ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
DRAFT ENVIRONMENTAL IMPACT REPORT

PROPOSED TSHWANE STRENGTHENING PROJECT PHASE 1: APOLLO-VERWOERDBURG LOOP-IN TRANSMISSION POWER LINES & SUBSTATION EXTENSION

GAUTENG PROVINCE

(DEA Ref No: 12/12/20/1470)

FINAL FOR SUBMISSION TO DEA
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Prepared by:

Savannah Environmental Pty Ltd

UNIT 606, 1410 EGLIN OFFICE PARK
4 EGLIN ROAD, SUNNINGHILL, GAUTENG
PO BOX 148, SUNNINGHILL, 2157
TEL: +27 (0)11 234 6621
FAX: +27 (0)86 684 0547
E-MAIL: INFO@SAVANNAHSA.COM
WWW.SAVANNAHSA.COM

Prepared for:

Eskom Holdings Ltd
Eskom Transmission
PO Box 1091
Johannesburg
2000

PROJECT DETAILS

DEA Reference Nos.	:	12/12/20/1470 (Apollo – Verwoerdburg turn-in power lines and substation extension)
Title	:	Environmental Impact Assessment Process Final Environmental Impact Assessment Report for the Proposed Tshwane Strengthening Project Phase 1, Gauteng Province
Authors	:	Savannah Environmental (Pty) Ltd Zama Dlamini Jo-Anne Thomas
Sub-consultants	:	Bathusi Environmental Consultants Endangered Wildlife Trust (EWT) Julius Pistorius MetroGIS ARC Institute for Soil, Climate and Water MasterQ Research
Client	:	Eskom Holdings Limited (Eskom Transmission)
Report Status	:	Final Environmental Impact Assessment Report for Authority Review and Decision

When used as a reference this report should be cited as: Savannah Environmental (2010) Final Environmental Impact Assessment Report for the Proposed Tshwane Strengthening Project Phase 1 (Apollo-Verwoerdburg), Gauteng Province

PURPOSE OF THE DRAFT EIA REPORT

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

Eskom has appointed Savannah Environmental, as independent environmental consultants, to undertake the EIA. The EIA process is being undertaken in accordance with the requirements of the National Environmental Management Act (NEMA; Act No. 107 of 1998).

The EIA Report consists of the seven chapters:

» **Chapter 1** provides background to the proposed Tshwane Strengthening project Phase 1 and the environmental impact assessment process
» **Chapter 2** provides an overview of the proposed Tshwane Strengthening project Phase 1
» **Chapter 3** outlines the process which was followed during the EIA Phase of the EIA process
» **Chapter 4** provides a description of the environment which may be potentially affected by the proposed project (Apollo-Verwoerdburg substation and turn-in power lines)
» **Chapter 5** provides an assessment of the potential issues associated with the proposed extension of the Verwoerdburg substation and the 2X400kV turn in and out power lines
» **Chapter 6** presents the conclusions and recommendations of the EIA and an Impact Statement
» **Chapter 7** presents the list of references and information sources used for the compilation of this FEIR.

The Scoping Phase of the EIA identified and described potential issues associated with the proposed project, and defining the extent of studies required within the EIA. The EIA Phase addresses those identified potential environmental impacts

and benefits (direct, indirect, cumulative impacts) associated with all the phases of the project including design, construction and operation, and recommends appropriate mitigation measures for potentially significant environmental impacts. The EIA report aims to provide the environmental authorities with sufficient information to make an informed decision regarding the proposed project.

The release of the draft EIA Report provides stakeholders and I&APs and opportunity to verify that the issues they have raised through the EIA process have been captured and adequately considered. The final EIA Report will incorporate all issues and responses raised during the public review period of the draft EIA report prior to submission to the Department of Environmental Affairs.

PUBLIC REVIEW OF THE DRAFT EIA REPORT

The Draft EIA Report was made available for public review at the following public places in the project area from **03 March to 07 April 2010** at the following locations:

Rietvlei Nature Reserve - Reception	City of Tshwane Metropolitan Municipality- Environment and Planning Department
Centurion Brach Library – Pioneer Road	Irene Library
Kungwini Local Municipality Offices– Reception	www.eskom.co.za/eia
www.savannahsa.com	

EXECUTIVE SUMMARY

Background and Project Overview

In order to reinforce the existing Transmission network in the Tshwane Region, Eskom Transmission is currently proposing the construction of a 400kV transmission power line between the existing Apollo and Pluto substations. In addition, increased demand for a reliable electricity supply in the Central Grid has necessitated that Eskom Transmission improves the reliability and capacity of the transmission network in the area. Further, upgrade of the 400/132kV Verwoerdburg substation and establishment of a new Phoebus substation is also being proposed in the area in order to improve the reliability and quality of supply problems in the Tshwane area. Eskom Transmission is therefore proposing the construction of the **Tshwane Strengthening Project Phase 1.** The Tshwane Strengthening Project Phase 1 comprises of the following:

» **The extension and upgrade of the existing Verwoerdburg** Substation.
» Construction of **2x 400kV loop in and out lines from the existing Apollo–Pluto** transmission line which will feed into the Verwoerdburg Substation, a distance of approximately ~4 km.
» Construction of the **new Phoebus Substation** adjacent to Hangklip Substation.
» Construction of a **new 400kV transmission power line** between the Phoebus Substation and the Kwagga Substation, a distance of ~30 km.
» Construction of loop in/out power line from Apollo-Dinaledi into Phoebus substation.
» **Associated (infrastructure) works** to integrate the new transmission power lines and substation into the Transmission grid (such as access roads, communication tower, etc) and accommodate the new lines at existing substations (such as the construction of new feeder bays within the existing substation sites).

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

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

As separate applications were submitted to DEA for the different components of the project, separate

reports have been compiled by Savannah Environmental as follows:

» The **nature and extent of the proposed 2x 400kV loop in and out lines from the existing Apollo–Pluto and the expansion and upgrade of the Verwoerdburg substation**, as well as potential environmental impacts associated with the construction, operation and decommissioning of this infrastructure are **assessed in this Final EIA Report (Reference Number 12/12/20/1470)**.
» The **nature and extent of the proposed 400kV transmission power line between the Kwagga and Phoebus Substations, the expansion of the Kwagga Substation and construction of the Phoebus Substation**, as well as potential environmental impacts associated with the construction, operation and decommissioning of this infrastructure are **assessed in a separate Final EIA Report (Reference Number 12/12/20/1471 and 12/12/20/1524)**.

This draft Environmental Impact Assessment (EIA) Report consists of the following chapters:

» **Chapter 1** provides background to the proposed Tshwane Strengthening project Phase 1 and the environmental impact assessment process
» **Chapter 2** provides an overview of the proposed Tshwane Strengthening project Phase 1
» **Chapter 3** outlines the process which was followed during the EIA Phase of the EIA process
» **Chapter 4** provides a description of the environment which may be potentially affected by the proposed project (Apollo-Verwoerdburg substation extension and turn-in power line)
» **Chapter 5** provides an assessment of the potential issues associated with the proposed extension of the Verwoerdburg substation and the 2X400kV turn in and out power lines
» **Chapter 6** presents the conclusions and recommendations of the EIA and an Impact Statement
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Background and Overview of the Proposed Project

Eskom Holdings Ltd (Eskom) is responsible for the provision of reliable and affordable power to its consumers in South Africa. Electricity by its nature cannot be readily or inexpensively stored and, therefore, must be used as it is generated. Electricity must, therefore, be efficiently transmitted from the point of generation to the end-user.

As part of its assessment of supply requirements, and as a result of the projected load growth of the Gauteng region, Eskom have determined that additional transmission capacity will be required in the Tshwane area by the year 2013. For this reason, Eskom Transmission is proposing the **Tshwane Strengthening Project**. Figure 1 provides an indication of the study area considered within the EIA process for this proposed project (TSP Phase 1). This report focuses on the following components:

» Extension of the Verwoerdburg substation (refer to Figure 1).
» Construction of a **new 400kV transmission power line** between the Phoebus Substation and the Kwagga Substation, a distance of ~30 km (refer to Figure 2).

Associated (infrastructure) works to integrate the new transmission power lines and substation into the Transmission grid (such as access roads, communication tower, turn-in lines, feeder bay etc) and accommodate the new lines at existing substations (such as the construction of new feeder bays within the existing substation sites).

In addition, it must be noted that the **Tshwane Strengthening Project Phase 2** consists of the proposed Lomond/Anderson power line corridor and the refurbishment of the Lomond substation, while **Phase 3** includes the Hangklip/Dinaledi 132kV corridor as well as the installation of a third transformer at the Verwoerdburg substation. Lastly, **Phase 4** includes the addition of a second transformer at the proposed Phoebus substation. The environmental impact assessment by **Nemai Consulting** is currently underway for the Tshwane Strengthening Project Phase 2 including the establishment of the Anderson substation and the 400kV power line between Dinaledi and Anderson substations, (Reference Numbers **12/12/20/1567** and **12/12/20/1568**) and the EIA for Phase 3 and 4 have not yet commenced.

The Purpose and Need for the Proposed Project

The current Eskom transmission network supplies the City of Tshwane Metropolitan Municipality (CoT) via three substations, namely: Kwagga, Njala and Verwoerdburg. The contracted reserve capacity at each point is reviewed annually. CoT has applied for new supply points and a step load increase to Eskom Transmission and Distribution. The three parties (Distribution, Transmission and the City of Tshwane Metropolitan Municipality) agreed on the 20-year load forecast for the CoT and also concluded that the CoT and the Eskom transmission networks supplying Tshwane need to be strengthened. A number of options were analysed based on technical and economic benefits to all parties involved (refer to Figure 1).

Environmental Impact Assessment

The proposed Tshwane Strengthening Project Phase 1 is subject to the requirements of the Environmental Impact Assessment Regulations (EIA Regulations) published in GN 28753 of 21 April 2006, in terms of Section 24(5) of the National Environmental Management Act (NEMA, No 107 of 1998). In terms of sections 24 and 24D of NEMA, as read with GNs R385 (Regulations 27–36) and R387, a Scoping and EIA are required to be undertaken for this proposed project.

The National Department of Environmental Affairs (DEA) is the competent authority for this project as Eskom is a statutory body. An application for authorisation has been accepted by DEA (under Application Reference number **12/12/20/1270**. Through the decision-making process, the DEA will be supported by the Gauteng Department of Agriculture and Rural Development (GDARD) as the commenting authority.

A comprehensive public participation process was undertaken in accordance with Regulation 56 of Government Notice No R385 of 2006 during the Scoping phase of this EIA process. This public participation process comprised the following:

» **Notification of the EIA Process** in the printed media and on site, as well as through written notification to identified stakeholders affected landowners
» **Identification and registration** of I&APs and key stakeholders.
» Compilation and distribution of a **Background Information Document** (BID) to all identified I&APs and key stakeholders
» **On-going consultation** with identified I&APs and stakeholders
» Compilation and maintenance of a **database** containing the names and addresses of all registered parties
» Preparation of a **Comments and Response Report** detailing key issues raised by I&APs as part of the EIA Process.

Figure 1: Locality map showing the locality of the Verwoerdburg substation adjacent to Doornkloof East in Pretoria under investigation during the EIA process

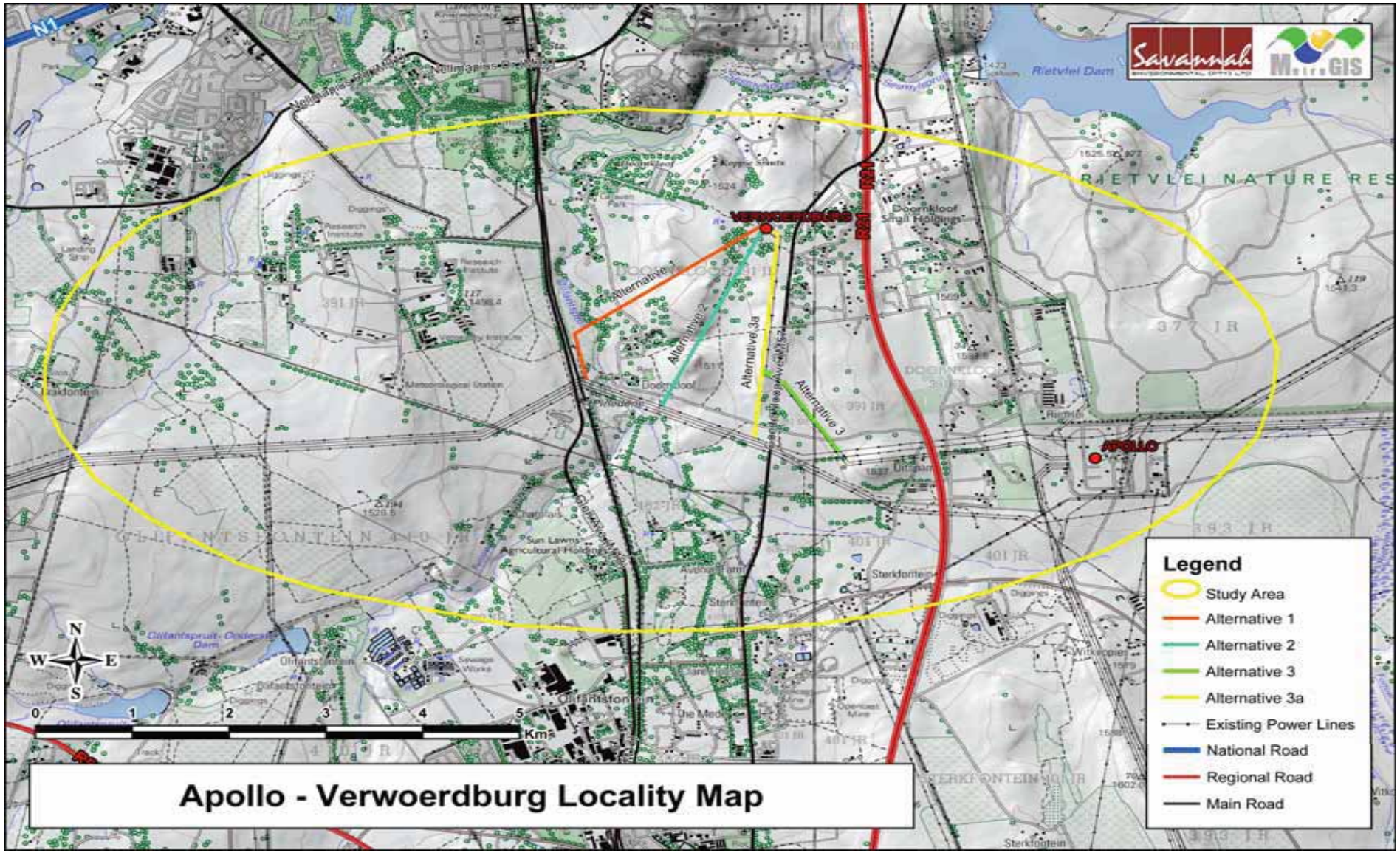

Figure 2: Locality map showing the locality of the proposed Apollo-Verwoerdburg turn-in power lines under investigation during the EIA process

The Need for Additional Transmission Capacity in the Tshwane Area

Studies undertaken by Eskom have shown a steady 3% per annum average load growth for the area fed from Verwoerdburg, Wildebeest and Apollo substations, the main bulk supply substations to the Tshwane Region. This is due to light industrialisation, commercialisation, urban growth and electrification within this area. It is also a sign of good economic growth in this area.

Alternatives for Satisfying the Additional Electricity Supply Need within the Tshwane Area

Electrical supply constitutes a complex system of generation facilities, substations, and transmission and distribution power lines. The system operates on a demand-supply structure with the power being generated and transmitted at the moment it is needed.

The "Do Nothing" Option

The 'do nothing' alternative is the option of not extending the existing Verwoerdburg substation as well as not constructing any new transmission power lines looping in from the Apollo-Pluto power lines. By not taking any action, Eskom Transmission may end with a situation of not being able to ensure firm supply into some parts of the country and the Tshwane area in particular, in the very near future (i.e. by 2012). This option is therefore discarded as a feasible alternative as it would neither supply the projected demand for electricity nor optimise the existing infrastructure.

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.

