DRAFT

Environmental Impact Report

for the

Apollo - Phoebus - Vulcan 400kV

Transmission Lines Project.

July 2003

EXECUTIVE SUMMARY

Electricity cannot be stored. It is generated and transmitted over long distances, mainly from the Mpumalanga region, at the very instant it is needed. Eskom does expansion planning on the basis of projected demand increases. The demand increases are incurred, amongst others, due to:

- *Economic growth*
- *Growth in tourism*
- *Redevelopment programme*
- *Upliftment programmes*

The Rustenburg / Pretoria North region is an area that experienced significant economical growth over the past few years. Should this growth be sustained over the next two to three years, pressure on the existing electrical supply system could be expected to increase dramatically.

Eskom Transmission has to take timeous action to ensure the capability of meeting the expected increase in demand. It is also necessary to optimise the existing electrical supply system to obtain the maximum benefit from this system and to ensure firm supply to all existing and future customers.

An Environmental Impact Study (EIS) was commissioned by Eskom Transmission to investigate the most appropriate way of optimising the electrical supply system in the Rustenburg / Pretoria North region to meet the forecast demand increase. Initial technical feasibility studies indicated that optimising of the existing system through acquiring two new 400kV Transmission line servitudes between Apollo and the proposed Phoebus Substations and Vulcan and Phoebus Substations, would be the most appropriate solution to overcome the foreseen problem in the short to medium term.

The different options considered were the following:

- *Do nothing*
- *Demand side management*
- *Installation of a new generation system in the region*
- *Upgrade existing Transmission lines through using bigger conductors*
- *New 400kV Transmission lines from Apollo Substation to Phoebus Substation and Vulcan Substation to Phoebus Substation new servitudes*

The most appropriate solution seems to be the installation of two new 400kV Transmission lines from Apollo Substation to Phoebus Substation and Vulcan Substation to Phoebus Substation on new servitudes. The 400 kV Transmission lines will give Eskom Transmission the opportunity to meet the expected demand, properly integrate the Rustenburg / Pretoria North Region, as well as supply uninterrupted

electricity to the current and future users in the short to medium term, with the minimum adverse environmental impact.

The main issues associated with the option chosen are the following:

- *Certain impacts have been identified and although they can be mitigated successfully, they must be addressed in detail in the Environmental Impact Control Plan*
- *The new servitude must be acquired in the Study area covered by this Environmental Impact Study in conjunction with all the relevant landowners and communities*
- *The new Transmission lines will be bigger than existing lines with a possible bigger visual impact*
- *The Transmission lines will have a minor impact on existing land uses except where new developments are planned, and options for community involvement on servitude use and maintenance must be explored fully*
- *The issue of job creation, which is a major issue in the area covered by the study, must be explored further and local labour must be used where possible*
- *The good relations established in the communities involved must be maintained*

Through mitigation, most issues concerning the new Transmission line could be addressed.

- *Visual impact could be minimised by design, placement of towers and screening*
- *Existing land use practices, for example crop production, would be protected against damage*
- *Using minimum servitude width (55m) to accommodate the proposed Transmission line*
- *Allowing certain practices under the Transmission line could minimise the effects on land use.*

Eskom Transmission therefore proposes a development that will:

- *meet the projected demand*
- *optimise existing infrastructure*
- *minimise cost*
- *minimise any adverse environmental impact.*

Status of this report:

*This report is the **Draft Environmental Impact Report**. The report is available to IAPs for review and comments. All comments received will be incorporated into the final EIR. The final EIR will be submitted to DEAT and a ROD on the project will be issued.*

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CHAPTER 1
INTRODUCTION

1.1 BACKGROUND

South Africa has an energy-intensive economy that is dependent on abundant supplies of cheap energy. Under the RDP, Eskom has undertaken to reduce the real price of electricity for all customers so that South African producers and manufacturers can remain competitive on world markets, create jobs and generate wealth. A second objective of the RDP is to ensure supply of electricity to all in South Africa.

Eskom Transmission Division has obtained the license for bulk supply of electricity throughout South Africa from the National Electricity Regulator (NER) and is also supplying and importing electricity to and from our neighbouring countries. The rapid increase in demand experienced when new industrial developments take place, requires system development that can supply this demand increase.

The electrical Transmission network in South Africa is planned holistically, to provide adequate and reliable electricity to all local customers at the lowest possible cost and with minimum environmental impact.

The development of mining and the associated smelting industry in the Rustenburg area requires a second point of in feed of bulk electricity into an area currently supplied mainly from the Matimba Power Station at Ellisras. These specific industries require high electricity loads that must be supplied on a firm and continuous basis. No more supply can be sourced from Matimba, therefore Eskom Transmission has to link this area to another network supplied from the Mpumalanga area. Most of Eskom's electricity generation currently takes place in Mpumalanga.

The connection from Apollo Substation (Olifantsfontein) and Vulcan Substation (Witbank) to a proposed new 400kV substation, called Phoebus, in Rosslyn north of Pretoria, will form the required link to the generation area of Mpumalanga. The Phoebus substation will be situated next to the existing Hangklip Distribution Substation. Eskom Transmission plans the establishment of at least two 400kV Transmission lines. Phoebus Substation will be connected to Adis Substation at Brits to complete the link to Rustenburg.

The rapid increase of industrial and residential development in the areas north of Pretoria is also contributing to the demand for more electricity. The existing demand exceeds 1000 megawatt and it is anticipated to exceed 2000 megawatt by the year 2020.

The anticipated increase in the demand for electricity by Eskom customers' e.g. (municipalities, mining, and industry) requires that the existing Transmission network be strengthened to prevent overloading and power failures.

1.2 PURPOSE OF THE ENVIRONMENTAL IMPACT REPORT

This document looks at the need, alternatives to satisfy the need and assesses the potentially significant issues and associated impacts related to the proposed new Transmission lines.

The objectives of this document are the following:

- *To **establish the need** for increased electricity supply to the Rustenburg and Pretoria north region.*
- *To **examine the different options** for addressing the need.*
- *To **identify the most appropriate option** acceptable to all interested and affected parties (IAPs), including Eskom.*
- *To **summarise** all the information gathered during all phases of the EIS.*
- *To **analyse and synthesise** all information and to ensure correctness of information.*
- *To **assess the potential significance** of impacts associated with the most appropriate option.*
- *To make **recommendations** concerning the project based on gathered information.*
- *To **comply** with the Regulations under the Environment Conservation Act 73 of 1989 as well as the National Environmental Management Act.*
- *To **provide an opportunity for public participation and public review** of the report findings.*

This is a draft Environmental Impact Report that is submitted to IAPs for their comments. This report will also be submitted to the Gauteng and Mpumalanga environmental departments for their comments. All comments will be included in a final Environmental Impact Report that will be submitted to the national Department of Environmental Affairs and Tourism (DEAT) for authorisation.

Eskom Transmission is required under legislation to apply to DEAT for authorisation of its projects.

1.3 REPORT STRUCTURE

This report is structured in the following way:

Executive summary
This is a summary of the whole report, its findings and recommendations.

Chapter 1
Short background information on Eskom and the purpose of this document.

Chapter 2
Terms of reference for the Environmental Impact Study.

Chapter 3
The need for additional Transmission capacity and strengthening of the electrical supply system in the Rustenburg and Pretoria north region.

Chapter 4
The alternative ways of satisfying the need as well as the proposed strategy to satisfy the need.

Chapter 5
Pertinent legislation that is applicable to the project.

Chapter 6
The process adopted for the Environmental Impact study.

Chapter 7
Brief description of the project and the major activities associated with the project.

Chapter 8
Description of the study area and all aspects influenced by the proposed project or influencing the proposed project.

Chapter 9
Assessment and mitigation of all significant impacts associated with the project.

Chapter 10
Conclusions.

Chapter 11
Recommendations.

Chapter 12
Glossary of terms

After chapter 12 the following is included:
Appendices, references, list of preparers and contributors and maps.

CHAPTER 2
TERMS OF REFERENCE

2.1 INTRODUCTION

Eskom has identified a twofold need:

- The need for additional Transmission capacity in the Rustenburg area (refer Chapter 3.2).
- The need to optimise the electrical transmission system in the Rustenburg and Pretoria North Area (refer Chapter 3.3).

There are various alternative ways for satisfying the need (refer Chapter 4).

2.2 TERMS OF REFERENCE

The following objectives were set at the start of the EIS:

- To explore the need.
- To investigate alternative ways of satisfying the need.
- To identify the most appropriate option for satisfying the need through a process of public participation.
- To identify and address the issues and impacts associated with the most appropriate option.

Departure points

- The formulation of departure points for this study is as follows. It originates from “Need for the Apollo - Phoebus -Vulcan 400kV Transmission lines” (Chapter 3), and from the “Alternatives to satisfy the need” (Chapter 4). The spatial structure and land should be utilised in the best interest of the economy.
- Eskom’s commitment towards the environment sees that all its activities are assessed against this requirement.
- The supply of bulk electricity should follow development priorities (such as industry) and not the reverse.
- This additional infrastructure will firstly supply basic needs such as bulk electricity supply to the industrial areas in the Rustenburg area and secondly to the areas north of Pretoria. It is possible to supply bulk electricity in harmony with the natural and built environment.
- All the regions’ inhabitants require a reasonable level of basic, sustainable services.
- The standard of bulk electricity supply must ensure appropriate services on all levels, and these must be affordable, acceptable and sustainable.
- The natural environment is an irreplaceable resource. The infiltration and change of incompatible activities and actions can destroy it. Therefore ecologically sensitive areas should be taken into consideration when corridors

are selected for the proposed Transmission lines within the identified study area.

2.3 ASSUMPTIONS

The following assumptions were made during the study:
a) The information collected during the Scoping exercise done by Catalyst, an Independent Consultant Company (Appendix 1), is the issues perceived by the IAPs to be of importance. All issues are rated according to the results from the public scoping exercise done by Catalyst for the purpose of this study. These issues are addressed in this report in chapter 9.

b) It is assumed that the formal channels used to announce the project were sufficient to draw potential IAPs into the public participation process (PPP), and that there would be a consequent awareness of the project at community level.

c) No participating IAPs raised a direct objection against the proposed Transmission lines. The main concerns were about the social impact, the visual impact, possible health impacts as well as the impact on land use. It is therefore assumed that the proposed Transmission line project, with the right mitigatory measures taken, is acceptable to IAPs as the most appropriate option for satisfying the need.

d) The public will have the opportunity to review the draft EIR and their areas of concern will be reflected accurately within the final EIR. It is assumed that the widest possible representation for review will be obtained. It is however possible that some IAPs may be excluded.

2.4 LIMITATIONS

The following limitations can be pointed out and may have an effect on the EIS:

a) **Requests for information: -**information flow is not constant due to people changing positions all the time. Certain planned developments may not be known due to planning not being finalised and the possible exclusion of landowners during the study. Sensitivity around the planning process and competition may also play a role. Certain information such as the exact location of protected species may also not be made public.

b) **Correctness of information**: -all information supplied by IAPs, through correspondence and verbal communications, as well as specialists inside and outside Eskom, is assumed to be correct.

c) **List of interested and affected parties (IAPs): -**despite the effort made to inform as many IAPs as possible and although the list of IAPs is comprehensive, some IAPs may not have been identified.

d) **Landowners: -**due to the ever changing property market and the registration of properties to the new owners not being finalised, some of the affected landowners may not have been identified as information is not always passed from one landowner to the next. Physically affected landowners will however only be identified once the final negotiations for the final route takes place.

e) **Physical limitations: -**the area itself puts physical limitations on placement of a line route due to existing developments / natural features. The use of overhead Transmission lines, as the most appropriate solution to satisfy the need, increases the visual impact of the proposed Transmission lines.

f) **Design limitations: -**to transmit 400 kV, there are certain factors that determine the size of the structures necessary, such as safety distances, electrical clearances, etc. It is therefore necessary to ensure enough space within which to place the new Transmission lines. To put the lines underground has major financial and environmental implications.

g) **Financial feasibility:** -the financial feasibility of the project imposes a number of constraints on the project, for example:

- the length of lines
- number of bends in the lines
- tower types and conductors used for the project
- land values

h) **Incomplete or unavailable information:**

TABLE 2.4.1. **INCOMPLETE OR UNAVAILABLE INFORMATION**

INFORMATION	**REASON**	**IMPLICATIONS**
FAUNA	No specific information related to the exact location of protected or endangered species.	The final alignment of the line will be scrutinised for such species. The Environmental Management Programme (EMP) will address fauna, their habitats and specific locations.
AVI-FAUNA	No specific information received yet on the placement of bird diverters to reduce collisions.	Refer specialist study – appendix 3. Final servitude to be inspected and recommendations for installation of diverters to be included in the EMP.
VEGETATION	No specific information related to the exact location of protected or endangered species.	The final alignment of the line will be scrutinised for such species. The Environmental Management Programme (EMP) will address fauna, their habitats and specific locations.

TABLE 2.4.1. **INCOMPLETE OR UNAVAILABLE INFORMATION (Continued)**		
ARCHAEOLOGY AND PALAEONTOLOGY	No specific information related to the exact location of sites on the preferred corridor.	Once the final route alignment is decided, a survey needs to be done to determine the existence and importance of any sites. The EMP will address archaeology.
NEW DEVELOPMENTS	Most new developments known as per the development framework of Tswane Metro.	It is possible that not all new / planned developments will be known until negotiations start, once the final route is chosen. Some developments are still in their planning phases.
VISUAL IMPACT AND IMPACT ON TOURISM	Only speculatively known.	Mitigatory measures must be taken as far as possible to ensure visual acceptability of the Transmission line. Where possible the line must be placed in service corridors. Refer Tourism specialist report by P Norton.

CHAPTER 3
THE NEED FOR THE APOLLO – PHOEBUS - VULCAN 400kV TRANSMISSION LINES

3.1 INTRODUCTION

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 lines transmit power, mainly from the Power Stations located at the Mpumalanga coal fields to major substations where the voltage is reduced for distribution to industry, businesses, homes and farms all over the country.

If Eskom Transmission is to honour its commitment to meet the increasing needs of end users, it has to establish and expand its infrastructure of Transmission lines and Substations on an ongoing basis. Due to substantial urbanisation as well as new mining, smelter and industrial loads in the area north of the Magaliesberg and the area north of Pretoria, 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.

