.g. *Aloe dichotoma*, such populations can be avoided. An exception is birds that are killed by contact with power lines, but this impact is assessed separately below. The significance of the impact is rated 45, medium. With the proposed mitigation the probability of the impact drops to 1 and the magnitude to 5 resulting in the impact being rated 13, low.

Issue	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Impacts on populations of endemic and red data species	No	Negative	3	5	7	3	45 **Medium**
	Yes	Negative	3	5	5	1	13 **Low**
Corrective Actions	• Avoid sensitive habitats, as defined in the sensitivity assessment • Avoid populations of species of special concern, e.g. *Aloe dichotoma*						

6.3.1.5 Impacts on the movement and migration of bird and animal species

Overhead power lines may have a potentially lethal impact on local populations of some bird species. For example, there is a high incidence of fatalities and injuries due to collisions with overhead power lines and fences for Ludwig's Bustard, the Peregrine Falcon and the Lanner Falcon (Barnes 2000). The nature of the impact is negative and it is likely to have a long-term negative impact on the threatened status of some organisms. It will be restricted to the immediate area where the power line is built and the immediate surroundings, but affects processes (migration) that operate at a regional, national or even international scale and is rated 5. The impact is permanent and rated 5. The magnitude is moderate to high, depending on the species of concern, and rated 8 and the probability is high and rated 4. Mitigation is difficult. Possible mitigation includes installing devices on the power line to increase visibility, but research is ongoing to deal with such impacts. The significance of the impact is rated 72, high. With the proposed mitigation the probability of the impact drops to 3 and the magnitude to 5 resulting in the impact being rated 45, medium.

Such impacts are permanent to long-term at the regional scale and have HIGH negative significance.

Issue	**Corrective measures**	**Impact**					**Significance**
		Nature	Extent	Duration	Magnitude	Probability	
Impacts on movement and migration of bird and animal species	No	Negative	5	5	8	4	72 **High**
	Yes	Negative	5	5	5	3	45 **Medium**
Corrective Actions	• Install devices on power lines to reduce impacts/collisions and cases of electrocution						

6.3.2 Social and Cultural Impacts

6.3.2.1 Actual health and fertility

The perception exist that power lines affect fertility in humans and animals. This will be scientifically examined in the environmental report, but whether scientific proof exists or not, the mere fact that it was mentioned by interested and affected parties qualifies it as a possible impact.

Issue	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Actual health and fertility	No	Negative	1	5	6	2	24 **Low**
	Yes	Negative	1	1	2	1	4 **Low**
Corrective Actions	• Scientific studies regarding this possible impact should be studied and the results must be communicated to I&APs.						

6.3.2.2 Aspirations for the future

There are a few places in the study area with great tourism potential. Plans have been made to market the area, relying heavily on the sense of place- the isolate and relatively wild and unspoilt nature of these attractions will be spoilt by infrastructure like a power line.

Issue	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Aspirations for the future	No	Negative	2	5	6	2	26 **Low**
	Yes	Negative	2	5	4	1	11 **Low**
Corrective Actions	• A Visual Impact Study has been conducted, and its recommendations must be implemented to minimise the impact on the sense of place.						

6.3.2.3 Aesthetic quality

Community members are concerned about the aesthetic impact of the development on the area. A Visual Impact Assessment has been conducted and has made recommendations in this regard.

Issue	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Aesthetic quality	No	Negative	2	5	8	4	60 **High**
	Yes	Negative	2	5	2	2	18 **Low**
Corrective Actions	• Colour schemes must complement the local environment. • Minimising disturbance to fields and provision of ongoing protection. • Revegetation/rehabilitation of disturbed sites.						

6.3.2.4 Adequacy of physical infrastructure

There is a concern amongst community members that the road infrastructure is not adequate if any other route than the one that follows the existing road would be chosen. The Sishen – Saldanha railway line and Telkom lines already traverse the area. Given servitudes and legal requirements regarding the distances these structures must be from each other, a number of farmers are of the opinion that there would be so much infrastructure running across their farms that the physical farming area would be compromised. The importance of keeping gates closed; especially in livestock farming areas must be reiterated.

Issue	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Aesthetic quality	No	Negative	2	2	8	4	48 **Medium**
	Yes	Negative	2	2	4	2	16 **Low**
Corrective Actions	• Community Monitoring and Management Committee (CMMC) to become involved in liaisons with ESKOM about the planning and timeframes of proposed infrastructure. • Route adjacent to existing road to be given favourable consideration. • Relevant role players like Eskom, Telkom and Spoornet must meet and consult each other about future planning in the area, and the possibility of sharing existing infrastructure. Existing infrastructure must be utilised as far as reasonably possible.						