New Generation Systems

The option of a new coal-fired, gas, renewable or nuclear generation plant being commissioned near to the load centre could be considered. This may have a more negative overall impact on the environment due to the land requirements, fuel resources, etc., and would take at least five years to implement and would not address the foreseen supply demand in the short-term.

Upgrade Existing Transmission Power Lines by using Bigger Conductors

The upgrade of existing transmission lines in the area by using bigger conductors would require these existing power lines to be permanently off while being upgraded to thicker conductors. This would put the existing and future load at risk

should the remaining lines in the area trip. The upgrade option would result in the physical load on the existing towers increasing substantially, resulting in sagging of the conductors. The existing towers would be inadequate to support this physical load. The power transmission from the Apollo substation would not be able to be evacuated to the load centres without causing dynamic instability in the Eskom network which could result in black-outs. This option would not improve the reliability of the Transmission system nor be sustainable and is therefore not considered to be a feasible alternative.

Extension of the Verwoerdburg Substation and construction of 2X 400kV turn in & out power lines from Apollo-Pluto Transmission power lines

The alternative is part of the new generation and transmission capacity alternatives. The need for increased capacity and the need for optimising existing infrastructure would be met through the implementation of this option.

This option is most favoured by Eskom Transmission as well as the City of Tshwane Electricity Department as it is considered to be the most feasible from a technical and economic perspective, and will meet the required need for increased capacity and the need for optimising existing infrastructure in the short- and long-term. This option is therefore nominated as the preferred option by Eskom Transmission to supplement the power supply to the Pretoria North area.

Evaluation of Project Alternatives - Substation Site extension and Turn in & out Power Lines

The expansion of the Verwoerdburg substation was identified by Eskom for investigation within a broader study area based on technical criteria. Therefore, land adjacent to and north-west of the existing substation was considered to be the most suitable from a technical perspective and was provided to the EIA team for further investigation through the EIA process. There were no alternative sites identified and investigated for the substation expansion because the proposal is for the expansion of existing infrastructure.

Alternative Turn-in Transmission Power Line Corridors

Subsequent to the specialist workshop, an additional alternative was identified direct from the Verwoerdburg substation southwards towards the Apollo-Dinaledi power lines (Savannah Environmental, 2009). Therefore, Alternatives 1, 2, 3 and 3a has been included within this EIA Report.

Alternative Corridor 1 starts at Verwoerdburg Substation and runs south-west for approximately 2 km to Glen Avenue road. It turns south from here and joins into the existing

Apollo-Pluto lines. The corridor crosses some open grassland and a small stream.

Alternative Corridor 2 starts at Verwoerdburg Substation and runs south-south west for approximately 2.3 km in a straight line before joining into the existing Apollo-Pluto lines. This corridor crosses some open grassland and a small koppie.

Alternative Corridor 3 starts at Verwoerdburg Substation and follows existing transmission lines for the entire length. It follows the road for the majority of the route. Alternative 3 does not cross any streams or koppies.

Alternative Corridor 3a starts at Verwoerdburg Substation and follows existing transmission lines towards the Apollo-Pluto lines south of the Verwoerburg substation. This alternative forms a straight line from the substation towards the Apollo-Pluto lines west of M57 Main Road.

Conclusions and Recommendations drawn from the Assessment of the proposed extension Verwoerdburg Substation

The majority of potential impacts identified to be associated with the construction and operation of the proposed substation are anticipated to be localised and restricted to the existing substation site footprint. No environmental fatal flaws were identified to be associated with the site. This is largely due to the fact that the extension of the substation at this site is within the existing substation site footprint, which is already transformed as well as the fact that it would be associated with minimum disturbance to environment. For this reason, the majority of the specialists recommended that the proposed extension be implemented around the existing substation footprint.

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

The majority of potential impacts identified to be associated with the construction and operation of the proposed substation are anticipated to be localised and restricted to the existing substation site footprint. No environmental fatal flaws were identified to be associated with the site. However some areas requiring mitigation have been highlighted. Environmental specifications for the management of potential impacts are detailed within the draft Environmental Management Plan (refer to Figures 3).

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

Nomination of a preferred alternative is based on the specialist recommendations, public participation and the

recommendations of the specialist workshop undertaken during the EIA Phase of the project.

From the conclusions of the specialist studies undertaken, the following has been recommended regarding the power line corridors investigated:

» In terms of impacts on biodiversity, alternatives 1 and 2 are considered to be "**no go areas**" because of the ecological attributes and sensitivities along these corridors. For this reason, **alternative corridor 3 and 3a** are preferred with moderate to low ecological sensitivity.

» In terms of avifauna, the first and most preferred alternative is **alternative 3**. This alternative follows existing power lines for the entire length and thus the impact on avifauna in terms of collisions, habitat destruction and disturbance will be significantly less. The next most preferred alternative is **alternative 3a**. While this alternative will have slightly higher impacts than alternative 3 these impacts are seen as insignificant and thus this alternative may also be used with minimal impact on avifauna. Alternatives 1 and 2 are not preferred due to the sensitive habitats which are crossed by these corridors.

» From a visual sensitivity analysis undertaken, the preferred alignment is **Alternative 3** based on total area of high visual impact and cumulative impact of existing power lines, although there are no fatal flaws eliminating the three (alternative 1, 2 and 3a) alternatives.

» In terms of Agricultural Potential, in comparing the alternatives, the most suitable route would be either **Alternative 2** or **Alternative 3/3a**, where all of the soils are shallow and rocky, with a low agricultural potential. Alternative 1 is not preferred due to an area of higher potential in the vicinity of the river.

» From a Heritage Impact assessment, no heritage resources were identified along alternative corridor 3 and 3a. Graveyards were identified to be located in the vicinity of Alternatives 1 and 2. Against this background, the preferred alternative **corridors are 3 and 3a**.

From the conclusions of the specialist workshop undertaken, it was concluded that Alternative corridor 1 and 2 are not recommended for development due to the unacceptably high impacts on the biophysical environment as well as the impacts on the social environment. Therefore,

development within these two corridors should be avoided. Alternative corridor 3 was nominated as the preferred alternative by the majority of the specialists. Impacts associated with Alternative 3a are not expected to differ significantly from those associated with Alternative 3. Therefore, this alternative is considered acceptable from an environmental perspective.

As Alternative 3a is shorter than Alternative 3 and would eliminate the need for a bend (and an associated self-supporting tower), this alternative is preferred from an economic and technical perspective. Therefore, from a holistic perspective (i.e. considering technical, ecological, social and economic criteria), **Alternative 3a** is nominated as the preferred alternative (refer to Figure 4).

It is considered vital that construction of the two turn-in power lines within this corridor take the recommended conditions identified by the specialist studies in to consideration. Should the project be authorised by DEA, the final routing of the turn-in power lines within the nominated preferred corridor should be undertaken in consultation with the affected landowners and the following specialists.

» Biodiversity specialist
» Avifauna specialist
» Heritage specialist

In addition, once the final turn-in transmission power line alignment has been negotiated and the tower positions surveyed and pegged, a walk-through survey must be undertaken by the specialists in order to minimise potential environmental impacts associated with the proposed project.

Figure 3: Recommended site location for the proposed Verwoerdburg substation extension

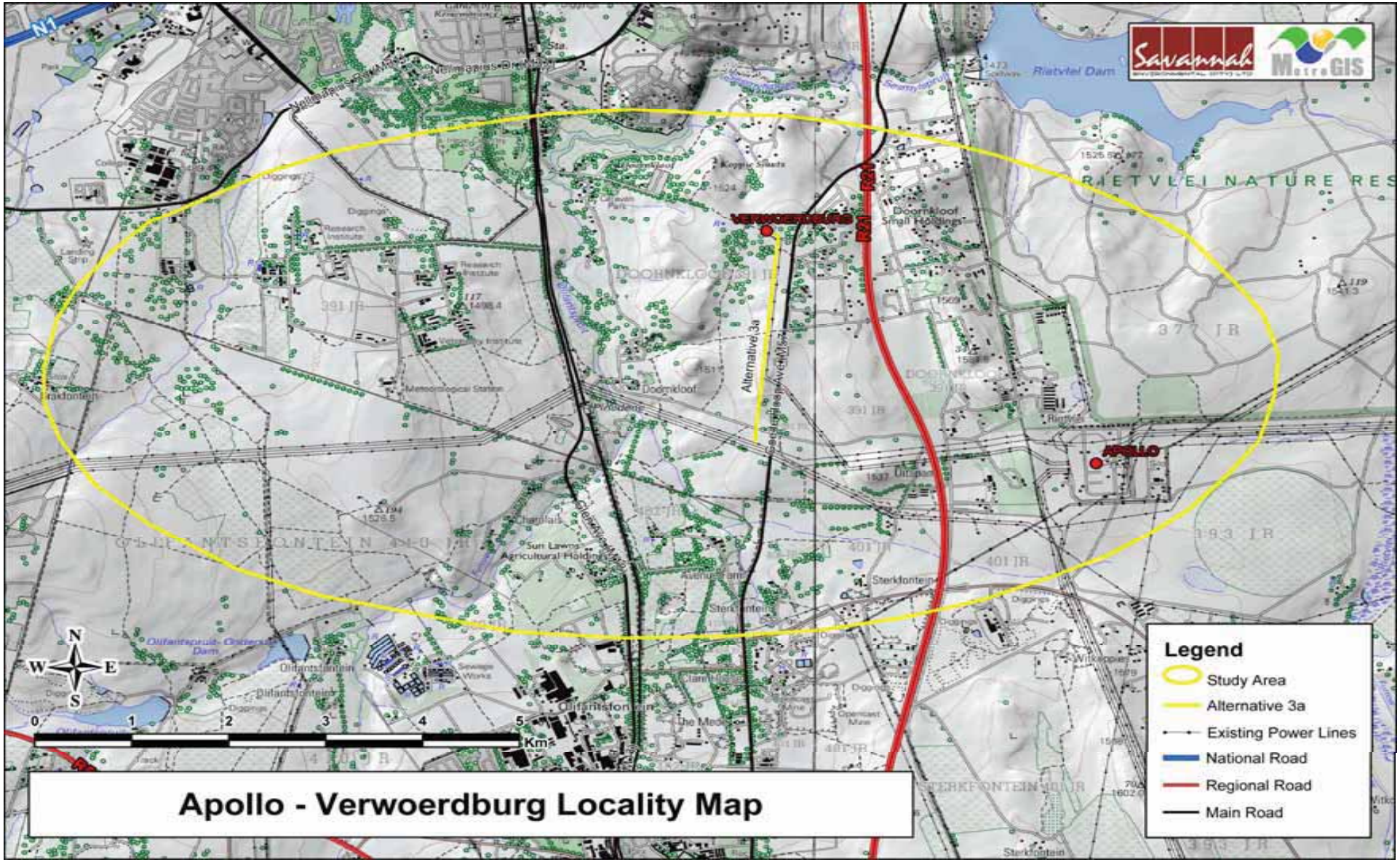

Figure 4: Nominated preferred alternative corridor for the proposed Apollo-Verwoerdburg turn-in power lines

Overall Conclusion (Impact Statement)

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

» Although some impacts of potential high significance are associated with the transmission lines and substation, there are no environmental fatal flaws that should prevent the proposed turn-in power lines and substation from being constructed on the proposed alignment and the proposed substation extension site respectively, provided that the recommended mitigation measures are implemented.
» No issues of significance were identified to be associated with the proposed extension of the Verwoerdburg substation.
» Alternative corridor 1 and 2 are not preferred from the conclusions of the majority of the specialists. This alternative corridor was only preferred from an agricultural potential perspective.
» The majority of the specialists recommended that alternative 3 be nominated as the preferred alternative followed by alternative corridor 3a.
» From a holistic perspective, **Alternative Corridor 3a** is nominated as the preferred corridor for the construction of the proposed turn-in transmission power lines.
» The significance levels of the majority of identified negative impacts can be mitigated and minimised by implementing the recommended mitigation measures

Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the proposed substation extension, construction and operation of the turn-in transmission power lines, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the application for the proposed Tshwane Strengthening Project Phase 1, Apollo-Verwoerdburg component (EIA Ref 12/12/20/1470) be authorised by DEA to include the following:

» Extension/upgrade of the Verwoerdburg substation on either side of the existing substation.
Construction of 2X 400 kV transmission power lines looping in and out of the Apollo-Pluto transmission lines within **Alternative Corridor 3a**. Eskom must negotiate the most appropriate route within this corridor with the affected landowners.

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

- All mitigation measures detailed within this report and the specialist report contained within Appendices F to K must be implemented.
- The draft Environmental Management Plan (EMP) should form part of the contract with the Contractors appointed to construct and maintain the proposed Tshwane Strengthening Project Phase 1 (Apollo-Verwoerdburg component), and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for all life cycle phases of the proposed project is considered to be key in achieving the appropriate environmental management standards as detailed for this project.
- Applications for all other relevant and required permits required to be obtained by Eskom must be submitted to the relevant regulating authorities. This includes permits for the transporting of all components (abnormal loads) to site and disturbance of protected vegetation.
- A biodiversity specialist must conduct a final walkthrough before construction in order to identify and relocate any possible plant species of conservation importance.
- During construction, unnecessary disturbance to habitats should be strictly controlled and the footprint of the impact should be kept to a minimum.
- The EMP for construction must be updated to include site specific information and specifications resulting from the final walk-through surveys. This EMP must be submitted to DEA for approval prior to the commencement of construction on site.
- Utilisation of cross-rope suspension tower structures is recommended where possible rather than the conventional self-supporting strain towers that are more obstructive
- Mitigation of the visual impact though conventional visual impact mitigation measures (i.e. vegetation screening, landscaping or design) is highly unlikely to succeed due to the inherent functional design of the substation structures and transmission line infrastructure. The mitigation of secondary visual impacts, such as security and functional lighting, construction activities, etc. may be possible and should be implemented and maintained on an on-going basis.
- The process of communication and consultation with the community representatives must be maintained after the closure of this EIA process, and, in particular, during the construction phase associated with the proposed project.

Finally to ensure that social impacts are mitigated during construction and operation, it is recommended that the following: * A Social Management Plan during construction and operation; * A Local Labour and Workforce Plan; * An Influx Management Plan; * A Decommissioning and Closure Plan; * A Grievances Mechanism for the construction and operational phases; and * A Stakeholder Engagement and Education plan for construction and operation	

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ABBREVIATIONS AND ACRONYMS

APASA	Association of Professional Archaeologists of Southern Africa
ASGISA	Accelerated and Shared Growth Initiative of South Africa
BID	Background Information Document
CoT	City of Tshwane
CTESPS	City of Tshwane Electricity Supply Plan Scheme
DE	Department of Energy
DEA	National Department of Environmental Affairs
DEAT	National Department of Environmental Affairs and Tourism
DPW	Department of Public Works
DEIR	Draft Environmental Impact Report
DSM	Demand Side Management
DWA	Department of Water Affairs
DWEA	Department of Water and Environmental Affairs
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EWT	Endangered Wildlife Trust
GDARD	Gauteng Department of Agriculture and Rural Development
GDP	Gross Domestic Product
GG	Government Gazette
GGP	Gross Geographical Product
GN	Government Notice
GPS	Geographic Positioning System
I&AP	Interested and Affected Party
ICNIRP	International Commission for Non-Ionising Radiation Protection
IDP	Integrated Development Plan
ISEP	Integrated Strategic Electricity Planning
KLM	Kungwini Local Municipality
kV	Kilovolt
MW	Mega Watt
NEMA	National Environmental Management Act (No 107 of 1998)
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act (No 25 of 1999)
NWA	National Water Act (Act 36 of 1998)
OHS	Occupational Health and Safety
PSDF	Provincial Spatial Development Framework
SAHRA	South African Heritage Resources Agency
SACNASP	South African Council of Natural Scientific Professions
SDF	Spatial Development Framework
SEIA	Socio-economic Impact Assessment
SIA	Social Impact Assessment

SoE State owned Enterprise

DEFINITIONS AND TERMINOLOGY

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Cumulative impacts: Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g. discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.

Do nothing alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Environment: the surroundings within which humans exist and that are made up of:

i. the land, water and atmosphere of the earth;
ii. micro-organisms, plant and animal life;
iii. any part or combination of (i) and (ii) and the interrelationships among and between them; and
iv. the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental Impact: An action or series of actions that have an effect on the environment.