The introduction of power from another source would help to reduce the sensitivity at Matimba Power Station. To meet these demands and to stabilise Matimba, it was decided by Eskom that the best solution would be to develop an electrical corridor between Matimba Power Station and Vulcan Substation near Witbank, linking it to the Generation systems of Mpumalanga. Environmental Impact Studies were completed from Spitskop Substation to Bighorn Substation near Marikana and from Bighorn to the proposed Phoebus Substation. However, this report is concerned only with the section between Apollo to Phoebus Substation and Phoebus to Vulcan Substation (Refer map 1 and map 10).

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 balance 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 significantly impacting on the environment.

3.2 THE NEED FOR ADDITIONAL TRANSMISSION CAPACITY IN RUSTENBURG AND PRETORIA NORTH AREAS

Hundreds of kilometres of 400 kV Transmission lines feed electricity from Matimba Power Station to Transmission Substations in North West Province. Some of these lines also feed into the Gauteng Province (Refer map 10).

The existing Transmission lines are becoming heavily loaded and are predicted to reach their full capacity very soon. These Transmission lines can not supply the increased demand from the new industrial developments in Rustenburg. New bulk supply substations and Transmission line extensions from the current network in the Rustenburg to Brits areas are currently approved and will be constructed in the near future.

It is becoming very difficult to manage with one line out of service since the other 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 3-5% per annum average load growth for the area fed from Bighorn Substation, near Marikana, the main bulk supply substation to the Rustenburg area. This is due to industrialisation, urban growth and electrification. It is also 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 by the year 2004. The development of mines and smelters in the Rustenburg area, however, requires the short-term injection of a major supply into the area just to cater for the industrial development.

3.3 THE NEED TO OPTIMISE THE ELECTRICAL TRANSMISSION SYSTEM IN THE RUSTENBURG AND PRETORIA NORTH AREAS

From 3.2 it can thus be seen that a fault on any of the lines serving the Rustenburg area could have a detrimental effect on supply to customers once the new industrial customers are supplied from the existing network.

Eskom Transmission has taken measures to get the most out of the existing Transmission system so that the construction of the new line will occur only when needed. These measures include:

- Comprehensive checks on the existing lines to ensure that they are within the legal clearance for overhead lines. Lines sag when placed under heavy load conditions, due to heating of the conductors.

- Installation of line monitoring devices that measures the atmospheric conditions prevailing. This allows Eskom Transmission to decide whether the lines can cope with more loading (e.g. on a cold day the line can be loaded to more than usual levels since the lines cool down and they do not sag as much.)

- Installation of a new Transmission Substation named Ikaros north of Rustenburg, and the connecting of this substation with the Matimba-Midas 400kV Transmission line, as well as with Bighorn Substation at Marikana (Refer map 10).

- When reinforcement options were looked at, the best option was chosen to ensure that an optimised mix of cost, technical benefit and environmental impact was achieved.

It is clear that new Transmission lines will be needed as all options for optimisation of the existing infrastructure have already been studied and implemented. The new Transmission lines will be brought into operation at the time when the load growth and demand exceeds the supply, sometime in 2004. Connecting to another source of supply, i. e. the Mpumalanga power stations will also ensure a firm supply into the area at all times. It is therefore necessary to secure the necessary servitudes timeously, to ensure this will be possible.

3.4 CONCLUSION

A definite twofold need has been identified:

- to optimise the existing system and
- the need for additional capacity in the Rustenburg and Pretoria North area.

By increasing the supply into the Rustenburg area, the foreseen load growth can be addressed in a suitable and economical way. Optimisation of the current system is currently underway, and would alleviate some problems in the system. The short to medium term need will be addressed by the increased supply due to the new Transmission lines.

CHAPTER 4
ALTERNATIVES FOR SATISFYING THE NEED

4.1 INTRODUCTION

Electrical supply constitutes a complex system of generation facilities, substations and Transmission lines. The system operates on a demand-supply structure. The power is generated and transmitted at the moment it is needed. Spare generation capacity is currently available in the system supplied by the coal-fired power stations in the Mpumalanga Province. It is therefore not necessary to increase generating capacity to cater for the forecast load growth.

The forecast growth in demand over the next few years urgently requires Eskom Transmission to take timeous action. It is therefore necessary to ensure extra supply capacity into the Rustenburg and Pretoria North areas. There is a definite need to overcome the future overloading problems on the existing Transmission lines.

The ideal solution should be to:

- meet the projected demand
- optimise existing infrastructure
- minimise cost
- minimise any adverse environmental impact.

4.2 ALTERNATIVES FOR SATISFYING THE NEED

The following alternatives for satisfying the twofold need for additional electrical supply to the region and optimising the existing infrastructure were investigated by Eskom Transmission:

4.2.1 The do nothing option

To maintain the status quo is the easy way out. By not taking any action, Eskom Transmission may end with a situation of not being able to ensure firm supply into the region in the very near future. This would eventually lead to load shedding which can cause major disruptions of power supply to different areas at different times. This can have a major impact on the economics of the region, as no real economic growth can take place. New township and industrial developments in the region in the near future will cause overloading of the existing Transmission system, with resultant power failures. This option is therefore ruled out because it would neither supply the projected demand for electricity nor optimise the existing infrastructure.

Eskom Transmission has taken all measures to date to ensure that the existing Transmission system will be utilised to its full capacity (see section 3.3 above).

4.2.2 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 practised to a certain extent, but is currently not considered feasible for expansion in this particular region.

Eskom Transmission is currently looking at various means to achieve a flatter load profile in this area. However, the large concentration of industrial users in this area makes this a very difficult option to pursue.

4.2.3 New generation systems

A new coal fired, gas or nuclear generation plant could be commissioned near to the load centre. This would have a more negative overall impact on the environment and would take at least five years to implement; therefore this option was not investigated, as Eskom does not experience a shortage in generation capacity at present, only the means to transmit power to the load centres. This option would also not supply the foreseen demand increase in the short term. The cost of such an option will be extremely high compared to the cost of Transmission lines. Transmitting power through Transmission lines is currently the most economical way to supply bulk electricity.

The use of other types of generation such as wind and solar energy were suggested by some IAPs, but the high cost and low output of such systems does not make them economically feasible for the supply of bulk electricity as is required by large industrial users.

4.2.4 Upgrade existing Transmission lines by using bigger conductors

The physical load on the existing towers would increase substantially and the towers would be inadequate. Furthermore, it would not be possible to remove one Transmission line from service to perform the upgrading work, as the remaining supply lines would not be able to supply the electrical loads in the region. This option would also not optimise the existing infrastructure.

4.2.5 Construct a 400 kV Transmission line between Apollo and Phoebus Substations and a 400kV Transmission line between Phoebus and Vulcan Substations

This option will sufficiently reinforce the present network, as it will form the third feeder into Bighorn Substation near Marikana. Power will flow via Adis Substation to Ikaros Substation north of Rustenburg to feed some of the loads currently fed from smaller Distribution Substations. This will also link the Rustenburg area with the Generation systems in Mpumalanga. This is the option most favoured by Eskom Transmission (Refer map 10).

This alternative is definitely the most economical apart from doing nothing that can be implemented in the short term. The need for increased capacity and the need for optimising existing infrastructure would be met.

The advantages with this option are as follows:

- It overcomes the line overloading problems.
- It will create a more flexible network since it forms an interconnection between the loads fed from Matimba Power Station and the Generation area of Mpumalanga. This will improve the overall reliability of the system, which will be of benefit to both Eskom and to all electricity users in the area.
- It improves the reliability of supply to the Rustenburg area which presently feeds very sensitive industrial customers whose presence here affect the livelihoods of the people and the economy of the North West Province.
- It will be less costly than other options that were considered.

Due to current land use and development in the area north of the Magaliesberg between Rustenburg and Pretoria North, very little open corridors remain that could be utilised to install major Transmission lines with a servitude of 55 metres. New routes must however be secured to ensure servitudes for the expansion of the network and to be able to meet the forecast increase in demand.

The need for increased capacity and the need for optimising existing infrastructure will be met in this way, and this option is put forward as the most feasible option by Eskom Transmission.

4.3 FEEDBACK FROM IAPs AND SPECIALIST STUDIES

Feedback received from IAPs during the Scoping phase has highlighted a number of issues in the main study area (Map 1) that were considered and assessed in this report. The secondary and refined study area where the Transmission lines can be placed, was identified based on specialist studies as included in the appendices, taking into consideration the issues raised by the IAPs and current land use (Map 2).

Due to the limited area available for development of transmission lines, the narrowed study area as shown on Map 2 has been carefully scrutinised. The principle of following existing service corridors such as roads, railway lines and other power lines were used to identify a suitable corridor for the placement of the new Transmission lines. This has limited the final corridor severely between Phoebus and the N1. Alternative alignments within this area have therefore been limited to one alignment that follows existing infrastructure a closely as possible. All the specialists have basically agreed that this is the most suitable alignment for this area.

The use of the existing vacant servitude from Rietvlei Nature Reserve to the N1 is also put forward as being the most sensible option in this area, as Eskom has a vested right on the vacant servitude. To limit the effect on Rietvlei Nature Reserve, the line to Apollo substation has however been deviated from the existing vacant servitude through Rietvlei, to follow an alignment outside the Reserve. Due to the nature of current and planned developments in this specific area, a few possible alignments were identified as is shown on Map 9. Upon detailed investigation of these different alignments, it was concluded that the new line could follow any of these alignments. The significance of the impacts of the Transmission line will be the same for all the different alignments. One proposed alignment is therefore put forward as the most preferred alignment as described in Chapter 11.

4.4 PROPOSED STRATEGY FOR SATISFYING THE NEED

The twofold need can be satisfied through construction of two 400 kV Transmission lines, one between Apollo and Phoebus Substations and a second Transmission line linking Phoebus to Vulcan Substation at Witbank. The installation of

the Apollo - Phoebus -Vulcan 400 kV Transmission lines would offer the following benefits to Eskom Transmission and its customers in the Rustenburg and Pretoria North region in the short to medium term:

- Increased supply to the region.
- The proposed lines improve the electrical system performance in the region.
- The proposed lines will ensure the capacity of Eskom Transmission to supply the forecast increase in demand.
- It will alleviate current problems at Matimba Power Station.

Eskom Transmission is aware that it is thus of paramount importance that the necessary servitudes be obtained, to ensure an acceptable quality of electrical supply to the region.

CHAPTER 5
THE LEGAL POSITION

5.1 INTRODUCTION

A project involving the positioning of a new Transmission line requires a vigorous review of applicable legislation, policy guidelines and administrative procedures.

This chapter reviews legislation pertaining to environment conservation, pollution prevention, use and conservation of resources, protection of the socio-cultural heritage, etc.

- The proposals represent the culmination of a multi-disciplinary and wide-ranging planning process extending over a three-year period. The EIA study for this project proposal is aiming at policies and plans, as well as the physical-spatial detail.

- Eskom Transmission's mission is to supply cost effective electricity. Electricity generation and distribution has an impact on the environment, and Eskom Transmission therefore stands accountable to its customers, stakeholders and communities to strive for the principles of sustainable development and make this an integral part of its business.

- Environmental planning, consultation and assessment processes have to comply with all applicable state, provincial and local regulations. Such legislation broadly embraces pollution prevention, resource use and conservation, and socio-cultural (heritage) protection.

- Adherence to the EIA regulations of sections 21, 22 and 26 (September 1997) of the Environmental Conservation Act, 1989 must be ensured, as it is a requirement throughout the project's life cycle.

5.2 PERTINENT ENVIRONMENTAL LEGISLATION

Given the nature of the Phoebus-Apollo-Vulcan 400 kV Transmission line study area and the proposed development, some pertinent environment laws that are applicable to the study area have been identified and are presented in Table 5.2.1.

TABLE 5.2.1 PERTINENT ENVIRONMENTAL LEGISLATION APPLICABLE TO THE PROJECT.

NAME OF ACT OR ORDINANCE	AREA OF APPLICATION	CONTROLLING AUTHORITY
Advertising on Roads and Ribbon Development Act (Act no 21 of 1940)	Prohibition of leaving refuse, and erection and construction of structures near certain roads	Department of Transport
Agricultural Pests Act (Act no 36 of 1983)	Control to prevent agricultural pests, including the importation of exotic plants and animals	Department of Agriculture
Atmospheric Pollution Prevention Act (Act no 45 of 1965)	Control of all forms of air pollution, e.g. smoke, dust and vehicle emissions	Delegated through regulations to local authorities Department of Health
Conservation of Agricultural Resources Act (Act no 43 of 1983)	Control of the utilisation and protection of wetlands, soil conservation and related matters, control and prevention of veld fires, control of weeds and invader plants, the control of water pollution from farming practices	Department of Agriculture
Environment Conservation Act (Act no 73 of 1989) and regulations under the act	Matters relating to conservation, littering, combating of noise, etc.	Dept of Environment Affairs Dept of Water Affairs and Forestry Local authorities
Eskom Conversion Act 13 of 2001	Matters relating to Eskom	Eskom Holdings
Fencing Act (Act no 31 of 1963)	Prohibition of damage to a property owner's gates and fences	Department of Agriculture
Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act no 36 of 1947)	Control of aspects concerning the importation, manufacture, registration, sale, storage and use of pesticides and herbicides	Department of Agriculture
National Forest Act (Act no 84 of 1998)	Control of veld, forest and mountain fires and the protection of biota and ecosystems	Department of Environmental Affairs and Tourism

TABLE 5.2.1 PROMINENT ENVIRONMENT LAWS APPLICABLE TO THE PROJECT (CONTINUED).

Hazardous Substances Act (Act no 15 of 1973)	Control of substances capable of causing injury, ill-health or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitising or flammable nature	Department of Health
Health Act (Act no 63 of 1977)	Control of the provision of sewerage and sanitary facilities and the pollution of surface and ground water, which may endanger human health	Most powers delegated to local authorities Department of Health
National Heritage Resources Act (Act no 25 of 1999)	Control over the protection of heritage resources	SAHRA and Provincial heritage protection agencies
Minerals Act (Act no 50 of 1991)	Controls land use and infrastructure on mining and prospecting areas. Controls environmental matters in areas to which this Act applies, e.g. the removal of trees and vegetation	Department of Mineral and Energy Affairs
National Environmental Management Act (Act no 107 of 1998)	Environmental management of the RSA	National and Provincial environmental authorities
National Roads Act (Act no 54 of 1971)	Disposal of waste near national roads	Department of Transport
Occupational Health and Safety Act (Act no 85 of 1993)	Controls the exposure of employees and the public to dangerous and toxic substances or activities	Department of Manpower
Physical Planning Act (Act no 125 of 1991)	Regional and urban structural plans (Sections 23-27)	Department of Regional Planning and Land Affairs
Regional Services Council Act (Act no 109 of 1985)	Enabling regional services councils to control environmental matters within their areas of jurisdiction	Regional Services Councils
National Water Act (Act no 36 of 1998)	Control of the conservation and use of water for domestic and industrial purposes; treatment and disposal of waste and waste water and pollution of surface and ground water	Department of Water Affairs and Forestry

Of importance are also all provincial and municipal by-laws and regulations that are not listed here. Some of the acts may have changed or are in the process of change. However, once construction starts, current legislation and all amendments will apply.