6.3.2.5 Personal risk and exposure

A number of concerns have been voiced about personal safety and risk exposure. Amongst these are the concern that undesirable people will be attracted to the area, strangers on farms servicing the power lines and fires as a result of possible theft of conductors of transmission lines. The communities are close-knit and because it is such a small community one of the factors making it safe was the fact that everybody knows each other.

Issue	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Personal risk and exposure	No	Negative	1	5	8	3	42 **Medium**
	Yes	Negative	1	5	4	2	20 **Low**
Corrective Actions	• Community Monitoring and Management Committee (CMMC) must work with Eskom to negotiate access to farms for service purposes. • Technical investigations about actual risk of fires – results should be made available to farmers.						

6.3.2.6 Crime and violence

Kenhardt has a significantly lower crime rate than Groblershoop (http://www.saps.gov.za). In 2004/2005 the most reported crime in Kenhardt and Groblershoop was assault. The rural nature of the area

accounts for the stock theft incidences. In both areas there was a slight decrease in crime in 2004/005. Although the area is seen as a generally safe place, farm murders are a reality in the South African society. Farmers do not feel safe on their own farms, and any strangers are met with suspicion. Many farmers do not welcome the idea of construction teams working on their farms and technical teams fixing the power lines.

Issue	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Crime and violence	No	Negative	2	2	8	3	36 **Medium**
	Yes	Negative	2	1	4	2	14 **Low**
Corrective Actions	• Eskom must liaise with the farmer's unions and a protocol for gaining access to farms should be established and distributed to all parties involved. • Construction teams should be clearly identified by wearing uniforms of identification cards that should be exhibited in a visible place on their body.						

6.3.2.7 Property value

The development might have an impact on property values and resale potential. Servitudes must be acquired by Eskom. Farmers will receive compensation for the right of way through their land.

Issue	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Property value	No	Negative	2	5	8	4	60 **High**
	Yes	Negative	2	5	6	4	52 **Low**
Corrective Actions	• Eskom's Land Acquisitions Unit must be in contact with the affected parties throughout the process.						

6.3.2.8 Replacement cost of environmental functions

This refers to the cost of replacing a function that was previously provided by the environment. When the power line is erected, farmers will still be able to utilise the area underneath the power line and within the servitudes. Other environmental functions relate to visual impacts like the unspoilt vistas and scenic value of the Orange River. These vistas are especially important to potential tourism enterprises.

Issue	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Replacement cost of environmental functions	No	Negative	2	5	6	4	52 **Medium**
	Yes	Negative	2	5	4	4	44 **Low**
Corrective Actions	• Consult farmers in exact placing of structures • Allow farming activities to continue in servitudes						

6.3.2.9 Loss of natural and cultural heritage

The proposed power lines will add to the process of changing the sense of place. A Heritage Impact Assessment has been undertaken to identify areas of heritage importance, of which there are a number in the area however a detailed investigation of each pylon position will be undertaken when the exact route is known to elucidate any heritage/cultural sites or artifacts of significance.

Issue	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Loss of natural and cultural heritage	No	Negative	2	5	4	4	44 **Medium**
	Yes	Negative	2	5	4	3	33 **Medium**
Corrective Actions	• Eskom and the Community Monitoring and Management Committee (CMMC) must discuss the issue and develop a management plan in order to preserve these resources. • Each pylon position must be thoroughly inspected by a suitably qualified archaeologist prior to construction.						

6.3.2.10 Impact equity

Impact equity is related to the fairness of the distribution of impacts across the community. It must be ensured that the people who will benefit from the development must also share in carrying the costs. Of great concern is the fact that the transmission line will cross over a number of farms that do not have access to electricity, and bypass a community that struggles to obtain adequate electrical supplies, but not provide a solution to these local problems. The project will lead to gain on a national level, but the local people who will be impacted on will not benefit from the project.

Issue	Corrective measures	Impact					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Impact equity	No	Negative	2	4	4	2	20 **Low**
	Yes	Positive	2	4	6	4	48 **Medium**
Corrective Actions	• Benefits must be ploughed back into the community. The Community Monitoring and Management Committee (CMMC) can assist in identifying worthy recipients and ensuring impact equity. Eskom Transmission must convey the message to Eskom distribution and aid in empowering the community on all levels, starting with providing information on the correct procedures to follow to obtain the required results.						

6.3.3 Summary of Operational Phase Impacts

The table below provides a summary of the operational phase impacts (with and without mitigation measures). All but one of the impacts identified (i.e. Impact equity) will be negative impacts with or without mitigation, and this is due to the fact that the proposed transmission line will not provide any real benefits to the community in the vicinity of the study area but is aimed at improving electricity supply to the cape regional grid.