Environmental impact assessment: Environmental Impact Assessment (EIA), as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental management plan: An operational plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its ongoing maintenance after implementation.

Heritage: That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act of 2000).

Indirect impacts: Indirect or induced changes that may occur as a result of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

Interested and Affected Party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups and the general public.

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare".

Red data species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

Significant impact: An impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment.

INTRODUCTION CHAPTER 1

In order to strengthen the existing Transmission network in the Tshwane Region, Eskom Transmission is currently proposing the construction of a 400kV looping/out of existing Apollo-Pluto transmission power line. In addition, increased demand for a reliable electricity supply in the Central Grid has necessitated that Eskom Transmission improves the reliability and capacity of the transmission network in the area. Further, upgrade of the 400/132kV Verwoerdburg substation and establishment of a new Phoebus substation is also being proposed in the area in order to improve the reliability and quality of supply problems in the Tshwane area. Eskom Transmission is therefore proposing the construction of the **Tshwane Strengthening Project Phase 1.** The Tshwane Strengthening Project Phase 1 comprises of the following:

» **The extension and upgrade of the existing Verwoerdburg** Substation.
» Construction of **2x 400kV loop in and out power lines from the existing Apollo–Pluto** transmission line which will feed into the Verwoerdburg Substation, a distance of approximately ~4 km.
» Construction of the **new Phoebus Substation** adjacent to Hangklip Substation.
» Construction of a **new 400kV transmission power line** between the Phoebus Substation and the Kwagga Substation, a distance of ~30 km.
» Construction of 2 x 400 kV loop in/out of the Apollo-Dinaledi line into Phoebus substation.
» **Associated (infrastructure) works** to integrate the new transmission power lines and substation into the Transmission grid (such as access roads, communication tower, etc) and accommodate the new lines at existing substations (such as the construction of new feeder bays within the existing substation sites).

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

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

As separate applications were submitted to DEA, separate reports have been compiled by Savannah Environmental as follows:

» The **nature and extent of the proposed 2x 400kV loop in and out power lines from the existing Apollo–Pluto and the extension and upgrade of the Verwoerdburg substation**, as well as potential environmental impacts associated with the construction, operation and decommissioning of this infrastructure are **assessed in this Final EIA Report (Reference Number 12/12/20/1470)**.
» The **nature and extent of the proposed 400kV transmission power line between the Kwagga and Phoebus Substations, the upgrade of the Kwagga Substation and construction of the Phoebus Substation**, as well as potential environmental impacts associated with the construction, operation and decommissioning of this infrastructure are **assessed in a separate Final EIA Report (Reference Number 12/12/20/1471 and 12/12/20/1524)**.

This draft Environmental Impact Assessment Report consists of the following chapters:

» **Chapter 1** provides background to the proposed Tshwane Strengthening project and the environmental impact assessment process
» **Chapter 2** provides an overview of the proposed project
» **Chapter 3** outlines the process which was followed during the EIA Phase of the EIA process
» **Chapter 4** provides a description of the environment which may be potentially affected by the proposed Verwoerdburg substation expansion and the 2X400kV Apollo-Verwoerdburg turn-in power lines
» **Chapter 5** provides an assessment of the potential issues associated with the proposed Verwoerdburg substation extension and the 2X400kV turn-in power lines and comparatively assesses the identified alternative corridors
» **Chapter 6** presents the conclusions and recommendations of the EIA and an Impact Statement
» **Chapter 7** presents the list of references and information sources used for the compilation of this FEIR

1.1. Background and Overview of the Proposed Project

Eskom Holdings Ltd (Eskom) is responsible for the provision of reliable and affordable power to its consumers in South Africa. Electricity by its nature cannot be readily or inexpensively stored and, therefore, must be used as it is generated. Electricity must, therefore, be efficiently transmitted from the point of generation to the end-user.

In South Africa, thousands of kilometres of high voltage transmission lines (i.e. 765kV or 400kV transmission lines) transmit this power, which is mainly generated at power stations in the Mpumalanga and Limpopo provinces, to

Eskom's transmission substations. At these transmission substations, the voltage is reduced and distributed to smaller distribution substation throughout the country through distribution lines (i.e. 132kV, 88kV or 66kV Distribution lines). Here the voltage is reduced and distributed to local substations, which distribute the power via various small lines (i.e. 22kV and 11kV lines) to local users. The power generated by Eskom can only be utilised from points of supply which transform power into usable voltage. However, transmission power lines and substations play a vital role in ensuring the provision of Distribution substations with sufficient power to be reticulated to the consumer.

If Eskom is to meet its mandate and commitment to supply the increasing needs of end-users, the organisation is required to plan, establish and expand its infrastructure of generation capacity and transmission power lines on an on-going basis, in parallel to the expanding electricity generation process. It is vital that transmission capacity keeps up with both electricity generation capacity and electricity demand.

As part of its assessment of supply requirements, and as a result of the projected load growth of the Gauteng region, Eskom have determined that additional transmission capacity will be required in the Tshwane area by the year 2013. For this reason, Eskom Transmission is proposing the **Tshwane Strengthening Project**. Figure 1.1 and 1.2 provides an indication of the study area considered within the EIA process for this proposed project. This report focuses on the following components:

» **The extension and upgrade of the existing Verwoerdburg** Substation.
» Construction of **2x 400kV loop-in lines from the existing Apollo–Pluto** transmission line which will feed into the Verwoerdburg Substation, a distance of approximately ~4 km.

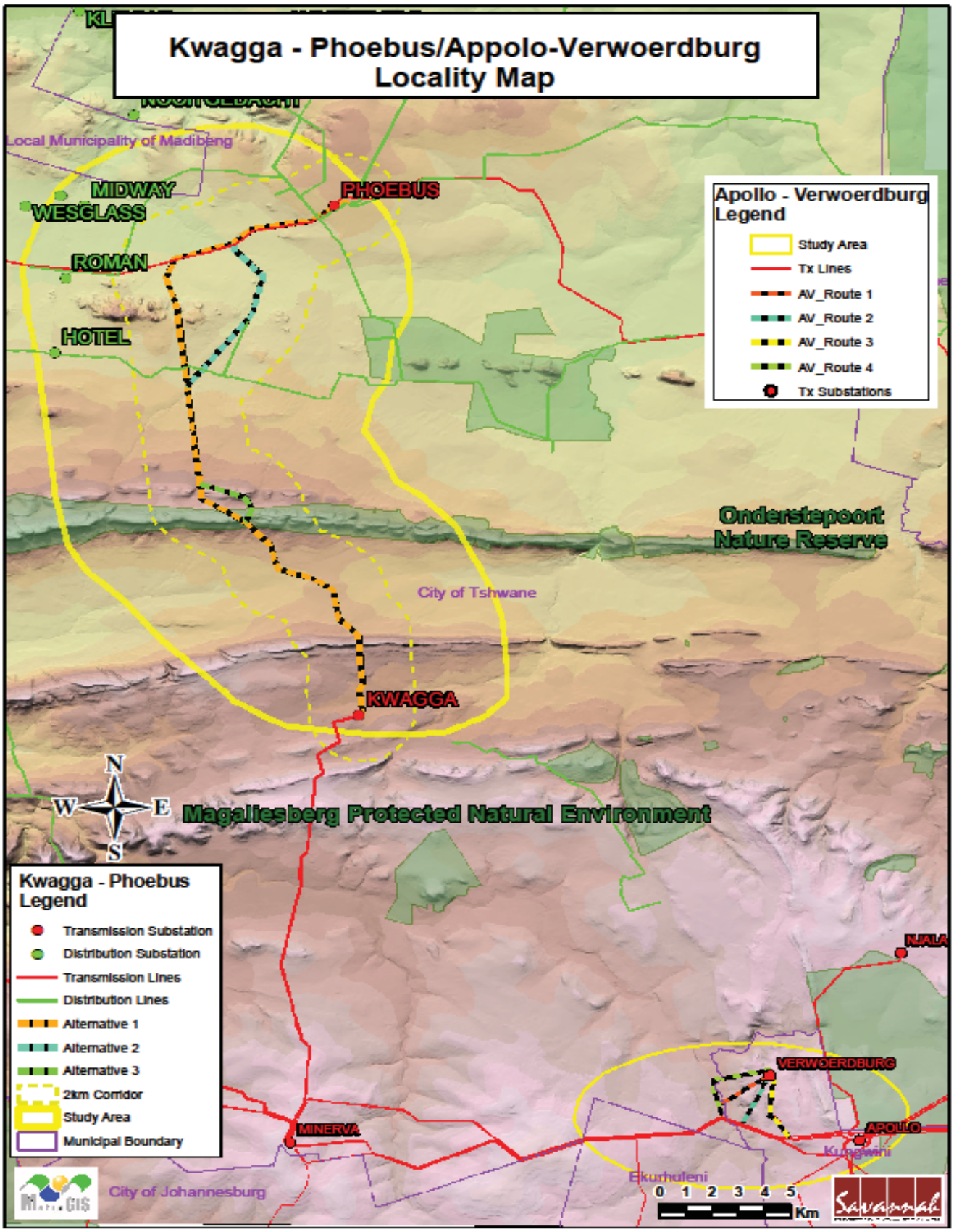


Figure 1.1: Locality Map showing the various components of the proposed Tshwane Strengthening Project Phase 1

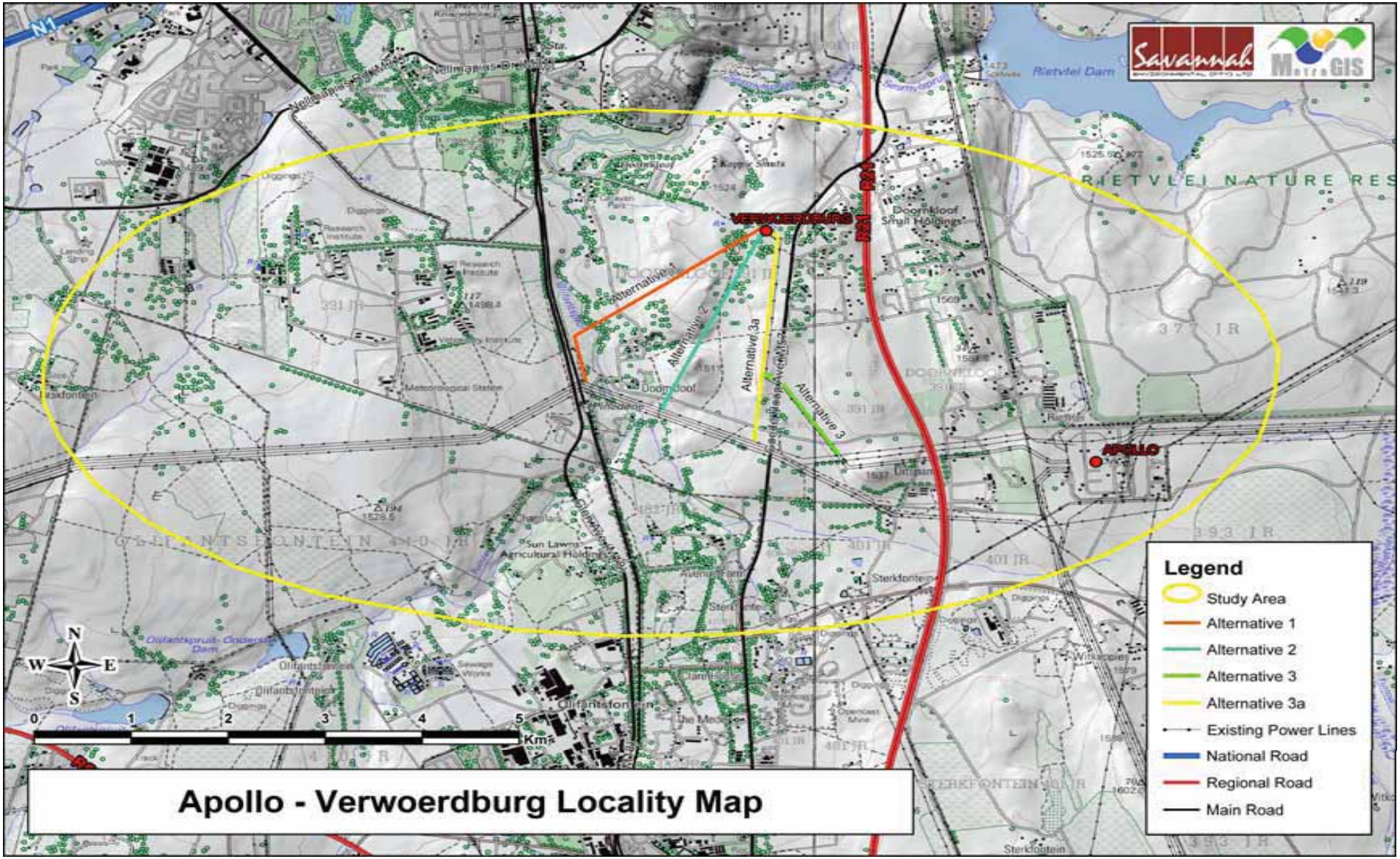


Figure 1.2: Locality map showing the study area for the extension of Verwoerdburg substation and two 400kV turn in and out transmission power lines, as well as alternatives identified for consideration in the EIA process

1.2. The Purpose and Need for the Proposed Project

South Africa is an energy intensive country, largely as a result of an historic economic focus on energy intensive industries such as mining and primary metal processing. With current energy and electricity demands within the country projected to continue increasing, new investments in electricity generation and transmission capacity are required over the next few years.

The current Eskom transmission network supplies the City of Tshwane Metropolitan Municipality (CoT) via three substations, namely: Kwagga, Njala and Verwoerdburg. The contracted reserve capacity at each point is reviewed annually. CoT has applied for new supply points and a step load increase to Eskom Transmission and Distribution. The three parties (Distribution, Transmission and the City of Tshwane Metropolitan Municipality) agreed on the 20-year load forecast for the CoT and also concluded that the CoT and the Eskom transmission networks supplying Tshwane need to be strengthened. A number of options were analysed based on technical and economic benefits to all parties involved.

1.3. Requirement for an Environmental Impact Assessment Process

The proposed Tshwane Strengthening Project is subject to the requirements of the Environmental Impact Assessment Regulations (EIA Regulations) published in terms of Section 24(5) of the National Environmental Management Act (NEMA, No 107 of 1998). This section provides a brief overview of EIA Regulations and their application to this project.

NEMA is national legislation that provides for the authorisation of certain controlled activities known as "listed activities". In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be considered, investigated, assessed and reported on to the competent authority (the decision-maker) charged by NEMA with granting of the relevant environmental authorisation. The National Department of Environmental Affairs (DEA) is the competent authority for this project. Applications for authorisation have been accepted by DEA (under Application Reference numbers **12/12/20/1470** (Apolllo-Verwoerbdurg), **12/12/20/1471** (Kwagga – Phoebus 400kV power lines) and **12/12/20/1524** (Kwagga-Phoebus substations). Through the decision-making process, DEA will be supported by the Gauteng Department of Agriculture and Rural Development (GDARD)[1].

[1] Only one component of the project (Apollo-Verwoerdburg, 12/12/20/1470) is the subject of this report. The other components of the Tshwane Strengthening Project (12/12/20/1471 (Kwagga – Phoebus 400kV power lines) and 12/12/20/1524 (Kwagga-Phoebus substations)) are the subject of a separate report.

The need to comply with the requirements of the EIA Regulations ensures that decision-makers are provided the opportunity to consider the potential environmental impacts of a project early in the project development process, and assess if environmental impacts can be avoided, minimised or mitigated to acceptable levels. Comprehensive, independent environmental studies are required to be undertaken in accordance with the EIA Regulations to provide the competent authority with sufficient information in order for an informed decision to be taken regarding the project.