Objectives of the Regulations with regard to sections 21, 22 and 26 of the Environmental Conservation Act, 73 of 1989

- to ensure that the environmental effects of activities are taken into consideration before decisions in this regard are taken;

- to promote sustainable development, thereby achieving and maintaining an environment which is not harmful to people's health or well-being;

- to ensure that identified activities which are undertaken do not have a substantial detrimental effect on the environment; and

- to prohibit those activities that will cause detrimental damage to the environment

- to ensure public involvement in the undertaking of identified activities; and

- to regulate the process and reports required to enable the Minister or his designated competent authority to make informed decisions on activities.

CHAPTER 6
THE EIA PROCESS ADOPTED FOR THE STUDY

6.1 INTRODUCTION

This section depicts the process followed during the EIS for the Apollo – Phoebus - Vulcan 400 kV project. The study adheres to the Regulations promulgated under sections 21 and 26 of the Environment Conservation Act 73 of 1989, the principles of NEMA, 107 of 1998, as well as the DEAT Guidelines, April 1998.

The Environmental Impact Assessment process for linear developments developed by the Eskom Transmission Land and Rights Section is used for the purpose of this Environmental Impact Study. Interested and affected parties are invited to participate in the project as the investigations proceed and have the opportunity to review the studies and reports.

Once this draft EIR has been publicly reviewed and is finalised, a final EIR will be handed to DEAT for authorisation. When authorisation is obtained, servitudes for the construction of the proposed Transmission lines will be obtained through negotiations between Eskom and the individual landowners. Based on the outcome of these negotiations, the final alignment of the Transmission line will be surveyed.

An Environmental Management Programme (EMP) will then developed with specialist input on the final alignment. This EMP ensures that care is taken of the environment during and after the construction phase of a project.

6.2 GENERAL APPROACH TO THE STUDY

The general approach to the study is depicted in table 6.2.1

TABLE 6.2.1 APPROACH TO THE STUDY

Phase	**Main action**	**Description**
Phase 1	Need and justification	Establish the need. Establish alternatives. Appoint project team.
Phase 2	Electrical and technical feasibility study	Electrical and technical feasibility. Evaluate alternatives. Identify problem areas. Decision on continuation or termination of project.
Phase 3	Appoint independent consultants, peer reviewer and specialists	Identify study area. **Pre-application meeting with DEAT**
Phase 4	Scoping	**Public involvement strategy:** • Media releases and advertisements • Identify and contact IAPs. • Letters to IAPs • Public meetings **Scoping report.**
Phase 5	Environmental impact study	**Draft Environmental Impact Report (EIR).**
Phase 6	Review	Internal review. Peer review. Independent IAP review. Provincial Govt review. Comments received and analysed, and Draft EIR revised. **Final EIR**
Phase 7	Record of Decision	**Final EIR submitted to DEAT for a Record of Decision** on the project. Appeal period.
Phase 8	Project implementation	**Approved Environmental Management Programme (EMP) implemented on site**

6.3 INITIAL TECHNICAL AND ELECTRICAL FEASIBILITY STUDIES

Eskom Transmission assessed the different options for supplying bulk electricity to the Rustenburg and Pretoria North areas technically, economically, environmentally and on a time scale. Electrical and technical feasibility studies were also initiated. From the studies undertaken it became clear that Eskom Transmission needs to address the foreseen growth in demand in the short to medium term.

Eskom currently has a surplus capacity of electricity generation, which negates the requirement for a new power station in the short term. The option of demand side management, which is a cost-effective option, also had to be negated because it would only delay the need for a very short period and would not satisfy the projected demand. Alternative sources of electricity such as solar and wind energy will not be able to meet the steep increase in demand from major industrial customers in the short term. These options therefore were also not feasible.

The following deductions could be made from issues raised by project team members during the electrical and technical feasibility study:

- The team agreed that new Transmission lines are required to supply the customer demands in the short term.
- The general feeling of most team members was that finding a new route may be difficult, especially in certain built-up areas, and that a detailed EIS is required.

6.4 IDENTIFICATION OF POTENTIAL IAPs

Through existing contacts, previous studies and research into possible IAPs, a list of IAPs was compiled. A concerted effort was made to identify all statutory and non-statutory bodies as well as landowners affected by the proposed new line. The list was made available for public scrutiny and possible expansion.

Newspaper advertisements and replies thereto also increased the number of IAPs identified for the study. Personal contact at ground level with communities through workshops and questionnaires identified many IAPs. This process was carried out by Catalyst, an independent facilitator company.

6.5 SCOPING

A sound public participation process (PPP) was developed as part of the Environmental Impact Study and community involvement was incorporated in all aspects of the process. With this in mind, the following took place:

1) A Plan of Study for Scoping was developed and submitted to DEAT and the Department of Agriculture, Conservation, Environment and Land Affairs (DACEL) of Gauteng. Because the proposal has trans-provincial boundary impacts and Eskom Holdings is Government owned, it is legally required that DEAT would be the lead agent for this EIS, as long as GDACEL and the Mpumalanga Department was kept abreast of the process and content. This has been done.
2) Various public participation processes were followed, including advertisements; flyers, posters and a series of public meetings (See scoping report for details).
3) A community forum was set up, which included representatives from agriculture, health, conservation, eco-tourism, etc. They helped guide the EIS for this project, including agreeing to the Terms of Reference for the specialist studies, by specialists whom they also assisted in identifying.
4) As the study area was quite large (Map 1), it was decided to carry out a desktop study with the various specialists, to try and eliminate the obvious potentially problematic areas. These studies included Aesthetics; Archaeology; Bird study; Eco-tourism; Fauna; Conservation; Vegetation, including the Land study and Water. All information is shown on the **Combined Information Map**. This resulted in a reduced area (Map 8) for close scrutiny and further study. This report is the result of the detailed study.

The areas covered by the desktop studies were:

Area:	**Specialist:**
Birdlife	Chris Van Rooyen - EWT
Flora	Cathy Dzerefos
Fauna	Peter Norton
Conservation areas	Peter Norton
Tourism	Mike Gardner
Aesthetics	Mike Gardner
Water	Melissa Moffet
Archaeology	Julius Pistorius

It was then agreed that Tourism; Conservation areas; Aesthetics; Flora and Fauna will be studied in more detail in the reduced area, and that the following would be subject to a desktop study:

EMF, lightning, health issues, Demand Side Management, renewable energy and possible climate change. The information gathered during the specialist studies is shown on Map 2 to Map 7.

It was subsequently also agreed that a more detailed avi-fauna, vegetation as well as archaeological studies would be included as part of an EMP, once the final routing of the lines have been negotiated.

6.5.1 **Scoping process**

A comprehensive and detailed scoping process was handled by Catalyst, an independent scoping facilitator. IAPs were contacted and issues and concerns were recorded at public meetings for inclusion in the assessment of impacts.

Catalyst and Eskom personnel with appropriate expertise were available to:

- Inform the public about the project
- Address public concerns
- Record public comments and recommendations
- Identify areas of concern to be addressed by the EIS
- Gather specific information relevant to the study area.

The scoping process was concluded in a Scoping Report that was submitted to DEAT for approval. The Scoping Report was accepted as being comprehensive and acceptable and was therefore approved by the relevant authorities.

6.5.2 **Constraints of the process**

- Delays and non-participation on the part of certain important IAPs.
- Lack of information on land ownership.
- Time scales, especially in identifying ownership of land.
- Apathy from certain sectors of IAPs.

6.5.3 **Response to scoping**

The following deductions could be made from issues raised by IAPs during the scoping exercise:

- Some of the major concerns were the visual impact, land use implications (with regard to new developments) and possible damage to endangered species or veld types that the new development may have.
- The possible effect on the health of people living near to the proposed Transmission line route.
- The possibility of job creation with regard to the project.
- The impacts on tourism and nature reserves in the area.

- Specialist studies must be done to investigate the issue raised by the IAPs.

It must therefore be stressed that the new servitude must be carefully selected, and all concerns duly recognised and issues addressed.

6.5.4 **Issues raised through scoping**

The following issues were raised during the scoping process:

- The visual impact of the line (Aesthetics)
- Air pollution
- Land pollution
- Noise pollution
- Archaeological and palaeontological impacts
- Impact on birds
- Construction impacts
- Electric and magnetic fields (EMF) and health
- Impact on indigenous vegetation and crops
- Impact on infrastructure
- Job creation
- The impacts on land use
- Impacts on land values and property values
- Loss of amenities
- Impact on the sense of place
- Soil erosion
- Impact on water quality and wetlands
- Impact on Fauna (Wildlife)
- Impact on Rietvlei Nature Reserve, and other Nature Reserves north of Pretoria
- Impact on NEGI (North Eastern Gauteng Initiative)
- Impact on ridges areas such as Bronberg

The Environmental Impact Study (EIS) team thus accepts that all issues listed above are to be addressed in the Environmental Impact Assessment (EIA) in Chapter 9. All results and the description of the study area are included in this Environmental Impact Report (EIR).

6.6 ENVIRONMENTAL IMPACT STUDY

The EIS is a combination of research on the affected area, consultation with landowners and other specialists, and addressing the concerns of IAPs. All issues identified by IAPs are assessed in the EIA. Positive and negative impacts are assessed and ways to mitigate negative impacts and enhance positive impacts are addressed.

Ongoing consultation with IAPs in the area ensures that the study team is kept informed at all times. The study team consists of specialist environmentalists, an independent

scoping facilitator, Catalyst, surveyors, negotiators and engineers and public participation practitioners. A peer reviewer, Mr Guy Nicholson, was also appointed on the project, to review the findings of the EIS and the content of the Environmental Impact report. This was done to ensure conformance to DEAT requirements regarding the study and subsequent reports.

The study approach and list of contacted institutions

A Plan of Study for the EIA was submitted to the relevant authorities and was approved. This report represents a study of the issues that were identified throughout the Screening and Scoping phases of this project as contained in the Scoping Report. Issues that were identified during these phases of the project, by the Project team, were obtained through the following methods:

- **4 x Site visits to the study area**
- Visits to and consultations with:
    - Pretoria Distributor - Land Survey Department
    - Proposed Phoebus site
    - Areas between Phoebus site, Apollo and Vulcan Substations
    - 3 x meetings with Town Planner (Gauteng region), who was already appointed on the project
    - Meetings and site visits with specialists for information - (Archaeologist, Ecologist, Botanist, Town Planner)
    - Eskom Park - Witbank - Land Survey Department
    - Meeting with Gauteng Provincial Government - Deputy Director (Environmental Affairs)
    - Meeting with Mpumalanga Provincial Government - Deputy Director (Environmental Affairs)
    - Meeting with DEAT National
    - Town Council of Akasia
    - Town Council of Pretoria
    - Town Council of Bronkhorstspruit
    - Town Council of Rayton
    - Briefing documents with the project description and maps were sent to Government departments, local authorities, NGO's and other institutions.
    - Public meetings
    - Community forum meetings

The EIS was completed by June 2003. The **Draft Environmental Impact Report** (EIR) is now available for IAP review during August 2003. All comments will be

included in the **final EIR.** A public **Record of Decision** (ROD) will be published, once the study is complete, by the Department of Environmental Affairs and Tourism (DEAT).

6.7 CURRENT STATUS OF THE STUDY

This report is the **Draft Environmental Impact Report**. The report is available to IAPs for review and comments. All comments received will be incorporated into the final EIR. The final EIR will be submitted to DEAT and a ROD on the project will be issued.

The draft EIR will be available at Public libraries throughout the study area for public review. It is also published on the Eskom website at the following address;
www.eskom.co.za/eia.

The availability of this report will be announced via letters to IAPs and newspaper advertisements.

Comments on this Draft EIR can be sent to Eskom care of:

Me Carol Streaton
D1 Z40
Megawatt Park
P O Box 1091
Johannesburg
2000

Responses and comments can also be faxed to Me Streaton
at fax number : 011 800 3917 or
e-mail to : carol.streaton@eskom.co.za

The time for responses closes on **19 September 2003**.

CHAPTER 7
DESCRIPTION OF THE PROJECT

7.1 INTRODUCTION

This chapter describes the technical characteristics of the proposed Transmission lines, and gives an overview of the major activities associated with the project.

7.2 TECHNICAL CHARACTERISTICS

Two 400kV Transmission lines of approximately 60km and 100km will be constructed. The **three (3) electrical phases** of each 400 kV line will be in a **horizontal configuration** (see figure 7.2.1a-c).

The servitude or right of way is a legal right accorded to Eskom by landowners. A 400 kV Transmission line requires a servitude width of **55m**. Where there are physical constraints such as other power lines adjacent to the new servitude, a minimum of **35m**-separation distance from such lines is required. Without physical constraints, parallel lines will have at least 5**5m**-separation distance.

Three (3) types of towers could be used for construction of the Phoebus-Apollo-Vulcan Transmission lines. These are:

a) Self-supporting strain and suspension towers,
b) Guyed-anchor towers,
c) Cross-rope suspension towers, and

The self-supporting strain and suspension towers are more bulky than the other tower types. The guyed-anchor and cross-rope type towers are newer designs that have a lesser visual impact.