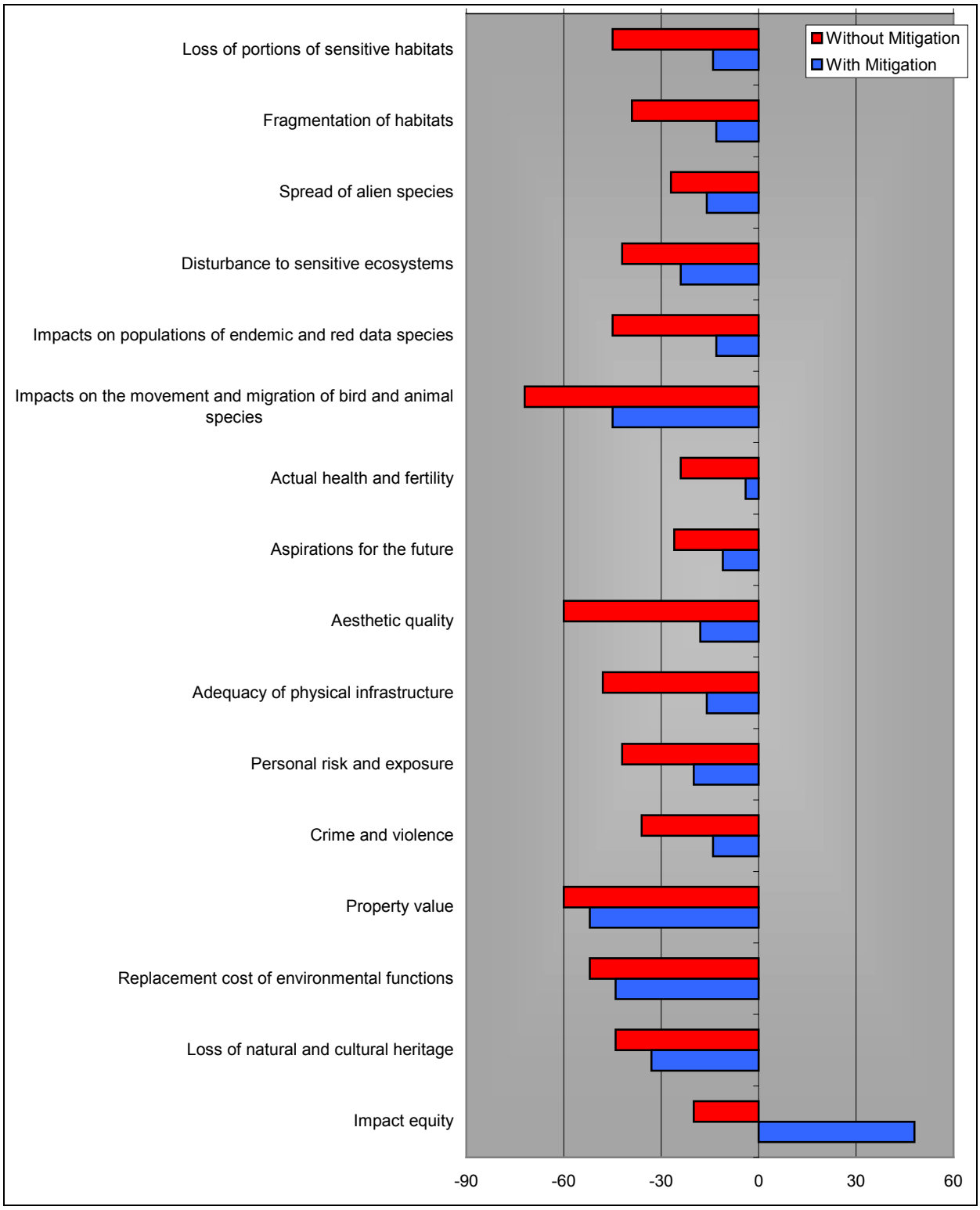


Figure 3: Summary of Operational Phase Significance Ratings.

7 Public Participation

A public participation process as required by the DEAT will be carried out. The details of the public participation process are indicated below.

7.1 Introduction

The public is classified as a group whose interest may be affected positively or negatively by a proposal or activity and/or who are concerned with a proposal or activity and its consequences. The public should be adequately engaged in processes that affect their biophysical, social, cultural and economic environment. Democratic governance, the increasing degree of decentralisation in decision-making and the growing influence of NGO, community-based organisations and the private sector, has increased opportunities for this.