In terms of sections 24 and 24D of NEMA, as read with Government Notices R385 (Regulations 27–36) and R387, a Scoping and EIA are required to be undertaken for this proposed project as it includes the following activities listed in terms of GN R386 and R387 (GG No 28753 of 21 April 2006):

Number & date of relevant notice	**Activity No/s (in terms of relevant Regulation or notice)**	**Description of listed activity**
Government Notice R387 (21 April 2006)	1(l)	The construction of facilities or infrastructure, including associated structures or infrastructure, for the transmission and distribution of above ground electricity with a capacity of 120 kV or more.
Government Notice R386 (21 April 2006)	1(c)	The above ground storage of a dangerous good, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of 1000 cubic metres or more at any other location or site including the storage of one or more dangerous goods, in a tank farm
Government Notice R386 (21 April 2006)	14	The construction of masts of any material of type and of any height, including those used for telecommunications broadcasting and radio transmission, but excluding: (a) masts of 15 m and lower exclusively used by (i) radio amateurs; or (ii) for lightening purposes (b) flagpoles; and (c) lightening conductor poles
Government Notice R386 (21 April 2006)	15	The construction of a road that is wider than 4 m or that has a reserve wider than 6 m, excluding roads that fall within the ambit of another listed activity or which are access roads of less than 30 m long.

This report documents the assessment of the potential environmental impacts of the proposed construction, operation and decommissioning of the proposed Verrwoerdburg substation extension and associated loop in and out transmission power lines. This EIA Phase followed the Scoping Phase, and was conducted in accordance with the requirements of the EIA Regulations in terms of Section

24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998).

1.4. Eskom's Planning Process and the Role of the Environmental Impact Assessment Process

Eskom Transmission's planning process is required to be based on anticipated load requirements, rather than immediate load requirements in order to timeously supply the anticipated increased demand in the country. This is due to the time-consuming process of acquiring the necessary permissions to construct such infrastructure from DEA and the National Energy Regulator of South Africa (NERSA), servitude negotiations with landowners, as well as transmission power line design and construction. Although, the regulatory processes are time consuming, this is necessary for the project.

Technically feasible transmission power line alignment corridors were identified and investigation within the EIA process. Through the EIA process, preferred alternative transmission power line alignments will be nominated. Should the project be authorised by the National Department of Environmental Affairs (DEA), Eskom will then enter into a servitude negotiation process with each affected landowner. The process of negotiating a servitude is independent of the EIA process, and will be undertaken directly by Eskom Transmission.

While there should be reasonable confidence in the environmental acceptability of the preferred corridor nominated (generally a corridor of 2 km in width), certain criteria identified during the land negotiation process and the final placement of towers may require minor alterations to the power line alignment within the corridor which receives environmental authorisation. These may include:

» Identification of a technical problem during the detailed design phase which will require excessive cost to resolve (e.g. unstable subsurface conditions identified by detailed geotechnical investigations).
» Request by a landowner during the course of the negotiation process that the alignment be shifted to avoid disruption of a particular activity on his property, but provide a feasible and reasonable new alignment.

Provided such potential deviations to the power line alignment are within the corridor authorised and are not unreasonable, it is fair for Eskom Transmission to investigate and negotiate local adjustments. This may be required at a number of points along the alignment.

1.5. Objectives of the Environmental Impact Assessment Process

The Scoping Phase of the EIA process identified potential issues associated with the proposed project, and defined the potentially feasible alternatives and extent of the studies required within the EIA Phase. This was achieved through a desk-top evaluation of the proposed project using existing information, involving the project proponent, specialists with experience in undertaking EIAs for similar projects, and a public consultation process with key stakeholders that included both government authorities and interested and affected parties (I&APs).

The EIA assesses those identified potential environmental impacts and benefits (direct, indirect and cumulative impacts) associated with all phases of the project including design, construction, operation and decommissioning, and recommends appropriate mitigation measures for potentially significant environmental impacts. The EIA report aims to provide the environmental authorities with sufficient information to make an informed decision regarding the proposed project.

The Draft EIA Report includes a draft Environmental Management Plan (EMP), which details environmental specifications required to be implemented to reduce environmental impacts associated with the proposed project. Should the project be authorised, this EMP will be finalised and will form part of the Contract documentation for construction and operation of the substation and power lines.

The release of a draft EIA Report (including the draft EMP) provides stakeholders with an opportunity to verify that the issues that they have raised through the EIA process have been captured and adequately considered. The final EIA Report will incorporate all issues and responses raised during the public review of the draft EIA report prior to submission to DEA.

1.6. Details of Environmental Assessment Practitioner and Expertise to conduct the Scoping and EIA

Savannah Environmental was contracted by Eskom Transmission as an independent environmental assessment practitioner to undertake an Environmental Impact Assessment (EIA) for the proposed project, as required by the NEMA EIA Regulations. Neither Savannah Environmental, nor any of its specialist sub-consultants on this project are subsidiaries of or affiliated to Eskom Holdings Limited. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed project.

Savannah Environmental is a specialist environmental consulting company providing a holistic environmental management service, including environmental assessment and planning to ensure compliance and evaluate the risk of

development; and the development and implementation of environmental management tools.

The Savannah Environmental team has considerable experience in environmental assessment and environmental management, and has been actively involved in undertaking environmental studies for a wide variety of projects throughout South Africa. Strong competencies have been developed in project management of environmental EIA processes, as well as strategic environmental assessment and compliance advice, and the identification of environmental management solutions and mitigation/risk minimising measures.

Savannah Environmental has gained extensive knowledge and experience on potential environmental impacts associated with electricity generation and transmission projects through their involvement in related EIA processes. They have successfully managed and undertaken EIA processes for other power transmission projects for Eskom Holdings Limited throughout South Africa. Curricula vitae for the Savannah Environmental project team consultants are included in Appendix A.

In order to adequately identify and assess potential environmental impacts, Savannah Environmental has appointed several specialist consultants to conduct specialist studies, as required. Details of these specialist studies are included in Chapter 3. The curricula vitae for the EIA specialist consultants are also included in Appendix A.

Electricity cannot be stored and must therefore be generated and delivered over long distances at the very instant it is needed. In South Africa, thousands of kilometres of high voltage transmission power lines transmit power, mainly from the power stations located in 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 mandate and commitment to meet the increasing needs of end-users, it has to establish and expand its infrastructure of transmission power lines and substations on an ongoing basis. Due to substantial annual load growth, load shifts and step loads in the recent past, it has become necessary to reinforce the existing electrical infrastructure through the establishment of new electricity generation and transmission capacity.

Eskom is the primary supplier of electricity in South Africa and supplies power in bulk to most towns and cities, the municipalities of which sell it to households, industrialists and other end-users within their areas of jurisdiction. Eskom also sells bulk electricity directly to end-users in some parts of South Africa. 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 the projected demand for electricity[2] in relation to 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.

As part of its capacity expansion and grid strengthening programme, Eskom Transmission is proposing the **Tshwane Strengthening Project Phase 1**. The Tshwane Strengthening Project Phase 1 is proposed to include the following:

» Extension of the existing Verwoerdburg (Rietvlei) Substation.
» Construction of 2x400kV loop in and out power lines from Apollo – Pluto transmission lines to feed into the Verwoerdburg (Rietvlei) Substation, a distance of approximately 4 km.
» Construction of 400kV loop in and out lines to feed into the Phoebus Substation from the existing Apollo-Dinaledi transmission power line, a distance of approximately 1 km.

[2] This is undertaken through the Integrated Strategic Electricity Planning (ISEP) process

» Construction of a new 400kV transmission power line between the proposed Phoebus Substation and the Kwagga Substation, a distance of ~30 km.
» Expansion of the existing Kwagga Substation.
» Establishment of the new Phoebus substation adjacent to existing Hangklip substation

In total, approximately 36 km of new power line is proposed as part of the Tshwane Strengthening project Phase 1.

2.1. The Need and Justification for the Proposed Project

The following provides a brief description of the need and desirability of the project from the proponent's perspective.

2.1.1. The Need for Additional Transmission Capacity in the Tshwane Area

Hundreds of kilometres of transmission power lines feed electricity from power stations in the Mpumalanga and Limpopo Provinces to transmission substations across the country. The existing transmission power lines and substations within Gauteng are becoming heavily loaded and are predicted to reach their full capacity in the near future (approximately 20 years). Through technical investigations undertaken by Eskom, it has been concluded that the current transmission power line and substation infrastructure cannot supply the increased demand in the Gauteng North area. It is becoming increasingly difficult for Eskom Transmission to meet its mandate of supplying electricity to the area during a contingency situation which involves the loss of one power line, as the remaining power lines have to carry the entire load. This makes it difficult to carry out routine maintenance, resulting in the potential deterioration of operating lines and poor line performance (including faults, etc). This can be largely attributed to development growth in the area, hence an increased demand for power.

A twenty-year electricity demand forecast is produced by Eskom Transmission annually. In this forecast, inputs from customers and various governmental and commercial associations regarding load growth are taken into account. Due to economic growth and the government's policy, *"Accelerated and Shared Growth Initiative for South Africa"* (ASGISA), it was calculated that the load for the country will grow at an aggregated value of 4% per annum from the current load of 34 807 MW in 2007 to approximately 93 776 GW in 2030.

Studies undertaken by Eskom have shown a steady 3% per annum average load growth for the area fed from Verwoerdburg, Wildebeest and Apollo substations, the main bulk supply substations to the Tshwane Region. This is due to light

industrialisation, commercialisation, urban growth and electrification within this area. It is also a sign of good economic growth in this area. The load forecasters within Eskom predict that this load growth will continue into the future, which will result in the need for additional power by the year 2013. The load demand mentioned here is subject to change as the prevailing economic climate changes and as other Eskom initiatives to conserve energy are widely adopted. The various developments are being monitored, and their effect will be incorporated in future plans. The expected load in the Pretoria area is shown in Table 2.1 below.

Table 2.1: Projected/Expected electricity loads in the Pretoria area up to 2018 (source: Eskom Transmission Ten Year Plan, 2009-2018)

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Projected Load (MW)	2171	2264	2354	2443	2570	2655	2736	2815	2931	3004	3074

2.1.2. The Need to Optimise the Electrical Transmission System in the Tshwane Area

From Section 2.1.1 above it is clear that a fault on any of the power lines supplying the Tshwane Region could have a detrimental effect on supply to customers within this area once new customer/s are supplied from the existing network. Eskom Transmission has already implemented measures to optimise the existing Transmission system within the Tshwane Region such that the construction of new power lines to supply this area 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 determine 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 as on hot days).
» Installation of new infrastructure
» Demand side management
» Selection of the most appropriate reinforcement options in order to ensure that an optimised mix of cost, technical benefit and environmental impact was achieved.
» Energy Efficiency initiatives

As all options for optimisation of the existing infrastructure in the Tshwane area have already been studied and implemented, new transmission power lines will be required to be constructed in order to meet the predicted load requirements. The new transmission lines will be required to be brought into operation at the time when the load growth and demand exceeds the supply, i.e. by 2012. It is therefore necessary to secure the required servitudes timeously, to ensure this will be possible.

A definite two-fold need for new transmission power lines has therefore been identified:

» To optimise the existing system; and
» To increase line capacity in the Transmission system.

By increasing the supply into the Transmission system, the forecasted 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 load requirements can be addressed by the increased supply through the construction of new transmission power lines. In addition the extension and upgrade of the existing substations will improve the supply to the area.

2.2. Alternatives for Satisfying the Additional Electricity Supply Need within the Tshwane Area

Electrical supply constitutes a complex system of generation facilities, substations, and transmission and distribution power lines. The system operates on a demand-supply structure with the power being generated and transmitted at the moment it is needed.

The forecast growth in demand in the Tshwane region over the next few years (25-30 years), however, urgently requires Eskom Transmission to take timeous action to ensure supply reaches the end-users. It is therefore necessary to ensure extra supply capacity into the Tshwane area. There is a definite need to overcome the future overloading problems on the existing transmission lines and substations.

The ideal solution should be to:

» meet the projected demand
» optimise existing infrastructure
» minimise cost
» minimise any adverse environmental impacts.

The following alternatives for satisfying the two-fold need for additional electrical supply to the region and optimising the existing infrastructure were investigated by Eskom Transmission.

2.2.1. The "Do Nothing" Option

The 'do nothing' alternative is the option of not extending the existing Verwoerdburg substation as well as not constructing any new transmission power lines looping in from the Apollo-Pluto power lines. By not taking any action, Eskom Transmission may end with a situation of not being able to ensure firm supply into some parts of the country and the Tshwane area in particular, in the very near future (i.e. by 2012). This would eventually lead to load shedding which can cause major disruptions of power supply to different areas at different times. This will have a significant impact on the economy of the Tshwane region, as no real economic growth would be able to take place without additional electricity supply. Therefore, without the implementation of this proposed project, there will be significant impacts on the reliability and stability of electricity supply to the Tshwane region. This option is therefore discarded as a feasible alternative as it would neither supply the projected demand for electricity nor optimise the existing infrastructure.

2.2.2. 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 generation 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. This is so because there will be large step loads in the Tshwane area in the 20-25 years horizon. As part of a long-term plan, Eskom is planning to deload Apollo and Minerva substation as part of additional supply to Pelly. As part of the strengthening of the Tshwane region, Eskom is also planning refurbishment of Lomond substation.

Eskom Transmission is currently investigating various means to achieve a flatter load profile in this area such as building new electricity infrastructure, expansion and upgrade of existing substation infrastructure. However, the large

concentration of industrial and commercial users in this area makes this a very difficult option to pursue. This option is therefore not considered to be feasible to meet the long-term power demands associated with the expansions in the Pretoria area.

2.2.3. New Generation Systems

The option of a new coal-fired, gas, renewable or nuclear generation plant being commissioned near to the load centre could be considered. This may have a more negative overall impact on the environment due to the land requirements, fuel resources, etc., and would take at least five years to implement and would not address the foreseen supply demand in the short-term. In addition, the cost of such an option will be extremely high compared to the cost of transmission power lines and could prove to be non-feasible from an economic perspective. Transmitting power via overhead transmission power lines is currently considered to be the most economical and environmentally acceptable way to supply bulk electricity.

The use of other types of generation such as wind and solar energy were suggested by some I&APs within the public participation process. However, the high cost and low output of such systems does not make these economically feasible for the supply of base load electricity supply[3] to the Tshwane area.

Therefore, this option is not considered feasible to address the need in the Tshwane area and was not investigated further within this EIA process.

2.2.4. Upgrade Existing Transmission Power Lines by using Bigger Conductors

The upgrade of existing transmission lines in the area by using bigger conductors would require these existing power lines to be permanently off while being upgraded to thicker conductors. This would put the existing and future load at risk should the remaining lines in the area trip. The upgrade option would result in the physical load on the existing towers increasing substantially, resulting in sagging of the conductors. The existing towers would be inadequate to support this physical load. Therefore, to mitigate against sagging, additional towers would be required to be constructed within the existing servitudes being upgraded. Furthermore, it would not be possible to remove one transmission power line from service to perform the upgrading work, as the remaining supply lines would not be able to supply the electrical loads in the Transmission system. The power transmission from the Apollo substation would not be able to be evacuated to the

[3] "Base load electricity generating capacity" refers to power station technology designed specifically to generate electricity continuously for all hours of the day and night. Wind and solar power does not provide base load electricity

load centres without causing dynamic instability in the Eskom network which could result in black-outs. This option would not improve the reliability of the Transmission system nor be sustainable and is therefore not considered to be a feasible alternative.

2.2.5. Extension of the Verwoerdburg (Rietvlei) Substation and construction of 2X 400kV Loop in and out transmission power line between into Apollo-Pluto from Verwoerdburg Substation

The alternative is part of the new generation and transmission capacity alternatives. The need for increased capacity and the need for optimising existing infrastructure would be met through the implementation of this option.

Due to current land use and development in the country, very limited open corridors remain that could be utilised to install major transmission power lines. 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. Therefore, Eskom Transmission is proposing the extension of the existing Verwoerdburg 400/132kV substation and Verwoerdburg-Apollo, 2X 400kV loops in and out of the existing Apollo-Pluto 400kV transmission power lines at Verwoerdburg Substation in order to strengthen the transmission network.

The advantages associated with this option include:

» It overcomes the line overloading problems.
» It will create a more flexible network, since it forms an interconnection between the loads fed from Apollo substation and the proposed new Phoebus substation[4]. This will improve the overall reliability of the Transmission system, which will be of benefit to both Eskom and to all electricity users within the area.
» It will improve the angular stability of the Tshwane generation pool.
» Compared to the other options considered, this option proves to be more economical.
» It improves the reliability of supply to the Tshwane Customer Load network. This network presently feeds the City of Tshwane customers, affecting the livelihoods of the people and the economy of the area (refer to Figure 2.1).