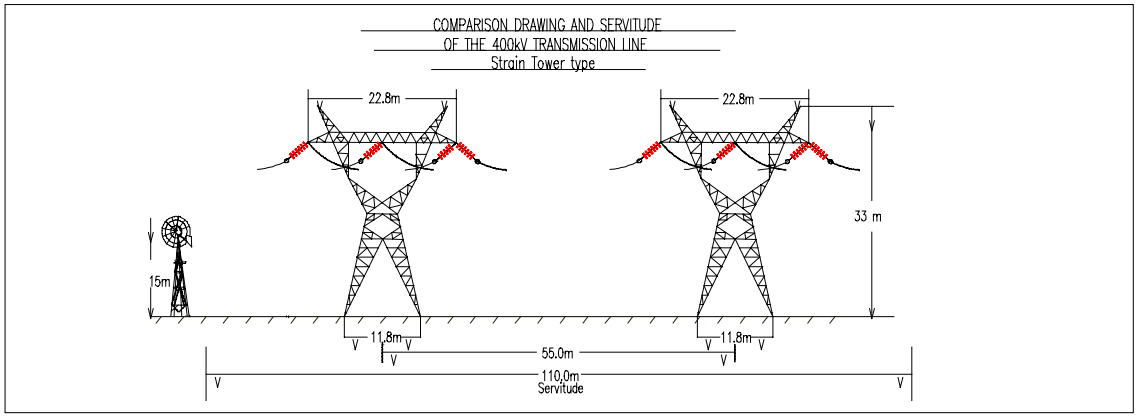

Figure 7.2.1a. 2 x 400 kV Transmission Towers (Strain type)

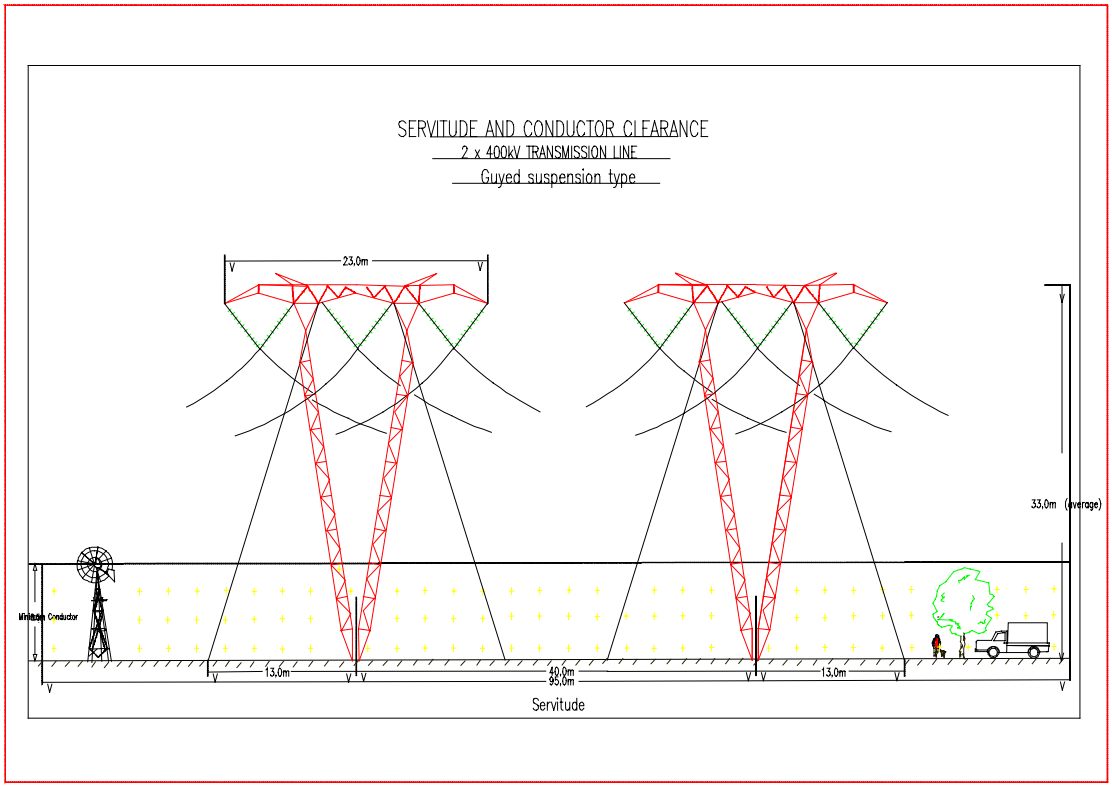

Figure 7.2.1b. 2 x 400kV Guyed-anchor Transmission towers

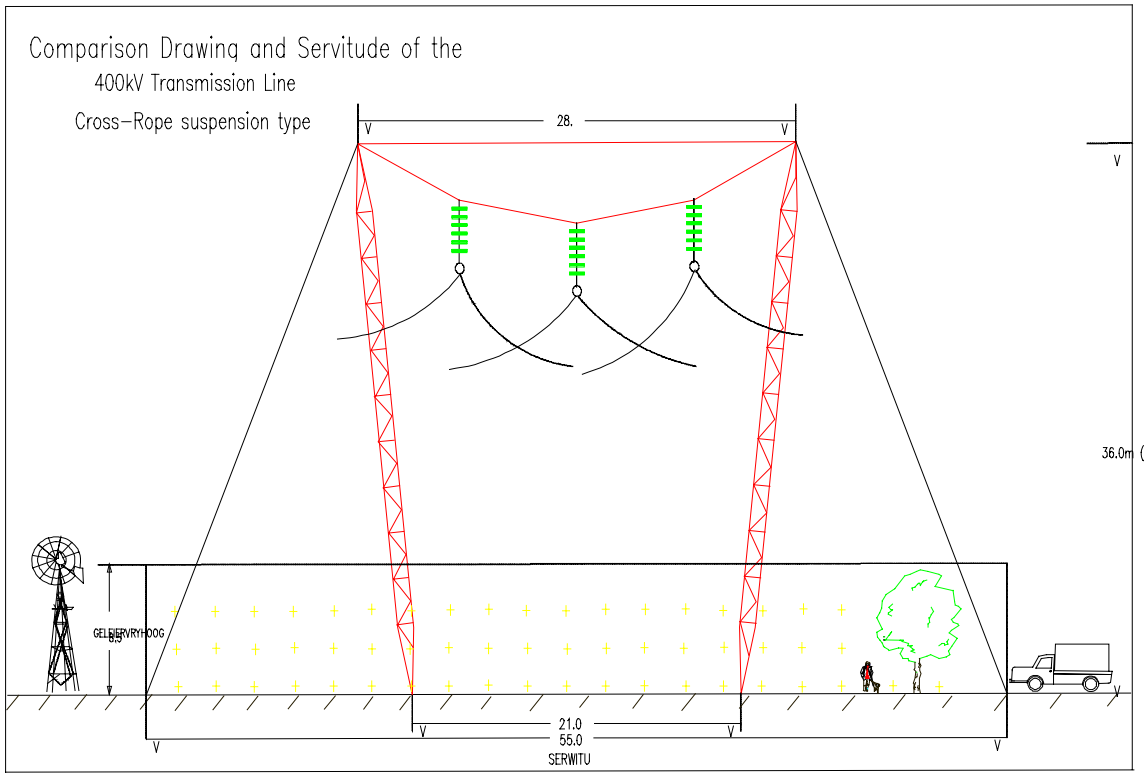

Figure 7.2.1c. 400 kV Cross-rope suspension Transmission tower

7.3 MAJOR ACTIVITIES ASSOCIATED WITH THE PROJECT

The project needs to be implemented in phases. The project phases include the following:

- Environmental Impact Study
- Decision and ROD from DEAT
- Negotiations with landowners
- Survey of the line route
- Development of an EMP
- Construction of the new line
    - Servitude vegetation clearing (6m) where required for access
    - Installation of servitude gates to facilitate access
    - Pegging of tower positions
    - Foundation nomination and excavation
    - Installation of foundations
    - Delivery of steel on site
    - Assembly of towers
    - Erection of towers
    - Stringing of conductors
    - Tensioning of the conductors
    - Servitude cleaning
    - Ground works to rehabilitate disturbed areas
- Operation and maintenance for the lifetime of the Transmission line

The whole construction phase will be controlled through an **Environmental Management Programme (EMP).** The function of this EMP is to ensure compliance with basic environmental principles, and is part of any contractual agreement entered into with the Contractor. The EMP will minimise the environmental impact during the construction and subsequent maintenance of the proposed Transmission line.

The EMP includes but is not limited to the following:

- Landowner and community special conditions as negotiated
- ROD conditions from DEAT
- Physical access plans
- Restrictions placed on the Contractor in working areas to protect ecologically and culturally sensitive areas
- Erosion control measures
- Re-vegetation plans
- Instructions for maintenance of servitude, etc.

CHAPTER 8
DESCRIPTION OF THE STUDY AREA

8.1 INTRODUCTION

The one proposed Transmission line will traverse land between Phoebus Substation near Rosslyn and Apollo Substation near Olifantsfontein. The second line will traverse land between Phoebus Substation and Vulcan Substation near Witbank (refer map 2). In areas close to Phoebus it might be required to place the two lines parallel where it is feasible. The use of double circuit towers will only be considered where there are severe environmental and space constraints, largely due to high costs and significantly higher visual impact.

This chapter gives a brief description of the area influenced by the proposed Transmission lines. It examines the potential **biophysical, socio-economic** and **socio-cultural** issues associated with the project.

8.2 REGIONAL CONTEXT

The proposed Transmission lines will form a link between the Rustenburg and Pretoria North areas with the Transmission networks of Gauteng (Apollo) and Mpumalanga (Vulcan). Rustenburg is one of Eskom Transmission's main load centres in the North West Province, where electricity is used mainly for mining and smelting purposes. Phoebus Substation will be linked to Adis Substation to feed power into the Rustenburg area (refer map 10), but will also become a future distribution point for electricity to the area north of Pretoria.

The natural environment

The natural environment plays a very important role in the region, especially in Gauteng, as development is putting huge strain on the few open spaces left in the Province. The Magaliesberg, Witwatersberg, Skurweberg and Bronberg, due to steep topography and a relatively low number of current developments, serve as habitats for a wide variety of plant and animals species and for this reason is worthy of conservation.

The Moreleta Spruit, Apies, Hennops and Jukskei rivers all run through urban areas and the flood plains of these rivers serve as regional open spaces. These water courses and the dams located in them are valuable assets for eco-tourism. The mountain ranges and floodplains of rivers have historically been well integrated into the metropolitan areas of Midrand, Centurion, Pretoria and Akasia with the nett result

that the natural environment features strongly in the existing urbanised areas. However, as land become scarcer and more expensive, pressure on nature areas for urban development mounts.

The natural environment is also very important from an economic point of view. Scenic areas like the Zoutpan crater, Roodeplaat Dam, Rietvlei Dam, and the Bronkhorstspruit Dam have considerable tourism potential which can, if utilised to the full, create job opportunities which will benefit the region as a whole.

Another important link between the natural environment and the economy lies with mining, both open cast and shaft mining. There are several valuable minerals and construction materials present in the region, and these are being mined throughout the study area. Unfortunately mining also impacts negatively on the environment; in addition there is a seeming lack of control over mining and rehabilitation measures.

Industry can also impact negatively on the environment and, without effective control measures has considerable potential for serious damage to the environment, visually and through air and water pollution. In the case of Eskom Transmission's proposal to construct two Transmission lines in the area, visual impact of these lines has to be considered.

Agriculture, which is function of the natural environment, also has important links with economy: It feeds people and provides jobs to several thousands of people in the region. Intensive agricultural activities are concentrated around the Crocodile River irrigation system; around the Apies River irrigation system north of the Bon Accord Dam, and in the eastern sub-region with extensive crop farming. In addition the game farms north-east of Wallmannsthal serve as important income generators, create job opportunities and contribute to nature conservation.

There is a constant pressure from urban development on the natural environment. Eskom is in the advantageous position of having in the past established a balance between development and conservation. However, it will in future become increasingly important to endeavour to maintain this balance. Horizontal urban expansion has occurred relatively unchecked in the region. The Pretoria area contains the central metropolitan core that has developed outwards in all directions, but especially towards the east and the south-east.

North and south of this core, linear development has taken place towards Soshanguve in the north-west and towards Midrand in the south. It should be noted that Soshanguve

forms part of a greater urbanised area (Ga Rankuwa, Hebron, Itsoseng, Mabopane and Winterveld) which lies in the North West Province. Soshanguve is situated about 30 kilometres north of the core and Midrand 30 kilometres south of the core. Land use zoning has resulted in a relatively rigid separation of land uses, large areas being almost exclusively covered by residential, others by industry, commercial and business uses.

8.3 AREA OF INFLUENCE

The area influenced by the proposed Transmission lines will be the area in closest proximity to the proposed line; thus it can be predicted that most impacts are of a local nature and extent. The construction activities will be limited to the servitude that covers a width of 55m.

8.4 BIOPHYSICAL ASPECTS

The biophysical aspects are all aspects relating directly to the natural environment and exclude all man-made structures or features. These include geology, topography, geomorphology, climate, hydrology and drainage, fauna, avi-fauna and flora.

8.4.1 Geology

Granitic rocks of the Johannesburg-Pretoria Granite Dome underlie the southern part, between Rooihuiskraal and Midrand. This granite dome is characterised by a thick residual soil profile, caused by decomposition of the very old landform.

A wide zone of dolomite occurs above the granite sand which extends from Atteridgeville, through Centurion and from there southwards through Clayville. Dolomites are known for their large groundwater reserves, stored in cavities and voids that are often linked. Due to subsurface erosion, mostly caused by leaking services and the disturbance of the upper soil layers, large underground cavities sometimes occur, often causing sinkholes. Such sinkholes have occurred adjacent to the Ben Schoeman Highway.

Sedimentary and volcanic rocks of the Pretoria Group occupy large areas of the study area. The alternating succession of shales and quartzite has formed the series of parallel mountain ranges of which the Magaliesberg is the most prominent. Gabbro and norite of the Rustenburg Layered Sequence underlie the large flat area to the north of the Magaliesberg. This area is characterised by isolated small hills of almost solid rock, which are surrounded by flat areas where thick layers of black and brown clay occur.

Granites of the Bushveld Igneous Complex occur over large areas in the northern parts of the study area. Soil development in this area is rather limited and shallow rock and outcrops are common features. The eastern parts of the study area, to the north of Bronkhorstspruit and Cullinan, are largely underlain by quartzitic sandstone of the Waterberg Group. This area is characterised by prominent hills with steep slopes and valleys with cliff rock faces.

Sedimentary rocks of the Karoo Supergroup, mainly consisting of tillite, shale, siltstone and sandstone, occur sporadically within the study area. The Mpumalanga's coal deposits, associated with the Karoo Basin are largely located east of the study area. Intrusions of dolerite and diabase in the form of narrow dykes and largely sills are common features of the study area.

The dolomite formations south of Pretoria contain possibly the most important aquifer in the Southern Africa. At present large quantities of groundwater are extracted daily for domestic use by municipalities of Pretoria, Centurion and Midrand. Large-scale extraction, however, requires careful monitoring of the water table since excessive drawdown will increase the risk of sinkhole development.