Due to the different levels of success achieved thus far in the process of public participation, many different perceptions exist with regard to the value it adds and its effectiveness. To ensure an effective process the objectives with regards to the process should be clearly defined as well as partaker's responsibility, appropriate approaches and techniques. The level of engagement considers the social profile of stakeholders, context-related issue (literacy etc), and spatial scale of the activity.

Public participation contributes to the identification of key issues of concern and possible solutions.

7.2 Methodology

The methodology used for the public participation was defined by two criteria namely, the requirements of the National Department of Environmental Affairs and Tourism (DEAT), the Northern Cape Department of Tourism, Environment and Conservation as well as previous experience with scoping studies. The methodology can be summarised as the identification of Interested and Affected Parties (I&AP's), their notification, consultation and involvement.

7.2.1 Identification of Interested and Affected Parties

Interested and Affected Parties were identified through consultation with the authorities (local and provincial), the property owners, site visits and the previous public participation process undertaken during the Scoping phase of this EIA. A database of all I&AP's identified for involvement in this process is included in Appendix 12. Any I&AP's contacting Tswelopele Environmental in response to the adverts described in Section 7.2.2 will be added to the database as registered I&AP's.

7.2.2 Public Notice

Public notices provide an official announcement of an intent to undertake a certain activity and provide I&AP's with the opportunity to comment.

English and Afrikaans advertisements were placed in The Gemsbok Newspaper on the 1st of November 2006 and an Afrikaans advertisement was placed in the Volksblad Newspaper on the 27th of October 2006 (refer to Appendix 10 for proof of the advertisements placed). The comment period for interested

and affected parties was 30 days starting from the 1st of November 2006, as per the DEAT requirements (refer to the letter from DEAT included in Appendix 1.1).

All registered I&AP's were contacted (by phone, fax and/or e-mail) and informed of the availability of the Draft EIR (and associated comment period) as well as the dates, times and venues for the public meetings.

7.2.3 Public meetings

Table 2 below shows the location, date, venue and times for the public meetings. These meetings will be held in order to inform the public of the outcome of the Environmental Impact Report as well as to obtain feedback on any additional issues pertaining to the proposed transmission power line. A detailed Issues and Response Report (IRR) will be included in Appendix 14 for submission of the Final EIR to the relevant authorities and will include comments received on the EIR.

Table 2. Schedule of public meetings.

Location	Type Of Meeting	Date	Venue	Time
Kenhardt	Public Meeting	27 November 2006	NG Kerksaal	13h00 – 14h00
Wegdraai	Public Meeting	27 November 2006	Wegdraai Community Hall	08h00 – 09h00

7.2.4 Recording

Any unregistered I&AP's names and contact details will be recorded as well as their relationship to the project and any comment or concerns raised. A copy of the I&AP database is included in Appendix 12.

Attendance registers as well as minutes of the public meetings are included in Appendix 13.

7.2.5 Reporting

Issues raised during the public participation period are summarised in the Issues and Response Report (Appendix 14). The issues were received in writing or raised at public meetings during the Scoping as well as the EIR Phase. Issues raised to date include the following:

- Alternatives – Landowners, wishing to protect their properties requested that rigorous consideration of alternative routes should take place
- Request for Power Supply to the farmers and the community of Wegdraai
- Tourism Impact – possible impact of the transmission power line in proximity to game farms and nature reserves
- Safety and Security – impact on security of properties, with the inclusion of construction camps and safety of residents
- Job creation

- Conservation concerns – Concern was expressed over the future of sensitive species located within the study area.

The above issues have been recorded in the Issues and Response Report (IRR). Relevant responses to the issues raised, have been included in the IRR as well as detailed in this Draft EIR. As such, the Issues Report provides a summary of the concerns and/ objections raised by interested and affected parties, with respect to the proposed transmission power line. It also includes a summary of the public participation process, as undertaken during the EIR phase of the EIA process. Consequently, the Issues Report (as well as copies of some of the detailed correspondence received from I&AP's) will be submitted with the Draft and Final Environmental Impact Report (EIR), to the relevant environmental authority, for decision-making. In this regard, the EIR forms the culmination of the EIA process.

7.2.6 Public Review of draft Environmental Impact Report

The Draft Environmental Impact Report is being made available for public review and comment on the 1st of November 2006 for a period of 30 days. Copies of the Draft Scoping Report will be made available at the following venues for public review:

- Kenhardt Public Library (Park Street, Kenhardt);
- Wegdraai: c/o Tommie Claasen (Ward Councillor);
- Groblershoop Police Station (210 Hoofstraat, Groblershoop);
- Kenhardt Farmers Union (c/o Mr. Michael van Niekerk);
- Kleinbegin Farmers Union (c/o Mr. Louis Kotze – on his farm Kleinbegin);
- Tswelopele Environmental Office (259 Kent Avenue, Ferndale, Randburg, 2194); and
- An electronic copy of the report will also be made available for download on the Eskom Website (www.eskom.co.za/eia).