[4] This proposed development is a subject of separate report assessing Kwagga-Phoebus substations and Kwagga-Phoebus power lines (EIA Reference Nos 12/12/20/1524 and 12/12/20/1471).

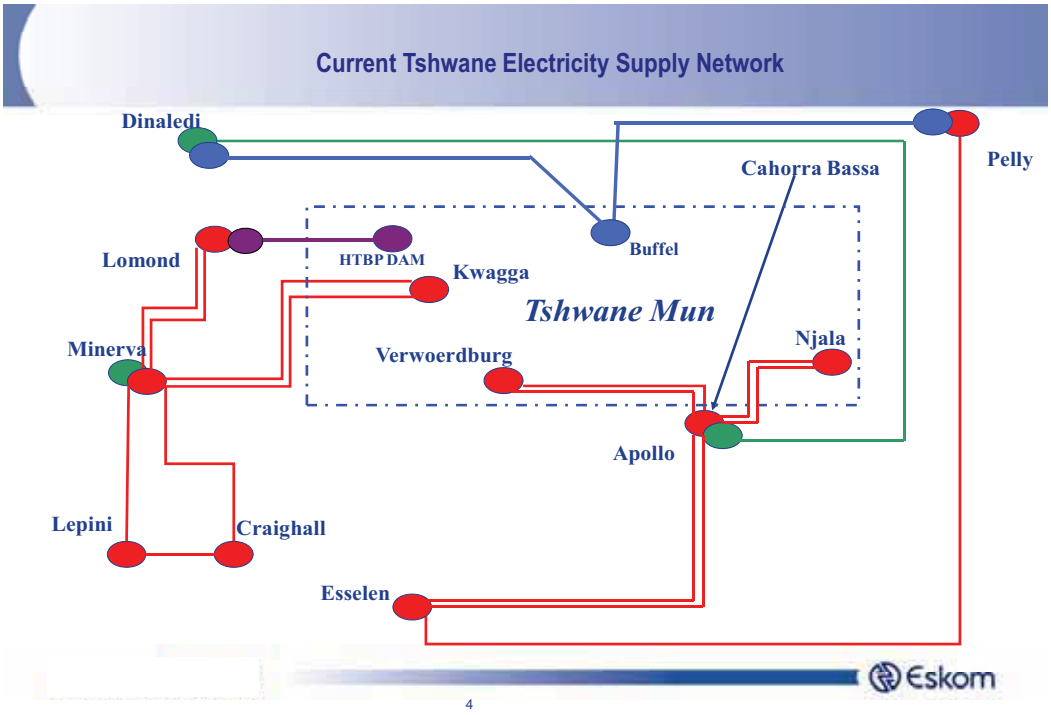


Figure 2.1: Current Tshwane Electricity Supply network (Eskom Planning, 2009)

Due to current land use and development in the Irene, Doornkloof East area, very little open space remains that could be utilised to install major transmission power lines with a servitude of 110 m (i.e. two 400 kV lines in parallel). 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.

This is the option most favoured by Eskom Transmission as well as the City of Tshwane Electricity Department as it is considered to be the most feasible from a technical and economic perspective, and will meet the required need for increased capacity and the need for optimising existing infrastructure in the short- and long-term. This option is therefore nominated as the preferred option by Eskom Transmission to supplement the power supply to the Tshwane area.

2.3. Proposed Strategy for Satisfying the Additional Electricity Supply Need within the City of Tshwane Metropolitan Municipal Area

From the analysis of the various alternatives to satisfy the need for additional power transmission capacity, Eskom Transmission determined that the extension and upgrade of the existing Verwoerdburg (Rietvlei) substation and construction of 400kV loop-in transmission power lines as part of the Tshwane Strengthening Project Phase 1 was the most feasible and cost-effective solution in order to meet

the CoT electricity requirement (refer to 2.1.2 above)[5]. This solution will also de-load the heavily loaded Minerva- and Apollo substations. The proposed project involves the following:

» Extension of the **Verwoerdburg substation**
» Construction of **2x 400kV loop in & out** power lines from Apollo-Pluto into Apollo-Verwoerdburg (i.e. two 400kV lines in parallel).
» **Associated Infrastructure works** to integrate the new transmission lines into the Transmission grid (such as access roads, bus bar, etc).

The installation of the two 400kV loop-in transmission power lines and expansion of the Verwoerdburg substation would offer the following benefits to Eskom Transmission and its customers in the Tshwane Region in the medium- to long-term:

» Increased electricity supply to the region.
» The proposed power lines and substation expansion will improve the electrical system performance in the region.
» The proposed substation expansion and power lines will ensure the capacity of Eskom Transmission to supply the forecasted increase in electricity demand in the region.
» It will alleviate the current supply constraints in the Eskom and City of Tshwane Power network.

Eskom Transmission is aware that it is thus of paramount importance that the required servitudes be obtained, to ensure an acceptable quality of electrical supply to the region. Overhead lines have been proposed over underground cables as the disadvantages of underground cables outweigh that of overhead lines.

» Underground cabling is more expensive, since the cost of burying cables at transmission voltages is several times greater than overhead power lines.
» Whereas finding and repairing overhead wire breaks can be accomplished in hours, underground repairs can take days or weeks, and for this reason redundant lines are run.
» Operations are more difficult since the high reactive power of underground cables produces large charging currents and so makes voltage control more difficult.
» Cables could take up a larger land footprint as compared to overhead lines. This is a due to cables being required to be in trenches from the source of supply to the load. As a result, the land above the cable cannot be utilised for

[5] Subject of a separate report investigating the other two components of the Tshwane Strengthening project Phase 1 (Savannah Environmental, 2010)

private purposes. The land footprint of overhead power lines is much less due to the land only being required to construct the towers approximately every 200 m.

» The environmental impacts associated with underground cabling are considered to be significantly higher than that associated with overhead lines as trenches are required to be excavated for long distances resulting in severe damage to habitats and surrounding areas.

2.4. Verwoerdburg Substation Site

2.4.1. Identification of Substation Site

The expansion of the Verwoerdburg substation was identified by Eskom for investigation within a broader study area (refer to Figure 2.2) based on technical criteria. Therefore, land adjacent to and north-west of the existing substation was considered to be the most suitable from a technical perspective and was provided to the EIA team for further investigation through the EIA process. There were no alternative sites identified and investigated for the substation expansion because the proposal is for the expansion of existing infrastructure. The criteria used in selecting the land north-west of the existing substation include, amongst others:

» access during construction and operation,
» avoidance of environmentally sensitive features/areas, and
» Land earmarked for substation expansion is owned by Eskom.

The area under investigation is already characterised by infrastructure of a similar nature, i.e. the existing Verwoerdburg substation and Apollo-Pluto power lines. It is therefore, at this stage, not foreseen that additions to the Verwoerdburg substation would yield significant negative impacts to the surrounding environment. Since the substation is an existing facility, there was no need to identify alternative sites other than the one earmarked for the proposed extension. Potential impacts are assessed in detail within Chapters 5 and 6 of this report.

2.4.2. Construction Process for the Substation

The proposed substation extension is proposed to be constructed in the following simplified sequence, and will take approximately 10 months to complete:

Step 1: Survey of the substation site (including a final survey by environmental specialists and the compilation of a site-specific Environmental Management Plan (EMP)

Step 2: Site clearing and levelling and construction of access road to substation site (if required)

Step 3: Construction of terrace and substation foundation, including the installation of stormwater drainage on the surface to dispose of such stormwater on the terrace

Step 4: Assembly, erection and installation of equipment (including transformers and control building)

Step 5: Connection of conductors to substation infrastructure

Step 6: Rehabilitation of any disturbed areas and protection of erosion sensitive areas.

Extension of the existing fences will be installed to secure the substation and the substation site. These fences include a 2.4 m high security fence to enclose all assets, a 1.8 m high fence around the yards, and a 1.2 m high boundary fence on the property-line (refer to Photograph 2.1 and 2.2).

Construction crews for construction of the substation will constitute mainly skilled and semi-skilled workers. No construction workers will reside on site. It is most likely that construction workers will be accommodated within formal housing within towns surrounding the study area.

Photograph 2.2: showing infrastructure development for a typical substation site

Substation Construction

Photograph 2.1: showing earthworks for a substation site

Figure 2.2: Google Image showing the proposed Verwoerdburg substation extension identified for investigation in the EIA process

Photograph 2.3: View of the existing Verwoerdburg substation and Apollo-Pluto power lines (looking north from the M57)

2.4.4. Technical Details of the Proposed Substation

» *Substation Design:*

Depending on the final design of the proposed extension to the Verwoerdburg substation, a total area of 300 m^2 will be required for the extension of the substation. The equipment will be designed according to Eskom specifications. The maximum height of the substation development will be 25 m.

Photograph 2.4: View of the gravel access road to Verwoerdburg substation from the south

2.5. Alternative Transmission Power Line Corridors

2.5.1. Identification of Alternative Transmission Power Line Corridors

The extent of the study area and the selection of corridors within the study area gave consideration to such aspects as ecological impacts, social impacts, visual impacts, heritage impacts, technical feasibility and cost. Technically viable, environmentally sound and cost effective corridors were identified by Eskom Transmission and Savannah Environmental EIA team for the proposed Apollo-Verwoerdburg turn-in power lines. These corridors are 2km wide.

The following technical requirements have been considered in the identification of feasible corridors for the establishment of the required transmission power lines:

» As far as possible, the servitude lengths between supply points should be minimised.
» As far as possible, the number and magnitude of angles along the power line should be minimised in order to allow the use of less expensive and visually intrusive tower types.
» As far as possible, the proposed new 400kV transmission power line should be constructed in parallel with existing linear infrastructure. This will assist to minimise the physical impact on individual properties and/or activities on these properties along the proposed route.
» Crossing over of existing major power lines should be avoided as far as possible, as this increases the potential for technical incidents during operation.
» The alignment should cater for known topographical/terrain constraints of the tower types to be used, as well as soil conditions for the foundations in terms of geotechnical suitability and costs.
» The proposed alignment should provide for the need of appropriate access roads to the servitude and tower positions for the both construction and maintenance/operation phases.
» The following obvious and observable environmental issues should be taken into account:
    - human settlements and communities
    - land use (where possible)
    - passing between water bodies (bird flight paths usually extend between water bodies)
    - ecologically sensitive areas
    - scenic areas with high visual/aesthetic quality
    - untransformed indigenous vegetation.

Two transmission line corridors in order to loop the Apollo-Pluto power line in and out of the Verwoerdburg substation (refer to Figure 2.3). Subsequent to the scoping evaluation and the specialist workshop, the specialist team, the I&APs and stakeholders suggested that additional alternative corridors following the existing Apollo-Pluto power lines along the M57 main road should also be investigated in the EIA phase (Savannah Environmental, 2009). Therefore, Alternatives 1, 2, 3 have been investigated in detail in this EIA Report (refer to Figure 2.4). An additional alternative was added subsequent to the specialist workshop. A comparative assessment of the potential environmental impacts associated with these alternative power line corridors is presented within Chapter 6 of this report.

2.5.2. Description of Alternative Power Line Development Corridors Considered in the EIA Phase of the EIA Process

Alternative Corridor 1 starts at Verwoerdburg Substation and runs south-west for approximately 2 km to Glen Avenue road. It turns south from here and joins into the existing Apollo-Pluto lines. The corridor crosses some open grassland and a small stream.

Alternative Corridor 2 starts at Verwoerdburg Substation and runs south-south west for approximately 2.3 km in a straight line before joining into the existing Apollo-Pluto lines. This corridor crosses some open grassland and a small koppie.

Alternative Corridor 3 starts at Verwoerdburg Substation and follows existing transmission lines for the entire length. It follows the road for the majority of the route. Alternative 3 does not cross any streams or koppies.

Alternative Corridor 3a starts at Verwoerdburg Substation and follows existing transmission lines towards the Apollo-Pluto lines south of the Verwoerburg substation. This alternative forms a straight line from the substation towards the Apollo-Pluto lines west of the M57 Main Road.

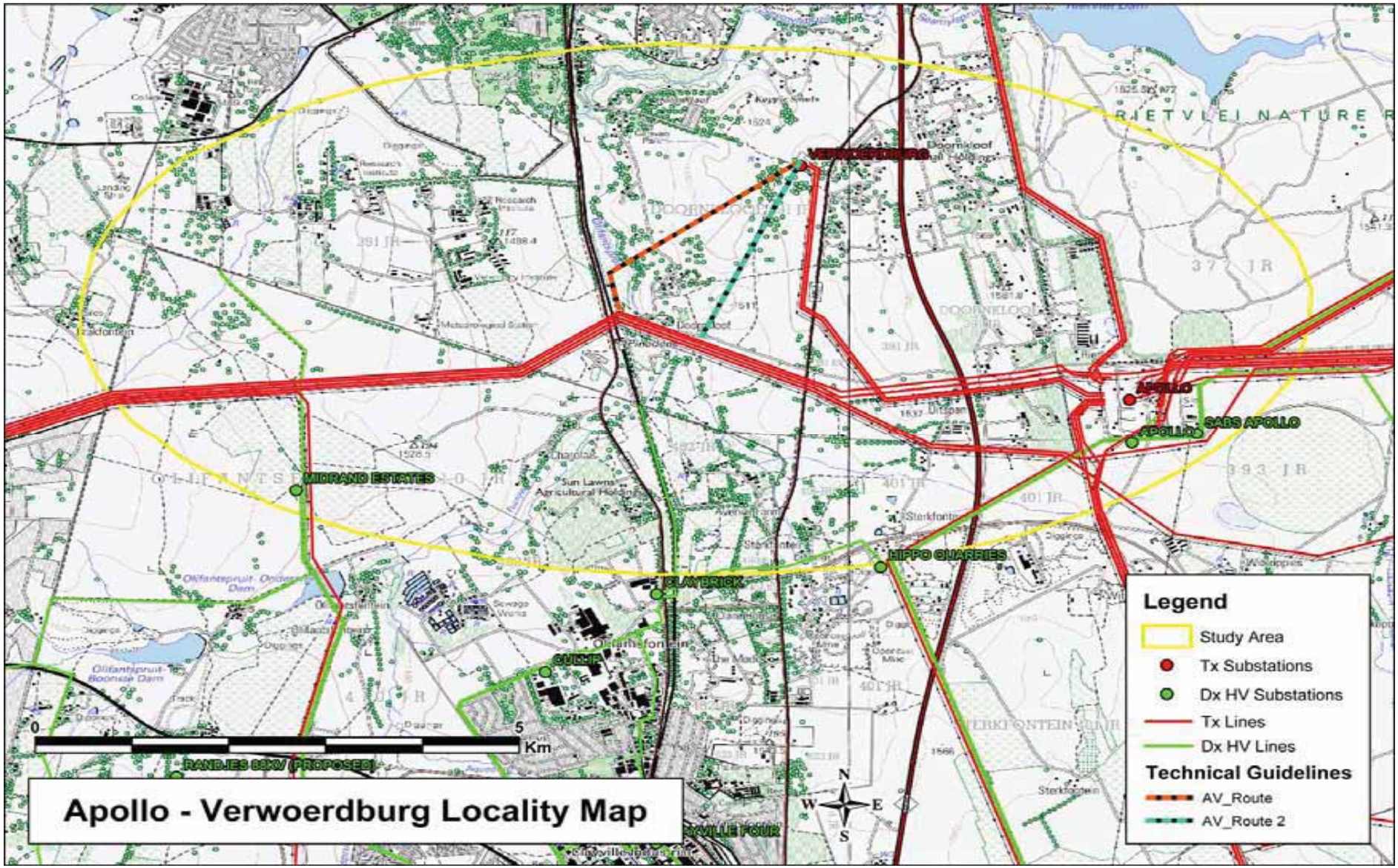


Figure 2.3: Map showing the alternative power line corridors identified by Eskom for investigation during scoping phase of the EIA process