Other aquifers in the study area are mostly the structural type, which can yield strong boreholes, but due to their relatively small storage capacity, has limited application. Although the available groundwater (excluding dolomitic aquifers) in the study area is small compared to the surface water resources, it plays an important role in the rural areas, often being the only source of potable water.

Mining activities occur throughout the study area. Borrow pits for sand is mostly located near urban development. Residual granite south of Pretoria, towards Apollo substation, is used for concrete aggregate, but requires washing and screening to remove excess fine material. Alluvial sands, derived from the quartzitic sandstone of the Waterberg Group, are exploited for coarse concrete aggregate and road building gravels (base-course) in the Pretoria area where quartzite and gabbro are used. Dolomite is mined in the Centurion area and mainly used for flux in the steel industry.

The shale deposits of the Karoo Super group have been mined over long periods in the past in the Hammanskraal area, north of Pretoria. It is still being mined at Clayville for refractory bricks. The larger mining activities in the study area occur at the Premier Diamond Mine near Cullinan, east of Pretoria, at the Vergenoeg Fluor Mine in the vicinity of

Rust de Winter, and at a number of chrome mines to the western side of the study area.

Geological significance with respect to the proposed Transmission lines

In assessing the influence of geology in the study area, one cannot ignore the potential impact of the transported horizon of material on top of any resultant residual material occurring immediately above the parent rock. Transported material is expected to be extensive in plan, but relatively shallow in terms of depth. It is likely to be either Aeolian or Colluvial origin.

Therefore, the geology (underlying rock) together with any residual and / or transported material that may be present, will have an effect or influence on the engineering properties of the tower foundation material, the foundation system cost, soil erosion potential, and construction access under either dry or wet conditions. The topography and the resultant effect on access is obviously also (and has been) influenced by the geology and the differential weathering properties of the rock material.

Erosion is not considered to be a major threat in this particular study area due to the relatively good vegetation cover and gentle slopes. Appropriate erosion control measures must nevertheless be implemented along servitude roads and next to tower positions in accordance with the Eskom Specifications.

Mineral resources in economically viable concentrations are not expected to influence the routing of the proposed Transmission lines significantly. Seismic activity is seen as essentially negligible and should therefore not influence the line routing.

8.4.2 Topography and major land features

Phoebus substation is situated at an approximate altitude of 1250m above mean sea level, and Vulcan substation at an approximate altitude of 1550m above mean sea level. The terrain covered by the study area is gently to moderately undulating.

The western half of the study area is characterised by the prominent east-west Magaliesberg mountain range in the north from where it extends to the east of Mamelodi. The eastern part of the study area is topographically much more evenly sloped than the western part. The major influences to future development are the eastern extremities of the

Magaliesberg, which restricts the expansion of Mamelodi, and the Bronberg, which influences the direction, and extent of future expansion of the eastern and south-eastern suburbs of Pretoria.

The influence of these mountain ranges is manifested in both the steep topography associated with it and the sensitive plant and animal communities that inhabit it. These mountain ranges are, however, not only restrictive, but also provide opportunities for regional open space.

The terrain covered by the study area is moderately undulating with flat plains and certain areas with rocky ridges such as the Magaliesberg and Bronberg. These are seen as vulnerable to development and should be avoided where possible. The Gauteng Province has specifically decided to put an effort into protecting the ridges as these form habitats with high bio-diversity.

Access to the line routes and Transmission towers may constitute the greatest challenge in determining the Transmission line routes.

8.4.3 Geomorphology

Erosion is not expected to be a major problem as vegetation can recover quickly due to the fairly high annual rainfall. Slope stability may however present a significant threat to a Transmission line and the correct placement of towers should therefore receive serious consideration in areas where slopes are present. Proper erosion control measures should also be installed and maximum use must be made of existing access roads.

8.4.4 Climate

The annual rainfall in the study area is between 700 mm per annum in the west, and 800 mm per annum in the east.

The study area has a moderate climate posing no real problems for normal human activities. The summers are hot while frost can occur during the winter. Precipitation mainly occurs during summer in the form of thunderstorms, often accompanied by hail. This type of precipitation results in brief peak volumes of run-off water, sometimes resulting in drainage systems overflowing.

The predominant wind direction is north to north-east. The major climatological influence in the area is the inversion zone occurring in the upper air during winter months. This inhibits the rising of hot polluted air and gives rise to a so-called “heat island” over the central sub-region, resulting in

excessively high levels of air pollutants. This poses a major health hazard to inhabitants. The problem is especially relevant in the central and northern parts of Pretoria and in the area north-west of Clayville.

The climate is moderate with cold winters and warm summers, especially in the area close to Witbank. The area north of Pretoria is more moderate with not such cold winter temperatures.

8.4.5 Hydrology and drainage

The area is covered by sub-sections of two major catchment areas, these being the Crocodile / Limpopo River system in the west, and the Olifants River system in the east. The Crocodile River system consists of the Jukskei and Hennops Rivers and Sesmylspruit in the south-western part of the study area, and the Pienaars River (which includes the Moreleta Spruit) on the eastern boundary of the central sub-region.

The Elands and Wilge Rivers drain the eastern part which both flows in a north-easterly direction to form part of the bigger Olifants River drainage system. The Bronkhorstspruit and Premier Mine dams are part of the Olifants River system. The Bon Accord and Roodeplaat dams are all part of the Crocodile River drainage system. Some seasonal marshes and marshy sponge areas, which serve as natural water purification systems and habitats for plants and birds, occur in the eastern part of the region in the vicinity of Bronkhorstspruit. Urbanisation within the area causes an increase in run-off rates and volumes due to impermeable surfaces. As a result, a diminished sub-surface flow of water is experienced which influences the replenishment of water tables. Information gathered during the Water study is depicted on Map 4. (Appendix 4 Specialist study)

8.4.6 Fauna

The Roodeplaat Dam area, stretching from Doornpoort farm boundary to the Baviaanspoort Prison is cut up into smallholdings where the owners keep either horses or various livestock. The vegetation is mostly disturbed with only a few patches of natural vegetation. A large variety of wild animals are found in the region, of which the mammals are particularly important. They include types of mice, hare, hedgehog, aardwolf, leopard, cat species, jackal, mongoose, warthog and several types of buck.

The area is heavily populated with many township developments underway or planned. Nature conservation areas do occur and should be avoided where possible. It can

however be accepted that there will be a component of fauna present. This will include birds, reptiles, insects and probably lots of smaller mammals. It can also be accepted that some species found in the area might be on the endangered species list, such as the Golden mole. Although no serious concerns were raised about the possible impact of the new Transmission line on the fauna of the area, it must be accepted that this component does exist.

For the purpose of the study, the fauna that would most likely be affected is classified as follows:

- Avi-fauna
- Mammals

8.4.6.1 **Birds**

Although many bird species occur in the and some of these may be on the endangered list, information on past recordings of bird collisions in this area seems to point to the fact that it has never been a significant problem in the area. With the large electrical clearances on the proposed new 400 kV Transmission line, the chances of bird electrocutions are highly unlikely. Design of the Transmission lines will also ensure the safety of roosting birds on the lines, and mitigation measures can be installed to minimise collisions. Most bird species will also be concentrated in areas less populated such as nature reserves. The problem areas identified during the Bird study done by Mr Chris van Rooyen, EWT, is shown on Map 2 and in appendix2.

8.4.6.2 **Mammals**

Most big mammal species have been driven from the area for many years. Monkeys and Baboons and mostly smaller mammals associated with densely vegetated areas may be found. It is however highly unlikely that the line would have any adverse impacts on mammals still present in the area. Due to the large electrical clearances on the proposed line, electrocutions of any animal species are highly unlikely. No impact on stock farming is foreseen. See also appendix 6 for specialist study by P Norton.

8.4.7 Flora

Various flora types are found in the study area and information gathered during the study is depicted on Map 3. For the purpose of the study a specialist, Ms C Dzerefos was employed to study the possible impact of the proposed Transmission line on the vegetation in the study area. Her report is contained within appendix 3. Mixed vegetation is found in the northern parts of the region and contributes to the bushveld character of this area. The grassveld biome in

the study area only consists of one veld type, namely the central variation of the Bankenveld, represented by the open grassveld of the Witwatersrand and elevated undulating landscape. Threatened fauna and flora (red data species) occur in certain localities in the study area.

The area around Phoebus is zoned for industrial development. Most of the vegetation is disturbed, even on the smallholdings that are situated further to the east. The natural vegetation on the smallholdings is used for grazing (mostly cattle). The Haakdoringboom area is under smallholdings and small farms with most of the vegetation either destroyed or altered by unsound farming practices. There are a few places where the remaining natural vegetation is used for small-scale cattle farming.

Onderstepoort area is made up of smallholdings with patches of closed deciduous low *Rhus lancea - Acacia karroo* woodland. The natural vegetation is mostly removed in this area. Along the slopes of he Pyramid Hills, vegetation is still mostly unchanged and is a closed deciduous low *Euphorbia ingens - Berchemia zeyheri* woodland. This area is currently not used for any type of farming.

Doornpoort area is currently used for mixed cattle / game ranching with a large area to the east and south of Hall's Hill that is to be developed as a township in the near future. Directly at the base of the slopes, the area shows signs of past disturbance by early cattle farmers right up to the early 1950's with many of the structures still visible.

The areas of concern are depicted on Map 3. The following main components regarding vegetation will be assessed: Natural vegetation, invader species, protected species and agricultural crops.

8.4.7.1 **Natural vegetation**

Large areas of the original study area still contain some natural vegetation. Most of the indigenous component inside the study area, that is still of conservation value, is mainly concentrated inside current nature reserves and contained on the ridges. A large portion of the study area is however earmarked for township and industrial development. The specialist study has pointed out that the species component under existing power lines in the study area is higher that that of other areas, which makes the Transmission line servitude an opportunity for protection of species as Eskom Transmission do not allow development under its Transmission lines.

8.4.7.2 **Invader species**

Invader species currently present in some parts of the study area are Wattle and Blue gum. The disturbance of soil can lead to colonisation by especially Wattle. The spreading of these plants through construction vehicles is also a threat. All efforts must be made to prevent the spreading of these plants to non-infested areas.

8.4.7.2 **Protected and red data species**

Red data species do occur in the study area. The exact position of such plants is currently not determined, apart from possibly the ridge areas, because the final alignment of the Transmission line has not yet been decided and negotiated. Once the final alignment is known, the specialist will once again be commissioned to study the alignment and make recommendations for mitigation to be included in the EMP where the line may affect species. It is however foreseen that the final proposed corridor would not impact greatly on red data species.

8.4.7.4 **Agricultural crops**

Agricultural crops are grown in certain areas of the study area. These must be treated with respect and compensation must be paid to crop owners should any losses occur. The more formal agriculture in the study area is found on the route to Witbank, where maize is farmed.

8.5 SOCIO-ECONOMIC ASPECTS

8.5.1 Land-use

The most important land uses identified along the proposed corridors are the following:

- Conservation areas
- Maize farming
- Housing developments, upmarket, formal and less formal
- Industrial areas

The areas surrounding the proposed corridor between Phoebus and Apollo Substations are mostly taken up by urban development, including residential and industrial developments. Some formal low cost housing developments are also found along the proposed corridor. Informal settlements are also found in many areas. The area towards Vulcan Substation is mainly open farmlands with informal settlements developing close to Vulcan Substation. It is thus very important to secure servitudes, before the whole area is

developed, which will place serious constraints on obtaining servitudes for Bulk supply of electricity to the intended areas north and west of Pretoria.

8.5.2 Urban areas, smallholdings and informal settlements

Informal and formally planned settlements are found close to most of the proposed line routes, especially in the area north and east of Pretoria. Some of these settlements are structured and services are provided, whereas others are totally unstructured. Some future developments that are planned or are in the final stages of planning also include upmarket developments, including the area adjacent to Rietvlei Nature Reserve. All proposed and planned developments will have to be taken into consideration during final planning and alignment of this Transmission line routes.

8.5.3 Forestry and wooded areas

There are no commercial forestry areas affected by the proposed new Transmission line.

8.5.4 Conservation areas

There are several proclaimed nature reserves in the study area of which the Magaliesberg, Onderstepoort, Doornpoort, Roodeplaat, Rietvlei Dam and Fonteinedal are situated within or directly adjacent to the central part of the study area. Because of the high conservation status of these areas, they are protected from development and have a strong influence on the future direction and extend of urbanisation.

Apart from the proclaimed nature reserves, several other sensitive areas have been identified in the study area. These include areas where red data species occur; undisturbed areas like a portion of Wallmannsthal and the area directly east of it; marshlands around Bronkhorstspruit; the Bronberg south-east of Pretoria; and the Skurweberg and Witwatersberg west of Pretoria. In doing the investigations for the purpose of this report it was recognised that apart from the existing nature reserves at the Roodeplaat Dam another reserve is proposed within the study area to be known as the Buffelsdrift Nature Reserve.

The remainder of the study area mainly consists of farms and small farms. With regard to the farms the future planning thereof and whether any development of major nature will take place within any part of the study area is unknown.

8.5.4.1 Nature reserves

The following proclaimed nature reserves are found in and near the study area and are shown on Map 6:
Rietvlei Nature Reserve
Onderstepoort Nature Reserve
Bon Accord Nature Reserve
Proposed Buffelsdrift Nature Reserve

8.5.4.2 Natural heritage sites

There are no registered natural heritage sites within the proposed corridor as described in Chapter 11.

8.5.4.3 Conservation worthy sites

The specialist study has identified areas of indigenous vegetation that may be conservation worthy, which is shown on Map 6. The specialist used for the study was P Norton and his report is found in appendix 6. The proposed corridors for the Transmission lines should try and avoid these areas where possible. Where technical difficulties are encountered in placing the corridors as suggested, the route will have to be moved and this may lead to a slight increase in impact on indigenous vegetation. Mitigation measures must then be introduced to minimise the impact.

8.5.5 Infrastructure

8.5.5.1 General service infrastructure

An extensive infrastructure and well-developed service infrastructure exists in the urbanised parts of the study area. Supply authorities do some long term planning to provide for future growth. The quality of local distribution service infrastructure and standard of service varies between suburbs, with lower quality and operational inadequacies characterising services in some township areas. There is a backlog in the provision of service infrastructure in formal and informal settlements with some areas having only rudimentary or informal services.

8.5.5.2 Airways Infrastructure

There are commercial and military airports in the study area. Military airports are the Waterkloof and Zwartkops. Registered airports in the area are listed below.