7.2.7 Issues Report

All comments collected from the various sources will be compiled and included in the I&AP database as well as addressed in the Issues and Response Report (to be submitted with the Final EIR to the relevant authorities for decision making).

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions drawn from the EIA process

During the course of the EIA investigation, specialist input was obtained for all aspects of the proposed transmission power line along with the associated impacts on the receiving environment. Specialist assessment of route alternatives helped inform the final decision of the preferred route. The final route selection depends on numerous biophysical and socio-economic impacts and the purpose of this EIA was to determine which route would result in the least significant negative impact on the receiving environment. Possible impacts that have been identified are detailed below (according to the relevant specialist field) and significant impacts are detailed with possible mitigation measures proposed in order to reduce the cumulative impact of the development. It must be borne in mind that a transmission power line does not only provide benefits to a small number of individuals in a limited area but is part of the national electricity grid which benefits the nation as a whole. The Cape region has been plagued with electricity supply problems in the past and this transmission power line (Aries to Garona) is aimed at addressing this situation as part of a larger infrastructure upgrade program by Eskom Transmission.

The alternative routes proposed during the course of this EIA have been assessed by each of the specialists and the conclusions of this assessment are summarised in Table 3 at the end of this section.

8.1.1 Avifaunal perspective

Through perching and nesting on power line towers, many of the larger bird species can cause electrical faults through their faeces, and nest material. However, on the structure proposed for this power line, it is not possible for these birds to perch or nest directly above the live hardware, so this impact is not anticipated to be significant at all. Some species will however still nest within the “columns” of the towers (such as Sociable Weaver). The proposed “cross rope suspension tower” can be seen in APPENDIX C of the specialist report (refer to Appendix 4 of this EIR). The most significant anticipated impact of this power line on birds is that of collision with the earth wire. The most sensitive areas in this respect are the Hartbeesrivier crossing, the “wetland” or pan areas, the arable lands adjacent to the Orange River, and the Orange River crossing itself. Fortunately the alignment currently crosses the rivers and arable lands at relatively good, narrow points. The Orange River is by far the most significant river in the study area, and possibly the only significant water source. It represents important habitat for many bird species associated with water. River courses in general represent important flight paths for many bird species, therefore posing a collision risk. The proposed crossing of the Orange River by this alignment is in a relatively good position as it is adjacent to an existing railway bridge, and is also situated at a relatively narrow section of the river and associated floodplain.

1B is preferred over 1A for the following reasons:

- There is approx 3km difference in length (1A = 47km, 1B = 43km).
- East of the “Neus se berg” ridge line 2B is considerably closer to the railway line and district road – within approx 1km for approx 19km. This is an advantage in terms of disturbance as

explained above. Adjacent to Neus se berg the line is close to the railway line and road which is an advantage in terms of disturbance levels.

- Just west of "Neus se berg" there seems to be little difference between the two alternatives, both cross and pass close to several wetlands. It appears that 1A may cross slightly more wetland tongues, although this is not conclusive.

2B is preferred over 2A for the following reasons:

- It is closer to the existing district road and railway line – these are existing sources of disturbance that should already discourage sensitive bird species from the area to some extent. In the vicinity of Aasvoelkop it passes through the ridge line close to the disturbance of the railway line.
- It is shorter in length – 2B = approx 29km, 2A = approx 35km. This is particularly important in these two squares i.e. 2920BD & 2921AC which have the highest report rate for Ludwig's Bustard and relatively high for Kori Bustard. The length of line through these squares should if possible be kept to a minimum.

8.1.2 Social perspective

It is recommended that a Community Management and Monitoring Committee (CMMC) be established. This committee would serve as a communication channel between the community and Eskom. Members of the committee should include representatives from environmental groups, civil society, ward councillors, government departments, construction teams and Eskom. Such a committee will play an important role in executing the proposed mitigation measures. It is anticipated that most social impacts pertaining to the power line will be experienced in the pre-construction and construction phases, with minimal impacts in the operational and decommissioning phases.

8.1.3 Visual perspective

Alternative 2C is rated to have the greatest potential impact on the visual environment. Its impact is *high* i.e. where the impact must have an influence on the decision process to develop in the area. Although there are minor differences in the impact rating for the other alignments, they are all *medium* i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated.