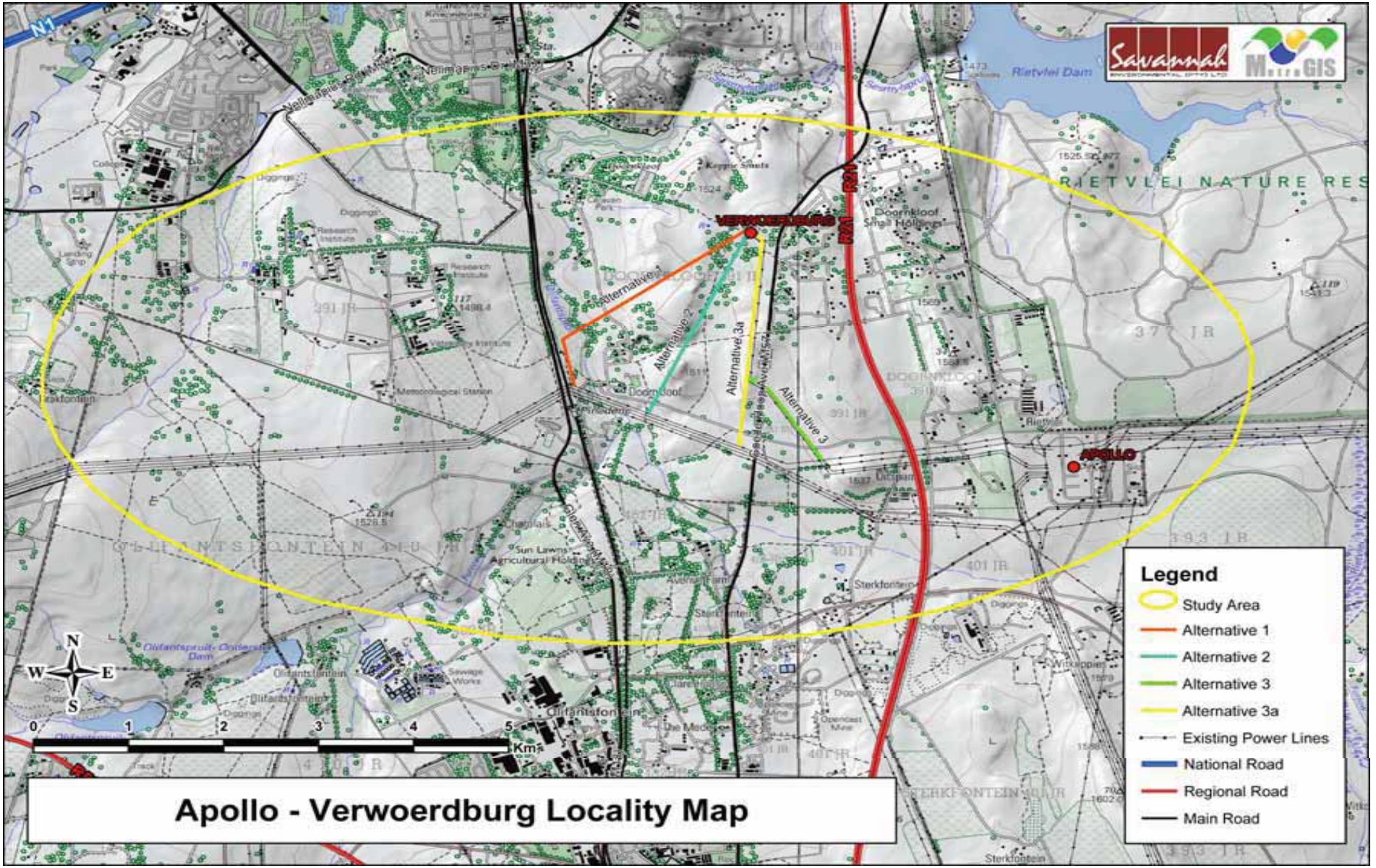
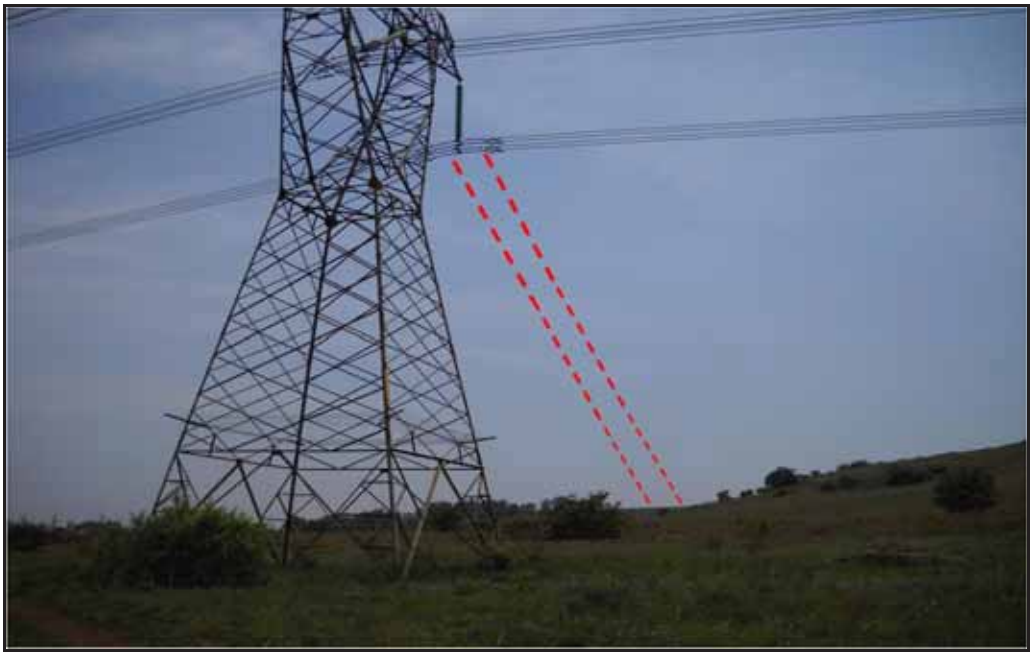


Figure 2.4: Map showing the alternative power line corridors investigated in the EIA Phase of the process

Photograph 2.5: Existing Apollo-Pluto power lines north-west of the Verwoerdburg substation



Photograph 2.6: Typical self supporting tower used for Apollo-Pluto lines in the vicinity of Alternative 2 (red dotted lines for turn-in power line)

2.5.3. Construction Phase

Transmission lines are constructed in the following simplified sequence:

Step 1: Determination of technically feasible alternatives
Step 2: EIA input into route selection
Step 3: Negotiation of final route with affected landowners

Step 4: Survey of the route (by air), should the need arise considering the length of the proposed line

Step 5: Determination of the conductor type

Step 6: Selection of best-suited conductor, towers, insulators, foundations

Step 7: Final design of line and placement of towers (including final walk-though survey by environmental specialists and compilation of site-specific Environmental Management Plan (EMP))

Step 8: Issuing of tenders, and award of contract to construction companies

Step 9: Vegetation clearance and construction of access roads (where required)

Step 10: Tower pegging

Step 11: Construction of foundations

Step 12: Assembly and erection of towers

Step 13: Stringing of conductors

Step 14: Rehabilitation of disturbed area and protection of erosion sensitive areas

Step 15: Testing and commissioning

Construction of the lines proposed as part of the entire Tshwane Strengthening Project Phase 1 will take approximately 24 months to complete. Construction of these lines is anticipated to begin in 2011.

2.5.6. Technical Details of Tower and Transmission Line Designs

All components of a transmission line are interdependent, but are distinct in the roles which they fulfil. The primary components include towers, foundations, insulators and hardware, and conductors.

» *Towers*

Transmission line conductors are strung on in-line (suspension) towers and bend (strain) towers. Various designs are available for use by Eskom on the proposed Apollo-Verwoerburg turn-in power lines (refer to Figure 2.5 to 2.7). The type of towers which can be used will be dependent on the final alignment of the power lines and individual agreements with affected land owners and stakeholders.

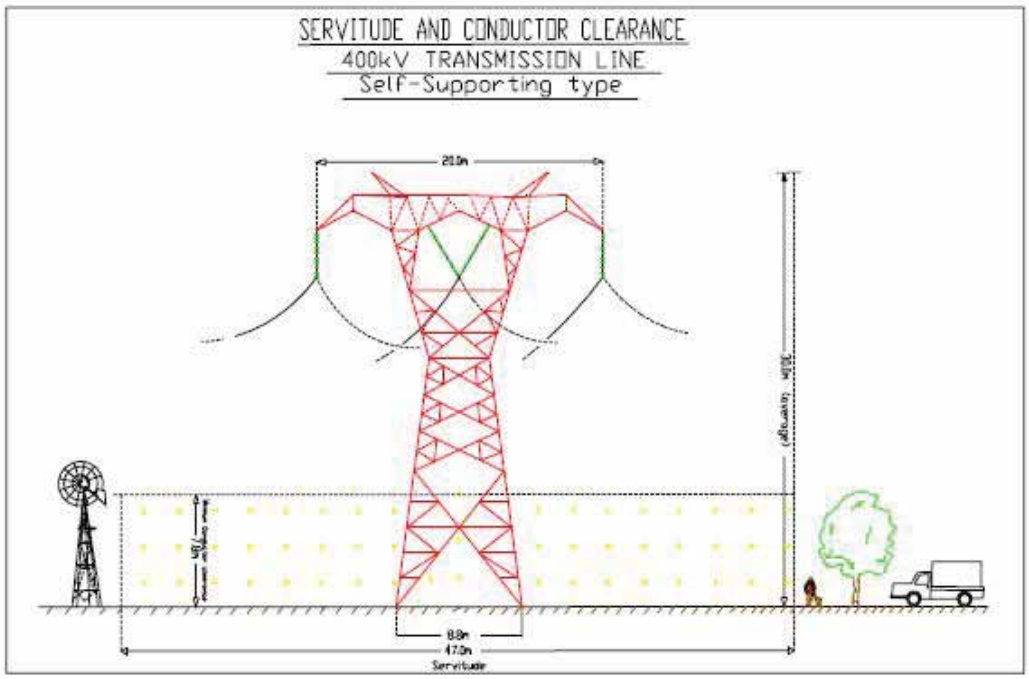


Figure 2.5: Diagrammatic representation of the self-supporting strain/bend tower.

Figure 2.6: Self-supporting double-circuit tower

Figure 2.7: Guyed and Compact Cross-rope suspension tower typically used along the existing Dinaledi-Anderson 400kV transmission power line route

The compact cross-rope suspension tower is typically used along the straight section of the servitude, while the self-supporting angle towers are used where there is a bend in the power line alignment.

» *Servitude Requirements*
The servitude width for a 400kV transmission power line is 55 m. Transmission power lines running in parallel must have a minimum separation of 55 m. The minimum horizontal clearance to any building, structures, etc not forming part of the Transmission power line must be 3,8 m (Figure 2.8), while the minimum vertical clearance between the conductors and the ground is 8,1 m.

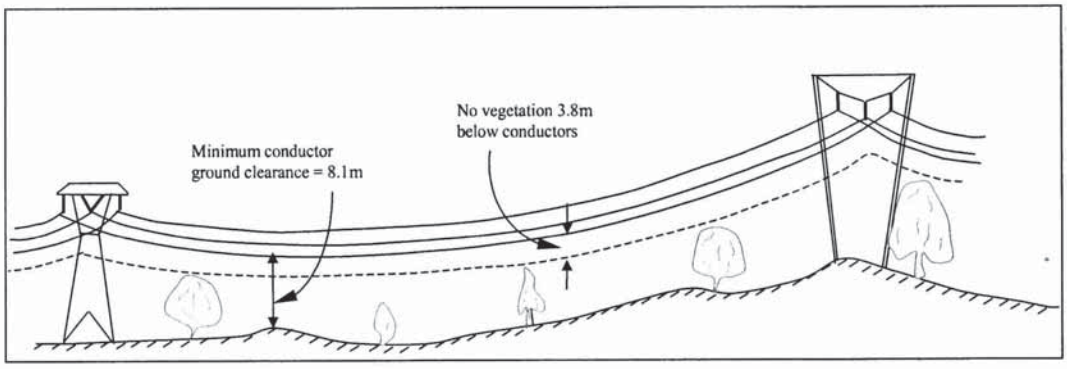


Figure 2.8: Servitude requirements in terms of vegetation clearing under conductors and minimum ground clearance

The minimum distance of a 400kV transmission power line running parallel to proclaimed public roads must be 95 m from the centre of the transmission power

line servitude to the centre of the road servitude. Any main road located close to a transmission line tower must have Armco barriers as protection.

The minimum distance between any part of a tree or shrub and any bare phase conductor of a 400kV transmission line must be 3,8 m, allowing for the possible sideways movement and swing of power towers and conductors.

A maximum 8 m wide strip is to be cleared of all trees and shrubs down the centre of the transmission line servitude for stringing purposes only. Any tree or shrub in other areas which will interfere with the operation and/or reliability of the Transmission line will be trimmed or completely cleared. The clearing of vegetation will take place, with the aid of a surveyor, along approved profiles and in accordance with the approved EMP, and in accordance with the minimum standards to be used for the vegetation clearing for the construction of the proposed transmission power lines as listed in Table 2.2.

Table 2.2: Minimum standards to be used for vegetation clearing for the construction of a new transmission power line

Item	Standard	Follow up
Centre line of the proposed Transmission line	Clear to a maximum (depending on tower type and voltage) of a 4-8m wide strip of all vegetation along the centre line. Vegetation to be cut flush with the ground. Treat stumps with herbicide.	Re-growth shall be cut within 100 mm of the ground and treated with herbicide, as necessary.
Inaccessible valleys (trace line)	Clear a 1 m strip for access by foot only, for the pulling of a pilot wire by hand.	Vegetation not to be disturbed after initial clearing – vegetation to be allowed to re-grow.
Access/service roads	Clear a maximum (depending on tower type) 6 m wide strip for vehicle access within the maximum 8 m width, including de-stumping/cutting stumps to ground level, treating with a herbicide and re-compaction of soil.	Re-growth to be cut at ground level and treated with herbicide as necessary.
Proposed tower position and proposed support/stay wire position	Clear all vegetation within proposed tower position in an area of 20 x 20 m (self-supporting towers) and 40 x 40 m (compact cross-rope suspension towers) around the position, including de-stumping/cutting stumps to ground level, treating with a herbicide and re-compaction of soil. Allow controlled agricultural practices, where feasible.	Re-growth to be cut at ground level and treated with herbicide as necessary.

Item	Standard	Follow up
Indigenous vegetation within servitude area (outside of maximum 8 m strip)	Area outside of the maximum 8 m strip and within the servitude area, selective trimming or cutting down of those identified plants posing a threat to the integrity of the proposed transmission line.	Selective trimming
Alien species within servitude area (outside of maximum 8 m strip)	Area outside of the maximum 8 m strip and within the servitude area, remove all vegetation within servitude area and treat with appropriate herbicide.	Cut and treat with appropriate herbicide.

Once the centre line has been cleared, the contractor's surveyor will peg every tower position and marks the crossing point with existing fences for new gate installation. Where required, once the tower positions have been marked, the vegetation clearing team will return to every tower position and clear vegetation (in accordance with the specification outlined in the Environmental Management Plan (EMP) for assembling and erection purposes.

» *Foundations*

The choice of foundation is influenced by the type of terrain encountered, as well as the underlying geotechnical conditions. Geotechnical requirements for all tower types are catered for by using various foundation types, which are designed to withstand conditions varying from hard rock to waterlogged marshes. The main types of foundations include piles, pad-and-chimney, and rock anchors. The actual size and type of foundation to be installed will depend on the type of tower to be erected, and the actual sub-soil conditions. Strain towers require more extensive foundations for support than in-line suspension towers, which contribute to the construction expenses.

The construction of foundations is the slowest part of the line construction, and is typically started some time ahead of tower erection. Prior to filling of the foundations and tower erection, excavated foundations are covered or fenced in, in order to safe-guard unsuspecting animals and people from injury. The foundations also represent the biggest unknown in the cost and construction time, since access to the tower sites is required for earth-moving machinery and concrete.

All foundation excavations are back-filled, stabilised through compaction, and rehabilitated at ground level.

» *Insulators and Hardware*

The insulators and hardware are used to connect the conductors to the towers. The main types are glass, porcelain, and composite insulators.

Glass and porcelain have been used for many years, and are the most common. They are, however, heavy and susceptible to breakage by vandals, as well as contamination by pollution. Composite insulators have a glass-fibre core with silicon sheds for insulation. The composite insulators are light-weight and resistant to both vandalism and pollution. They are, however, more expensive than the more common glass insulators.