TABLE 4: REGISTERED AIRPORTS IN THE STUDY AREA

AIRPORT	LENGTH OF RUNWAY (m)	TYPE OF SURFACE	LICENSED
Bronkhorstspruit	1200	-	No
De Hoop	-	-	No
Fastfontein	-	-	No
Grand Central	1 720 x 15	Asphalt	Yes
Haakdoornboom	635 x 12	Gravel	Yes
Rashoop	835 x 18	Gravel / soil	Yes
Wonder Air	-	-	No
Wonderboom	1 828 x 30 1 280 x 22	Asphalt	Yes

Source: ***Greater Pretoria Structure Plan, 1995***

8.5.5.3 Existing and proposed road networks

The major existing roads providing access to these smallholdings are the Mabopane highway, which is apart of the constructed PWV9, the old Pretoria-Warmbaths roads and the N1 or Pietersburg highway. Another secondary route within this area is the Moloto road that at present is the major route between KwaNdebele and Pretoria. This route furthermore serves as a spine to various land uses, apart from the agricultural uses, which are abutting it. These uses include certain recreation facilities as well as small-scale business and light industrial uses.

As for Soshanguve the development of the smallholdings directly to the east of the Phoebus substation, as earmarked in terms of the Mabopane-Centurion Development Corridor, depends highly on the increase in accessibility which will only be achieved if the PWV9 is fully constructed.

For the purpose of the construction of the proposed Transmission lines in the study area where the smallholdings are located, two areas are considered as important with respect to future developments. These areas are the most western Haakdoringboom smallholdings, which form part and parcel of the Mabopane-Centurion Corridor.

In terms of the proposed development for that area, several extensions to the existing residential areas in Soshanguve are planned, with various other uses to support the residential use also to be established in this area. Other developments that might have an impact on the proposed Transmission lines is the area earmarked for the KwaNdebele-Pretoria Development Corridor which mostly covers the smallholdings in Rooiwal, Waterval and Buffelsdrift.

8.5.5.4 Existing electricity networks

The formal urbanised part of the study area is well provided with bulk electricity. Eskom, as national electricity generator and distributor, has excess generating capacity. Generally the distribution network is adequate to supply the existing loads at firm capacity.

Local electricity distribution

Organisations within the study area and adjacent areas that obtain electricity in bulk from Eskom Transmission and distribute it locally are:

- Pretoria City council
- Centurion City Council
- Various Platinum Mines
- Bronkhorstspruit Town Council
- Local Government Affairs Council
- Gauteng Province, Community Development Branch
- Premier Mine
- Government Institutions
- Eskom generally undertakes distribution in rural areas.
- Improvements have been proposed for the Transmission system within the western side of the study area.
- Eskom Distribution is the electricity supply authority for the Soshanguve area.
- The various authorities within the eastern sub-region also purchase their power from Eskom and redistribute their internal supply themselves.
- The informal settlements near Soshanguve, Atteridgeville and Mamelodi, as well as those at Leeuwkraal, Boschfontein, Zevenfontein, Ekangala and Bapsfontein do not have services.

The local infrastructure is very well developed in some areas. In other areas there are informal settlements without any infrastructure.

Services such as roads, railway lines, electricity supply, water and telephone services are in place in most areas and may be affected in a minor way due to the possible positioning of the proposed new Transmission line. No services will however be disrupted unless such services have to be deviated, and then only very temporarily.

8.5.6 Agriculture

Agriculture in the study area consists mainly of maize crops along the proposed corridor to Vulcan Substation as well as some stock farming. Informal agriculture may be found near some informal settlements. Formal agriculture anywhere in the study area between Phoebus and Apollo Substations is limited to small scale farming activities.

8.6 SOCIO-CULTURAL ASPECTS

8.6.1 Historical sites

The Pretoria area has a rich history, which has left a vast heritage of sites and buildings relating to people living in the region.

The known historical sites have been identified and are shown on the attached Map 5. The final route must be carefully chosen so as not to disturb known sites.

8.6.2 Archaeological and palaeontological sites

There are known sites within the greater study area as shown on Map 5 derived from the Archaeological Study of Dr J Pistorius contained within appendix 5. The exact positions of possible sites within the proposed corridors are however not known, as the corridors were chosen to avoid known sites. The proposed Transmission lines should not affect archaeological or palaeontological sites. For any such sites identified once the final route is chosen, mitigatory measures can be adopted to ensure they are protected. Graves along the route must be identified, marked and treated with respect. A specialist will again be consulted during the EMP phase to ensure all possible sites along the final corridor alignment are identified.

8.6.3 Tourism

The tourism situation in the area the implications for the proposed development are described in the report of M

Gardner in appendix 7. Many small-scale tourism operations are found throughout the study area. These are mainly accommodation and conferencing facilities. Small-scale operations catering for the local market are found. The proposed Transmission lines should not have any major effect on tourism. Information regarding possible tourism areas is depicted on Map 7.

8.6.4 Recreation

- Pleasure resorts (i.e. Camping and picnic sites, swimming, tennis etc): Fountains, Derdepoort, Wonderboompoort, Nkwe, and Little Eden.
- Dams (i.e. Angling, boating, camping and picnic sites): Roodeplaat, Rietvlei, Bon Accord, and Bronkhorstsbaai.
- Botanical gardens: Pretoria
- Zoological gardens, aquariums, snake parks: Pretoria, Schoemansville, and Midrand.
- Hiking trails: Moreleta, Fountains, Faerie Glen Nature Reserve.
- Cultural / historical centres: Zoutpan, Cullinan Mine, Pioneers' Museum, Willem Prinsloo Agricultural Museum, Voortrekker Monument as well as numerous art galleries and museums in Pretoria.
- Health resort / hydro: Hoogland in the Skurweberg.

The proposed Transmission lines should not have any major effect on recreation.

8.6.5 Aesthetics

The visual and aesthetic qualities of the area are described by M Gardner in the Visual Analysis Report contained within appendix 7. Development has scarred the area, and formerly pristine areas are now either developed or used for agricultural purposes. Very few aesthetically pristine areas are still to be found. The current Nature Reserves and some ridges may be the exception to the rule in this area, and it is possible to route the proposed lines to avoid these reserves and some ridges. However, the scenic value of the areas traversed by the proposed Transmission lines is subjective.

The specialist report does conclude that additional lines will have some additional negative visual impact in the area. Although the visual impact is the single most difficult impact to mitigate, every effort should be made to introduce measures to minimise visual impact as much as possible.

CHAPTER 9
ASSESSMENT AND MITIGATION OF POTENTIALLY SIGNIFICANT IMPACTS

9.1 INTRODUCTION

This chapter assesses the issues of concern raised by IAPs during the scoping process (see 6.5 page14). This chapter also identifies and describes the potential impacts associated with these issues of concern, and suggests possible mitigatory measures that could be applied to minimise negative impacts and enhance positive impacts.

The following issues / issues of concern were identified by IAPs:

Table 9.1.1 Issues raised through Scoping

Aesthetics (Visual impact)
Air, land and water pollution
Impact on archaeological and palaeontological sites
Impacts on birds
Construction impacts
Impact on indigenous vegetation and crops
Impact on Rietvlei Nature Reserve, and other Nature Reserves north of Pretoria
Impacts on infrastructure
Job creation
Impacts on land use
Impacts on land and property values
Loss of amenities
Electric and Magnetic Fields (EMF) and health
Impact on NEGI (North Eastern Gauteng Initiative) Impact on ridges areas such as Bronberg
Noise pollution
Impacts on the sense of place
Soil erosion
Impacts on wetlands and water quality
Impacts on fauna

In sections 9.2 and 9.3 the issues of concern are addressed and

- the potential impacts on the study area arising from each issue of concern are described,
- the impacts are assessed, by the author, in terms of specific criteria commonly used in the *Guideline document: EIA Regulations, April 1998, DEAT*(Table 9.2),
- the potential for the mitigation of impacts is then identified and discussed (Table 9.3).

Table 9.1.2 gives a summary of the criteria used for the assessment of the issues of concern as raised through public scoping DEAT, 1998).

TABLE 9.1.2: SUMMARY OF CRITERIA USED FOR THE ASSESSMENT OF THE ISSUES OF CONCERN

	CRITERIA	**DESCRIPTION OF ELEMENTS THAT ARE CENTRAL TO EACH ISSUE.**
DESCRIPTION	Nature	What causes the effect?
		Who will be affected?
		What will be affected?
		How will it be affected?
	Status	Positive, negative or neutral.
ASSESSMENT	Extent	Is the impact **site specific**, i.e. extending as far as the activity.
		Does the impact extend **locally**, i.e. extend to the site and its immediate surroundings.
		Does the impact extend **regionally**, i.e. have an impact on the region.
		Does the impact extend **nationally**, i.e. have an impact on a national scale.
		Does the impact extend **internationally**, i.e. have an impact on an international scale.
	Duration	**Short term**, i.e. 0-5 years.
		Medium term i.e. 5-11 years
		Long term, i.e. impact ceases after the operational life cycle of the activity either because of natural processes or by human intervention.
		Permanent, i.e. mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.
	Magnitude	**Low**, i.e. natural and social functions and processes are not affected or minimally affected.
		Medium, i.e. affected environment is notably altered. Natural and social functions and processes continue albeit in a modified way.
		High, i.e. natural or social functions or processes could be substantially affected or altered to the extent that they could temporarily or permanently cease.
	Reversibility	Impact is reversible or irreversible.
	Cumulative or non-cumulative	Potential of two or more impacts to combine to form cumulative or synergistic impacts.
MITIGATION	Potential to mitigate each of the negative impacts	Description of the mitigatory measures. Extent to which mitigatory measures could influence the significance and status of each impact.
	Potential to optimise each of the positive impacts	Description of the optimisation measures. Extent to which they could influence the significance of each impact.

9.2 POTENTIALLY SIGNIFICANT ISSUES AND ASSOCIATED IMPACTS

TABLE 9.2. DESCRIPTION OF POTENTIALLY SIGNIFICANT ISSUES AND ASSOCIATED IMPACTS

Issue	Component	Comments	Status	Extent	Magnitude	Duration	Reversibility
1. Possible visual impact	1.1 General	The proposed Transmission line towers are much higher than existing towers in the area and may cause an intrusion in scenic areas. The lines are likely to be more visible from many viewpoints in the area due to their size. The local population may be affected by greater visibility of these towers.	Negative	Local	High	Long-term	Irreversible
2. Pollution	2.1 Air pollution	Air pollution can be caused by dust from the construction activities. There are no other possible causes of air pollution.	Negative	Local	Low	Short-term	Reversible
	2.2 Land pollution	Construction rubble and plastic bags are a major contributor to land pollution. Oil spills can occur should machinery break down or be serviced on the servitude. The use of the veld for toilets can also contribute to pollution that may have adverse health effects.	Negative	Local	Low	Short-term	Reversible
	2.3 Water pollution	Water pollution can take place should construction rubble, oil, household rubbish or sanitary rubbish end up in water sources.	Negative	Local	Low	Short-term	Reversible
3. Possible impact on historical, archaeological and palaeontological sites	3.1 General	Historical, archaeological and palaeontological sites do exist in the study area and may be disturbed during construction. If any sites were found during construction it may constitute new finds from which new information about the area can be gained.	Negative Positive	Local to regional Local to regional	High High	Long-term Long-term	Reversible Irreversible
	3.2 Graves and prayer sites	Graves are known to exist and certain prayer sites may occur. These sites can be disturbed through uncontrolled construction practices.	Negative	Local to regional	Medium	Medium-term	Reversible
4. Possible impact on birds	4.1. General	Possible bird collisions with overhead lines, especially as fog occur frequently in some areas in the study area. Protected and endangered species may be affected if they should fly into the line or be electrocuted by the line.	Negative Negative	Local to regional Local to national	High High	Long-term Long-term	Reversible Reversible
	4.2. River valleys	Fog occurs more frequently and for longer periods. Larger birds with slower reactions may fly into the line. Protected and endangered species may be affected adversely. Birds tend to fly down river valleys and should the line cross the river, bird collisions may occur.	Negative Negative	Local to regional Local to national	High High	Long-term Long-term	Reversible Reversible

TABLE 9.2 CONTINUED

5. Construction	5.1 General	Uncontrolled construction practices may lead to several significant impacts. The communities may be disturbed and amenities damaged. Infrastructure can also be damaged. The relations between the Contractor and Eskom on one side and the Community on the other could be severely damaged.	Negative	Local	Medium	Medium-term	Reversible
6. Electric and magnetic fields (EMF) and health	6.1 Electric fields	Some people deem electric fields dangerous, especially after prolonged exposure. It may/may not cause disorders. No conclusive proof for or against the effect of electric fields is available.	Negative	Local	Medium	Long-term	Reversible
	6.2 Magnetic fields	Some people deem magnetic fields dangerous, especially after prolonged exposure. It may/may not cause disorders. No conclusive proof for or against the effect of magnetic fields is available.	Negative	Local	Medium	Long-term	Reversible
	6.3 Health	Some people are concerned the lines may affect their health when it is in close proximity to them.	Negative	Local	Medium	Long-term	Reversible
7. Impacts on vegetation	7.1 General	The new line may have an adverse effect on vegetation through damage during construction. Species diversity in the servitude area may be lost.	Negative	Local to regional	Medium	Short to medium-term	Reversible
	7.2 Development issues	Due to the other developments planned in the area, the servitudes may act as a buffer against physical development and cause some areas to be conserved. The servitudes can become bio-diversity corridors.	Positive	Local	High	Long-term	Irreversible
	7.3 Indigenous vegetation and medicinal plants (bio-diversity)	Construction activities may lead to the destruction and loss of indigenous vegetation. This destruction may be enhanced if erosion should occur after completion of the project. Bio-diversity may be lost due to the construction process	Negative	Local to regional	High	Long-term	Reversible
	7.4 Conservation areas	Conservation areas can be significantly impacted should the proposed Transmission line traverse such areas	Negative	Local to regional	High	Long-term	Reversible
	7.5 Conservation worthy areas	The ridges in the Gauteng area are all conservation worthy sites and could be impacted on by Transmission lines	Negative	Local to regional	Medium	Long-term	Reversible
	7.6 Agricultural crops	Agricultural crops may be damaged during construction	Negative	Local	Low	Short-term	Reversible
	7.7 Alien species	Alien species may invade the servitude during and after construction, thereby replacing the natural vegetation.	Negative	Local	High	Long-term	Reversible
8. Possible impact on Infrastructure.	8.1 General	Disruptions of services or damage to infrastructure that could affect consumers may occur.	Negative	Local	Low	Short-term	Reversible
	8.2 Municipal services	The increased congestion of infrastructure could cause loss of services affecting all customers dependant on these services. Damage to electricity, telephone and water supply lines may occur during construction.	Negative	Local	Low	Short-term	Reversible