The following route alignment is therefore proposed, as it would have the least impact on the visual environment:

Northern section: Alternative 1B
Central section:
Southern section: Alternative 2A

It is *highly probable* that the proposed 400kv transmission power line, will have at least a *medium negative* impact on the *local* visual environment in the *short term* during the construction phase. During

the operational phase, the significance of impact is predicted to be *medium* in the *long term* i.e. the impact will only cease after the operational life span of the project, and *high* for Alternative 2C should it be selected.

Mitigation measures are not feasible after the route has been chosen i.e. mitigation can only take place in the routing of the line to avoid conflict areas. Therefore mitigation of any significant kind is not achievable during the operational phase.

8.1.4 Ecological perspective

From an ecological perspective alternative route 1B is very preferable to route 1A, due to the fact that it passes through an area already affected by existing infrastructure, i.e. gravel roads, railway line and a farm homestead complex. Route 1A passes through an untransformed area with high sensitivity.

Currently, either route 2A or 2B may be considered since the difference in ecological sensitivity is marginal. Route 2B has a small section of High sensitivity, but this is impacted by other infrastructure. Route 2A is longer and therefore less preferable from this aspect.

The Short Route Option (alternative route 2C and 1A) is not preferred since it contains all the disadvantages of route 1A (the passage north of Neus se Berg).

A variety of plant and animal species of special concern have been identified during this investigation of the site for the Garona substation upgrade that could occur in the type of habitats available at the site. The protected tree, *Acacia haematoxylon*, occurs on site as a single small individual. The vegetation around the site is a mosaic of Kalahari Karroid Shrubland and Gordonia Duneveld and is considered to have medium sensitivity. The proposed substation extension could, therefore, have a negative impact on the conservation status of threatened plant or animal species or vegetation communities, but few of these impacts are considered to have a high significance due to the small size of the proposed development. Mitigation can also reduce many of these impacts. The impact of greatest concern from an ecological point of view is the high incidence of mortality associated with electrocution or impacts with power lines by birds.

8.1.5 Soil and agricultural perspective

The main impact will be the loss of the soil resource as a result of sitting of pylons and any other infrastructure. However, this will be minimal, due both to the small areas involved, as well as the fact that the area is climatically of limited dryland potential as a result of the climatic limitations.

The only zone of agriculturally important soils is found along the Orange River, where irrigation is practiced. However, the transmission power line will follow an existing bridge over the river and no new areas of high potential soils will be affected.

As far as the soils are concerned (given the scale of investigation of 1:250 000), there is no preference for either of the alternatives. The soils that will be encountered are very similar for either set of alternatives.

8.1.6 Heritage perspective

Once the final route is decided and tower positions known, selections of the latter, which are deemed to be in potentially more sensitive locales, should be inspected more closely. There are no grounds presently, based on archaeological considerations, for deciding between the northern or southern alternative routes at the south-western end of the line near Kenhardt.

All sites are protected by law: a permit would be required if any site is to be destroyed. Mitigation measures, if necessary, would need to be formulated and acted upon. From a heritage perspective, the proposed transmission power line is not expected to have a high negative impact since the pylon positions will be inspected by a qualified archaeologist prior to final sitting and construction taking place.

8.1.7 Tourism perspective

From a tourism perspective **visual impacts** and potential **disruption from construction activities** are the greatest possible issues.

Tourism is a sensitive industry based primarily on subjective perspectives of visitors to an area. In destinations where tourism is focused on outdoors or based on natural elements, such as wilderness, sky, rivers, veld and wildlife, the tourism value rests largely on the experience which can be provided. The study area is such an area, and there is potential for negative visual impacts on tourism from the erection of a transmission line. This can potentially be an issue during the day as well as during the night. During the day, the line can potentially obscure views, degrade scenery and decrease the scenic value of the area or part of the area. Additionally, any lighting that may potentially be used may extend the visual impact into the night in a part of the country renowned for its night skies and stargazing.

There is also the potential that construction activities carried out in close proximity to tourism enterprises or to places where tourists visit will negatively impact on and detract from the tourist experience. Such impacts could include noise, site disturbance during the construction phase, dust from vehicles and visual and aesthetic impacts from such construction and crew camps on the feeling of tourists having a serene and secluded nature experience. The location of work camps in close proximity to tourism enterprises can also be a potential issue in terms of noise, light, and feelings of solitude that tourists are seeking out.

There are reports in the area of problems with the reliability and quality the power supply. If developments such as transmission lines can lead to better services for local people and for tourism enterprises seeking to provide a high standard of service, then there is potential for a positive impact, or spin off, from the development. By better servicing areas with electricity, this can create an environment where tourism can emerge or improve.