» *Conductors*
The conductors are made of aluminium with a steel core for strength. Power transfer is determined by the area of aluminium in the conductors. Conductors are used singularly, in pairs, or in bundles of three, four or six. The choice is determined by factors such as audible noise, corona, and electro-magnetic field mitigation.

Many sizes of conductor are available, the choice being based on the initial and life-cycle costs of different combinations of size and bundles, as well as the required load to be transmitted.

2.6. Servitude Negotiation and the EIA Process

Transmission power lines are constructed and operated within a servitude (110 m wide for 2X400kV lines) that is established along the entire length of the power line. Within this servitude, Eskom Transmission has certain rights and controls that support the safe and effective operation of the power line. The process of achieving the servitude agreement is referred to as the Servitude Negotiation (Acquisition) Process, or simply just the negotiation process. The following important points relating to the negotiation process should be noted:

» Servitude negotiation is a private matter between Eskom Transmission and the relevant (affected) landowner.
» The negotiation process involves a number of stages (see below), and culminates in the 'signing' of a servitude. Here Eskom Transmission enters into a legal agreement with the landowner.
» The servitude is registered as a 'right of way', and Eskom do not (purchase the land but the right to built and transmit electricity over the property) servitude from the landowner. Compensation measures are agreed in each case.
» The agreements will detail such aspects as the exact location and extent of the servitude, and access arrangements and maintenance responsibilities, as well as any specific landowner requirements.
» The negotiation process may take place at any time in the planning of a new power line (this is mostly after the EIA report/Environmental Authorisation when the preferred alternative is known..

» This process must be completed (i.e. the agreement must be signed) with the relevant landowner before construction starts on that property.
» The negotiation process is undertaken directly by Eskom Transmission either by its employees or a contract negotiator negotiating on behalf of Eskom and is independent of the EIA process. It is important that the aims of the two processes are seen as separate.

The EIA process has become important in the initial planning and route selection of new transmission lines. For this reason, it is usually preferable that the negotiation process begins after the EIA has been completed. At this stage there is greater confidence in the route to be adopted, and it would be supported by environmental authorisation. However, it may be required that the negotiation process begins earlier, and may begin before, or run in parallel with the EIA process. This may be due to urgent timeframes for the commissioning of the new power line, knowledge of local conditions and constraints, etc. Eskom Transmission has a right to engage with any landowner at any time, though they do so at risk if environmental authorisation has not been awarded.

2.6.1. The Negotiation Process

Eskom Transmission, often with assistance from contract negotiators is responsible for the negotiation process for all new transmission power lines. It is critical that the process is correctly programmed and incorporated into the planning of a new line. The negotiation process involves the following steps:

i. Initial meeting with the landowner.
ii. The signing of an 'option' to secure a servitude (this indicates that the owner will accept that the power line will traverse his property, subject to conditions to be finalised in the negotiation of the servitude agreement). An option is valid for one year.
iii. Once the route is confirmed (i.e. options are signed with the upstream and downstream landowners), the servitude agreement will be finalised with the individual landowners. This agreement will set out the conditions for the establishment, rehabilitation and maintenance of the servitude, and will be site-specific (as different landowners may have different requirements). Compensation payments would be made when the servitude is registered at the Deeds Office[6].

[6] Compensation will be based on present day property valuations for all properties obtained from registered evaluators. Eskom only pays compensation for the strip of land that is affected at 100% of present day property value. In cases where properties are significantly affected, Eskom may consider purchasing the whole property at present day market value. All improvements will be valued. Sentimental value is not considered in any valuations as it is not measurable. Valuations are done according to the Expropriation Act.

iv. Once construction is complete and the land rehabilitated to the landowners satisfaction (and as agreed prior to construction), the landowner signs a 'Final Release' certificate. Until the 'Final Release' certificate has been signed, Eskom Transmission remains liable for the condition of the land.

v. Once the clearance certificate is signed, the responsibility for the power line and servitude is handed over to the regional Eskom Transmission office.

2.7. Project Operation Phase

The expected lifespan of the proposed transmission power line and substation is between 35 and 40 years, depending on the maintenance undertaken on the power line and substation structures.

During the life-span of the transmission power line and substation, on-going maintenance is performed. Power line inspections are undertaken on an average of 1 – 2 times per year, depending on the area. During this maintenance period, the power line is accessed via the access routes, as agreed with affected landowners during the negotiation phase. During maintenance activities on the substation, components may require replacement in order to significantly extend the lifespan of the substation. Maintenance of the power line and substation is required to be undertaken in accordance with the specifications of the Environmental Management Plan (EMP) which forms part of this EIA Report (refer to Appendix O).

The creation of additional employment opportunities during the operational phase of the power line and substation will be limited, and will be restricted to skilled maintenance personnel employed by Eskom.

2.6.1. Servitude Maintenance Responsibilities

The management of a transmission power line servitude is dependent on the details and conditions of the agreement between the landowner and Eskom Transmission, and are therefore site-specific. These may, therefore, vary from one location to another. However, it is a common occurrence that there is a dual responsibility for the maintenance of the servitude:

» Eskom Transmission will be responsible for the tower structures, maintenance of access roads, watercourse crossings, and gates and fences relating to servitude access.
» The landowner will retain responsibility for the maintenance of the land and land use within the servitude (e.g. cropping activities, veld management, etc.).

Exceptions to the above may arise where, for example dual use is made of the access roads and gates or specific land use limitations are set by Eskom Transmission within the servitude which directly affects the landowner (e.g. forestry). Maintenance responsibilities are, ultimately, clearly set out in the servitude agreement.

APPROACH TO UNDERTAKING THE ENVIRONMENTAL IMPACT ASSESSMENT PHASE CHAPTER 3

An Environmental Impact Assessment (EIA) process refers to the process (dictated by the EIA Regulations) which involves the identification of and assessment of direct, indirect and cumulative environmental impacts associated with a proposed project. The EIA process comprises two phases: **Scoping Phase** and **EIA Phase**. The EIA process culminates in the submission of an EIA Report (including a draft environmental management plan (EMP) to the competent authority for decision-making. The EIA process is illustrated below:

The EIA process for the proposed Tshwane Strengthening Project has been undertaken in accordance with the EIA Regulations published in Government Notice 28753 of 21 April 2006, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). The environmental studies for this proposed project were undertaken in two phases, in accordance with the EIA Regulations.

3.1. Phase 1: Scoping Study

The Scoping Study, which commenced in May 2009, provided I&APs with the opportunity to receive information regarding the proposed project, participate in the process and raise issues of concern.

The Scoping Report aimed at detailing the nature and extent of the proposed Tshwane Strengthening Project, identifying potential issues associated with the proposed project, and defining the extent of studies required within the EIA. This was achieved through an evaluation of the proposed project, involving the project proponent, specialist consultants, and a consultation process with key stakeholders that included both relevant government authorities and interested and affected parties (I&APs). In accordance with the requirements of the EIA Regulations, feasible project-specific alternatives (including the 'do nothing' option) were identified for consideration within the EIA process.

The draft EIR compiled was made available at public places for I&AP review and comment from the 03 March to 07 April 2010. All the comments, concerns and suggestions received during the report review period are included in the final EIA Report. The Final Scoping Report and Plan of Study for EIA were submitted to the National Department of Environmental Affairs and Tourism (DEA) and the Gauteng Department of Agriculture and Rural Development (GDARD) in September 2009. The Final Scoping Report was accepted by DEA, as the competent authority in January 2010 (refer to Appendix B). In terms of this acceptance, an Environmental Impact Assessment was required to be undertaken for the proposed project.

3.2. Phase 2: Environmental Impact Assessment

Through the Scoping Study, feasible alternatives were identified for further investigation in the EIA Phase of the process. These alternatives are described in Chapter 2 of this report. A number of issues requiring further study for all components of the project (i.e. the substation and power lines) were highlighted. A comparative assessment of identified issues associated with the identified feasible alternatives has been undertaken within the EIA phase of the process (refer to Chapter 6).

The EIA Phase aimed to achieve the following:

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

The EIA addresses potential environmental impacts and benefits (direct, indirect and cumulative impacts) associated with all phases of the project including design, construction, operation and decommissioning, and aims to provide the environmental authorities with sufficient information to make an informed decision regarding the proposed project.

3.3. Overview of the EIA Phase

The EIA Phase has been undertaken in accordance with the EIA Regulations published in Government Notice 28753 of 21 April 2006, in terms of NEMA. Key tasks undertaken within the EIA phase included:

» Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
» Undertaking a public involvement process throughout the EIA process in accordance with Regulation 56 of Government Notice No R385 of 2006 in order to identify any additional issues and concerns associated with the proposed project.
» Preparation of a Comments and Response Report detailing key issues raised by I&APs as part of the EIA Process (in accordance with Regulation 59 of Government Notice No R385 of 2006).
» Undertaking of independent specialist studies in accordance with Regulation 33 of Government Notice No R385 of 2006.
» Preparation of this Draft EIA Report in accordance with the requirements of the Regulation 32 Government Notice No R385 of 2006.

These tasks are discussed in detail below.

3.3.1. Authority Consultation

As Eskom is a state-owned enterprise (SoE), the National DEA is the competent authority for this application. A record of all authority consultation undertaken prior to the commencement of the EIA Phase was included within the Scoping Report. Consultation with the regulating authorities (i.e. DEA and GDARD) has continued throughout the EIA process. Authority consultation within the EIA process included the following:

» Pre-application consultation regarding the proposed project and the EIA process to be undertaken.
» Submission of applications for authorisation to DEA for the Apollo-Verwoerdburg substation extension and loop in and out transmission lines. Copies of these applications were submitted to GDARD. These applications were approved and the reference numbers 12/12/20/1470 (transmission power lines), and 12/12/20/1471 (Kwagga-Phoebus power lines) and 12/12/20/1524 (Kwagga-Phoebus substations) were allocated to the project. Authorisation was thus granted to continue with the Scoping Phase of the project.
» Ongoing consultation with the regulating authorities regarding the EIA process and specific requirements in this regard.

» Submission of the Final Scoping Report to DEA and GDARD and receipt of approval letter in January and February, respectively 2010.
» A consultation meeting in order to discuss the proposed project, alternatives identified, the public consultation process undertaken and the issues identified for consideration in the EIA process.

The following will also be undertaken as part of this EIA process:

» A consultation meeting with DEA and GDARD in order to discuss the findings and conclusions of the EIA Report, should they require.

A record of all authority consultation undertaken prior to the commencement of the EIA Phase was included within the Scoping Report. A record of the consultation in the EIA process is included within Appendix B.

3.3.2. Comparative Assessment of Alternatives

The following project alternatives were investigated in the EIA (refer to Figure 2.4):

» Power line alternative corridors 1, 2, 3 and 3a.
» Land adjacent to the existing Verwoerdburg substation is the only feasible site for the extension of the Verwoerdburg substation.

These alternatives are described in detail in Chapter 2 of this report.

3.3.3. Public Involvement and Consultation

The aim of the public participation process was primarily to ensure that:

» Information containing all relevant facts in respect of the proposed project was made available to potential stakeholders and I&APs.
» Participation by potential I&APs was facilitated in such a manner that all potential stakeholders and I&APs were provided with a reasonable opportunity to comment on the proposed project.
» Comment received from stakeholders and I&APs was recorded and incorporated into the EIA process.

Through on-going consultation with key stakeholders and I&APs, issues raised through the Scoping Phase for inclusion within the EIA study were confirmed. All relevant stakeholder and I&AP information has been recorded within a database of affected parties (refer to Appendix C for a listing of recorded parties and landowner consultation map). While I&APs were encouraged to register their interest in the project from the onset of the process, the identification and

registration of I&APs has been ongoing for the duration of the EIA process and the project database has been updated on an on-going basis. A total of 89 parties have registered their interest in the project to date.

In order to accommodate the varying needs of stakeholders and I&APs, as well as ensure the relevant interactions between stakeholders and the EIA specialist team, the following opportunities were provided for I&APs issues to be recorded and verified through the EIA phase, including:

» Focus group meetings (pre-arranged and stakeholders invited to attend).
» One-on-one consultation meetings and telephonic consultation sessions (consultation with various parties, for example with directly affected landowners, by the project participation consultant as well as specialist consultants).
» Written, faxed or e-mail correspondence.

Records of all consultation undertaken in the EIA phase of the process are shown in Table 3.1 below and within Appendix D.

Table 3.1: Record of Meeting held during the EIA process

Meeting	Organisation/stakeholder	Date
Internal Stakeholder Meeting	City of Tshwane Electricity	22 June 2009
Local Authority Meeting	City of Tshwane Open Space Planning Department	21 August 2009
Focus Group Meeting	Wildlife and Environment Society of South Africa (WESSA) and AgriGAUTENG	28 July 2009, 12 August 2009 and 20 January 2010
Public Meeting	Interested and Affected Parties (Community)	12 August 2009
Authority Meeting	City of Tshwane Electricity	18 and 23 March 2010
Public Meeting	Interested and Affected Parties	18 March 2010

3.3.4. Identification and Recording of Issues and Concerns

Issues and comments raised by I&APs over the duration of the EIA process have been synthesised into Comments and Response Reports (refer to Appendix E for the Comments and Response Reports compiled from both the Scoping and EIA Phases). A summary of the key issues raised to date includes:

» Social and socio-economic issues

» Visual issues
» Biodiversity issues
» EIA process comments/issues
» Technical comments/issues
» Issues related to the proposed route alternative corridors
» Servitude comments/concerns
» Compensation comments/concerns
» Existing infrastructure
» Proposed/planned infrastructure/developments
» Eskom distribution related issues
» Communication issues

Where possible, comprehensive responses to issues raised have been included in the Comments and Response Report by the EIA project team as well as Eskom Transmission. Where issues are raised that the EIA team considers beyond the scope and purpose of this EIA process, clear reasoning for this view is provided.

3.3.5. Summary of Frequently Raised Issues

Table 3.2 provides a summary of issues/comments frequently raised through the public participation process regarding the proposed project. Responses regarding the way forward regarding these key issues/comments are also provided.

Table 3.2: Summary of key issues raised through the public participation process

Issue/Concern	Reference in SIA and Comments and Responses Report
Although the alternative routes for the project cross-agricultural land, it is well inside the urban edge and most, if not all of the land, already belong to developers. Furthermore, we don't see any intensive farming operations that could be affected by any one of the two routes. [Freek Tomlinson, AGRIGauteng]	*Section 3.1.2: Changes in access to resources that sustain livelihoods*
We are keen to understand how landowners within the Doornkloof East area are going to be affected by the proposed loop-in power lines and also the beneficiaries of the project. [Herman Joubert, landowner]	*Impacts are assessed throughout the SIA report*
Why is the alternative route adjacent to the M57 following the existing power lines not included in the maps and the draft scoping report? This alternative seems a better option if one were to consider that the area along the M57 is already transformed.	*Addressed throughout the SIA as an assessment of Alternative 3*

[David Boshof]	
We are currently busy with the designs for the development of light industry in our property along one of the proposed loop-in line alternatives [Herman Joubert, landowner]	*Section 3.1.2: Changes in access to resources that sustain livelihoods*
Why is the existing line not being considered as an alternative in order to keep impacts within the already transformed areas. [Nico van Wyk]	*Addressed throughout the SIA as an assessment of Alternative 3*
The potential impact of the proposed development including the upgrade of the substation on the road users is very important and this should be taken into account during the design phase of the project. [Nico van Wyk]	*Section 3.1.2: Change in traffic volumes and patterns on (access) roads*

3.3.6. Assessment of Issues Identified through the Scoping Process

Based on the findings of the Scoping Study, the following issues were identified as being of low significance, and therefore not requiring further investigation within the EIA:

» Potential impacts on topography
» Potential impacts on transmission infrastructure associated with climate and atmospheric conditions
» Potential impacts associated with geology and soils

Issues which require further investigation within the EIA phase, as well as the specialists involved in the assessment of these impacts are indicated in Table 3.3.