TABLE 9.2 CONTINUED

9. Possible impacts on property and land use.	9.1. General.	Adverse impacts on residential properties, smallholdings and farming land, due to the positioning of the proposed line. Reduced productivity of agricultural land and interference with management of agricultural land may occur. Residents and landowners may be affected adversely if the line interferes with their existing practices. Land that could be developed may be affected adversely.	Negative	Local	High	Medium-term	Reversible
	9.2 Servitude use	The community can use servitude for many purposes. Crop production, conservation of areas and the growing of medicinal plants can increase the value of the servitude for the communities affected by the servitude. The servitude could provide a refuge for bio-diversity as certain development is prohibited.	Positive	Local	High	Long-term	Irreversible
10. Impact on property and land values	10.1 General	The line may have a negative effect on land and property values in that property and land values may tend to decrease once the line is constructed.	Negative	Local	Medium	Medium-term	Reversible
11. Impact on amenities	11.1 Loss of amenities	The line may cause the loss of current amenities should no unused open space be found to place the servitude	Negative	Local	Medium	Medium-term	Reversible
	11.2 Gaining of amenities	The servitude can be utilised as public open space and for recreation. The use of the servitude by the community would help to prevent the degradation of the servitude and provide them with an asset.	Positive	Local	High	Long-term	Irreversible
12. Noise pollution	12.1 General	Noise may increase during construction activities which may adversely affect the community	Negative	Local	Low	Short-term	Reversible
	12.2 Conductor noise	Conductor noise or line humming may occur in future as the line is energised and becomes older and more polluted. This may adversely effect the community. People living close to the line may be affected, especially on rainy and misty days.	Negative	Local	Medium	Permanent	Irreversible
13. Impact on the sense of place	13.1 General	The Transmission line may seem to be out of place, especially in those areas where there are no existing lines. This may seem like an intrusion into the community by a foreign object.	Negative	Local	Medium	Medium-term	Reversible

TABLE 9.2 CONTINUED

14. Soil erosion	14.1 General	Possible increase in soil erosion due to scarring of topsoil during construction. Degradation of land may take place. Vegetation and the river ecosystem may be affected	Negative	Local	Medium	Medium-term	Reversible
	14.2 Areas with steep slopes.	Construction on steep slopes could trigger erosion, or increase existing erosion. Topsoil is likely to be lost and natural areas and agricultural activities may be affected. Vegetation may be lost and environmental degradation could occur.	Negative	Local	High	Long-term	Reversible
15. Possible impact on wetlands	15.1 General	Possible impact on wetlands foreseen during construction	Negative	Local to regional	Medium	Medium term	Reversible
16. Possible impacts on animals	16.1 General	Habitat loss can occur should degradation of the servitude environment take place. The food base can be negatively affected, with a resultant loss of animal species in the vicinity of the Transmission line.	Negative	Local	High	Long-term	Reversible
	16.2 Bio-diversity	Loss of bio-diversity may occur.	Negative	Local	High	Long-term	Reversible
	16.3 Electrocution	Electrocution may occur but due to the large electrical clearances required for the proposed line, this is highly unlikely	Neutral	N. A.	N. A.	N. A.	
	16.4 New habitat	Clearing of the servitude of alien vegetation may create new habitat for new species, such as grazing for domestic animals. Increase in bio-diversity may occur.	Positive	Local	High	Long-term	Reversible
17. Possible indirect impact on rivers	17.1. General	Siltation due to erosion can occur. The embankments can be destabilised if towers are placed on slopes close to the embankments, and this can lead to landslides into the river system. The river ecosystem can be affected adversely.	Negative	Local	High	Medium-term	Reversible
18. Reliability of power supply	18.1. General	A significant increase in firm supply area is foreseen. The proposed line should lead to a decrease in power failures that would affect consumers positively. Although some end consumers may not feel the effect directly, the region would benefit immensely.	Positive	Local to regional	High	Long term	Reversible

9.3. MITIGATION OF POTENTIALLY SIGNIFICANT IMPACTS

TABLE 9.3. MITIGATION OF POTENTIALLY SIGNIFICANT IMPACTS

Impact	Component	Mitigatory measures	Likely effectiveness	Status	Extent	Magnitude	Duration
1. Visual impact	1.1. General	Placement of towers next to existing towers on parallel lines. Line placement to avoid skyline where possible. Due to other developments planned in the area, the visual quality of the study area will decrease over time. Implement specialist recommendations	Visual impact could be reduced significantly in most areas.	Negative	Local	Low	Medium term
2. Pollution	2.1 Air pollution	Construction vehicles to travel at low speeds to reduce the effect of dust. Where extreme problems are experienced, watering down of the dust can be done.	Air pollution can be minimised significantly	Negative	Local	Very low	Short-term
	2.2 Land pollution	All rubble to be removed from site. Dustbins to be placed at sites for household rubbish. Oil spills to be cleaned up immediately and no servicing of vehicles to be allowed in the servitude. Chemical toilets to be provided on site.	Land pollution can be minimised significantly	Negative	Local	Very low	Short-term
	2.3 Water pollution	No construction rubble, household rubbish or any other sanitary waste to be dumped in or near the river. Chemical toilets to be provided on site.	Water pollution can be prevented or minimised significantly	Negative	Local	Very low	Short-term
3. Possible impact on archaeological and palaeontological sites	3.1 General	Known historical archaeological and palaeontological sites in the study area can be avoided by careful placement of the line. If any sites were found it would constitute new finds from which new information about the area can be gained.	Sites will be avoided or protected during construction More information about the area can come to light.	Negative Positive	Local Local to regional	Very low High	Short-term Permanent
	3.2 Graves and prayer sites	Graves are known to exist and certain prayer sites do occur. These sites must be identified, marked and no disturbance should be allowed.	No disturbance of any identified and known sites allowed during construction.	Neutral	N. A.	N. A.	N. A.
4. Possible impact on birds	4.1 General	Line to be marked with bird flight diverters (BFD), where problem areas are identified.	Bird collisions can be reduced significantly	Negative	Local	Low	Long-term
	4.2 River valleys	All river crossings to be marked with BFD.	Bird collisions can be reduced significantly	Negative	Local	Low	Long-term

TABLE 9.3 CONTINUED

5. Construction	5.1 General	The Environmental Management Programme (EMP) should control all activities of the contractor strictly. The EMP must be part of the contract. All activities must be within legal, policy and contractual limits and no transgressions should be allowed. All disruptions of community infrastructural services must be communicated to the community. Any unforeseen damage which may cause a disruption must be rectified immediately	Construction impacts can be reduced significantly with a proper EMP. Contractor to be held responsible for all transgressions. All transgressions addressed immediately and amicably to the satisfaction of all IAPs	Negative	Local	Low	Short term
6. Electric and magnetic fields	6.1 Electric fields	The line design is of such a nature that the effect of electric fields will be extremely low at the edge of the servitude area. Precautionary principle applies. No people will be allowed to live in the servitude and no developments will be allowed that can cause people to be in the servitude for extended periods. Appendix 3 shows the design parameters for electric fields.	The electric fields are contained to the extent of the servitude and are well below international standards.	Neutral	Local	N.A	Permanent
	6.2 Magnetic fields	The design of the line is of such a nature that the effect of magnetic fields will be extremely low at the edge of the servitude area. Precautionary principle applies. No people will be allowed to live in the servitude and no developments will be allowed that can cause people to be in the servitude for extended periods. Appendix 3 shows the design parameters for magnetic fields.	The magnetic fields are contained to the extent of the servitude and are well below international standards.	Neutral	Local	N.A	Permanent
	6.3 Health	The precautionary principle applies. By not allowing long-term exposure to EMFs, prevention of possible diseases can be obtained.	Possible health problems reduced significantly.	Neutral	Local	N A	Permanent
7. Impacts on vegetation	7.1 General	Impacts to be confined to the extent of the servitude and controlled by the EMP. Line to be placed as suggested by specialist where technically possible. Rehabilitation to be done upon completion of construction to rectify any damage. Only indigenous plants to be protected by the use of markers for no go areas.	Impact on vegetation can be minimised significantly.	Negative	Local	Low	Short-term

TABLE 9.3 CONTINUED

	7.2 Development issues	Due to the other developments planned in the area, the servitude may act as a buffer against development and effect some areas to be conserved.	Positive effect on conservation can be obtained.	Positive	Local	High	Long-term
	7.3 Indigenous vegetation and medicinal plants (bio-diversity)	Implement specialist recommendations and suggested mitigation measures where possible.	Damage to indigenous plants can be minimised significantly.	Negative	Local	Low	Short-term
	7.4 Conservation areas	Any area registered as conservation area must be avoided where possible.	The line will be placed outside registered Nature Reserves where possible	Positive	Local	High	Long-term
	7.5 Conservation worthy sites	Try and avoid placement of the line through conservation worthy areas such as over ridges and through wetlands	Impact can be reduced significantly by using the shortest routes through such areas if they can not be avoided at all costs. Servitudes can become bio-diversity corridors.	Negative	Local	Low	Medium-term
	7.6 Agricultural crops	Damage to agricultural crops to be compensated fully. Community to be encouraged to utilise the servitude for crop production where this is feasible, excluding trees in excess of 3m. Areas of conservation worthiness to be excluded and conservation principles to be applied. This could be achieved by involving the community.	People can be involved with servitude maintenance through controlled utilisation of the servitude.	Positive	Local	High	Long-term
	7.7 Alien species	The spreading of alien species can be controlled through a proper herbicide maintenance plan. All existing alien species within the servitude to be removed and the servitude rehabilitated.	Spreading of alien species can be prevented and existing aliens can be eradicated.	Positive	Local	High	Long-term

TABLE 9.3 CONTINUED

8. Possible impact on Infrastructure.	8.1 General	No disruptions of any services should be allowed.	Community not affected	Neutral	N.A.	N.A.	N.A.
	8.2 Municipal services	Any proposed disruption to municipal services to be communicated to the community. Any unforeseen damage to be rectified immediately. Contract or EMP to include rules concerning municipal services.	Community not adversely affected.	Neutral	N.A.	N.A.	N.A.
9. Impacts on property and land use.	9.1. General.	Because the line will be placed mostly in open space, the impact on property and land use in these areas would not change significantly. In areas where relocation is required, compensation will be paid to the affected parties. Careful placing of the towers to avoid activities or buildings and using the most appropriate tower designs, could limit the effect of the new line on land use and properties significantly.	Very effective reduction in impact if the route is chosen carefully and with involvement of the community at all levels.	Negative	Local	Low	Short-term
	9.2 Servitude use	Areas of conservation worthiness that are identified and managed as such could enhance the value of the servitude area and benefit the community as a whole. The use of the servitude for crop production could also benefit the community and individuals affected by the line route.	Significant increase in the value of the servitude to the community through community involvement.	Positive	Local	High	Long-term
10. Impact on property and land values	10.1 General	Careful placement of the line should reduce the impact on property and land values. The use of the servitude as public open space in built up areas could reduce the impact significantly.	Significant reduction on the impact of the line on property and land values can be attained.	Negative	Local	Low	Long-term
11. Impact on amenities	11.1 Loss of amenities	Careful placement of the line through community involvement could reduce the loss of amenities. All planning disciplines to be involved in the planning of the final route.	Significant reduction in the impact can be attained.	Negative	Local	Low	Long-term

TABLE 9.3 CONTINUED

	11.2 Gaining of amenities	The servitude can be utilised as public open space and for recreation. The use of the servitude by the community would help to prevent the degradation of the servitude and provide them with an asset.	Amenities such as open spaces and conservation areas can be created.	Positive	Local	High	Permanent
12. Noise pollution	12.1 General	Controlling construction carefully can reduce noise levels. The contract or EMP to include specifications for speed limits, etc. especially in built up areas. Strict control over the Contractor is necessary.	Impact can be reduced significantly.	Negative	Local	Very low	Short-term
	12.2 Conductor noise	The design of the line ensures that the conductor noise is limited to the servitude. Outside the servitude, conductor noise would be well within statutory limits and well below international standards. The noise of the conductors can be reduced by regular maintenance.	Impact can be reduced significantly and the community should not be affected.	Negative to neutral	Local	Very low	Permanent
13. Impact on the sense of place	13.1 General	The Transmission line is part of the total development of the region. Although it is unsightly and will be so for a long time, careful placement of the line plus the added benefits of open space and supply security should not cause this effect to rally against the line. The addition to an already degraded environment in some areas should have no effect at all.	Impact is reduced if seen as part of the total development scenario of the region.	Negative to neutral.	Local	Low	Short-term
14. Soil erosion	14.1 General	EMP to control construction to ensure the best methods is used. Soil erosion should however not be a major problem due to the soil conditions over most of the proposed line route. In areas of severe slopes, careful placement of the towers could decrease or remove the possibility for erosion. Rehabilitation will also help to prevent erosion. The controlled use of the servitude after construction could also decrease the incidence of erosion.	Effective if contract or EMP stipulates correct procedures and if strict control is kept on construction activities.	Negative	Local	Very low	Short-term

TABLE 9.3 CONTINUED

	14.2. Areas with steep slopes.	Construction activities should be carefully monitored to ensure compliance with the EMP. The EMP should limit construction activities to those that are acceptable in preventing environmental damage. No scarring of such areas would be allowed. Rehabilitation would ensure recovery without any problems. Erosion prevention measures should be taken right from inception of the construction process. Minimal topsoil disturbance to be allowed.	Very effective if a proper EMP is included in the contract. Contractor site staff should be properly informed and trained.	Negative	Local	Low	Short-term
15. Possible impact on wetlands	15.1 General	Adverse impact on wetlands can be prevented through strict EMP conditions. Known wetlands in the study area can be crossed with ease.	Very effective if a proper EMP is included in the contract.	Negative	Local	Very low	Short-term
16. Possible impacts on animals	16.1. General	Construction methods to be used that minimises habitat destruction. EMP to control construction methods. Areas worthy of conservation for habitat protection to be marked and avoided. No poaching allowed. Rehabilitation will enhance the chances of animals returning after construction.	Impacts can be reduced drastically through proper control measures included in the EMP.	Negative	Local	Very low	Short-term
	16.2 Bio-diversity	Loss of bio-diversity can be reduced through protection of habitat and rehabilitation of habitat. The community should however be involved for this goal to be attained.	Significant reduction of the impact foreseen if the community can be involved.	Negative	Local	Low	Short-term
	16.3 Electrocution	The design of the line with large electrical clearances will prevent the chances for electrocution. The towers will provide perching, nesting and roosting sites for birds.	Positive impact can be obtained.	Positive	Local	Medium	Long-term
	16.4 New habitat creation	New habitat created where alien vegetation is cleared and rehabilitation takes place.	Increase in bio-diversity can even be attained through proper management and conservation methods.	Positive	Local	High	Long-term

TABLE 9.3 CONTINUED

17. Possible indirect impact on rivers	17.1. General	The EMP should control any actions close to rivers strictly. In the event of unforeseen pollution of any river or damage to the riverbanks, the contractor must be held fully responsible for rehabilitation.	No significant impact foreseen. EMP should be able to address and prevent any problems. Any problems that do arise must be addressed.	Neutral	N.A.	N.A.	N.A.
18. Reliability of power supply	18.1. General	Power supply to the region as a whole would increase in reliability with the construction of the new line. Future economical growth will be accommodated and no development in future should be hampered due to a lack of power supply.	Very effective in enhancing the reliability of supply to the region.	Positive	Local to regional	High	Long-term

CHAPTER 10
CONCLUSIONS

The objectives that were set at the start of the EIS have been met, viz.:

- The **need** has been established
- **Alternative ways** of satisfying the need were explored
- The **most appropriate option** for satisfying the need has been identified
- The **issues and impacts** associated with the most appropriate option have been **identified and assessed**.
- Mitigatory measures have been identified that could enhance positive impacts and reduce negative impacts significantly.