Table 3: Summary of specialist assessment of route alternatives showing preferred routes, routes which are not preferred and routes which are not dependent on specialist field.

	Alternative Route Alignment				
	1A	**1B**	**2A**	**2B**	**2C**
Soil Specialist	No preference (soils very similar for all routes)	No preference (soils very similar for all routes)	No preference (soils very similar for all routes)	No preference (soils very similar for all routes)	No preference (soils very similar for all routes)
Avifauna	Not preferred	Preferred over 1A	Not preferred	Preferred over 2A	Not preferred
Ecological	Not preferred	Ok	Ok	Ok	Not preferred
Social (SIA)	Route not specific to social impacts	Route not specific to social impacts	Route not specific to social impacts	Route not specific to social impacts	Route not specific to social impacts
Visual (VIA)	Not preferred	Preferred	Preferred	Not preferred	Not preferred
Heritage	No preference (no heritage features identified)	No preference (no heritage features identified)	No preference (no heritage features identified)	No preference (no heritage features identified)	No preference (no heritage features identified)

8.1.8 Cost implications

Eskom Holdings Limited Transmission Services have provided feedback on the various route alternatives based on technical and financial constraints. The various alternatives present terrain obstacles as well as variations in the length of the proposed power line. According to Eskom Holdings Limited (refer to Appendix 16), alternative route 1B is about 3km longer than route 1A, which represents an additional cost of R4.5 million while the terrain over which alternative 1B is routed provides problems with the large bend angles as well as the steep mountainous terrain which would require self supporting towers to be used in this area (greater cost). Similarly, alternative route 2A is approximately 12km longer than alternative route 2C and this represents roughly R15 million of additional costs to this alternative.

8.2 Recommendations

During the course of the EIA process, numerous specialists were commissioned in order to provide a professional opinion on potential issues resulting from the construction of the 400kV transmission power line between the Aries and Garona substation. Detailed public involvement was also utilised to help inform the process and get local opinion on the proposed project. Key interested and affected parties were additionally consulted (Spoornet, Telkom, etc.) to collect comments/objections and to enable open discussion between all parties involved in order to ensure that the development results in the least significant impacts on the receiving environment.

No major objections were received with regards to the proposed transmission power line and Garona substation extension however some I&AP's did voice their concerns regarding the fact that the power line would not directly benefit the local community. This fact cannot be adequately mitigated however it is recommended that Eskom Transmission work closely with the community of Kenhardt, Groblershoop and Wegdraai to attempt to implement some form of electricity provision (including solar panels, etc). This small contribution would be greatly appreciated by the local community.

Mitigation measures for the numerous impacts that have been identified are detailed in this report as well as the individual specialist reports and these mitigation measures must form part of the Record of Decision from DEAT and the Northern Cape provincial government to ensure that these impacts are minimised as far as practically possible. The following mitigation measures must be adhered to and apply to the transmission power line in it's entirety:

- The raptor nests should not require any management and should be left alone as far as possible;
- The Sociable Weaver nests should be monitored closely and if they begin to pose problems then the Endangered Wildlife Trust (EWT) should be consulted for recommendations on how best to manage them;
- All construction and maintenance activities should conform to generally accepted environmental best practice guidelines at all times. In particular, construction camps should preferably be placed in the towns and not close to natural vegetation so as to minimize the impact of illegal activities such as hunting, snaring firewood collection etc.;
- The ECO for the project should attempt to identify any breeding pairs of raptors (or any other bird species) and report them to the EWT as early as possible in the construction phase so as to allow adequate recommendations to be made with respect to minimising the impact on these birds;
- All sections of power line crossing drainage lines should be marked, only on the one relevant span;
- Power line crossing the Hartbeesrivier and Orange River and associated arable lands should be marked, including one span either side;
- Power line crossing or adjacent to any dams or open water sources should be marked, including one span either side;
- Since it would be impractical to mark the power line through all the natural vegetation areas to mitigate for collision of species such as Secretary bird, it is rather suggested that the power line be patrolled annually and areas where collisions have occurred can then be marked reactively;
- Marking of the power line should be according to the technical specifications contained in APPENDIX E of the specialist avifaunal report (refer to Appendix 4 of this EIR);
- Due to the sensitivity of the "wetland"/pan/flats areas, the difficulty in distinguishing them from the surrounding habitat, and their apparent absence from the land cover and land use data sets - it will be necessary for the EWT to conduct a final "walk through" assessment once the exact alignment has been surveyed and each tower position has been pegged. This will allow the identification of exact spans of line that will need to be marked with a suitable marking device;

- Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the power line route;
- Avoid populations of species of special concern, e.g. *Aloe dichotoma*, when planning power line route;
- Use water sprayers to reduce dust emissions off road surfaces;
- Ensure effective fire-control at camp and construction sites of construction crew;
- Raise awareness of necessity for fire-control;
- Institute management system to react to veld fires that do occur;
- Use existing access roads as service and construction roads, where possible;
- Avoid medium to tall vegetation in planning the power line route;
- Assess the planned pylon sites individually for sensitive ecological and heritage features;
- If it is necessary to cross potentially sensitive areas, then attempt to do so in a manner that will cause the least amount of fragmentation;
- Rehabilitate disturbed areas following construction and monitor erosion in areas previously disturbed until the vegetation has suitably re-established;
- Don't translocate topsoil from one area to another or bring in topsoil from other areas;
- It is recommended that a Community Management and Monitoring Committee (CMMC) be established. This committee would serve as a communication channel between the community and Eskom. Members of the committee should include representatives from environmental groups, civil society, ward councillors, government departments, construction teams and Eskom. Such a committee will play an important role in executing the proposed mitigation measures. It is anticipated that most social impacts pertaining to the power line will be experienced in the pre-construction and construction phases, with minimal impacts in the operational and decommissioning phases.
- An Environmental Control Officer must be appointed to ensure contractors conduct themselves in an appropriate way and to make sure that the EMP and the conditions of the RoD are implemented

Recommendations pertaining to the extension of the Garona substation are as follows:

- Using existing access routes as much as possible during construction and maintenance of the substation.
- Limit disturbance to vegetation and rehabilitate disturbed vegetation as quickly as possible.
- Ensure effective fire control at camp and construction sites during construction.
- Sections of the power line that pose a hazard to Ludwig's bustard and other large birds should be marked with appropriate devices.

This Environmental Impact Report presents the relevant information to the Department of Environmental Affairs and Tourism and the Northern Cape Department of Tourism, Environment and Conservation for the purpose of decision-making. Authority on the approval and development of the proposed activity lies solely in the hands of the delegated decision maker. Tswelopele Environmental, as independent consultants, primary involvement in the EIA process is to provide the relevant authority with access to all relevant information in relation to the proposed activity.

9 REFERENCES

ARC Institute for Soil Climate and Water (2006) Soils and agricultural potential of proposed Garona-Aries transmission line, Northern Cape.

David Hoare Consulting (2006) Ecological investigation of the proposed Eskom sub-station extension at Garona, Northern Cape.

DEAT (2004) Environmental Impact Reporting, Integrated Environmental Management, Information Series 15, Department of Environmental Affairs and Tourism (DEAT), Pretoria.

ECO Africa Environmental Consultants (2006) Tourism Impact Study

Endangered Wildlife Trust (2006) Bird Impact Assessment Study Scoping Report 400kV Transmission line Aries – Garona, Northern Cape.

McGregor Museum (2006) Archaeological Specialist Input to the EIA Phase for the proposed Aries-Garona Eskom Transmission Power Line, Northern Cape and comment on Garona Substation Extension.

Newtown Landscape Architects (2006) Visual Impact Assessment for Proposed ESKOM 400kV Power Transmission Line between Garona and Aries Sub-stations.

Strategic Environmental Focus (2006) Social Impact Assessment Categories.

Appendix 1.1:

Letter from DEAT, dated 01 July 2005 and Plan of Study for EIA

Appendix 1.2:

Description of the Environment and any Trends

Appendix 1.3:

Supplemental Information pertaining to the Scoping Report

Appendix 1.4:

Description and Evaluation of Project Alternatives

Appendix 2:

Map of the study area with route alignment and alternatives proposed

Appendix 3:

Soil and Agricultural Potential (Specialist Report)

Appendix 4:

Avifaunal Assessment (Specialist Report)

Appendix 5:

Ecological (Specialist Report)

Appendix 6:

Heritage Impact Assessment (Specialist Report)

Appendix 7:

Social Impact Assessment (Specialist Report)

Appendix 8:

Visual Impact Assessment (Specialist Report)

Appendix 9:

Tourism Assessment (Specialist Report)

Appendix 10:

Public Notices and Newspaper Advertisement

Appendix 11:

Background Information Document & Comment Sheet

Appendix 12:

Interested and Affected Party (I&AP) Database

Appendix 13:

Focus Group Meeting Minutes and Attendance Register

Appendix 14:

Issues & Response Report

Appendix 15:

A schematic diagram of the proposed extension to the Garona substation

Appendix 16:

Cost implications of alternative route alignments (Eskom Holdings Limited)