Table 3.3: Specialist studies undertaken within the EIA phase

Specialist Study	Specialist	Qualification and Registration/Affiliation
Biodiversity	Riaan Robbeson of Bathusi Environmental Consulting	MSc Plant Ecology, 8 years experience South African Council of Natural Scientific Professions (SACNASP), Ecological Scientist & Botanical Scientist Reg no: 400005/03
Avifauna	Luke Strugnell and Jon Smallie of Endangered Wildlife Trust	BSc Environmental Management) 2 years experience. South African Council of Natural Scientific Professions (SACNASP) Reg No: 400181/094000/09
Visual impact	Lourens Du Plessis of MetroGIS	BA (Geography and Anthropology) 11

assessment		years experience in GIS and visual impact assessment
Heritage Impact Assessment	Dr Julius Pretorius	D Phil Archaeology, Member of the Association of Southern African Professional Archaeologists (ASAPA) Member of the South African Archaeological Society, 28 years experience
Agricultural Potential	Garry Paterson of ARC – Institute for Soil, Climate and Water	Pr. Sci. Nat. Over 15 years experience
Social Impact Assessment	Nonka Byker of MasterQ Research	B Psych, NQF Assessor (Institute for People Development, 2005) Member of the Health Professions Council of South Africa (PRC 0000396) 3 years experience

Specialists investigations included desk-top evaluations of existing information (including that provided by land owners during the public participation process), as well as detailed field surveys (including Red Data field survey by the ecologist specialist) of the identified corridors and substation extension site. In undertaking field assessment and public participation, contact was made with all affected land owners.

An external review of the EIA process was undertaken by CEN Integrated Environmental Management Unit. The external reviewer has undertaken review for similar projects including Kyalami Strengthening Project, Mokopane Integration Project etc.

Specialist studies considered direct and indirect environmental impacts associated with the development of all components of the Tshwane Strengthening Project Phase 1. Issues were assessed in terms of the following criteria:

» The **nature**, a description of what causes the effect, what will be affected and how it will be affected.
» The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international.
» The **duration**, wherein it is indicated whether:
  * the lifetime of the impact will be of a very short duration (0–1 years);
  * the lifetime of the impact will be of a short duration (2-5 years);
  * medium-term (5–15 years);
  * long term (> 15 years); or
  * permanent.

» The **magnitude**, quantified o:
  * small and will have no effect on the environment;
  * minor and will not result in an impact on processes;
  * low and will cause a slight impact on processes;
  * moderate and will result in processes continuing but in a modified way;
  * high (processes are altered to the extent that they temporarily cease); and
  * very high and results in complete destruction of patterns and permanent cessation of processes.
» The **probability of occurrence**, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned:
  * improbable (probably will not happen);
  * improbable (some possibility, but low likelihood);
  * Assigned a score of 3 is probable (distinct possibility);
  * highly probable (most likely); and
  * definite (impact will occur regardless of any prevention measures).
» The **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.
» The **status**, which is described as positive, negative or neutral.
» The degree to which the impact can be reversed (**reversibility**).
» The degree to which the impact may cause **loss of irreplaceable resources**.
» The degree to which the impact can be *mitigated*.

The above criteria will be rated using the criteria indicated in the table below.

Magnitude	Reversibility	Duration	Spatial extent	Probability
5– Very high/ don't know	1-Reversible (regenerates naturally)	5- Permanent	5- International	5- Definite/don't know
4 - High		4- Long term (impact ceases after operational life)	4- National	4- High probability
3 - Moderate	3- Recoverable (needs human input)	3- Medium term (5- 15 years)	3- Regional	3- Medium probability
2 - Low		2- Short term (0-5 years)	2- Local	2- Low probability
1- Minor	5- Irreversible	1 - Immediate	1 – Site only	1-Improbable
0 - None				0 - None

The overall consequence of an impact must be determined by the sum of the individual score for magnitude, reversibility, duration and extent of an impact, multiplied by the probability of the impact occurring.

Significance = Consequence (severity + reversibility + duration + spatial scale) X Probability

The significance is then characterised as follows:

» **More than 60 significance points** indicate **High e**nvironmental significance,
» **Between 30** and **60 significance points** indicate **Moderate** environmental significance,
» **Less than 30 significance points** indicate **Low** environmental significance.

The impacts are ranked according to the significance rating results obtained. The relevant mitigation measures recommended are then considered and the significance of the impacts after mitigation determined. The impacts are then being ranked again according to the significance results after mitigation.

A specialist workshop was held on the 14th of January 2010, with all the specialists from the EIA team in attendance. The conclusions of each of the specialist studies were discussed and overall recommendation made regarding the preferred corridor for consideration by the competent authority (DEA).

3.3.6. Assumptions and Limitations

The following assumptions and limitations are applicable to the studies undertaken within this EIA Phase:

» All information provided by Eskom and I&APs to the Environmental Team was correct and valid at the time it was provided.
» Should the project be authorised by DEA, the Transmission line corridors identified by Eskom, and investigated through the EIA process are technically and economically viable.
» Should the project be authorised by DEA, the final power line route will be determined by Eskom through the negotiation process after the EIA process within the nominated preferred power line corridor.
» Strategic, forward planning deliberations are reflected in the IEP, NIRP and ISEP planning processes and do not form part of this EIA.

3.3.7. Public Review of Draft EIA Report and EIA Feedback Meeting

The Draft EIA Report was made available for public review from 03 March to 07 April 2010. During the public review period, a Public Meeting, Stakeholder Meeting and an authority meeting was held in order to facilitate comments on the Draft EIA Report.

Copies of the draft report were also made available to the City of Tshwane Metropolitan Municipality and Kungwini Local Municipality. Affected parties and stakeholders were also given CDs containing the report, on request.

The availability and duration of the public review process was advertised in Rekord Nord, Rekord Wes, Pretoria News, Daily Sun and the Citizen. In addition, all registered I&APs were notified of the availability of the report and public meeting by letter (refer to Appendix D).

3.3.8. Final EIA Report

The final EIA Report entails the comments from I&APs on the Draft EIA Report as well as the responses from the applicant and the EAP because the decision-making by environmental authorities is based upon these comments and responses.

3.4. Regulatory and Legal Context

The South African energy industry is evolving rapidly, with regular changes to legislation and industry role-players. The regulatory hierarchy for an energy transmission project of this nature consists of three tiers of authority who exercise control through both statutory and non-statutory instruments – that is National, Provincial and local levels.

3.4.1. Regulatory Hierarchy

At National Level, the main regulatory agencies are:

» *National Energy Regulator of South Africa (NERSA)*: This body is responsible for regulating all aspects of the electricity sector.
» *Department of Environmental Affairs (DEA)*: This Department is responsible for environmental policy and is the controlling authority in terms of NEMA and the EIA Regulations. DEA is the competent authority for this project, and charged with granting the relevant environmental authorisation.
» *Department of Energy (DE)*: This department is responsible for policy relating to all energy forms. It is the controlling authority in terms of the Electricity Act (Act No 41 of 1987).

» *Department of Transport and Public Works*: This department is responsible for roads and the granting of exemption permits for the conveyance of abnormal loads (as may be associated with the construction phase) on public roads.
» *South African Heritage Resources Agency*: This agency is responsible for any heritage resources and the granting of permits in any projects that have any potential impacts on the heritage resources of South Africa.

At Provincial Level, the main regulatory agency is:

» Gauteng Department of Agriculture and Rural Development (GDARD): This is the provincial authority involved in the EIA process and determines many aspects of Provincial Environmental policy. The department is a commenting authority for this project.

At Local Level, the local and municipal authorities are the principal regulatory authorities responsible for planning, land use and the environment. The proposed project falls within the City of Tshwane Metropolitan Municipality and Kungwini Local Municipality.

» In terms of the Municipal Systems Act (Act No 32 of 2000) it is compulsory for all municipalities to go through an Integrated Development Planning (IDP) process to prepare a five-year strategic development plan for the area under their control.
» By-laws and policies have been formulated by local authorities to protect environmental resources relating to issues such as air quality, community safety, etc.

3.4.2. Legislation and Guidelines that have informed the preparation of this EIA Report

The following legislation and guidelines have informed the scope and content of this Draft EIA Report:

» National Environmental Management Act (Act No 107 of 1998)
» EIA Regulations, published under Chapter 5 of the NEMA (GN R385, GN R386 and GN R387 in Government Gazette 28753 of 21 April 2006)
» Guidelines published in terms of the NEMA EIA Regulations, in particular:
  * Guideline 3: General Guide to Environmental Impact Assessment Regulations, 2006 (DEAT, June 2006)
  * Guideline 4: Public Participation in support of the Environmental Impact Assessment Regulations, 2006 (DEAT, May 2006)
  * Guideline 5: Assessment of alternatives and impacts in support of the Environmental Impact Assessment Regulations, 2006 (DEAT, June 2006)

Acts, standards or guidelines which have informed the project process and the scope of issues assessed within this EIA are summarised in Table 3.4.

Table 3.4: List of applicable legislation and compliance requirements required for the Tshwane Strengthening Project Phase 1.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
National Legislation			
National Environmental Management Act (Act No 107 of 1998)	EIA Regulations have been promulgated in terms of Chapter 5. Activities which may not commence without an environmental authorisation are identified within these Regulations. In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be considered, investigated, assessed and reported on to the competent authority (the decision-maker) charged by NEMA with granting of the relevant environmental authorisation. In terms of GNR 387 of 21 April 2006, a scoping and EIA process is required to be undertaken for the proposed project	National Department of Environmental Affairs and Tourism – lead authority. Gauteng Department of Agriculture, Conservation and Environment – commenting authority.	The final EIA report will be submitted to DEA and GDARD in support of the **application for authorisation** submitted in March 2009.
National Environmental Management Act (Act No 107 of 1998)	In terms of the Duty of Care provision in S28(1) Eskom as the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, stopped or minimised. In terms of NEMA, it has become the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.	Department of Environmental Affairs (as regulator of NEMA).	While **no permitting or licensing requirements** arise directly by virtue of the proposed project, this section will find application during the EIA phase and will continue to apply throughout the life cycle of the project.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
Environment Conservation Act (Act No 73 of 1989)	National Noise Control Regulations (GN R154 dated 10 January 1992).	National Department of Environmental Affairs Local authorities	» Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that— 5 *(a)* the containers in which any waste is stored, are intact and not corroded or in any other way rendered unlit for the safe storage of waste; *(b)* adequate measures are taken to prevent accidental spillage or leaking; *(c)* the waste cannot be blown away; *(d)* nuisances such as odour, visual impacts and breeding of vectors do not arise; 10 and *(e)* pollution of the environment and harm to health are prevented There is **no requirement for a noise permit** in terms of the legislation. Noise impacts are expected to be associated with the construction phase of the project and are likely to present an intrusion impact to the local community. On-site activities should be limited to 6:00am to 6:00pm Monday – Saturday (excluding public holidays). Should activities need to be undertaken outside of these times, the

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
			surrounding communities will need to be notified and appropriate approval will be obtained from DEA and the Local Municipality.
National Water Act (Act No 36 of 1998)	Section 21 sets out the water uses for which a water use license is required.	Department of Water Affairs	As no water use (as defined in terms of S21 of the NWA) will be associated with the proposed project, **no water use permits or licenses** are required to be applied for or obtained.
National Water Act (Act No 36 of 1998)	In terms of Section 19, Eskom as the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to prevent and remedy the effects of pollution to water resources from occurring, continuing or recurring.	Department of Water Affairs (as regulator of NWA)	While **no permitting or licensing requirements** arise directly by virtue of the proposed project, this section will find application during the EIA phase and will continue to apply throughout the life cycle of the project.
National Heritage Resources Act (Act No 25 of 1999)	Section 38 states that Heritage Impact Assessments (HIAs) are required for certain kinds of development including » the construction of a road, power line, pipeline, canal or other similar linear development or barrier exceeding 300 m in length; » any development or other activity which will change the character of a site exceeding 5 000 m^2 in extent. The relevant Heritage Resources Authority must be notified of developments such as linear developments (such as roads and power lines), bridges exceeding 50 m, or any development or other activity which will change the character of	South African Heritage Resources Agency (SAHRA)	Certain sites/graves of archaeological significance were identified within the proposed power line corridors were identified and therefore impacts on archaeological sites associated with the proposed project are expected to be of moderate significance for alternative 1 and 2. A **permit** may, however, be required should any **cultural/heritage sites** of significance be unearthed during the construction phase of the transmission power lines or at the substation site.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	a site exceeding 5 000 m^2; or the re-zoning of a site exceeding 10 000 m^2 in extent. This notification must be provided in the early stages of initiating that development, and details regarding the location, nature and extent of the proposed development must be provided. Stand alone HIAs are not required where an EIA is carried out as long as the EIA contains an adequate HIA component that fulfils the provisions of Section 38. In such cases only those components not addressed by the EIA should be covered by the heritage component.		
National Environmental Management: Biodiversity Act (Act No 10 of 2004)	In terms of Section 57, the Minister of Environmental Affairs has published a list of critically endangered, endangered, vulnerable and protected species in GNR 151 in Government Gazette 29657 of 23 February 2007 and the regulations associated therewith in GNR 152 in GG29657 of 23 February 2007, which came into effect on 1 June 2007. In terms of GNR 152 of 23 February 2007: Regulations relating to listed threatened and protected species, the relevant specialists must be employed during the EIA phase of the project to incorporate the legal provisions as well as the regulations associated with listed threatened and protected species (GNR 152) into specialist reports in order to identify permitting requirements at an early stage of	National Department of Environmental Affairs	Some Red Data species were identified along the proposed alternative 1 and 2 and this means that Eskom might be carrying out restricted activity, as is defined in Section 1 of the Act, **a permit** may be required to be obtained in this regard. **Specialist flora and fauna studies** are required to be undertaken as part of the EIA process. A specialist ecological assessment has been undertaken for the proposed project (refer to Appendix F). A **permit** may be required should any **protected plant species** within the power line corridors or at the substation site be **disturbed or**

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	the EIA phase.		**destroyed** as a result of the proposed development.
Conservation of Agricultural Resources Act (Act No 43 of 1983)	Regulation 15 of GNR1048 provides for the declaration of weeds and invader plants, and these are set out in Table 3 of GNR1048. Weeds are described as Category 1 plants, while invader plants are described as Category 2 and Category 3 plants. These regulations provide that Category 1, 2 and 3 plants must not occur on land and that such plants must be controlled by the methods set out in Regulation 15E.	Department of Agriculture	While **no permitting or licensing requirements** arise from this legislation, this Act will find application during the EIA phase and will continue to apply throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies must be developed and implemented. In addition, a weed control and management plan must be implemented.
Hazardous Substances Act (Act No 15 of 1973)	This Act regulates the control of substances that may cause injury, or ill health, or death by reason of their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc, nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can	Department of Health	It is necessary to identify and list all the Group I, II, III and IV hazardous substances that may be on the substation site and in what operational context they are used, stored or handled. If applicable, a **license** is required to be obtained from the Department of Health.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	be declared to be Group I or Group II hazardous substance; Group IV: any electronic product; Group V: any radioactive material. The use, conveyance or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.		
National Road Traffic Act (Act No 93 of 1996)	The Technical Recommendations for Highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges and culverts. The general conditions, limitations and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of	Gauteng Department of Public Transport, Roads and Works (provincial roads) South African National Roads Agency Limited (national roads)	An **abnormal load/vehicle permit** may be required to transport the various power line and substation components to site for construction. These include: » Route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. » Transport vehicles exceeding the dimensional limitations (length) of 22m.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.		
National Environmental Management: Waste Act (Act No 59) of 2008	» The Minister may by notice in the *Gazette* publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. » The Minister may amend the list by— *(a)* adding other waste management activities to the list; *(b)* removing waste management activities from the list; or 55 *(c)* making other changes to the particulars on the list.	National Department of Environmental Affairs (DEA)	» Any person who stores waste must at least take steps, unless otherwise provided by this Act.
Gauteng Transport Infrastructure Act (Act 8 of 2001) of 2001	» The provincial MEC may grant permit to undertake works within 200m of the published route upon receipt of the report assessing the potential impacts thereof.	Gauteng Department of Public Transport, Roads and Works	» Any application for authorisation contemplated in the ECA and NEMA in respect of a 200m area on either side of a published route determination for a provincial road must be accompanied by a report that addresses the issues listed in that section of the Act. The proposed power line crosses this 200m wide area in respect of route K105. Eskom will undertake this process outside of the EIA process.