A definite, twofold need, for the optimising of, and increasing the capacity of the electrical system in the Rustenburg and Pretoria North area has been identified. To address this twofold need, Eskom has to take timeous action to prevent the occurrence of power supply shortages and failures.

The ideal solution should be to:

- meet the projected demand
- optimise existing infrastructure
- minimise cost
- minimise any adverse environmental impact
- optimise any positive environmental impact.

Numerous alternative ways of addressing the need were investigated to ensure electrical and technical feasibility as well as cost effectiveness. The Scoping process, as part of the Environmental Impact Study, has shown that, from the possible alternative ways of satisfying the need identified by this study, the most appropriate solution is to install two 400kV Transmission lines between Phoebus and Apollo and Phoebus and Vulcan Substations. The optimal means of achieving this option is to find new servitudes for the lines.

There has been relatively high response to requests for IAP comments and input to the study, and it is not foreseen that any major relevant issues have been overlooked. Most possible means of informing the public were used to ensure maximum distribution of the information about the Environmental Impact Study (EIS). It is, however, possible that some people may still not know about the EIS on the proposed Transmission lines.

The process adopted for the EIS includes all elements as prescribed in the Regulations promulgated under the Environment Conservation Act 73 of 1989. IAPs were involved from the early stages and had the opportunity to participate in the project. An independent scoping facilitator was used. All comments received were studied and taken into consideration during the EIS.

No unacceptably high negative impacts are foreseen once proper mitigation measures have been applied. Due to the size of structures necessary to ensure that safety regulations are met, the proposed line is likely to be more visible than the existing lines in the area. The total development of the area in future would however reduce the impact of the line in the long term. The Transmission lines may even have a positive effect on conservation and the creation of public open space in future since no physical developments would be allowed within the servitudes. It is therefore necessary to choose the right options and to implement the mitigation measures fully to ensure an acceptable end product.

Table 10.1 depicts the issues of concern raised through scoping and the possible impacts before and after mitigation summarised briefly. These issues and associated impacts were assessed in chapter 9, using the criteria as set out in: *Guideline document: EIA Regulations, April 1998, DEAT.*

Table 10.1: Summary of impacts before and after mitigation

Issue	Component	Before mitigation				After mitigation			
		Status	**Extent**	**Magnitude**	**Duration**	**Status**	**Extent**	**Magnitude**	**Duration**
1. Possible visual impact	1.1 General	Negative	Local	High	Long-term	Negative	Local	Low	Medium term
2. Pollution	2.1 Air pollution	Negative	Local	Low	Short-term	Negative	Local	Very low	Short-term
	2.2 Land pollution	Negative	Local	Low	Short-term	Negative	Local	Very low	Short-term
	2.3 Water pollution	Negative	Local	Low	Short-term	Negative	Local	Very low	Short-term
3. Possible impact on archaeological and palaeontological sites	3.1 General	Neutral to positive	Local to regional	High	Long-term	Positive	Local to regional	High	Permanent
	3.2 Graves and prayer sites	Negative	Local to regional	Medium	Medium-term	Neutral	N. A.	N. A.	N. A.
4. Possible impact on birds	4.1. General	Negative	Local to regional	High	Long-term	Negative	Local	Low	Long-term
	4.2. River valleys	Negative	Local to regional	High	Long-term	Negative	Local	Low	Long-term
5. Construction	5.1 General	Negative	Local	Medium	Medium-term	Negative	Local	Low	Short term
6. Electric and magnetic fields (EMF)	6.1 Electric fields	Negative	Local	Medium	Permanent	Neutral	Local	N. A.	Permanent
	6.2 Magnetic fields	Negative	Local	Medium	Permanent	Neutral	Local	N. A.	Permanent
	6.3 Health	Negative	Local	Medium	Long-term	Neutral	Local	N. A	Permanent

TABLE 10.1 CONTINUED

7. Impacts on vegetation	7.1 General	Negative	Local to regional	Medium	Short to medium-term	Negative	Local	Low	Short-term
	7.2 Development issues	Positive	Local	High	Long-term	Positive	Local	High	Long-term
	7.3 Indigenous vegetation and medicinal plants (bio-diversity)	Negative	Local to regional	High	Long-term	Negative	Local	Low	Short-term
	7.4 Conservation areas	Negative	Local to regional	High	Long-term	Positive	Local	High	Long-term
	7.5 Conservation worthy areas	Negative	Local to regional	Medium	Long-term	Negative	Local	Low	Medium-term
	7.6 Agricultural crops	Negative	Local	Low	Short-term	Positive	Local	High	Long-term
	7.7 Alien species	Negative	Local	High	Long-term	Positive	Local	High	Long-term
8. Possible impact on Infrastructure.	8.1 General	Negative	Local	Low	Short-term	Neutral	N. A.	N. A.	N. A.
	8.2 Municipal services	Negative	Local	Low	Short-term	Neutral	N. A.	N. A.	N. A.
9. Possible impacts on property and land use.	9.1. General.	Negative	Local	High	Medium-term	Negative	Local	Low	Short-term
	9.2 Servitude use	Positive	Local	High	Long-term	Positive	Local	High	Long-term
10. Impact on property and land values	10.1 General	Negative	Local	Medium	Medium-term	Negative	Local	Low	Long-term
11. Impact on amenities	11.1 Loss of amenities	Negative	Local	Medium	Medium-term	Negative	Local	Low	Long-term
	11.2 Gaining of amenities	Positive	Local	High	Long-term	Positive	Local	High	Permanent
12. Noise pollution	12.1 General	Negative	Local	Low	Short-term	Negative	Local	Very low	Short-term
	12.2 Conductor noise	Negative	Local	Medium	Permanent	Negative to neutral	Local	Very low	Permanent
13. Impact on the sense of place	13.1 General	Negative	Local	Medium	Medium-term	Negative to neutral.	Local	Low	Short-term

TABLE 10.1 CONTINUED

14. Soil erosion	14.1 General 14.2 Steep slopes.	Negative Negative	Local Local	Medium High	Medium-term Long-term	Negative Negative	Local Local	Very low Low	Short-term Short-term
15. Possible impact on wetlands	15.1 General	Negative	Local to regional.	Medium	Medium-term	Negative	Local	Very low	Short-term
16. Possible impacts on animals	16.1 General	Negative	Local	High	Long-term	Negative	Local	Very low	Short-term
	16.2 Bio-diversity	Negative	Local	High	Long-term	Negative	Local	Low	Short-term
	16.3 Electrocution	Neutral	N. A.	N. A.	N. A.	Positive	Local	Medium	Long-term
	16.4 New habitat	Positive	Local	High	Long-term	Positive	Local	High	Long-term
17. Possible indirect impact on rivers	17.1. General	Negative	Local	High	Medium-term	Neutral	N. A.	N. A.	N. A.
18. Reliability of power supply	18.1. General	Positive	Local to regional	High	Long-term	Positive	Local to regional	High	Long-term

As can be seen from the EIS, most impacts foreseen can be successfully mitigated through the implementation of the measures as described in table 9.3. Positive impacts identified could help to make the Transmission lines more acceptable. It is however necessary to include all planning and development entities, identified during the study, in the final routing of the Transmission lines.

A comprehensive EMP will be required in order to address all specific problem areas and to ensure that minimal environmental damage occurs during the construction phase. A comprehensive rehabilitation plan, including a herbicide maintenance plan to control invader species must be implemented.

The study concludes that the most appropriate option for satisfying the need is to install two new 400 kV Transmission lines between Apollo and Phoebus and Phoebus and Vulcan Substations on new servitudes. Based on this Environmental Impact Study, it is concluded that it is possible to place Transmission lines within the study area as depicted on map 2. The recommended routes of the specialists should get preference where technically feasible. The final route alignment must however be negotiated with the different landowners, communities, planners and developers in the affected area.

CHAPTER 11
RECOMMENDATIONS

1. Two 400 kV Transmission lines should be built on new servitudes from Apollo Substation to Phoebus Substation and from Phoebus to Vulcan Substation as described in chapter 10.

2. More detailed investigations and further consultation with relevant landowners, authorities and other key parties should be initiated, in order to decide on the exact routing of these lines in the preferred corridor as described below and shown on map 10.

3. All alternative alignments as shown on map 10 have been studied as part of the detailed specialist studies in the reduced study area. All these alignments are technically feasible and the impacts will be of similar significance. The choice of a preferred corridor is made on the assumption that the shorter the route, the less impact it will generate.

3. Eskom should start negotiating servitude rights with affected landowners in the preferred corridor upon receipt of a ROD from DEAT to determine the exact routing of the Transmission lines. This will ensure that servitudes are timeously acquired.

4. The proposed lines should be carefully designed and all possible mitigation measures should be applied to make the proposed lines as acceptable as possible.

5. Once the final route alignment is chosen a survey should be conducted, to identify all possible endangered plant species, conservation worthy sites, historical, archaeological sites and graves, as well as placement of mitigation measures for bird interactions.

6. A comprehensive Environmental Management Programme (EMP) should be drawn up to address the following:

- All special conditions as set by landowners and other IAPs.
- All conditions of the ROD from DEAT
- All physical issues and their control.
- All biological issues and their control.
- All social issues and their control.
- All cultural issues and their control.
- Training of site staff on all possible environmental issues and impacts.
- Proper site control over construction methods and processes.
- Rehabilitation of the servitudes and construction sites and subsequent maintenance.
- Eradication of alien species and the subsequent maintenance of the servitudes to prevent their return.

7. The EMP should be part of the Contract and should therefore be legally enforceable. It should be drawn up in conjunction with the IAPs to ensure that all their concerns are dealt with.

8. The communities along the line route should be involved in the future maintenance of the servitude, either by using it or conserving areas that are conservation worthy. They should also be involved to ensure no invasion of the servitudes takes place. A community forum should be involved in the project.

FINAL PROPOSED CORRIDOR DESCRIPTION

Section 1 - Phoebus to N1

Transmission lines should follow northern section of the corridor along the existing powerline to the farm Onderstepoort and then turn in a south-easterly direction towards Sphinx railway junction as depicted by the purple line on Map 10. From Sphinx railway junction follow the railway line on the northern side up to the N1

Section 2 - N1 to R513

The Transmission line should follow the railway line on the northern side for another 2km, and then cross over to the southern side of the railway line. The line should then follow the southern side of the railway line up to the R513. (Purple line on Map 10)

Section 3 - R513 to Pienaarsrivier

The recommended route should cross the railway line after the R513 road and stay on the north-eastern side of the Magaliesberg down to Pienaarspoort. The line should then turn in a westerly direction through Pienaarspoort, crossing the railway line to the south just after the poort. The line should the follow a southerly direction over the R104 and N4 meeting up with the vacant servitudes just north of the Pienaarsrivier. (Purple line on Map 10)

Section 4 - Pienaarsrivier to Apollo Substation

The proposed route should follow the existing vacant servitudes down to the R50, turn south following the R50 down to the end of Rietvlei Nature Reserve. The proposed route should then cross over the R50 to the western side and then follow the R50 to the south of the Corobrick factory meeting the existing Kendal-Minerva 400kV Transmission line into Apollo without entering the game reserve, or disturbing wetlands.

Section 5 - Pienaarspoort to Vulcan

The proposed route should follow the existing powerlines in a southerly direction crossing over the R104 and N4 down to the railway line. The line should then follow the railway line until it meets the Minerva-Vulcan 400kV Transmission line. The line should the follow the existing line parallel on the northern side up to Vulcan Substation. (Brown line on Map 10)

CHAPTER 12
GLOSSARY OF TERMS

LIST OF ABBREVIATIONS:

Abbreviation	Description
DEAT	Department of Water Affairs and Tourism
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EIS	Environmental Impact Study
EMP	Environmental Management Programme
IAPs	Interested and Affected Parties
kV	Kilovolt
N. A	Not applicable
NER	National Electricity Regulator
RDP	Reconstruction and Development Programme
ROD	Record of decision
400 kV	400 000 volts

LIST OF TECHNICAL TERMS:

Conductor: A wire, cable, or other body that is capable of carrying electric current

Corridor: A strip of land containing services such as roads, power lines, etc.

Kilovolt: A unit of potential difference equal to 1000 volts.

Power line servitude: A real right in favour of the servitude holder allowing the erection and maintenance of structures and cables to transmit electricity over portions of land and restricting any activities that could pose a hazard to the Transmission of electricity, the environment and/or the safety of human and other living beings.

Power station: An electricity generating station.

Substation: An assembly of equipment in an electric power system through which electric energy is transformed from one voltage to another or switched.

Transmission line: A system of conductors suitable for conducting electric power between two or more terminals.

Voltage: Potential difference or electromotive force measured in volts.

ENVIRONMENTAL TERMS:

Terms as defined in *Guideline document: EIA Regulations, April 1998*, Department of Environment Affairs.

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